Final Step - B | Chemistry

The Solid State

CHOOSE THE CORRECT ALTERNATIVE. ONLY ONE CHOICE IS CORRECT. HOWEVER, QUESTIONS MARKED '*' MAY HAVE MORE THAN ONE CORRECT OPTION.

1. Which of the following is not a characteristic of a crystalline solid ?
- **(A)** Definite and characteristic heat of fusion
- **(B)** Isotropic nature
- **(C)** A regular periodically repeated pattern of arrangement of constituent particles in the entire crystal
- **(D)** A true solid

2. Which of the following is an amorphous solid ?
- **(A)** Graphite (C)
- **(B)** Quartz glass (SiO_2)
- **(C)** Chrome alum
- **(D)** Silicon carbide (SiC)

3. Which of the following arrangements shows schematic alignment of magnetic moments of anti-ferromagnetic substances ?
- **(A)** ↑ ↑ ↑ ↑ ↑ ↑
- **(B)** ↓ ↓ ↓ ↓ ↓ ↓
- **(C)** ↑ ↑ ↓ ↑ ↑ ↓
- **(D)** ↑ ↓ ↑ ↓ ↑ ↓

4. Which of the following is true about the value of refractive index of quartz glass ?
- **(A)** Same in all directions
- **(B)** Different in different directions
- **(C)** Cannot be measured
- **(D)** Always zero

5. Iodine molecules are held in the crystal lattice by _____.
- **(A)** London forces
- **(B)** Dipole-dipole interactions
- **(C)** Covalent bonds
- **(D)** Coulombic forces

***6.** Which of the following is a network solid ?
- **(A)** Graphite **(B)** I_2
- **(C)** Diamond **(D)** H_2O (Ice)

7. Which of the following oxide behaves as conductor or insulator depending upon temperature ?
- **(A)** CaO **(B)** SiO_2
- **(C)** Ti_2O_3 **(D)** MgO

8. The lattice site in a pure crystal cannot be occupied by _____.
- **(A)** Molecule **(B)** Ion
- **(C)** Electron **(D)** Atom

9. Schottky defect is observed in crystals when _____.
- **(A)** Some cations move from their lattice site to interstitial sites
- **(B)** Cations and anions are missing from the lattice in stoichiometric ratio
- **(C)** Some lattice sites are occupied by electrons
- **(D)** Some impurity is present in the lattice

10. Which of the following is true about the charge acquired by p-type semiconductor ?
- **(A)** Positive
- **(B)** Neutral
- **(C)** Negative
- **(D)** Depends on concentration of p impurity

11. The total number of tetrahedral voids in the face centred cubic unit cell is _____.
- **(A)** 6 **(B)** 8
- **(C)** 10 **(D)** 12

***12.** Which of the following point defects are shown by AgBr(s) crystals ?

(A) Schottky defect
(B) Frenkel defect
(C) Metal excess defect
(D) Metal deficiency defect

13. In which pair most efficient packing is present ?

(A) hcp and bcc **(B)** hcp and ccp
(C) bcc and ccp
(D) bcc and simple cubic cell

14. The percentage of empty space in a body centred cubic arrangement is _____.

(A) 74 **(B)** 68
(C) 32 **(D)** 26

***15.** Which of the following statement is(are) true about the hexagonal close packing ?

(A) The coordination number is 12
(B) It has 74% packing efficiency
(C) Tetrahedral voids of the second layer are covered by the sphere of the third layer
(D) In this arrangement spheres of the fourth layer are exactly aliened with those of the first layer

***16.** In which of the following structures coordination number for cations and anions in the packed structure will be same?

(A) Cl^- ion form fcc lattice and Na^+ ions occupy all octahedral voids of the unit cell
(B) Ca^{2+} ions form fcc lattice and F^- ions occupy all the eight tetrahedral voids of the unit cell
(C) O^{2-} ions form fcc lattice and Na^+ ions occupy all the eight tetrahedral voids of the unit cell
(D) S^{2-} ions form fcc lattice and Zn^{2+} ions go into alternate tetrahedral voids of the unit cell

17. What is the coordination number in a square close packed structure in two dimensions ?

(A) 2 **(B)** 3
(C) 4 **(D)** 6

18. Which kind of defects are introduced by doping in semiconductor materials ?

(A) Dislocation defect
(B) Schottky defect
(C) Frenkel defects
(D) Electronic defects

19. Silicon doped with electron-rich impurity forms _____.

(A) p-type semiconductor
(B) n-type semiconductor
(C) Intrinsic semiconductor
(D) Insulator

***20.** Which of the following statement is(are) true ?

(A) Paramagnetic substances are weakly attracted by magnetic field.
(B) Ferromagnetic substances cannot be magnetised permanently.
(C) The domains in antiferromagnetic substances are oppositely oriented with respect to each other.
(D) Pairing of electrons cancels their magnetic moment in the diamagnetic substances.

***21.** Which of the following statement is(are) true about the ionic solids ?

(A) Bigger ions form the close packed structure
(B) Smaller ions occupy either the tetrahedral or the octahedral voids depending upon their size
(C) Occupation of all the voids is not necessary
(D) The fraction of octahedral or tetrahedral voids occupied depends upon the radii of the ions occupying the voids

22. A ferromagnetic substance becomes a permanent magnet when it is placed in a magnetic field because _____.

(A) All the domains get oriented in the direction of magnetic field
(B) All the domains get oriented in the direction opposite to the direction of magnetic field
(C) Domains get oriented randomly
(D) Domains are not affected by magnetic field

23. Which of the following defects is also known as dislocation defect ?

(A) Frenkel defect
(B) Schottky defect
(C) Non-stoichimetric defect
(D) Simple interstitial defect

24. In the cubic close packing, the unit cell has _____.

(A) 4 tetrahedral voids each of which is shared by four adjacent unit cells
(B) 4 tetrahedral voids within the unit cell
(C) 8 tetrahedral voids each of the which is shared by four adjacent unit cells
(D) 8 tetrahedral voids within the unit cells

25. The edge lengths of the unit cells in terms of the radius of spheres constituting fcc, bcc and simple cubic unit cell respectively _____.

(A) $2\sqrt{2}r, \frac{4r}{\sqrt{3}}, 2r$ **(B)** $\frac{4r}{\sqrt{3}}, 2\sqrt{2}r, 2r$

(C) $2r, 2\sqrt{2}r, \frac{4r}{\sqrt{3}}$ **(D)** $2r, \frac{4r}{\sqrt{3}}, 2\sqrt{2}r$

26. CsCl crystallises in body centered cubic lattice. If 'a' its edge length, then which of the following expressions is correct?

(A) $r_{Cs^+} + r_{Cl^-} = 3a$

(B) $r_{Cs^+} + r_{Cl^-} = 3a/2$

(C) $r_{Cs^+} + r_{Cl^-} = \sqrt{3}a/2$

(D) $r_{Cs^+} + r_{Cl^-} = \sqrt{3a}$

27. Experimentally, it was found that a metal oxide has formula $M_{0.98}O$. Metal M, present as M^{2+} and M^{3+} in its oxide. Percentage of the metal which exists as M^{3+} would be :

(A) 7.01% **(B)** 4.08%
(C) 6.05% **(D)** 5.08%

28. Lithium forms body-centred cubic structure. The length of the side of its unit cell is 351 pm. Atomic radius of the lithium will be :

(A) 75 pm **(B)** 300 pm
(C) 240 pm **(D)** 152 pm

29. In a face-centred cubic lattice, atom A occupies the corner positions and atom B occupies the face centred positions. If one atom of B is missing from one of the face points, the formula of the compound is :

(A) A_2B **(B)** AB_2
(C) AB **(D)** A_2B_5

30. How many unit cells are present in a cube shaped ideal crystal of NaCl of mass 1.00 g?
[Atomic mass : Na = 23, Cl = 35.5]

(A) 2.57×10^{21} **(B)** 5.14×10^{21}
(C) 1.28×10^{21} **(D)** 1.71×10^{21}

31. The edge length of a face centred cubic cell of an ionic substance is 508 pm. If the radius of the cation is 110 pm, the radius of the anion is :

(A) 288 pm **(B)** 398 pm
(C) 618 pm **(D)** 144 pm

32. Percentage of free space in cubic close packed structure and in body centred packed structure are respectively :

(A) 30% and 26% **(B)** 26% and 32%
(C) 32% and 48% **(D)** 48% and 26%

33. Number of atoms in the unit cell of Na (bcc type crystal) and Mg (fcc type crystal) are, respectively :

(A) 4, 4 **(B)** 4, 2
(C) 2, 4 **(D)** 1, 1

34. In a compound, atoms of element Y form ccp lattice and those of element X occupy 2/3rd of tetrahedral voids. The formula of the compound will be :

(A) X_4Y_3 **(B)** X_2Y_3
(C) X_2Y **(D)** X_3Y_4

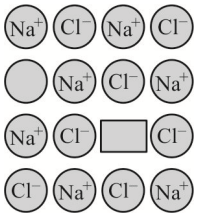
35. Total volume of atoms present in a face-centred cubic unit cell of a metal is (r is atomic radius) :

(A) $\frac{20}{3}\pi r^3$ **(B)** $\frac{24}{3}\pi r^3$
(C) $\frac{12}{3}\pi r^3$ **(D)** $\frac{16}{3}\pi r^3$

36. An ionic compound has a unit cell consisting of A ions at the corners of a cube and B ions on the centres of the faces of the cube. The empirical formula for this compound would be :

(A) A_3B **(B)** AB_3
(C) A_2B **(D)** AB

37 What type of crystal defect is indicated in the diagram shown below?



(A) Frenkel defect
(B) Schottky defect
(C) Interstitial defect
(D) Frenkel and Schottky defects

38. The vacant space in BCC lattice unit cell is :

(A) 48 % **(B)** 23 %
(C) 32 % **(D)** 26 %

39. If a is the length of the side of a cube, the distance between the body centered atom and one corner atom in the cube will be :

(A) $\frac{2}{\sqrt{3}}a$ **(B)** $\frac{4}{\sqrt{3}}a$
(C) $\frac{\sqrt{3}}{4}a$ **(D)** $\frac{\sqrt{3}}{2}a$

40. The number of carbon atoms per unit cell of diamond unit cell is :

(A) 6 **(B)** 1
(C) 4 **(D)** 8

41. The number of octahedral void(s) per atom present in a cubic close-packed structure is :

(A) 1 **(B)** 3
(C) 2 **(D)** 4

42. Structure of mixed oxide is cubic closed packed (ccp). The cubic unit cell of mixed oxide is composed of oxide ions. One fourth of the tetrahedral voids are occupied by divalent metal A and the octahedral voids are occupied by a monovalent metal B. The formula of the oxide is :

(A) ABO_2 **(B)** A_2BO_2
(C) $A_2B_2O_4$ **(D)** AB_2O_2

43. Which of the following statement is not correct ?

(A) The number of carbon atoms in unit cell of diamond is 8
(B) The number of Bravais lattices in which a crystal can be categorized is 14
(C) The fraction of the total volume occupied by the atoms in a primitive cell is 0.48
(D) Molecular solids are generally volatile

44. If 'a' stands for the edge length of the cubic systems: simple cubic, body centred cubic and face centred cubic, then the ratio of radii of the spheres in these systems will be respectively :

(A) $\frac{1}{2}a : \frac{\sqrt{3}}{2}a : \frac{\sqrt{2}}{2}a$
(B) $1a : \sqrt{3}a : \sqrt{2}a$
(C) $\frac{1}{2}a : \frac{\sqrt{3}}{4}a : \frac{1}{2\sqrt{2}}a$
(D) $\frac{1}{2}a : \sqrt{3}a : \frac{1}{\sqrt{2}}a$

45. The appearance of colour in solid alkali metal halides is generally due to :

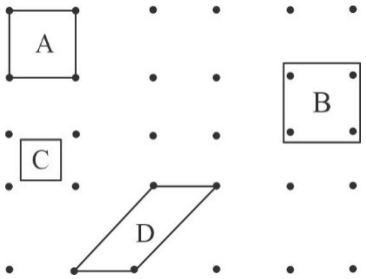
(A) interstitial positions
(B) F-centres
(C) Schottky defect
(D) Frenkel defect

46. If a solid $A^{\oplus}B^{\ominus}$ having ZnS structure is heated so that the ions along two of the axis passing through the face center particles are lost and bivalent ion (Z) enters here to maintain the electrical neutrality, so that the new formula unit becomes $A_xB_yZ_c$, Report the value of $x + y + c$.

47. Metal M of radius 50 nm is crystallized in FCC type and made cubical crystal such that face of unit cells aligned with face of cubical crystal. If the total number of metal atoms of M at all faces of cubical crystal is 6×10^{30}, then the area of one face of cubical crystal is $A\times10^{16}\ m^2$. Find the value of A.

48. O^{2-} ions are arranged in ccp in a spinel structure. A^{2+} ions occupy 1/8 of TVs and $B^{\oplus}$ ions occupy half of OV. The void volume of unit cell = 0.11 A. Find the value of A.

49. In the figure given below, four parallelogram are shown. How many parallelograms are unit cells?



50. Caesium atoms are the largest naturally occurring atoms. The radius of Cs atom is 2.6 Å. The number of moles of Cs atoms to be laid side by side to give a row of Cs atoms 2.50 cm long is $x \times 10^{-17}$. Find the value of x.

51. A solid has a structure in which X atoms are located at cubic corners of unit cell, O atom are at the edge centers and Y atoms at cube center. Then the formula of compound is $X_a Y_b O_c$.

If two atoms of O are missing from any of two edge centers per unit cell, then the molecular formula is $X_x Y_y O_z$.

Then, find the value of $(x + y + z) - (a + b + c)$.

52. A bcc lattice is made up of hollow spheres of B. Spheres of solids A are present in hollow spheres of B. The radius of A is half of the radius of B. The ratio of total volume of spheres of B unoccupied by A in a unit cell and volume of unit cell is

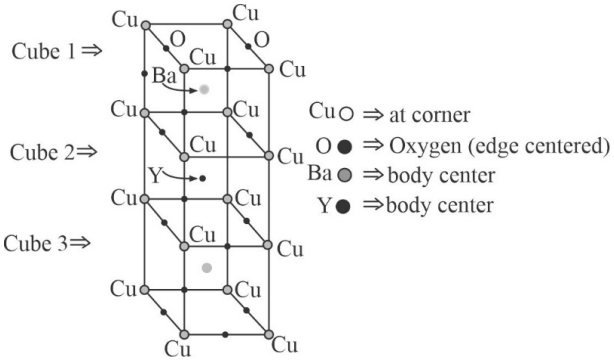
$A \times \frac{\pi\sqrt{3}}{64}$. Find the value of A.

53. Give the total score of the correct statements of the following.

	Statements	Score
a.	In an antifluorite structure, cations are present in all TVs	1
b.	If the radius of cation is 0.35 pm and that of anion is 0.95 pm, then the CN of the crystal is 4.	2
c.	An atom or ion is transferred from a lattice site to an interstitial position in Frenkel defect.	3
d.	The density of a crystal always decreases in point defects.	4

54. The following figure shows the unit cell of a compound, i.e., a mixed oxide of yttrium, barium, and copper. The formula of mixed oxide is $Y_a Ba_b cu_c O_d$.

Find the value of $(a + b + c + d)$.



55. The sum of number of hexagonal and triangular faces that are present in a truncated tetrahedron is:

56. How many next nearest neighbours are present of Zn^{+2} ions in FCC arrangement of ZnS.

Theory of Solutions

CHOOSE THE CORRECT ALTERNATIVE. ONLY ONE CHOICE IS CORRECT. HOWEVER, QUESTIONS MARKED '*' MAY HAVE MORE THAN ONE CORRECT OPTION.

1. The degree of dissociation 'α', of a weak electrolyte is :

(A) $\frac{i-1}{N+1}$ **(B)** $\frac{i-1}{N-1}$

(C) $\frac{N-1}{i-1}$ **(D)** $\frac{N+1}{i-1}$

where N is the number of ions given by 1 mol of the electrolyte.

2. When an aqueous solution freezes,

(A) Usually it is the solute that solidifies first

(B) The solvent and the solute solidify at the same time

(C) It is the water that solidifies first

(D) The vapour pressure of the solvent becomes abnormally high

3. Given that ΔT_f is the depression in freezing point of the solvent in a solution of a non-volatile solute of molality m, the quantity $\lim_{m\to 0}\left(\frac{\Delta T_f}{m}\right)$ is equal to:

(A) L_f (latent heat of fusion)

(B) K_b (ebullioscopic constant)

(C) K_f (cryoscopic constant)

(D) ΔH_{fus} (enthalpy of fusion)

4. The ratio of freezing-point depression values of 0.01 M solutions of urea, common salt and Na_2SO_4 are :

(A) 1 : 1 : 1 **(B)** 1 : 2 : 1

(C) 1 : 2 : 3 **(D)** 2 : 2 : 3

5. CNS^- ions give red colour with Fe^{3+} ions in aqueous solution as :

$$Fe^{3+}_{(aq)} + 3CNS^-_{(aq)} \longrightarrow \underset{\text{red}}{Fe(CNS)_{3(aq)}}$$

If 0.1M KCNS solution is separated from 0.1M $FeCl_3$ solution by means of semipermeable membrane, red colour will appear on :

(A) $FeCl_3$ solution

(B) KCNS solution side

(C) Both sides

(D) Neither side

***6.** Which pair(s) of liquids on mixing are expected to show no net volume change and no heat effect?

(A) Acetone and ethanol

(B) Chlorobenzene and bromobenzene

(C) Chloroform and benzene

(D) n-butyl chloride and n-butyl bromide

7. The osmotic pressure of a solution increases if the :

(A) Number of solute molecules is increased

(B) Temperature is decreased

(C) Volume is increased

(D) Number of solute molecules is decreased

***8.** Which of the following statements is correct ?

(A) The freezing point of water is depressed by the addition of glucose

(B) The degree of dissociation of a weak electrolyte decreases as its concentration decreases

(C) Energy is released when a substance dissolves in water provided that the hydration energy of the substance is more than its lattice energy

(D) If two liquids that form an ideal solution are mixed, the change in entropy is positive

***9.** The Maximum amount of a solid solute that can be dissolved in a specified amount of a given liquid solvent depend upon :

(A) Temperature **(B)** Nature of solute

(C) Pressure **(D)** Nature of solvent

10. Low concentration of oxygen in the blood and tissues of people living at high altitude is due to_____.

(A) Low temperature

(B) Low atmospheric pressure

(C) High atmospheric pressure

(D) Both low temperature and high atmospheric pressure

11. The unit of ebulioscopic constant is_____.

(A) $K\ kg\ mol^{-1}$ or $K\,(molality)^{-1}$

(B) $mol\,kg\,K^{-1}$ or $K^{-1}\,(molality)$

(C) $kg\,mol^{-1}\,K^{-1}$ or $K^{-1}\,(molality)^{-1}$

(D) $K\ kg\ mol^{-1}$ or $K\,(molality)$

***12.** Which of the following statements is(are) correct?

(A) Two different solutions of sucrose of same molality prepared in different solvents will have the same depression in freezing point

(B) The osmotic pressure of a solution is given by the equation $\Pi = CRT$ (where C is the molarity of the solution)

(C) Decreasing order of osmotic pressure for 0.01 M aqueous solutions of barium chloride, potassium chloride, acetic acid and sucrose is $BaCl_2 > KCl > CH_3COOH >$ sucrose.

(D) According to Raoult's law, the vapour pressure exerted by a volatile component of a solution is directly proportional to its mole fraction in the solution

***13.** Which of the following statements is(are) true?

(A) Units of atmospheric pressure and osmotic pressure are the same

(B) In reverse osmosis, solvent molecules move through a semipermeable membrance from a region of lower concentration of solute to a region of higher concentration

(C) The value of molal depression constant depends on nature of solvent

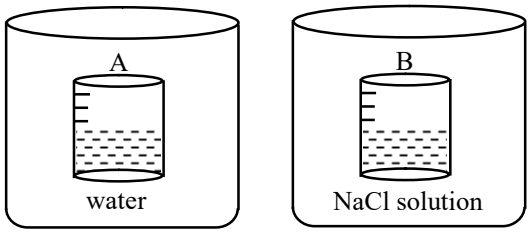
(D) Relative lowering of vapour pressure, is a dimensionless quantity

14. We have three aqueous solutions of NaCl labeled as 'A', 'B' and 'C' with concentrations 0.1 M, 0.01M and 0.001 M, respectively. The value of van't Hoff factor for these solutions will be in the order_____.

(A) $i_A < i_B < i_C$ **(B)** $i_A > i_B > i_C$

(C) $i_A = i_B = i_C$ **(D)** $i_A < i_B > i_C$

15. Two beakers of capacity 500 mL were taken. One of these beakers, labeled as "A", was filled with 400 mL water whereas the beaker labeled "B" was filled with 400 mL of 2 M solution of NaCl. At the same temperature both the beakers were placed in closed containers of same material and same capacity as shown in figure :



At a given temperature, which of the following statement is correct about the vapour pressure of pure water and that of NaCl solution.

(A) Vapour pressure in container (A) is more than that in container (B)

(B) Vapour pressure in container (A) is less than that in container (B)

(C) Vapour pressure is equal in both the containers

(D) Vapour pressure in container (B) is twice the vapour pressure in container (A)

16. If two liquids A and B form maximum boiling azeotrope at some specific composition then_____.

(A) A – B interactions are stronger than those between A – A or B – B

(B) vapour pressure of solution increases because more number of molecules of liquids A and B can escape from the solution

(C) vapour pressure of solution decreases because less number of molecules of only one of liquids escape from the solution

(D) A – B interactions are weaker than those between A – A or B – B

17. On the basis of information given below mark the correct option.

Information: On adding acetone to methanol some of the hydrogen bonds between methanol molecules break.

(A) At specific composition methanol-acetone mixture will form minimum boiling azeotrope and will show positive deviation from Raoult's law

(B) At specific composition methanol-acetone mixture forms maximum boiling azeotrope and will show positive deviation from Raoult's law

(C) At specific composition methanol-acetone mixture will form minimum boiling azeotrope and will show negative deviation from Raoult's law

(D) At specific composition methanol-acetone mixture will form maximum boiling azeotrope and will show negative deviation from Raoult's law

18. K_H value for Ar(g), CO_2(g), HCHO (g) and CH_4(g) are 40.39, 1.67, 1.83×10^{-5} and 0.413 respectively. Arrange these gases in the order of their increasing solubility.

(A) $HCHO < CH_4 < CO_2 < Ar$

(B) $HCHO < CO_2 < CH_4 < Ar$

(C) $Ar < CO_2 < CH_4 < HCHO$

(D) $Ar < CH_4 < CO_2 < HCHO$

***19.** Which of the following factor (s) affect the solubility of a gaseous solute in the fixed volume of liquid solvent?

I. Nature of solute **II.** Temperature

III. Pressure

The correct choice is :

(A) I and III at constant T

(B) I and II constant P

(C) II and III only

(D) III only

***20.** Intermolecular forces between two benzene molecules are nearly of same strength as those between two toluene molecules. For a mixture of benzene and toluene, which of the following are **not** true?

(A) $\Delta_{mix} H$ = zero

(B) $\Delta_{mix} V$ = zero

(C) These will form minimum boiling azeotrope

(D) These will not form ideal solution

21. Relative lowering of vapour pressure is a colligative property because_____.

(A) It depends on the concentration of a non electrolyte solute in solution and does not depend on the nature of the solute molecules

(B) It depends on number of particles of electrolyte solute in solution and does not depend on the nature of the solute particles.

(C) It depends on the concentration of a non electrolyte solute in solution as well as on the nature of the solute molecules

(D) It depends on the concentration of an electrolyte or non-electrolyte solute in solution as well as on the nature of solute molecules

***22.** Isotonic aqueous solutions must have the same_____.

(A) Solute

(B) Density

(C) Elevation in boiling point

(D) Depression in freezing point

***23.** Which of the following binary mixtures will have same composition in liquid and vapour phase?

(A) Benzene-Toluene

(B) Water-Nitric acid

(C) Water-Ethanol

(D) n-Hexane-n-Heptane

***24.** Colligative properties are observed when_____.

(A) A non volatile solid is dissolved in a volatile liquid

(B) A non volatile liquid is dissolved in another volatile liquid

(C) A gas is dissolved in non volatile liquid

(D) A volatile liquid is dissolved in another volatile liquid

25. Consider the separate solution of 0.500 M $C_2H_5OH_{(aq)}$, 0.100 M $Mg_3(PO_4)_2$ (aq), 0.250 M KBr (aq) and 0.125M Na_3PO_4(aq) at 25°C. Which statement is true about these solutions, assuming all salts to be strong electrolytes?

(A) They all have same osmotic pressure

(B) 0.100 M $Mg_3(PO_4)_2$ (aq) has the highest osmotic pressure

(C) 0.125 M Na_3PO_4 (aq) has the highest osmotic pressure

(D) 0.5000 M C_2H_5OH (aq) has the highest osmotic pressure

26. K_f for water is 1.86 K kg mol^{-1}. If your automobile radiator holds 1.0 kg of water, then how many grams of ethylene glycol ($C_2H_6O_2$) must you add to get the freezing point of the solution lowered to –2.8°C?

(A) 72 g **(B)** 93 g

(C) 39 g **(D)** 27 g

27. A 5.2 molal aqueous solution of methyl alcohol, CH_3OH, is supplied. What is the mole fraction of methyl alcohol in the solution?

(A) 0.100 **(B)** 0.190

(C) 0.086 **(D)** 0.050

28. The degree of dissociation (α) of weak electrolyte, A_xB_y is related to van't Hoff factor (i) by the expression.

(A) $\alpha = \dfrac{i-1}{(x+y-1)}$ **(B)** $\alpha = \dfrac{i-1}{(x+y+1)}$

(C) $\alpha = \dfrac{x+y-1}{i-1}$ **(D)** $\alpha = \dfrac{x+y+1}{i-1}$

29. A binary liquid solution is prepared by mixing n-heptane and ethanol. Which one of the following statements is correct regarding the behaviour of the solution?

(A) The solution formed is an ideal solution

(B) The solution is non-ideal, showing positive deviation from Raoult's law

(C) The solution is non-ideal, showing negative deviation from Raoult's law

(D) n-heptane shows positive deviation while ethanol show negative deviation from Rault's law

30. Equimolar solutions in the same solvent have

(A) Different boiling point and different freezing point

(B) Same boiling point and same freezing point

(C) Same freezing point but different boiling point

(D) Same boiling point but different freezing point

31. Which of the following liquid pairs shows a positive deviation from Raoult's law?

(A) Water - hydrochloric acid

(B) Benzene - methanol

(C) Water - nitric acid

(D) Acetone - chloroform

32. Which one of the following statements is false ?

(A) Raoult's law states that the vapour pressure of a component over a solution is proportional to its mole fraction

(B) The osmotic pressure (π) of a solution is given by the equation π=MRT, where M is molarity of the solution.

(C) The correct order of osmotic pressure for 0.01 M aqueous solution of each compound is $BaCl_2$ > KCl > CH_3COOH > Sucrose

(D) Two sucrose solutions of same molality prepared in different solvents will have the same freezing point depression

33. The boiling point of 0.2 mol kg^{-1} solution of X in water is greater than equimolal solution of Y in water. Which one of the following statement is true in this case ?

(A) Molecular mass of X is less than the molecular mass of Y

(B) Y is undergoing dissociation in water while X undergoes no change

(C) X is undergoing dissociation in water, while Y undergoing no change

(D) Molecular mass of X is greater than the molecular mass of Y

34. Which of the following is incorrect for an ideal solution ?

(A) $\Delta V_{mix} = 0$ **(B)** $\dfrac{\Delta P}{P_0} = \chi_B$

(C) $\Delta H_{mix} = 0$ **(D)** $\Delta S_{mix} = 0$

35. The van't Hoff factor *i* for a compound which undergoes dissociation in one solvent and association in other solvent is respectively.

(A) less than one and greater than one
(B) less than one and lesser than one
(C) greater than one and less than one
(D) greater than one and greater than one

36. An aqueous solution is 1.00 molal in KI. Which change will cause the vapour pressure of the solution to increase ?

(A) Addition of NaCl
(B) Addition of Na_2SO_4
(C) Addition of 1.00 molal KI
(D) Addition of water

37. A 0.0020 m aqueous solution of an ionic compound $[Co(NH_3)_5\ (NO_2)]Cl$ freezes at $-0.00732^\circ C$. The number of moles of ions which 1 mol of ionic compound produces on being dissolving in water will be : $(K_f = 1.86^\circ C/m)$

(A) 3 **(B)** 4
(C) 1 **(D)** 2

38. During osmosis, flow of water through a semipermeable membrane is :

(A) from solution having lower concentration only
(B) from solution having higher concentration only
(C) from both sides of semipermeable membrane with equal flow rates
(D) from both sides of semipermeable membrane with unequal flow rates

39. A solution of acetone in ethanol :

(A) obeys Raoult's law
(B) shows a negative deviation from Raoult's law
(C) shows a positive deviation from Raoult's law
(D) behaves like a near ideal solution

40. The relationship between osmotic pressures at 273 K, when 10 g glucose (p_1), 10 g urea (p_2), and 10 g sucrose (p_3) are dissolved in 250 mL of water is :

(A) $p_2 > p_1 > p_3$ **(B)** $p_2 > p_3 > p_1$
(C) $p_1 > p_2 > p_3$ **(D)** $p_3 > p_1 > p_2$

41. An ideal solution was found to have a vapour pressure of 80 torr when the mole fraction of a non-volatile solute was 0.2. What would be the vapour pressure of the pure solvent at the same temperature?

42. Calculate the mass of non-volatile solute having molecular mass 40, which should be dissolved in 57 gm octane to reduce its vapour pressure to 80%:

43. At $25^\circ C$, the vapour pressure of pure liquid *A* (mol. Mass = 40) is 100 torr, while that of pure liquid B is 40 torr, (mol. Mass = 80). The vapour pressure at 25°C of a solution containing 20 g of each A and B is:

44. A solution of 0.640 g of azulene in 100.0 g of benzene boils at 80.23°C. The boiling point of benzene is 80.10°C; and K_b is 2.53°C/molal. What is the molecular mass of azulene?

45. One molal solution of a carboxylic acid in benzene shows the elevation of boiling point of 1.518 K. The degree of association for dimerization of the acid in benzene is (K_b for benzene $= 2.53\ K\ kg\ mol^{-1}$) : Multiply your answer with 10.

46. The boiling point elevation constant for toluene is $3.32\ K\ kg\ mol^{-1}$. The normal boiling point of toluene is 110.7°C. The enthalpy of vaporisation of toluene would be nearly:

47. Calculate the percentage degree of dissociation of an electrolyte XY_2 (Normal molar mass = 164) in water if the observed molar mass by measuring elevation in boiling point is 65.6:

48. The freezing point of a 4% aqueous solution of `A′ is equal to the freezing point of 10% aqueous solution of `B′. If the molecular mass of `A′ is 60, then the molecular mass of `B′ will be:

49. Depression on freezing point of 0.01 molal aqueous HCOOH solution is 0.02046. 1 molal aqueous urea solution freezes at –1.86°C. Assuming molality equal to molarity, pH of HCOOH solution is:

50. A 1.0 g sample of $Co(NH_2CH_2CH_2NH_2)_3Cl_3$ is dissolved in 25.0 g of water and the freezing point of the solution is –0.87°C. How many ions are produced peer mole of compound? The K_f of water is 1.86°C/molal:

51. A 0.010 g sample of $Cr(NH_3)_4(SO_4)Cl$ is dissolved in 25.0 mL of water and the osmotic pressure of the solution is 59.1 torr at 25° C. How many moles of ions are produced per mole of compound?

52. At 48° C, the vapour pressure of pure CS_2 is 850 torr. A solution of 2.0 g of sulphur in 100 g of CS_2 has a vapour pressure 844.9 torr. Determine the atomicity of sulphur molecule:

53. The vapour pressure of two pure liquids A and B, that form an ideal solution are 100 and 900 torr respectively at temperature T. This liquid solution of A and B is composed of 1 mole of A and 1 mole of B. What will be the pressure, when 1 mole of mixture has been vaporized?

Electrochemistry

CHOOSE THE CORRECT ALTERNATIVE. ONLY ONE CHOICE IS CORRECT. HOWEVER, QUESTIONS MARKED '*' MAY HAVE MORE THAN ONE CORRECT OPTION.

1. Which of the following statement is correct?

(A) E_{Cell} and Δ_rG of cell reaction both are extensive properties

(B) E_{Cell} and Δ_rG of cell reaction both are intensive properties

(C) E_{Cell} is an intensive property while Δ_rG of cell reaction is an extensive property

(D) E_{Cell} is an extensive property while Δ_rG of cell reaction is an intensive property

2. The difference between the electrode potentials of two electrodes when no current is drawn through the cell is called_____.

(A) Cell potential **(B)** Cell emf **(C)** Potential difference **(D)** Cell voltage

3. Which of the following statement is not correct about an inert electrode in a cell?

(A) It does not participate in the cell reaction

(B) It provides surface either for oxidation or for reduction reaction

(C) It provides surface for conduction of electrons

(D) It provides surface for redox reaction

4. An electrochemical cell can behave like an electrolytic cell when_____.

(A) $E_{Cell} = 0$ **(B)** $E_{Cell} > E_{ext}$ **(C)** $E_{ext} > E_{Cell}$ **(D)** $E_{Cell} = E_{ext}$

5. Which of the statements about solutions of electrolytes is not correct?

(A) Conductivity of solution depends upon size of ions

(B) Conductivity depends upon viscosity of solution

(C) Conductivity does not depend upon solvation of ions present in solution

(D) Conductivity of solution increases with temperature

6. Using the data given below find out the strongest reducing agent.

$E^{o}_{Cr_2O_7^{2-}/Cr^{3+}} = 1.33\,V$ $E^{o}_{Cl_2/Cl^-} = 1.36\,V$ $E_{MnO_4^-/Mn^{2+}} = 1.51\,V$ $E^{o}_{Cr^{3+}/Cr} = -0.74\,V$

(A) Cl^- **(B)** Cr **(C)** Cr^{3+} **(D)** Mn^{2+}

7. Using the data given Q.6 and find out which of the following is the strongest oxidizing agent.

(A) Cl^- **(B)** Mn^{2+} **(C)** MnO_4^- **(D)** Cr^{3+}

8. Using the data given in Q.6 find out in which option the order of reducing power is correct.

(A) $Cr^{3+} < Cl^- < Mn^{2+} < Cr$ **(B)** $Mn^{2+} < Cl^- < Cr^{3+} < Cr$

(C) $Cr^{3+} < Cl^- < Cr_2O_7^{2-} < MnO_4^-$ **(D)** $Mn^{2+} < Cr^{3+} < Cl^- < Cr$

9. Use the data given in Q.6 and find out the most stable ion in its reduced form.

(A) Cl^- **(B)** Cr^{3+} **(C)** Cr **(D)** Mn^{2+}

10. Use the data of Q.6 and find out the most stable oxidized species.

(A) Cr^{3+} **(B)** MnO_4^- **(C)** $Cr_2O_7^{2-}$ **(D)** Mn^{2+}

11. The quantity of charge required to obtain one mole of aluminium from Al_2O_3 is_____.

(A) 1 F **(B)** 6F **(C)** 3 F **(D)** 2F

12. The cell constant of a conductivity cell_____.

(A) Changes with change of electrolyte **(B)** Changes with change of concentration of electrolyte

(C) Changes with temperature of electrolyte **(D)** Remains constant for a cell

13. While charging the lead storage battery_____.

(A) $PbSO_4$ anode is reduced to Pb **(B)** $PbSO_4$ cathode is reduced to Pb

(C) $PbSO_4$ cathode is oxidized to Pb **(D)** $PbSO_4$ anode is oxidized to PbO_2

14. $\Lambda^0_{m(NH_4OH)}$ is equal to_____.

(A) $\Lambda^0_{m(NH_4OH)} + \Lambda^0_{m(NH_4Cl)} - \Lambda^0_{(HCl)}$ **(B)** $\Lambda^0_{m(NH_4Cl)} + \Lambda^0_{m(NaOH)} - \Lambda^0_{(NaCl)}$

(C) $\Lambda^0_{m(NH_4Cl)} + \Lambda^0_{m(NaCl)} - \Lambda^0_{(NaOH)}$ **(D)** $\Lambda^0_{m(NaOH)} + \Lambda^0_{m(NaCl)} + \Lambda^0_{(NH_4Cl)}$

15. In the electrolysis of aqueous sodium chloride solution which of the half cell reaction will occur at anode?

(A) $Na^+(aq) + e^- \longrightarrow Na(s);\ E^{\ominus}_{Cell} = -2.71V$ **(B)** $2H_2O(\ell) \longrightarrow O_2(g) + 4H^+(aq) + 4e^-;\ E^{o}_{cell} = -1.23\,V$

(C) $H^+(aq) + e^- \longrightarrow 1/2H_2(g);\ E^{\ominus}_{Cell} = 0.00V$ **(D)** $Cl^- \longrightarrow 1/2Cl_2(g) + e^-;\ E^{o}_{cell} = -1.36\,V$

***16.** The positive value of the standard electrode potential of Cu^{2+}/Cu indicates that_____.

(A) This redox couple is a stronger reducing agent than the H^+/H_2 couple

(B) This redox couple is a stronger oxidizing agent than H^+/H_2

(C) Cu can displace H^+ from acid

(D) Cu cannot displace H^+ from acid

***17.** $E^{\ominus}_{Cell}$ for some half cell reactions are given below. On the basis of these mark the correct answer.

I. $H^+(aq) + e^- \longrightarrow 1/2H_2(g); \quad E^{\ominus}_{Cell} = 0.00V$

II. $2H_2O(\ell) \longrightarrow O_2(g) + 4H^+(aq) + 4e^-; \; E^{o}_{cell} = -1.23\,V$

III. $2SO_4^{2-}(aq) \longrightarrow S_2O_8^{2-}(aq) + 2e^-; \; E^{o}_{cell} = -1.96\,V$

The correct choice is :

(A) In dilute sulphuric acid solution, hydrogen will be reduced at cathode

(B) In concentrated sulphuric acid solution, water will be oxidized at anode

(C) In dilute sulphuric acid solution, water will be oxidized at anode

(D) In dilute sulphuric acid solution, SO_4^{2-} ion will be oxidized to tetrathionate ion at anode

***18.** $E^{\ominus}_{Cell} = 1.1V$ for Daniel cell. Which of the following expressions are correct description of state of equilibrium in this cell? (Given n)

(A) $1.1 = K_C$ **(B)** $\frac{2.303RT}{2F}\log K_c = 1.1$

(C) $\log K_c = \frac{2.2}{0.059}$ **(D)** $\log K_c = 1.1$

***19.** Conductivity of an electrolytic solution depends on_____.

(A) Nature of electrolyte **(B)** Concentration of electrolyte

(C) Power of AC source **(D)** Distance between the electrodes

***20.** $\Lambda^0_m\ H_2O$ is equal to _____.

(A) $\Lambda^0_{m(HCl)} + \Lambda^0_{m(NaOH)} - \Lambda^0_{(NaCl)}$ **(B)** $\Lambda^0_{m(HNO_3)} + \Lambda^0_{m(NaNO_3)} - \Lambda^0_{(NaOH)}$

(C) $\Lambda^0_{m(HNO_3)} + \Lambda^0_{m(NaOH)} - \Lambda^0_{(NaNO_3)}$ **(D)** $\Lambda^0_{m(NH_4OH)} + \Lambda^0_{m(HCl)} - \Lambda^0_{(NH_4Cl)}$

***21.** What will happen during the electrolysis of aqueous solution of $CuSO_4$ by using platinum electrodes?

(A) Copper will deposit at cathode **(B)** Copper will deposit at anode

(C) Oxygen will be released at anode **(D)** Copper will dissolve at anode

***22.** What will happen during the electrolysis of aqueous solution of $CuSO_4$ in the presence of Cu electrodes?

(A) Copper will deposit at cathode **(B)** Copper will dissolve at anode

(C) Oxygen will be released at anode **(D)** Copper will deposit at anode

***23.** Conductivity κ, is equal to _____.

(A) $\frac{1}{R}\frac{\ell}{A}$ **(B)** $\frac{G^*}{R}$ **(C)** Λ_m **(D)** $\frac{\ell}{A}$

***24.** Molar conductivity of ionic solution depends on_____.

(A) Temperature **(B)** Distance between electrodes

(C) Concentration of electrolytes in solution **(D)** Surface area of electrodes

***25.** For the given cell, $Mg\left|Mg^{2+}\right|\left|Cu^{2+}\right|Cu$

(A) Mg is cathode **(B)** Cu is cathode

(C) The cell reaction is $Mg + Cu^{2+} \longrightarrow Mg^{2+} + Cu$ **(D)** Cu is the oxidising agent

26. Resistance of 0.2 M solution of an electrolyte is $50\,\Omega$. The specific conductance of the solution is $1.4\,Sm^{-1}$. The resistance of 0.5 M solution of the same electrolyte is $280\,\Omega$. The molar conductivity of 0.5 M solution of the electrolyte is $S\,mol^{-1}$ is :

(A) 5×10^{-4} **(B)** 5×10^{-3} **(C)** 5×10^{3} **(D)** 5×10^{2}

27. The equivalent conductance of NaCl at concentration C and at infinite dilution are λ_c and λ_∞, respectively. The correct relationship between λ_c and λ_∞ is given as :

(A) $\lambda_c = \lambda_\infty + (B)C$ **(B)** $\lambda_c = \lambda_\infty - (B)C$ **(C)** $\lambda_c = \lambda_\infty - (B)\sqrt{C}$ **(D)** $\lambda_c = \lambda_\infty + (B)\sqrt{C}$

28. The metal that cannot be obtained by the electrolysis of an aqueous solution of its salts is :

(A) Ag **(B)** Ca **(C)** Cu **(D)** Cr

29. Given below are half-cell reactions : $Mn^{2+} + 2e^- \longrightarrow Mn,\ E° = 1.18V$

$$2\left(Mn^{2+} + e^- \longrightarrow Mn^{2+}\right),\ E° = +1.51V$$

The E° for $3Mn^{2+} \longrightarrow Mn + 2Mn^{3+}$ will be :

(A) –2.69V , the reaction will not occur **(B)** –2.69V , the reaction will occur

(C) –0.33V , the reaction will not occur **(D)** –0.33V , the reaction will occur

30. Given, $E°_{Cr^{3+}/Cr} = 0.74V$; $E°_{MnO_4^-/Mn^{2+}} = 1.51V$; $E°_{Cr_2O_7^{2-}/Cr^{3+}} = 1.33\,V$; $E°_{Cl/Cl} = 1.36V$

Based on the data given above, strongest oxidising agent will be :

(A) Cl **(B)** Cr^{3+} **(C)** Mn^{2+} **(D)** MnO_4^-

31. The standard reduction potentials for Zn^{2+}/Zn, Ni^{2+}/Ni and Fe^{2+}/Fe are $-0.76, -0.23$ and $-0.44\,V$, respectively. The reaction $X + Y^{2+} \longrightarrow X^{2+} + Y$ will be spontaneous when :

(A) X = Ni, Y = Fe **(B)** X = Ni, Y = Zn

(C) X = Fe, Y = Zn **(D)** X = Zn, Y = Ni

32. The reduction potential of hydrogen half-cell will be negative if :

(A) $p(H_2) = 1\,atm$ and $[H^+] = 2.0\,M$ **(B)** $p(H_2) = 1\,atm$ and $[H^+] = 1.0\,M$

(C) $p(H_2) = 2\,atm$ and $[H^+] = 1.0\,M$ **(D)** $p(H_2) = 2\,atm$ and $[H^+] = 2.0\,M$

33. Consider the following cell reaction : $2Fe(s) + O_2(g) + 4H^+(aq) \longrightarrow 2Fe^{2+}(aq) + 2H_2O(\ell),\quad E° = 1.67\,V$

At $[Fe^{2+}] = 10^{-3}M$, $P(O_2) = 0.1\,atm$ and $pH = 3$, then cell potential at 25°C is :

(A) 1.47 V **(B)** 1.77 V **(C)** 1.87 V **(D)** 1.57 V

34. The Gibbs energy for the decomposition of Al_2O_3 at 500°C is as follows

$$\frac{2}{3}Al_2O_3 \longrightarrow \frac{4}{3}Al + O_2\ \ \Delta_rG = +966\,kJ\,mol^{-1}$$

The potential difference needed for electrolyte reduction of Al_2O_3 at 500°C is at least :

(A) 4.5 V **(B)** 3.0 V **(C)** 2.5 V **(D)** 5.0 V

35. Given, $E^{\circ}_{Fe^{3+}/Fe} = -0.036\,V,\ E^{\circ}_{Fe^{2+}/Fe} = -0.439\,V$

The value of standard electrode potential for the charge, $Fe^{3+}(aq) + e^{-} \longrightarrow Fe^{2+}(aq)$ will be :

(A) $-0.072\,V$ **(B)** $0.385\,V$ **(C)** $0.770\,V$ **(D)** $-0.270\,V$

36. Given, $E^{\circ}_{Cr^{3+}/Cr} = 0.72\,V,\ E^{\circ}_{Fe^{2+}/Fe} = -0.42\,V$

The potential for the cell : $Cr\,|\,Cr^{3+}(0.1\,M)\,||\,Fe^{3+}(0.01\,M)\,|\,Fe$ is :

(A) $0.26\,V$ **(B)** $0.399\,V$ **(C)** $-0.399\,V$ **(D)** $-0.26\,V$

37. The equivalent conductances of two strong electrolytes at infinite dilution in H_2O (where ions move freely through a solution) at 25°C are given below : $\Lambda^{\circ}_{CH_3COONa} = 91.0\ Scm^2/equiv$; $\Lambda^{\circ}_{HCl} = 426.2\ Scm^2/equiv$

What additional information/ quantity one need to calculate Λ° of an aqueous solution of acetic acid ?

(A) Λ° of NaCl **(B)** Λ° of CH_3COOK

(C) The limiting equivalent conductance of $H^{+}\left(\lambda^{\circ}_{H^{+}}\right)$ **(D)** Λ° of chloroacetic acid $(ClCH_2COOH)$

38. The cell, $Zn\,|\,Zn^{2+}(1M)\,||\,Cu^{2+}(1M)\,|\,Cu$ $\left(E^{\circ}_{cell} = 1.10\,V\right)$, was allowed to be completely discharged at 298 K. The relative concentration of Zn^{2+} to $Cu^{2+}\left(\dfrac{[Zn^{2+}]}{[Cu^{2+}]}\right)$ is :

(A) antilog (24.08) **(B)** 37.3 **(C)** $10^{37.3}$ **(D)** 9.65×10^{4}

39. Resistance of a conductivity cell filled with a solution of an electrolyte of concentration 0.1 M is $100\,\Omega$. The conductivity of this solution is $1.29\ S\,m^{-1}$. Resistance of the same cell when filled with 0.2 M of the same solution is $520\,\Omega$. The molar conductivity of 0.2 M solution of the electrolyte will be :

(A) $124 \times 10^{-4}\ S\,m^2\,mol^{-1}$ **(B)** $1240 \times 10^{-4}\ S\,m^2\,mol^{-1}$

(C) $1.24 \times 10^{-4}\ S\,m^2\,mol^{-1}$ **(D)** $12.4 \times 10^{-4}\ S\,m^2\,mol^{-1}$

40. The molar conductivities Λ°_{NaOAc} and Λ°_{HCl} at infinite dilution in water at 25°C are 91.0 and $426.2\ S\,cm^2/mol$, respectively. To calculate Λ°_{HOAc}, the additional value required is :

(A) $\Lambda^{\circ}_{H_2O}$ **(B)** Λ°_{KCl} **(C)** Λ°_{NaOH} **(D)** Λ°_{NaCl}

41. Given the data at 25°C,

$Ag + I^{-} \longrightarrow AgI + e^{-}\ ;\ E^{\circ} = 0.152\,V\ ,\ Ag \longrightarrow Ag^{+} + e^{-}\ ;\ E^{\circ} = -0.800\,V$

What is the value of $\log K_{sp}$ for AgI ? $\left(2.303\dfrac{RT}{F} = 0.059\,V\right)$

(A) -8.12 **(B)** $+8.612$ **(C)** -37.83 **(D)** -16.13

42. Among the properties (A) reducing, (B) oxidising and (C) complexing, the set of properties shown by CN^{-} ion towards metal species is :

(A) A, B **(B)** B, C **(C)** C, A **(D)** A, B, C

43. In a hydrogen-oxygen fuel cell, combustion of hydrogen occurs to :

(A) Generate heat **(B)** Create potential difference between the two electrodes

(C) Produce high purity water **(D)** Remove adsorbed oxygen from electrode surfaces

44. In the cell that utilises the reaction $Zn(s) + 2H^+(aq) \rightarrow Zn^{2+}(aq) + H_2(g)$ addition of H_2SO_4 to cathode compartment will :

(A) Lower the E and shift equilibrium to the left

(B) Lower the E and shift the equilibrium to the right

(C) Increase the E and shift the equilibrium to the right

(D) Increase the E and shift the equilibrium to the left

45. For the following cell with hydrogen electrodes at two different pressure p_1 and p_2 : $\underset{p_1}{Pt(H_2)} | \underset{1M}{H^+(aq)} | \underset{p_2}{Pt(H_2)}$

emf is given by :

(A) $\frac{RT}{F}\log_e\frac{p_1}{p_2}$ **(B)** $\frac{RT}{2F}\log_e\frac{p_1}{p_2}$ **(C)** $\frac{RT}{F}\log_e\frac{p_2}{p_1}$ **(D)** $\frac{RT}{2F}\log_e\frac{p_2}{p_1}$

46. When 0.1 mol MnO_4^{2-} is oxidised, the quantity of electricity required to completely oxidise MnO_4^{2-} to MnO_4^- is :

(A) 96500 C **(B)** 2 × 96500 C **(C)** 9650 C **(D)** 96.50 C

47. The weight of silver (at wt. = 108) displaced by a quantity of electricity which displaces 5600 mL of O_2 at STP will be:

(A) 5.4 g **(B)** 10.8 g **(C)** 54.0 g **(D)** 108.0 g

48. At $25^\circ C$ the molar conductance of 0.1 M aqueous solution of ammonium hydroxide is $9.45\,ohm^{-1}\,cm^2\,mol^{-1}$. The degree of ionisation of ammonium hydroxide at the same concentration and temperature is : $(\Lambda_M^\infty)_{NH_4OH} = 238\ ohm^{-1}\,cm^2\,mol^{-1}$

(A) 4.008 % **(B)** 40.800 % **(C)** 2.080 % **(D)** 20.800 %

49. A hydrogen gas electrode is made by dipping platinum wire in a solution of HCl of pH = 10 and by passing hydrogen gas around the platinum wire at one atm pressure. The oxidation potential of electrodes would be :

(A) 0.118 V **(B)** 1.18 V **(C)** 0.059 V **(D)** 0.59 V

50. Consider the half-cell reduction reaction :

$Mn^{2+} + 2e^- \rightarrow Mn$; $E^\circ = -1.18\,V$ and $Mn^{2+} \rightarrow Mn^{3+} + e^-$; $E^\circ = -1.51\,V$

The E° for the reaction $3Mn^{2+} \rightarrow Mn^0 + 2Mn^{3+}$ and possibility of the forward reaction are respectively :

(A) –4.18 V and yes **(B)** +0.33 V and yes

(C) +2.69 V and no **(D)** –2.69 V and no

51. Standard reduction potentials of the half reaction are given below :

$F_{2(g)} + 2e^- \rightarrow 2F^-_{(aq)}$; $E^\circ = +2.85\,V$ $Cl_{2(g)} + 2e^- \rightarrow 2Cl^-_{(aq)}$; $E^\circ = +1.36\,V$

$Br_{2(l)} + 2e^- \rightarrow 2Br^-_{(aq)}$; $E^\circ = +1.06\,V$ $I_{2(s)} + 2e^- \rightarrow 2I^-_{(aq)}$; $E^\circ = +0.53\,V$

The strongest oxidising and reducing agents respectively are :

(A) F_2 and I^- **(B)** Br_2 and Cl^-

(C) Cl_2 and Br^- **(D)** Cl_2 and I_2

52. Standard electrode potential of three metals X, Y and Z are –1.2 V, + 0.5 V and – 3.0 V respectively. The reducing power of these metals will be :

(A) Z > Y > X **(B)** Y > X > Z **(C)** Z > X > Y **(D)** X > Y > Z

53. A solution contains Fe^{2+}, Fe^{3+} and I^- ions. This solution was treated with iodine at $25^\circ C$. E° for Fe^{3+}/Fe^{2+} is + 0.77 V and E° for $I_2/I^- = 0.536\,V$. The favorable redox reaction is :

(A) I_2 will be reduced to I^- **(B)** there will be no redox reaction

(C) I^- will be oxidised to I_2 **(D)** Fe^{2+} will be oxidised to Fe^{3+}

54. An increase in equivalent conductance of a strong electrolyte with dilution is mainly due to :

(A) increase in ionic mobility of ions

(B) 100% ionisation of electrolyte at normal dilution

(C) increase in both i.e., number of ions and ionic mobility of ions

(D) increase in number of ions

55. Which of the following expressions correctly represent the equivalent conductance at infinite dilution of $Al_2(SO_4)_3$. Given than $\Lambda^\circ_{Al^{3+}}$ and $\Lambda^\circ_{SO_4^{2-}}$ are the equivalent conductances at infinite dilution of the respective ions ?

(A) $2\Lambda^\circ_{Al^{3+}} + 3\Lambda^\circ_{SO_4^{2-}}$ **(B)** $\Lambda^\circ_{Al^{3+}} + \Lambda^\circ_{SO_4^{2-}}$

(C) $6\,(\Lambda^\circ_{Al^{3+}} + \Lambda^\circ_{SO_4^{2-}})$ **(D)** $1/3\Lambda^\circ_{Al^{3+}} + 1/2\,\Lambda^\circ_{SO_4^{2-}}$

56. On the basis of the following E° values, the strongest oxidizing agent is :

$$[Fe(CN)_6]^{4-} \rightarrow [Fe(CN)_6]^{3-} + e^{-1} \; ; \; E^\circ = -0.35\,V$$

$$Fe^{2+} \rightarrow Fe^{3+} + e^{-1} \; ; \quad E^\circ = -0.77\,V$$

(A) Fe^{3+} **(B)** $[Fe(CN)_6]^{3-}$ **(C)** $[Fe(CN)_6]^{4-}$ **(D)** Fe^{2+}

57. In electrolysis of NaCl when Pt electrode is taken then H_2 is liberated at cathode while with Hg cathode it forms sodium amalgam. Which of the following is true ?

(A) Hg is more inert than Pt

(B) More voltage is required to reduce H^+ at Hg than at Pt

(C) Na is dissolved in Hg while it does not dissolve in Pt

(D) Conc. of H^+ ions is larger when Pt electrode is taken

58. On heating one end of a piece of a metal, the other end becomes hot because of :

(A) energized electrons moving to the other end **(B)** minor perturbation in the energy of atoms

(C) resistance of the metal **(D)** mobility of atoms in the metal

59. Standard reduction potential at $25^\circ C$ of $Li^+ \,|\, Li, Ba^{2+} \,|\, Ba, Na^+ \,|\, Na$ and $Mg^{2+} \,|\, Mg$ are $-3.05, -2.90, -2.71$ and -2.37 volt respectively. Which one of the following is the strongest oxidising agent ?

(A) Ba^{2+} **(B)** Mg^{2+} **(C)** Na^+ **(D)** Li^+

60. Two Faraday of electricity is passed through solution of $CuSO_4$. The mass of copper deposited at the cathode is : (Atomic mass of Cu = 63.5 amu)

(A) 0 g **(B)** 63.5 g **(C)** 2 g **(D)** 127 g

61. Total charge required for the oxidation of two moles Mn_3O_4 into MnO_4^{2-} in presence of alkaline medium is :

62. A 250.0 mL sample of a $0.20\,M\,Cr^{3+}$ is electrolysed with a current of 96.5 A. If the remaining $[Cr^{3+}]$ is 0.1M, duration of process is :

63. The element indium is to be obtained by electrolysis of a molten halide of the element. Passage of a current of $3.20\,A$ for a period of $40.0\,min$ results in formation of $3.05\,g$ of In. What is the oxidation state of indium in the halide melt ? (Atomic mass of W = 114.8)

64. An electrolysis of a oxytungsten complex ion using $1.10\,A$ for 40 min produces $0.838\,g$ of tungsten. What is the charge on tungsten in the material ? (Atomic mass of In = 184)

65. $I_2(s)\,|\,I^-(0.1M)$ half cell is connected to a $H^+(aq)\,|\,H_2(1bar)\,|\,Pt$ half cell and e.m.f. is found to be $0.7717\,V$. If $E^\circ_{I_2|I^-} = 0.535\,V$, find the pH of $H^+\,|\,H_2$ half-cell.

66. Resistance of $0.1M$ KCl solution in a conductance cell is 300 ohm and conductivity is $0.013\,Scm^{-1}$. The value of cell constant is : Multiply your answer with 10.

67. Molar conductivity of a solution of an electrolyte AB_3 is $150\,Scm^2mol^{-1}$. If it ionises as $AB_3 \longrightarrow A^{3+} + 3B^-$, its equivalent conductivity will be :

68. The limiting equivalent conductivity of NaCl, KCl and KBr are 126.5, 150.0 and $151.5\,Scm^2eq^{-1}$, respectively. The limiting equivalent ionic conductivity for Br^- is $78\,Scm^{-1}$. The limiting equivalent ionic conductivity for Na^+ ions would be :

69. The resistance of $0.1N$ solution of formic acid is 200 ohm and cell constant is $2.0\,cm^{-1}$. The equivalent conductivity $(in\ Scm^2eq^{-1})$ of $0.1N$ formic acid is :

70. The ionic conductivity of Ba^{2+} and Cl^- at infinite dilution are 127 and $76\,ohm^{-1}cm^2eq^{-1}$ respectively. The equivalent conductivity of $BaCl_2$ at infinity dilution $(in\ ohm^{-1}cm^2eq^{-1})$ would be :

71. The conductance of a salt solution (AB) measured by two parallel electrodes of area $100\,cm^2$ separated by 10 cm was found to be $0.0001\Omega^{-1}$. If volume enclosed between two electrode contain 0.1 mole of salt, what is the molar conductivity (Scm^2mol^{-1}) of salt at same concentration : Multiply your answer with 10.

72. $108\,g$ fairly concentrated solution of $AgNO_3$ is electrolysed by using $0.1F$ charge. The mass of resulting solution is : Multiply your answer with 10.

73. The cell $Pt\,|\,H_2(g,\,0.1bar)\,|\,H^+(aq),\ pH = X\,||\,Cl^-(aq,\,1M)\,|\,Hg_2Cl_2\,|\,Hg\,|\,Pt$, has e.m.f. of $0.5755\,V$ at 25°C. The SOP of calomel electrode is $-0.28V$, then pH of solution will be : Multiply your answer with 10.

74. The standard reduction potential of normal calomel electrode and reduction potential of saturated calomel electrode are 0.27 and 0.33 volt respectively. What is the concentration of Cl^- in saturated solution of KCl ? Multiply your answer with 10.

Chemical Kinetics

CHOOSE THE CORRECT ALTERNATIVE. ONLY ONE CHOICE IS CORRECT. HOWEVER, QUESTIONS MARKED '*' MAY HAVE MORE THAN ONE CORRECT OPTION.

1. The rate constant of the reaction $A \longrightarrow B$ is $0.6 \times 10^{-3}\ mol\,L^{-1}\,s^{-1}$. If the initial concentration of A is 5 M, then concentration of B after 20 minutes is :

(A) 3.60 M **(B)** 0.36 M
(C) 0.72 M **(D)** 1.08 M

2. The activation energy of a reaction can be determined from the slope of which of the following graphs ?

(A) $\ln k$ vs $\frac{1}{T}$ **(B)** $\frac{T}{\ln k}$ vs $\frac{1}{T}$

(C) $\ln k$ vs T **(D)** $\frac{\ln k}{T}$ vs T

3. For a reaction between A and B the order with respect to A is 2 and the order with respect to B is 3. The concentrations of both A and B are doubled, the rate will increase by a factor of :

(A) 12 **(B)** 16
(C) 32 **(D)** 10

4. In a zero-order reaction, for every $10^{\circ}C$ rise of temperature, the rate is doubled. If the temperature is increased from $10^{\circ}C$ to $100^{\circ}C$, the rate of the reaction will become :

(A) 256 times **(B)** 512 times
(C) 64 times **(D)** 128 times

5. The rate of the reaction : $2N_2O_5 \rightarrow 4NO_2 + O_2$ can be written in three ways.

$$\frac{-d[N_2O_5]}{dt} = k[N_2O_5]\ ;$$

$$\frac{d[NO_2]}{dt} = k'[N_2O_5]\ ;\ \frac{d[O_2]}{dt} = k''[N_2O_5]$$

The relationship between k and k' and between k and k'' are :

(A) k' = 2k : k'' = k **(B)** k' = 2k : k'' = k/2
(C) k' = 2k ; k'' = 2k **(D)** k' = k : k'' = k

6. In the reaction :

$$BrO_{3(aq)}^{-} + 5Br_{(aq)}^{-} + 6H^{+} \rightarrow 3Br_{2(l)} + 3H_2O_{(l)}$$

The rate of appearance of bromine (Br_2) is related to rate of disappearance of bromide ions as :

(A) $\frac{d[Br_2]}{dt} = -\frac{5}{3}\frac{d[Br^-]}{dt}$

(B) $\frac{d[Br_2]}{dt} = \frac{5}{3}\frac{d[Br^-]}{dt}$

(C) $\frac{d[Br_2]}{dt} = \frac{3}{5}\frac{d[Br^-]}{dt}$

(D) $\frac{d[Br_2]}{dt} = -\frac{3}{5}\frac{d[Br^-]}{dt}$

7. If the rate of the reaction is equal to the rate constant, the order of the reaction is :

(A) 0 **(B)** 1 **(C)** 2 **(D)** 3

8. Given : $2A \rightarrow B + C$. It would be zero order reaction when :

(A) the rate of reaction is proportional to square of concentration of A
(B) the rate of reaction remains same at any concentration of A
(C) the rate remains unchanged at any concentration of B and C
(D) the rate of reaction doubles if concentration of B is increased to double

9. When a bio-chemical reaction is carried out in laboratory, outside the human body in absence of enzyme, then rate of reaction obtained is 10^{-6} times, the activation energy of reaction in the presence of enzyme is :

(A) 6/RT
(B) P is required
(C) different from E_a obtained in laboratory
(D) can't say anything

10. How enzymes increases the rate of reactions ?

(A) by lowering activation energy
(B) by increasing activation energy
(C) by changing equilibrium constant
(D) by forming enzyme substrate complex

***11.** Which of the following is(are) correct for a first order reaction ?

(A) The extent of reaction is equal to $(1 - e^{-kt})$

(B) Concentration of the reactant decreases exponentially with time

(C) Concentration of the product increases exponentially with time

(D) A plot of logarithm of concentration of reactant versus time is linear with negative slope

12. For the non-stoichiometric reaction, $2A + B \longrightarrow C + D$, data were obtained in three separate experiments, all at 298 K

Initial Conc. (A)	Initial Conc. (B)	Initial rate of Formation of *C* ($mol^{-1}\ s^{-1}$)
0.1 M	0.1 M	1.2×10^{-3}
0.1 M	0.2 M	1.2×10^{-3}
0.2 M	0.1 M	2.4×10^{-3}

The rate law of the formation of C is :

(A) $\frac{dc}{dt} = k[A][B]$ **(B)** $\frac{dc}{dt} = k[A^2][B]$

(C) $\frac{dc}{dt} = k[A][B]^2$ **(D)** $\frac{dc}{dt} = k[A]$

13. The rate of a reaction double when its temperature changes from 300 K to 310 K. Activation energy of such a reaction will be $(R = 8.314\ JK^{-1}\ mol^{-1}$ and $\log 2 = 0.301)$

(A) 53.6 kJ mol^{-1} **(B)** 48.6 kJ mol^{-1}

(C) 58.5 kJ mol^{-1} **(D)** 60.5 kJ mol^{-1}

14. For a first order reaction, $(A) \longrightarrow$ products the concentration of A changes from 0.1 M to 0.025 M in the 40 min. The rate of reaction when the concentration of A is 0.01 M is:

(A) 1.73×10^{-5} M / min

(B) 3.47×10^{-4} M / min

(C) 3.47×10^{-5} M / min

(D) 1.73×10^{-4} M / min

15. The rate of chemical reaction doubles for every $10°C$ rise of temperature. If the temperature is raised by $50°C$, the rate of the reaction increases by about :

(A) 10 times **(B)** 24 times

(C) 32 times **(D)** 64 times

16. A reactant (A) forms two products :

$A \xrightarrow{k_1} B$, Activation energy E_{a_1}

and $A \xrightarrow{k_2} C$, Activation energy E_{a_2}

If $E_{a_2} = 2E_{a_1}$, then k_1 and k_2 are related as :

(A) $k_1 = 2k_2\ e^{E_{a_2}/RT}$

(B) $k_1 = k_2 e^{E_{a_1}/RT}$

(C) $k_2 = k_1 e^{E_{a_2}/RT}$

(D) $k_1 = Ak_2 e^{E_{a_1}/RT}$

17. The time for half-life period of a certain reaction, $A \longrightarrow$ products is 1 h. When the initial concentration of the reactant 'A' is $2.0\ mol\ L^{-1}$, how much time does it take for its concentration to come from 0.50l to $0.25\ mol\ L^{-1}$, if it is a zero order reaction?

(A) 4 h **(B)** 0.5 h

(C) 0.25 h **(D)** 1 h

18. Rate of a reaction can be expressed by Arrhenius equation as $k = Ae^{-E/RT}$:

In this equation, E represents

(A) The energy above which all the colliding molecules will react

(B) The energy below which colliding molecules will not react

(C) The total energy of the reacting molecules at a temperature, T

(D) The fraction of molecules with energy greater than the activation energy of the reaction

19. In the presence of a catalyst, the heat evolved or absorbed during the reaction_____.

(A) Increases

(B) Decreases

(C) Remains unchanged

(D) May increases or decrease

20. Activation energy of a chemical reaction can be determined by _____.

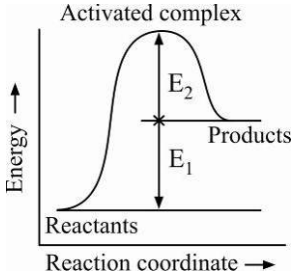
(A) Determining the rate constant at standard temperature

(B) Determining the rate constants at two temperatures.

(C) Determining probability of collision

(D) Using catalyst.

21. Consider Figure and mark the correct option.



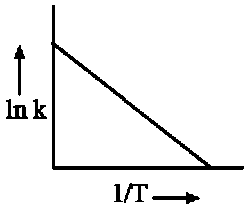
(A) Activation energy of forward reaction is $E_1 + E_2$ and product is less stable than reactant

(B) Activation energy of forward reaction is $E_1 + E_2$ and product is more stable than reactant

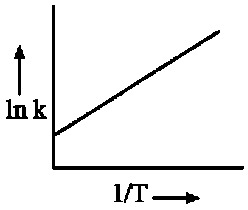
(C) Activation energy of both forward and backward reaction is $E_1 + E_2$ and reactant is more stable than product

(D) Activation energy of backward reaction is E_1 and product is more stable than reactant

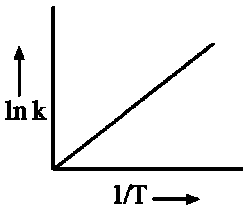
22. According to Arrhenius equation rate constant k is equal to $Ae^{-E_a/RT}$. Which of the following options represents the graph of ln k vs $\frac{1}{T}$?



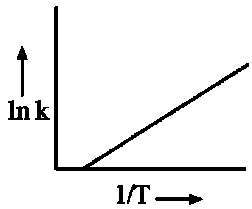
(A)



(B)



(C)



(D)

23. Consider the Arrhenius equation given below and mark the correct option : $k = Ae^{-E_a/RT}$

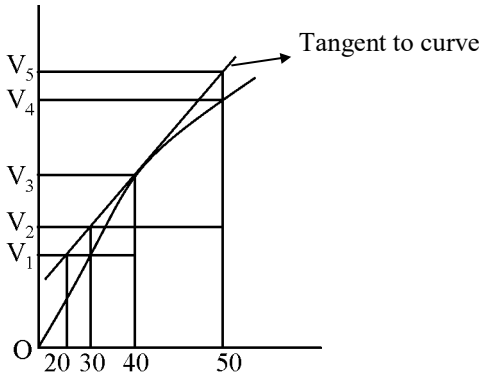
(A) Rate constant increases exponentially with increasing activation energy and decreasing temperature.

(B) Rate constant decreases exponentially with increasing activation energy and decreasing temperature.

(C) Rate constant increases exponentially with decreasing activation energy and decreasing temperature.

(D) Rate constant increases exponentially with decreasing activation energy and increasing temperature.

24. A graph of volume of hydrogen released vs time for the reaction between zinc and dil. HCl is given in Figure. On the basis of this mark the correct option.



(A) Average rate upto 40s is $\frac{V_3 - V_2}{40}$

(B) Average rate upto 40 seconds is $\frac{V_3 - V_2}{40 - 30}$

(C) Average rate upto 40 seconds is $\frac{V_3}{40}$

(D) Average rate upto 40 seconds is $\frac{V_3 - V_1}{40 - 20}$

25. Which of the following statements is not correct about order of a reaction.

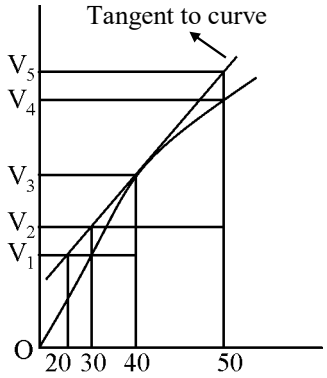
(A) The order of a reaction can be a fractional number

(B) Order of a reaction is experimentally determined quantity

(C) The order of a reaction is always equal to the sum of the stoichiometric coefficients of reactants in the balanced chemical equation for a reaction.

(D) The order of a reaction is the sum of the powers of molar concentration of the reactants in the rate law expression

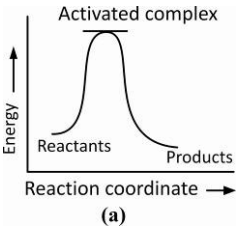
26. Consider the graph given in figure. Which of the following options does not shown instantaneous rate of reaction at 40^{th} second?

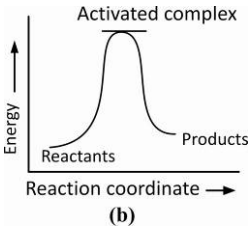


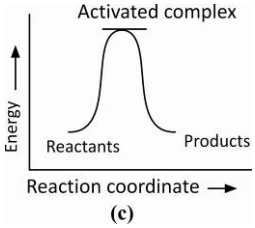
(A) $\frac{V_5 - V_2}{50 - 30}$ **(B)** $\frac{V_4 - V_2}{50 - 30}$

(C) $\frac{V_3 - V_2}{40 - 30}$ **(D)** $\frac{V_3 - V_1}{40 - 20}$

27. Which of the following graphs represents exothermic reaction?







(A) (a) only

(B) (b) only

(C) (c) only

(D) (a) and (b)

28. Which of the following statements is incorrect about the collision theory of chemical reaction?

(A) It considers reacting molecules or atoms to be hard spheres and ignores their structural features.

(B) Number of effective collisions determines the rate of reaction.

(C) Collision of atoms or molecules possessing sufficient threshold energy results into the product formation.

(D) Molecules should collide with sufficient threshold energy and proper orientation for the collision to be effective

29. Which of the following statement is not correct for the catalyst?

(A) It catalyses the forward and backward reaction to the same extent

(B) It alters ΔG of the reaction

(C) It is a substance that does not change the equilibrium constant of a reaction

(D) It provides an alternate mechanism by reducing activation energy between reactants and products

30. The value of rate constant of a pseudo first order reaction _____.

(A) Depends on the concentration of reactants present in small amount

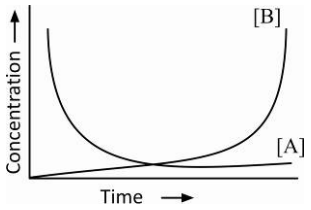
(B) Depends on the concentration of reactants presents in excess

(C) is independent of the concentration of reactants

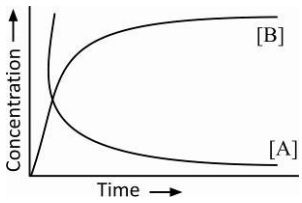
(D) Depends only on temperature

31. Consider the reaction A → B. The concentration of both the reactants and the products varies exponentially with time. Which of the following figures correctly describes the change in concentration of reactants and product with time?

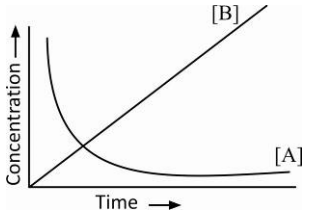
(A)



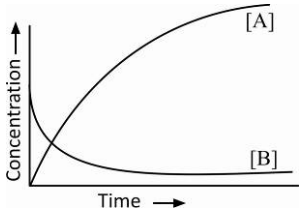
(B)



(C)



(D)



***32.** Rate law cannot be determined from balanced chemical equation if _____.

(A) Reverse reaction is involved
(B) It is an elementary reaction
(C) It is sequence of elementary reactions
(D) Any of the reactants is in excess

***33.** Which of the following statements are applicable to a balanced chemical equation of an elementary reaction?

(A) Order is same as molecularity
(B) Order is less than the molecularity
(C) Order is greater than the molecularity
(D) Molecularity can never be zero

***34.** In any unimolecular reaction _____.

(A) Only one reacting species is involved in the rate determining step
(B) The order and the molecularity of slowest step are equal to one
(C) The molecularity of the reaction is one and order is zero
(D) Both molecularity and order of the reaction are one

35. For a complex reaction _____.

(A) Order of overall reaction is same as molecularity of the slowest step
(B) Order of overall reaction is less than the molecularity of the slowest step
(C) Order overall reaction is greater than molecularity of the slowest step
(D) Molecularity of the slowest step is never zero or non integer

***36.** At high pressure the following reaction is zero order.

$$2NH_3(g) \xrightarrow[\text{Platinum catayst}]{1130\ K} N_2(g) + 3H_2(g)$$

Which of the following options are correct for this reaction?

(A) Rate of reaction = Rate constant
(B) Rate of the reaction depends on concentration of ammonia
(C) Rate of decomposition of ammonia will remain constant until ammonia disappears completely
(D) Further increase in pressure will change the rate of reaction

***37.** During decomposition of an activated complex.

(A) Energy is always released
(B) Energy is always absorbed
(C) Energy does not change
(D) Reactants may be formed

***38.** According to Maxwell Boltzmann distribution of energy _____ .

(A) The fraction of molecules with most probable kinetic energy decreases at higher temperatures
(B) The fraction of molecules with most probable kinetic energy increases at higher temperature
(C) Most probable kinetic energy increases at higher temperatures
(D) Most probable kinetic energy decreases at higher temperatures

***39.** In the graph showing Maxwell Boltzman distribution of energy _____.

(A) Area under the curve must not change with increase in temperature

(B) Area under the curve increases with increase in temperature

(C) Area under the curve decreases with increase in temperature

(D) With increase in temperature curve broadens and shifts to the right hand side

***40.** Which of the following statements are in accordance with the Arrhenius equation?

(A) Rate of a reaction increases with increase in temperature

(B) Rate of a reaction increases with decrease in activation energy

(C) Rate constant decreases exponentially with increase in temperature

(D) Rate of reaction decreases with decrease in activation energy

***41.** Mark the incorrect statements.

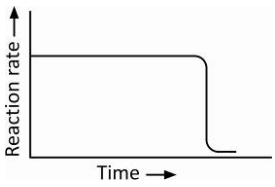
(A) Catalyst provides an alternative pathway to reaction mechanism

(B) Catalyst raises the activation energy

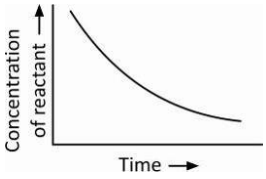
(C) Catalyst lowers the activation energy

(D) Catalyst alters enthalpy change of the reaction

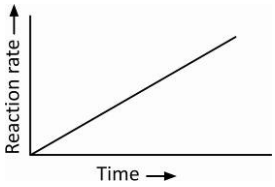
***42.** Which of the following graphs is correct for a zero order reaction?



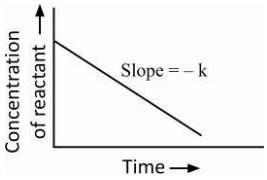
(A)



(B)

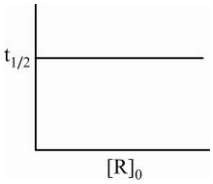


(C)

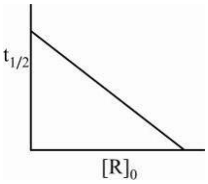


(D)

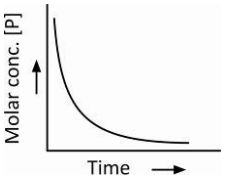
***43.** Which of the following graphs is correct for a first order reaction?



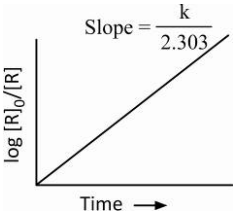
(A)



(B)



(C)



(D)

For Questions 44 - 45

(A) Statement-1 is True, Statement-2 is True and Statement-2 is a correct explanation for Statement-1.

(B) Statement-1 is True, Statement-2 is True and Statement-2 is NOT a correct explanation for Statement-1.

(C) Statement-1 is True, Statement-2 is False.

(D) Statement-1 is False, Statement-2 is True.

44. **Statement : 1** The enthalpy of reaction remains constant in the presence of a catalyst.

Statement : 2 A catalyst participating in the reaction, forms different activated complex and lowers down the activation energy but the difference in energy of reactant and product remains the same.

45. **Statement : 1** Rate constants determined from Arrhenius equation are fairly accurate for simple as well as complex molecules.

Statement : 2 Reactant molecules undergo chemical change irrespective of their orientation during collision.

46. For $A(s) + B(s) \longrightarrow C(s)$; rate = $k[A]^{1/2}[B]^2$, if initial concentration of A and B are increased by factors 4 and 2 respectively, then the initial rate is changed by the factor :

47. Reaction $A \rightarrow B$ follows second order kinetics Doubling the concentration of A will increase the rate of formation of B by a factor of :

48. For an elementary reaction, $X(g) \rightarrow Y(g) + Z(g)$ the half life period is 10 min. In what period of time would the concentration of X be reduced to 10% of original concentration ?

49. A first order reaction is 75% completed in 100 minutes. How long time will it take for its 87.5% completion ?

50. 99% of a first order reaction was completed in 32 minutes when 99.9% of the reaction will complete :

51. At 300 K the half-life of a sample of a gaseous compound initially at $1\,atm$ is $100\,sec$. When the pressure is $0.5\,atm$ the half-life is $50\,sec$. The order of reaction is :

52. The activation energy of the reaction, $A + B \longrightarrow C + D + 38\,kcal$ is $20\,kcal$. What would be the activation energy of the following reaction, $C + D \longrightarrow A + B$.

53. A radioactive sample has initial activity of $28\,dpm$ 30 minutes. After 69.3 minutes, it was found to have an activity of $28\,dpm$. Find the number of atoms in a sample having an activity of $100\,dpm$. Divide your answer with 100?

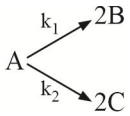
54. A radioactive element undergoing decay is left 20% of its initial weight after certain period of time t. How many periods should elapse from the start for the 50% of the element to be left over ? Multiply your answer with 100?

55. The half-life of a radioactive element is 100 minutes. The time interval between the stages to 50% and 87.5% decay will be :

56. A pure radio-chemical preparation was observed to disintegrate at the rate of 2140 counts/minutes at 12.35 P.M. At 3.55 P.M. of the same day, the disintegration rate of the sample was only 535 count/minutes. What is the half-life of the material ?

57. Reaction $A + B \longrightarrow C + D$ follows rate law, $r = k[A]^{1/2}[B]^{1/2}$. Starting with $1M$ of A and B each, what is the time taken for concentration of A two become $0.1M$? [Given $k = 2.303 \times 10^{-2}\,sec^{-1}$]

58. For given hypothetical elementary parallel reaction,



Where $\frac{k_1}{k_2} = \frac{1}{2}$

Initially only 2 moles of A are present. The total number of moles of A, B and C at the end of 75% reaction are :
Multiply your answer with 10?

59. For the first order reaction $A \longrightarrow B + C$, carried out at 27°C. If $3.8 \times 10^{-16}\%$ of the reactant molecules exists in the activated state, the E_a (activation energy) of the reaction is :

60. The ratio of activities of two ratio nuclides X and Y in a mixture at time $t = 0$ was found to be $4 : 1$. After two hours, the ratio of activities become $1 : 1$. If the $t_{1/2}$ of ratio nuclide X is 20 min then $t_{1/2}$ [in minutes] of ratio nuclide Y is :

Surface Chemistry

CHOOSE THE CORRECT ALTERNATIVE. ONLY ONE CHOICE IS CORRECT. HOWEVER, QUESTIONS MARKED '*' MAY HAVE MORE THAN ONE CORRECT OPTION.

1. The coagulating power of electrolytes having ions Na^+, Al^{3+}, and Ba^{2+} for arsenic sulphide sol increases in the order :

(A) $Al^{3+} < Ba^{2+} < Na^+$

(B) $Na^+ < Ba^{2+} < Al^{3+}$

(C) $Ba^{2+} < Na^{2+} < Al^{3+}$

(D) $Al^{3+} < Na^+ < Ba^{2+}$

2. According to Freundlich adsorption isotherm which of the following is correct?

(A) $\frac{x}{m} \propto p^0$ **(B)** $\frac{x}{m} \propto p^1$

(C) $\frac{x}{m} \propto p^{1/n}$

(D) All of the above are correct for different range of pressure

3. Gold numbers of protective colloids A, B, C and D are 0.50, 0.01, 0.10 and 0.005, respectively. The correct order of their protective powers is :

(A) $D < A < C < B$ **(B)** $C < B < D < A$

(C) $A < C < B < D$ **(D)** $B < D < A < C$

4. In Langmuir's model of adsorption of a gas on a solid surface :

(A) The rate of dissociation of adsorbed molecules from the surface does not depend on the surface covered

(B) The adsorption at a single site on the surface may involve multiple molecule at the same time

(C) The mass of gas striking a given area of surface is proportional to the pressure of the gas

(D) The mass of gas striking a given area of surface is independent of the pressure of the gas

5. The disperse phase in colloidal iron (III) hydroxide and colloidal gold is positively and negatively charged, respectively. Which of the following statement is not correct?

(A) Coagulation in both sols can be brought about by electrophoresis

(B) Mixing the sols has no effect

(C) Sodium sulphate solution causes coagulation in both sols

(D) Magnesium chloride solution coagulates the gold sol more readily than the iron (III) hydroxide sol

6. The volume of a colloidal particle, V_C as compared to the volume of a solute particle in a true solution V_S, could be :

(A) $\frac{V_C}{V_S} \approx 10^3$ **(B)** $\frac{V_C}{V_S} \approx 10^{-3}$

(C) $\frac{V_C}{V_S} \approx 10^{23}$ **(D)** $\frac{V_C}{V_s} \approx 1$

7. H_2 gas is adsorbed on the metal surface like tungsten. This follows…order reaction.

(A) Third **(B)** Second

(C) Zero **(D)** First

***8.** Which of the following options are correct?

(A) Micelle formation by soap in aqueous solution is possible at all temperatures

(B) Micelle formation by soap in aqueous solution occurs above a particular concentration

(C) On dilution of soap solution micelles may revert to individual ions

(D) Soap solution behaves as a normal strong electrolyte at all concentrations

***9.** Which of the following statements are correct about solid catalyst?

(A) Same reactants may give different product by using different catalysts

(B) Catalyst does not change ΔH of reaction

(C) Catalyst is required in large quantities to catalyse reactions

(D) Catalytic activity of a solid catalyst does not depend upon the strength of chemisorption

***10.** Freundlich adsorption isotherm is given by the expression $\frac{x}{m} = k p^{1/n}$ which of the following conclusions can be drawn from this expression.

(A) When $\frac{1}{n} = 0$, the adsorption is independent of pressure

(B) When $\frac{1}{n} = 0$, the adsorption is directly proportional to pressure

(C) When $n = 0$, $\frac{x}{m}$ vs p graph is a line parallel to x-axis

(D) When n = 0, plot of $\frac{x}{m}$ vs p is a curve

***11.** H_2 gas is adsorbed on activated charcoal to a very little extent in comparison to easily liquefiable gases due to_____.

(A) Very strong van der Waal's interaction

(B) Very weak van der Waals forces

(C) Very low critical temperature

(D) Very high critical temperature

***12.** Which of the following statements are correct?

(A) Mixing two oppositely charged sols neutralises their charges and stabilises the colloid

(B) Presence of equal and similar charges on colloidal particles provides stability to the colloids

(C) Any amount of dispersed liquid can be added to emulsion without destabilising it

(D) Brownian movement stabilises sols

***13.** An emulsion cannot be broken by _____and _____.

(A) Heating

(B) Adding more amount of dispersion medium

(C) Freezing

(D) Adding emulsifying agent

***14.** Which of the following substances will precipitate the negatively charged emulsions?

(A) KCl **(B)** Glucose

(C) Urea **(D)** NaCl

***15.** Which of the following colloids **CANNOT** be coagulated easily?

(A) Lyophobic colloids

(B) Irreversible colloids

(C) Reversible colloids

(D) Lyophilic colloids

***16.** What happens when a lyophilic sol is added to a lyophobic sol?

(A) Lyophobic sol is protected

(B) Lyophilic sol is protected

(C) Film of lyophilic sol is formed over lyophobic sol

(D) Film of lyophobic sol is formed over lyophilic sol

***17.** Which phenomenon occurs when an electric field is applied to a colloidal solution and electrophoresis is prevented?

(A) Reverse osmosis takes place

(B) Electroosmosis takes place

(C) Dispersion medium begins to move

(D) Dispersion medium becomes stationary

***18.** In a reaction, catalyst changes _____.

(A) Physically **(B)** Qualitatively

(C) Chemically **(D)** Quantitatively

***19.** Which of the following phenomenon occurs when a chalk stick is dipped in ink?

(A) Adsorption of coloured substance

(B) Adsorption of solvent

(C) Absorption and adsorption both of solvent

(D) Absorption of solvent

20. Water carrying impurities is purified by addition of potash alum. Al^{3+} of the potash alum causes:

(A) Peptization of negatively charged turbidity

(B) Coagulation of negatively charged turbidity

(C) Peptization of positively charged turbidity

(D) Coagulation of positively charged turbidity

21. Which property of colloids is not dependent on the charge on colloidal particles ?

(A) Electro-osmosis

(B) Tyndall effect

(C) Coagulation

(D) Electrophoresis

22. Which one of the following statements is incorrect about enzyme catalysis ?

(A) Enzymes are mostly proteinous in nature

(B) Enzyme action is specific

(C) Enzymes are denatured by ultraviolet rays and at high temperature

(D) Enzymes are least reactive at optimum temperature

23. If x is amount of adsorbate and m is amount of adsorbent, which of the following relations is not related to adsorption process ?

(A) $x/m = f(p)$ at constant T

(B) $x/m = f(T)$ at constant p

(C) $p = f(T)$ at constant (x/m)

(D) $\frac{x}{m} = p \times T$

24. The Langmuir adsorption isotherm is deduced using the assumption :

(A) the adsorption sites are equivalent in their ability to adsorb the particles

(B) the heat of adsorption varies with coverage

(C) the adsorbed molecules interact with each other

(D) the adsorption takes place in multilayers

25. Which one of the following forms micelles in aqueous solution above certain concentration ?

(A) Dodecyl trimethyl ammonium chloride

(B) Glucose

(C) Urea

(D) Pyridinium chloride

26. According to the adsorption theory of catalysis, the speed of the reaction increases because :

(A) the concentration of reactant molecules at the active centres of the catalyst becomes high due to adsorption

(B) in the process of adsorption, the activation energy of the molecules becomes large

(C) adsorption produces heat which increases the speed of the reaction

(D) adsorption lowers the activation energy of the reaction

27. Position of non polar and polar part in micelle :

(A) polar at outer surface but not polar at inner surface

(B) polar at inner surface non polar at outer surface

(C) distributed over all the surface

(D) are present in the surface only

28. Which of the following is not correct regarding the adorption of a gas on surface of a solid ?

(A) On increasing temperature adsorption increases continuously

(B) Enthalpy and entropy change is negative

(C) Adsorption is more for some specific substance

(D) It is a reversible reaction

29. At the critical micelle concentration (CMC) the surfactant molecules :

(A) associate **(B)** dissociate

(C) decompose

(D) become completely soluble

30. The ability of anion, to bring about coagulation of a given colloid, depends upon :

(A) magnitude of the charge

(B) both magnitude and charge

(C) its charge only

(D) sign of the charge alone

31. From the given following sol how many can coagulate the haemoglobin sol?

$Fe(OH)_3$, $Ca(OH)_2$, $Al(OH)_3$, starch, clay, As_2S_3, CdS, basic dye.

32. From the given following sol how many can coagulate silica acid sol?

$Fe(OH)_3$, $Ca(OH)_2$, $Al(OH)_3$, Starch, Clay, As_2S_3, CdS, Basic dye.

33. For the coagulation of 500 mL of arsenious sulphide sol, 2 mL of 1 M NaCl is required. What is the flocculation value of NaCl?

34. The coagulation of 100 mL of a colloidal sol of gold is completely prevented by addition of 0.03 g of Haemoglobin to it before adding 1 mL of 10% NaCl solution. Calculate the gold number of Haemoglobin.

35. The gold number of gelatin is 0.01. Calculate the amount of gelatin (in mg) to be added to 1000 mL of a colloidal sol of gold to prevent its coagulation, before adding 1 mL of 10% NaCl solution.

36. 526.3 mL of 0.5 m HCl is shaken with 0.5 g of activated charcoal and filtered. The concentration of the filtrate is reduced to 0.4 m. The amount of adsorption (x/m) is:

37. In an experiment, addition of 5.0 mL, of 0.006 M $BaCl_2$ to 10.0 mL of arsenic sulphite sol just causes the complete coagulation in 34 h. The following value of the effective ion is:

38. In an adsorption experiment, a graph between log (x/m) versus log P was found to be linear with a slope of 45°. The intercept on the y axis was found to be 0.301. Calculate the amount of the gas adsorbed per gram of charcoal under a pressure of 3.0 atm.

39. When 6×10^{-5} g of a protective colloid was added to 20 mL of a standard gold sol, the precipitation of latter was just prevented on addition of 2 mL of 10% NaCl solution.

The gold number of a protective colloid is $\frac{x}{100}$.

What is the value of x:

40. In an experiment, addition of 4.0 mL of 0.005 M $BaCl_2$ to 16.0 mL of arsenious sulphide sol just causes the complete coagulation in 2 h. The flocculating value of the effective ion is:

41. The diameter of colloidal particles range from 1 nm to 10^x nm. What is x ?

General Principles & Processes of Isolation of Elements

CHOOSE THE CORRECT ALTERNATIVE. ONLY ONE CHOICE IS CORRECT. HOWEVER, QUESTIONS MARKED '*' MAY HAVE MORE THAN ONE CORRECT OPTION.

1. Refining of impure copper with zinc impurity is to be done by electrolysis using electrodes as :

	Cathode	Anode
(A)	Pure copper	Pure zine
(B)	Pure zinc	Pure copper
(C)	Pure copper	Impure copper
(D)	Pure zinc	Impure zinc

***2.** Which of the following options are correct?

(A) Cast iron is obtained by remelting pig iron with scrap iron and coke using hot air blast

(B) In extraction of silver, silver is extracted as cationic complex

(C) Nickel is purified by zone refining

(D) Zr and Ti are purified by van Arkel method

***3.** In the extraction of aluminium by Hall-Heroult process, purified Al_2O_3 is mixed with CaF_2 to :

(A) Lower the melting point of Al_2O_3

(B) Increases the conductivity of molten mixture

(C) Reduce Al^{3+} into Al(s)

(D) Acts as catalyst

***4.** Which of the following statements is correct about the role of substances added in the froth floation process?

(A) Collectors enhance the non-wettability of the mineral particles

(B) Collectors enhance the wettability of gangue particles

(C) By using depressants in the process two sulphide ores can be separated

(D) Froth stabilisers decrease wettability of gangue

***5.** In the Froth Floatation process, zinc sulphide and lead sulphide can be separated by_____.

(A) Using collectors
(B) Adjusting the proportion of oil of water
(C) Using depressant
(D) Using froth stabilisers

***6.** Common impurities present in bauxite are_____.

(A) CuO **(B)** ZnO
(C) Fe_2O_3 **(D)** SiO_2

***7.** Which of the following reactions occur during calcination?

(A) $CaCO_3 \longrightarrow CaO + CO_2$

(B) $2FeS_2 + \frac{11}{2}O_2 \longrightarrow Fe_2O_3 + 4SO_2$

(C) $Al_2O_3.xH_2O \longrightarrow Al_2O_3 + xH_2O$

(D) $ZnS + \frac{3}{2}O_2 \longrightarrow ZnO + SO_2$

***8.** For the metallurgical process of which of the ores calcined ore can be reduced by carbon?

(A) Haematite **(B)** Calamine
(C) Iron pyrites **(D)** Sphalerite

***9.** The main reaction occurring in blast furnace during extraction of iron from haematite are_____.

(A) $Fe_2O_3 + 3CO \longrightarrow 2Fe + 3CO_2$

(B) $FeO + SiO_2 \longrightarrow FeSiO_3$

(C) $Fe_2O_3 + 3C \longrightarrow 2Fe + 3CO$

(D) $CaO + SiO_2 \longrightarrow CaSiO_3$

***10.** In which of the following method of purification, metal is converted to its volatile compound which is decomposed to give pure metal?

(A) Heating with stream of carbon monoxide
(B) Heating with iodine
(C) Liquation
(D) Distillation

***11.** Which of the following statements are correct?

(A) A depressant prevents certain type of particle to come to the froth
(B) Copper matte contains Cu_2S and ZnS
(C) The solidified copper obtained from reverberatory furnace has blistered appearance due to evolution of SO_2 during the extraction
(D) Zinc can be extracted by self-reduction

***12.** In the extraction of chlorine from brine_____.

(A) $\Delta G^{\ominus}$ for the overall reaction is negative
(B) $\Delta G^{\ominus}$ for the overall reaction is positive
(C) $E^{\ominus}$ for overall reaction has negative value
(D) $E^{\ominus}$ for overall reaction has positive value

13. Which method of purification is represented by the following equation?

$$\underset{\text{(Impure)}}{Ti(s)} + 2\,I_2(g) \xrightarrow{870K} TiI_4(g) \xrightarrow{2000K} \underset{\text{(Pure)}}{Ti(s)} + 2\,I_2(g)$$

(A) Zone Refining **(B)** Cupellation
(C) Polling **(D)** Van-Arkel

14. During the process of electrolytic refining of copper, some metals present as impurity settle as 'anode mud'. These are :

(A) Fe and Ni **(B)** Ag and Au
(C) Pb and Zn **(D)** Se and Ag

15. Which one of the following ores is best concentrated by forth- floatation method?

(A) Magnetite **(B)** Cassiterite
(C) Galena **(D)** Malachite

16. Aluminium is extracted by the electrolysis of :

(A) Alumina **(B)** Bauxite
(C) Molten Cryolite
(D) Alumina Mixed with Molten Cryolite

17. Cyanide process is used for the extraction of :

(A) Barium **(B)** Silver
(C) Boron **(D)** Zink

18. In the extraction of copper from its sulphide ore, the metal is finally obtained by the reduction of cuprous oxide with

(A) carbon monoxide
(B) copper (I) sulphide
(C) sulphur dioxide
(D) iron (II) sulphide

19. Roasting of sulphides gives the gas X as a byproduct. This is a colourless gas with choking smell of burnt sulphur and causes great damage to respiratory organs as a result of acid rain. Its aqueous solution is acidic, acts as a reducing agent and its acid has never been isolated. The gas X is :

(A) CO_2 **(B)** SO_3
(C) H_2S **(D)** SO_2

20. Which one of the following is a mineral of iron ?

(A) Malachite **(B)** Cassiterite
(C) Pyrolusite **(D)** Magnetite

21. Which of the following elements is present as the impurity to the maximum extent in the pig iron ?

(A) Manganese **(B)** Carbon
(C) Silicon **(D)** Phosphorus

22. Sulphide ores of metals are usually concentrated by froth floatation process. Which one of the following sulphide ores offer an exception and is concentrated by chemical leaching ?

(A) Galena **(B)** Copper pyrite
(C) Sphalerite **(D)** Argentite

23. Which of the following statements, about the advantage of roasting of sulphide ore before reduction is NOT true ?

(A) The ΔG_f° of the sulphide is greater than those for CS_2 and H_2S
(B) The ΔG_f° is negative for roasting of sulphide ore to oxide
(C) Roasting of the sulphide to the oxide is thermodynamically feasible
(D) Carbon and hydrogen are suitable reducing agents for metal sulphides

24. Calcium is obtained by :

(A) reduction of calcium chloride with carbon
(B) electrolysis of molten anhydrous calcium chloride
(C) roasting of limestone
(D) electrolysis of solution of calcium chloride in H_2O

25. In the context of the Hall-Heroult process for the extraction of Al, which for the following statements is false?

(A) CO and CO_2 are produced in this process
(B) Al_2O_3 is mixed with CaF_2 which lowers the melting point of the mixture and brings conductivity
(C) Al^{3+} is reduced at the cathode to form Al
(D) Na_3AlF_6 serves as the electrolyte

26. How many ores are sulphide ores from the given ores?
Azurite, Chalcocite, Iron pyrites, Limonite

27. How many metals are commercially purified by Van Arkel method from the given metals?
Ti, B, Zr, Pb, Hg

28. How many metals are commercially purified by electrolysis method from the given metals?

29. Find the number of following reactions which are involved in roasting process:

(i) $S_8 + 8O_2 \xrightarrow{\Delta} 8SO_2 \uparrow$

(ii) $P_4 + 5O_2 \xrightarrow{\Delta} P_4O_{10} \uparrow$

(iii) $4As + 3O_2 \xrightarrow{\Delta} 2As_2O_3 \uparrow$

(iv) $2ZnS + 3O_2 \xrightarrow{\Delta} 2ZnO + 2SO_2 \uparrow$

(v) $ZnCO_3 \xrightarrow{\Delta} ZnO + CO_2 \uparrow$

30. Find the number of reaction from the given reactions which can show calcination process:

(i) $CaCO_3 \cdot MgCO_3 \xrightarrow{\Delta} CaO + MgO + CO_2$

(ii) $CuCO_3.Cu(OH)_2 \xrightarrow{\Delta} 2CuO + H_2O + CO_2$

(iii) $Al_2O_2 \cdot 2H_2O \xrightarrow{\Delta} Al_2O_3 + 2H_2O$

(iv) $2CuS + 3O_2 \xrightarrow{\Delta} 2Cu_2O + 2SO_2$

31. Find the number of basic flux from the given compounds:
SiO_2, MgO, CaO, FeO, B_2O_3, $CaCO_3 \cdot MgCO_3$

32. Find the number of metal oxides which are decomposed on normal heating from the given oxides.
Na_2O, Al_2O_3, PbO, Ag_2O, HgO

33. How many metallic ores are concentrated by magnetic separation method from the given ores?
Cassiterite, Pyrolusite, Rutile, Magnetite, Galena, Cinnabar

34. Find the number of metals from the given metals which can be commercially purified by zone refining methods:
Si, Ge, Ga, Al, Ti, Zr

35. How many metals are commercially extracted by pyrometallurgy from the given metals?
Cu, Fe, Sn, Au, K, Na

36. Find the number of acidic flux from the given compounds:
$CaCO_3$, $Na_2B_4O_7$, $MgSiO_3$, $FeSiO_3$, P_2O_5

37. How many metals are commercially reduced by *Gold-schmidt* alumino *thermite process* from the given metals?
Na, Pb, Al, Mn, Cr, Sn

38. Find the number of metals which are commercially reduced by self-reduction from the given metals:
Fe, Al, Zn, Sn, Pb, Hg, Cu

39. Find the number of metals which are commercially reduced by carbon reduction method from the given metals:
Ag, Cr, Mn, Sn, Zn, Fe

40. How many metals are commercially extracted by hydro metallurgy from the given metals?
Ag, Mn, In, Cr, Pb, Au

41. How many metals are commercially extracted by electrometallurgy from the given metals?
Al, Mg, Na, K, Ag, Hg, Ti, Th, Zr, B

42. How many reactions can show slag formation process from the given reactions?

(i) $SiO_2 + CaO \rightarrow CaSiO_3$

(ii) $FeO + SiO_2 \rightarrow FeSiO_3$

(iii) $CaO + P_2O_5 \rightarrow Ca_3(PO_4)_2$

(iv) $Cr_2O_3 + 2Al \rightarrow Al_2O_3 + 2Cr$

(v) $MgCO_3 + SiO_2 \rightarrow MgSiO_3 + CO_2$

The p-Block Elements

CHOOSE THE CORRECT ALTERNATIVE. ONLY ONE CHOICE IS CORRECT. HOWEVER, QUESTIONS MARKED '*' MAY HAVE MORE THAN ONE CORRECT OPTION.

1. On addition of conc. H_2SO_4 to a chloride salt, colourless fumes are evolved but in case of iodide salt, violet fumes come out. This is because :

(A) H_2SO_4 reduces HI to I_2 **(B)** HI is of violet colour

(C) HI gets oxidised to I_2 **(D)** HI changes to HIO_3

2. In qualitative analysis when H_2S is passed through an aqueous solution of salt acidified with dil. HCl, a black precipitate is obtained. On boiling the precipitate with dil. HNO_3, it forms a solution of blue colour. Addition of excess of aqueous solution of ammonia to this solution gives_____.

(A) Deep blue precipitate of $Cu(OH)_2$ **(B)** Deep blue solution of $[Cu(NH_3)_4]^{2+}$

(C) Deep blue solution of $Cu(NO_3)_2$ **(D)** Deep blue solution of $Cu(OH)_2 \cdot Cu(NO_3)_2$

3. In a cyclotrimetaphosphoric acid molecule, how many single and double bonds are present?

(A) 3 double bonds; 9 single bonds **(B)** 6 double bonds; 6 single bonds

(C) 3 double bonds; 12 single bonds **(D)** Zero double bonds; 12 single bonds

4. Which of the following elements can be involved in $p\pi - d\pi$ bonding?

(A) Carbon **(B)** Nitrogen **(C)** Phosphorus **(D)** Boron

5. Which of the following pairs of ions are iso-electronic and iso-structural?

(A) CO_3^{2-}, NO_3^- **(B)** ClO_3^-, CO_3^{2-}

(C) SO_3^{2-}, NO_3^- **(D)** ClO_3^-, SO_3

6. Affinity for hydrogen decreases in the group from fluorine to iodine. Which of the halogen acids should have highest bond dissociation enthalpy?

(A) HF **(B)** HCl **(C)** HBr **(D)** HI

7. Bond dissociation enthalpy of $E-H$ (E = element) bonds is given below. Which of the compounds will acts as strongest reducing agent?

Compound	**NH_3**	**PH_3**	**AsH_3**	**SbH_3**
$\Delta_{diss}(E-H)/kJ\ mol^{-1}$	389	322	297	255

(A) NH_3 **(B)** PH_3 **(C)** AsH_3 **(D)** SbH_3

8. On heating with concentrated NaOH solution in an inert atmosphere of CO_2. White phosphorus gives a gas. Which of the following statement is incorrect about the gas?

(A) It is highly poisonous and has smell like rotten fish
(B) It's solution in water decomposes in presence of light
(C) It is more basic than NH_3
(D) It is less basic than NH_3

9. Which of the following acids forms three series of salts?

(A) H_3PO_2 **(B)** H_3BO_3 **(C)** H_3PO_4 **(D)** H_3PO_3

10. Strong reducing behaviour of H_3PO_2 is due to :

(A) Low oxidation state of phosphorus
(B) Presence of two —OH groups and one P—H bond
(C) Presence of one —OH group and two P—H bonds
(D) High electron gain enthalpy of phosphorus

11. On heating lead nitrate forms oxides of nitrogen and lead. The oxides formed are_____.

(A) N_2O, PbO **(B)** NO_2, PbO
(C) NO, PbO **(D)** NO, PbO_2

12. Which of the following elements does not show allotropy?

(A) Nitrogen **(B)** Bismuth
(C) Antimony **(D)** Arsenic

13. Maximum covalency of nitrogen is_____.

(A) 3 **(B)** 5 **(C)** 4 **(D)** 6

14. Which of the following statements is wrong?

(A) Single N—N bond is stronger than the singe P—P bond
(B) PH_3 can act as a ligand in the formation of coordination compound with transition elements
(C) NO_2 is paramagnetic in nature
(D) Covalency of nitrogen in N_2O_5 is four

15. A brown ring is formed in the ring test for NO_3^- ion. It is due to formation of :

(A) $[Fe(H_2O)_5(NO)]^{2+}$ **(B)** $FeSO_4.NO_2$
(C) $[Fe(H_2O)_4(NO)_2]^{2+}$ **(D)** $FeSO_4 \cdot HNO_3$

16. Elements of group-15 form compounds in +5 oxidation state. However, bismuth form only one well characterised compound in +5 oxidation state. The compound is :

(A) Bi_2O_5 **(B)** BiF_5 **(C)** $BiCl_5$ **(D)** Bi_2S_5

17. On heating ammonium dichromate and barium azide separately we get :

(A) N_2 in both cases

(B) N_2 with ammonium dichromate and NO with barium azide

(C) N_2O with ammonium dichromate and N_2 with barium azide

(D) N_2O with ammonium dichromate and NO_2 with barium azide

18. The oxidation state of central atom in the anion of compound NaH_2PO_2 will be_____.

(A) +3 **(B)** +5 **(C)** +1 **(D)** –3

19. Which of the following is not tetrahedral in shape?

(A) NH_4^+ **(B)** $SiCl_4$ **(C)** SF_4 **(D)** SO_4^{2-}

20. Which of the following are peroxoacids of sulphur?

(A) H_2SO_5 and $H_2S_2O_8$ **(B)** H_2SO_5 and $H_2S_2O_7$

(C) $H_2S_2O_3$ and $H_2S_2O_7$ **(D)** $H_2S_2O_6$ and $H_2S_2O_7$

21. Hot conc. H_2SO_4 acts as moderately strong oxidising agent. It oxidises both metals and non-metals. Which of the following element is oxidised by conc. H_2SO_4 into two gaseous products?

(A) Cu **(B)** S **(C)** C **(D)** Zn

22. A black compound of manganese react with a halogen acid to give greenish yellow gas. When excess of this gas reacts with NH_3 an unstable trihalide is formed. In this process the oxidation state of nitrogen changes from_____.

(A) -3 to $+3$ **(B)** -3 to 0 **(C)** -3 to $+5$ **(D)** 0 to -3

23. In the preparation of compounds of Xe, Bartlett had taken $O_2^+\ Pt\ F_6^-$ as a base compound. This is because :

(A) Both O_2 and Xe have same size

(B) Both O_2 and Xe have same electron gain enthalpy

(C) Both O_2 and Xe have almost same ionisation enthalpy

(D) Both Xe and O_2 are gases

24. In solid state PCl_5 is a_____.

(A) Covalent solid

(B) Octahedral strcutre

(C) Ionic solid with $[PCl_6]^+$ octahedral and $[PCl_4]^-$ tetrahedral

(D) Ionic solid with $[PCl_4]^+$ tetrahedral and $[PCl_6]^-$ octahedral

25. Reduction potentials of some ions are given below. Arrange them in decreasing order of oxidising power.

Ion	ClO_4^-	IO_4^-	BrO_4^-
Reduction Potential $E^\ominus$ / V	$E^\ominus = 1.19$ V	$E^\ominus = 1.65$ V	$E^\ominus = 1.74$ V

(A) $ClO_4^- > IO_4^- > BrO_4^-$ **(B)** $IO_4^- > BrO_4^- > ClO_4^-$

(C) $BrO_4^- > IO_4^- > ClO_4^-$ **(D)** $BrO_4^- > ClO_4^- > IO_4^-$

26. Which of the following is iso-electronic pair?

(A) ICl_2, ClO_2 **(B)** BrO_2^-, BrF_2^+

(C) ClO_2, BrF **(D)** CN^-, O_3

***27.** If chlorine gas is passed through hot NaOH solution, two changes are observed in the oxidation number of chlorine during the reaction. These are _____ and _____.

(A) 0 to $+5$ **(B)** 0 to $+3$ **(C)** 0 to -1 **(D)** 0 to $+1$

***28.** Which of the following options are not in accordance with the property mentioned against them?

(A) $F_2 > Cl_2 > Br_2 > I_2$ Oxidising power

(B) MI > MBr > MCI > MF Ionic character of metal halide

(C) $F_2 > Cl_2 > Br_2 > I_2$ Bond dissociation enthalpy

(D) HI < HBr < HCl < HF Hydrogen-halogen bond strength

***29.** Which of the following is correct for P_4 molecule of white phosphorus?

(A) It has 6 lone pairs of electrons **(B)** It has six $P-P$ single bonds

(C) It has three $P-P$ single bonds **(D)** It has four lone pairs of electrons

***30.** Which of the following statements are correct?

(A) Among halogens, radius ratio between iodine and fluorine is maximum

(B) Leaving $F-F$ bond, all halogens have weaker $X-X$ bond than $X-X'$ bond in inter-halogens

(C) Among inter-halogens compounds maximum number of atoms are present in iodine fluoride

(D) Inter-halogen compounds are more reactive than halogen compounds

***31.** Which of the following statements are correct for SO_2 gas?

(A) It acts as bleaching agent in moist conditions

(B) It's molecule has linear geometry

(C) It's dilute solution is used as disinfectant

(D) It can be prepared by the reaction of dilute H_2SO_4 with metal sulphide

***32.** Which of the following statements are correct?

(A) All the three $N-O$ bond lengths in HNO_3 are equal

(B) All $P-Cl$ bond lengths in PCl_5 molecule in gaseous state are equal

(C) P_4 molecule in white phohsphorus have angular strain therefore white phosphorus is very reactive

(D) PCl_5 is ionic in solid state in which cation is tetrahedral and anion is octahedral

***33.** Which of the following orders are correct as per the properties mentioned against each?

(A) $As_2O_3 < SiO_2 < P_2O_3 < SO_2$ Acid strength

(B) $AsH_3 < PH_3 < NH_3$ Enthalpy of vapourisation

(C) S < O < Cl < F More negative electron gain enthalpy

(D) $H_2O > H_2S > H_2Se > H_2Te$ Thermal stability

***34.** Which of the following statements are correct?

(A) $S-S$ bond is present in $H_2S_2O_6$

(B) In peroxosulphuric acid (H_2SO_5) sulphur is in +6 oxidation state

(C) Iron powder along with Al_2O_3 and K_2O is used as a catalyst in the preparation of NH_3 by Haber's process

(D) Change in enthalpy is positive for the preparation of SO_3 by catalytic oxidation of SO_2

***35.** In which of the following reactions conc. H_2SO_4 is used as an oxidising reagent?

(A) $CaF_2 + H_2SO_4 \longrightarrow CaSO_4 + 2HF$ **(B)** $2HI + H_2SO_4 \longrightarrow I_2 + SO_2 + 2H_2O$

(C) $Cu + 2H_2SO_4 \longrightarrow CuSO_4 + SO_2 + 2H_2O$ **(D)** $NaCl + H_2SO_4 \longrightarrow NaHSO_4 + HCl$

***36.** Which of the following statements are true?

(A) Only type of interaction between particles of noble gases are due to weak dispersion forces

(B) Ionisation enthalpy of molecular oxygen is very close to that of xenon

(C) Hydrolysis of XeF_6 is a redox reaction **(D)** Xenon fluorides are not reactive

37. Which of the statements given below is incorrect ?

(A) O_3 molecule is bent **(B)** ONF is isoelectronic with O_2N^-

(C) OF_2 is an oxide of fluorine **(D)** Cl_2O_7 is an anhydride of perchloric acid

38. Nitrogen dioxide and sulphur dioxide have some properties in common. Which property is shown by one of these compounds, but not by the other ?

(A) Is soluble in water **(B)** Is used as a food preservative

(C) Forms 'acid-rain' **(D)** Is a reducing agent

39. Acidity of diprotic acids in aqueous solutions increases in the order :

(A) $H_2S < H_2Se < H_2Te$ **(B)** $H_2Se < H_2S < H_2Te$

(C) $H_2Te < H_2S < H_2Se$ **(D)** $H_2Se < H_2Te < H_2S$

40. Which of the following does not give oxygen on heating ?

(A) $K_2Cr_2O_7$ **(B)** $(NH_4)_2Cr_2O_7$ **(C)** $KClO_3$ **(D)** $Zn(ClO_3)_2$

41. Which of the following statements is not valid for oxoacids of phosphorus ?

(A) Orthophosphoric acid is used in the manufacture of triple superphosphate

(B) Hypophosphorous acid is a diprotic acid

(C) All oxoacids contain tetrahedral four coordinated phosphorus

(D) All oxoacids contain atleast one P = O unit and one P – OH group

42. Sulphur trioxide can be obtained by which of the following reaction ?

(A) $CaSO_4 + C \xrightarrow{\Delta}$ **(B)** $Fe_2(SO_4)_3 + C \xrightarrow{\Delta}$

(C) $S + H_2SO_4 \xrightarrow{\Delta}$ **(D)** $H_2SO_4 + PCl_5 \xrightarrow{\Delta}$

43. In which of the following arrangements the given sequence is not strictly according to the property indicated against it?

(A) $HF < HCl < HBr < HI$: increasing acidic strength

(B) $H_2O < H_2S < H_2Se < H_2Te$: increasing pK_a values

(C) $NH_3 < PH_3 < AsH_3 < SbH_3$: increasing acidic character

(D) $CO_2 < SiO_2 < SnO_2 < PbO_2$: increasing oxidising power

44. How many bridging oxygen atoms are present in P_4O_{10} ?

(A) 6 **(B)** 4 **(C)** 2 **(D)** 5

45. Which one of the following orders is not in according with the property stated against it ?

(A) $F_2 > Cl_2 > Br_2 > I_2$ Bond dissociation energy

(B) $F_2 > Cl_2 > Br_2 > I_2$ Oxidising power

(C) $HI > HBr > HCl > HF$ Acidic property in water

(D) $F_2 > Cl_2 > Br_2 > I_2$ Electronegativity

46. Which of the following statement is true ?

(A) Silicon exhibits 4 coordination number in its compound

(B) Bond energy of F_2 is less than Cl_2

(C) Mn(III) oxidation state is more stable than Mn(II) in aqueous state

(D) Elements of 15^{th} gp shows only + 3 and + 5 oxidation states

47. Which of the following phosphorus is the most reactive ?

(A) Scarlet phosphorus **(B)** White phosphorus

(C) Red phosphorus **(D)** Violet phosphorus

48. Which of the following is used in the preparation of chlorine ?

(A) Both MnO_2 and $KMnO_4$ **(B)** Only $KMnO_2$

(C) Only MnO_2 **(D)** Either MnO_2 or $KMnO_4$

49. Repeated use of which one of the following fertilizers would increase the acidity of the soil ?

(A) Ammonium sulphate **(B)** Superphosphate of lime

(C) Urea **(D)** Potassium nitrate

50. Which of the following bonds has the highest energy ?

(A) S – S **(B)** O – O **(C)** Se – Se **(D)** Te – Te

51. Which of the following displaces Br_2 from an aqueous solution containing bromide ions ?

(A) I_2 **(B)** I_3^- **(C)** Cl_2 **(D)** Cl^-

52. Which of the following sets has strongest tendency of form anions ?

(A) Ga, Ni, Ti **(B)** Na, Mg, Al **(C)** N, O, F **(D)** V, Cr, Mn

53. Which of the following elements is extracted commercially by the electrolysis of an aqueous solution of its compound?

(A) Cl **(B)** Br **(C)** Al **(D)** Na

54. Sugarcane on reaction with nitric acid gives :

(A) CO_2 and SO_2 **(B)** $(COOH)_2$

(C) 2HCOOH (two moles) **(D)** no reaction

55. When chlorine is passed over dry slaked lime at room temperature, the main reaction product is :

(A) $Ca(ClO_2)_2$ **(B)** $CaCl_2$ **(C)** $CaOCl_2$ **(D)** $Ca(OCl)_2$

56. In the manufacture of bromine form sea water, the mother liquor containing bromides is treated with :

(A) carbon dioxide **(B)** chlorine **(C)** iodine **(D)** sulphur dioxide

57. PH_4I + NaOH forms

(A) PH_3 **(B)** NH_3 **(C)** P_4O_6 **(D)** P_4O_{10}

58. Pure nitrogen is prepared in the laboratory by heating a mixture of :

(A) NH_4OH + NaCl **(B)** NH_4NO_3 + NaCl **(C)** NH_4Cl + NaOH **(D)** NH_4Cl + $NaNO_2$

59. The beaching action of chlorine is due to :

(A) reduction **(B)** hydrogenation **(C)** chlorination **(D)** oxidation

60. Each of the following is true for white and red phosphorus except that they :

(A) are both soluble in CS_2 **(B)** can be oxidised by heating in air

(C) consist of the same kind of atoms **(D)** can be converted into one another

61. When orthophosporic acid is heated to $600^\circ C$, the product formed is :

(A) PH_3 **(B)** P_2O_5 **(C)** H_3PO_3 **(D)** HPO_3

62. Oxygen will directly react with each of the following elements except :

(A) P **(B)** Cl **(C)** Na **(D)** S

63. The gases respectively absorbed by alkaline pyrogallol and oil of cinnamon are :

(A) O_3, CH_4 **(B)** O_2, O_3 **(C)** SO_2, CH_4 **(D)** N_2O, O_3

64. Which among the following is the most reactive?

(A) Cl_2 **(B)** Br_2 **(C)** I_2 **(D)** ICl

65. Which one has the highest boiling point?
(A) He **(B)** Ne **(C)** Kr **(D)** Xe

66. The pair in which phosphorous atoms have a formal oxidation state of +3 is :
(A) Pyrophosphorous and hypophosphoric acids **(B)** Orthophosphorous and hypophosphoric acids
(C) Pyrophosphorous and pyrophosphoric acids **(D)** Orthophosphorous and pyrophosphorous acids

67. The reaction of zinc with dilute and concentrated nitric acid, respectively, produces:
(A) NO_2 and NO **(B)** NO and N_2O **(C)** NO_2 and N_2O **(D)** N_2O and NO_2

68. Number of $P-H$ bonds in $H_4P_2O_5$ are _____.

69. Number of $S-S$ linkage in $H_2S_4O_6$ are _____.

70. Total number of moles of paramagnetic gases obtained by heating 1 mole of $AgNO_3$ are _____.

71. Number of compounds which can undergo complete hydrolysis NCl_3, NF_3, $SbCl_3$, PCl_3, $BiCl_3$, SF_4 are _____.

72. Number of $d\pi - p\pi$ bond in SO_3 are _____.

73. Number of peroxy linkage in $H_2S_2O_7$ is _____.

74. Oxidation state of S in H_2SO_5 is _____.

75. Number of unpaired electrons in brown ring complex are _____.

76. Among NH_4NO_3, NH_4NO_2, $(NH_4)_2CO_3$, NH_4ClO_4, $(NH_4)_2SO_4$, $(NH_4)_2Cr_2O_7$, $Pb(NO_3)_2$.
Number of compounds which gives NH_3 are _____.

77. $I_2 + \text{conc. } HNO_3 \longrightarrow$ Product
Oxidation state of I in product is _____.

78. In the preparation of HNO_3, we get NO gas by catalytic oxidation of ammonia. The moles of NO produced by the oxidation of two moles of NH_3 will be _____.

79. Number of σ bonds in P_4O_6 is _____.

The d & f-Block Elements

CHOOSE THE CORRECT ALTERNATIVE. ONLY ONE CHOICE IS CORRECT. HOWEVER, QUESTIONS MARKED '*' MAY HAVE MORE THAN ONE CORRECT OPTION.

1. The electronic configuration of Cu(II) is $3d^9$ whereas that of Cu(I) is $3d^{10}$. Which of the following is correct?

(A) Cu(II) is more stable

(B) Cu(II) is less stable

(C) Cu(I) and Cu(II) are equally

(D) Stability of Cu(II) depends on nature of copper salts

2. What would happen when a solution of potassium chromate is treated with an excess of dilute nitric acid?

(A) Cr^{3+} and $Cr_2O_7^{2-}$ are formed

(B) $Cr_2O_7^{2-}$ and H_2O are formed

(C) CrO_4^{2-} is reduced to +3 state of Cr

(D) None of the above

3. Generally transition elements form coloured salts due to the presence of unpaired electrons. Which of the following compounds will be coloured in solid state?

(A) Ag_2SO_4 **(B)** CuF_2

(C) ZnF_2 **(D)** Cu_2Cl_2

4. On addition of small amount of $KMnO_4$ to cold concentrated H_2SO_4, a green compound is obtained which is highly explosive in nature. Identify the compound from the following.

(A) Mn_2O_7 **(B)** MnO_2

(C) $MnSO_4$ **(D)** Mn_2SO_3

5. The magnetic nature of elements depends on the presence of unpaired electrons. Identify the configuration of transition element, which shows highest magnetic moment.

(A) $3d^7$ **(B)** $3d^5$

(C) $3d^8$ **(D)** $3d^2$

6. Which of the following reactions are disproportionation reactions?

I. $Cu^+ \longrightarrow Cu^{2+} + Cu$

II. $3MnO_4^- + 4H^+ \longrightarrow 2MnO_4^{2-} + MnO_2 + 2H_2O$

III. $2KMnO_4 \xrightarrow{\Delta} K_2MnO_4 + MnO_2 + O_2$

IV. $2MnO_4^- + 3Mn^{2+} + 2H_2O \longrightarrow 5MnO_2 + 4H^+$

The correct choice is :

(A) I **(B)** I, II, III

(C) II, III, IV **(D)** I, IV

7. When $KMnO_4$ solution is added to oxalic acid solution, the decolourisation is slow in the beginning but becomes instantaneous after some time because :

(A) CO_2 is formed as the product

(B) Reaction is exothermic

(C) MnO_4^- catalyses the reaction

(D) Mn^{2+} acts as autocatalyst

8. $KMnO_4$ acts as an oxidising agent in acidic medium. The number of moles of $KMnO_4$ that will be needed to react with one mole of sulphide ions in acidic solution is :

(A) 2/5 **(B)** 3/5

(C) 4/5 **(D)** 1/5

9. Gadolinium belongs to 4f series. It's atomic number is 64. Which of the following is the correct electronic configuration of gadolinium?

(A) $[Xe]\ 4f^7\ 5d^1\ 6s^2$ **(B)** $[Xe]\ 4f^6 5d^1\ 6s^2$

(C) $[Xe]\ 4f^8 6d^2$ **(D)** $[Xe]\ 4f^9\ 5s^1$

10. Interstitial compounds are formed when small atoms are trapped inside the crystal lattice of metals. Which of the following is not the characteristic property of interstitial compounds?

(A) They have high melting points in comparison to pure metals

(B) They are very hard

(C) They retain metallic conductivity

(D) They are chemically very reactive

11. $KMnO_4$ acts as an oxidising agent in alkaline medium. When alkaline $KMnO_4$ is treated with KI, iodide ion is oxidised to_____.

(A) I_2 **(B)** IO^-

(C) IO_3^- **(D)** IO_4^-

12. Which of the following statements is not correct?

(A) Copper liberates hydrogen form acids

(B) In its higher oxidation states, manganese forms stable compound with oxygen and fluorine

(C) Mn^{3+} and Co^{3+} are oxidising agents in aqueous solution

(D) Ti^{2+} and Cr^{2+} are reducing agents in aqueous solution

13. When acidified $K_2Cr_2O_7$ solution is added to Sn^{2+} salts then Sn^{2+} charges to :

(A) Sn **(B)** Sn^{3+}

(C) Sn^{4+} **(D)** Sn^+

14. Highest oxidation state of manganese in fluoride is $+4\,(MnF_4)$ but highest oxidation state in oxides is $+7\,(Mn_2O_7)$ because_____.

(A) Fluorine is more electronegative than oxygen

(B) Fluorine does not posses d-orbitals

(C) Fluorine stabilises lower oxidation state

(D) In covalent compounds fluorine can form single bond only while oxygen forms double bond

15. Although Zirconium belongs to 4d transition series and Hafnium to 5d transition series even then they show similar physical and chemical properties because_____.

(A) Both belongs to d-block

(B) Both have similar ionization energy

(C) Both have similar atomic radius

(D) Both belong to the same group of the periodic table

16. Why is HCl not used to make the medium acidic in oxidation reaction of $KMnO_4$ in acidic medium?

(A) Both HCl and $KMnO_4$ act as oxidising agents

(B) $KMnO_4$ oxidises HCl into Cl_2 which is also an oxidising agent

(C) $KMnO_4$ is a weaker oxidising agent than HCl

(D) $KMnO_4$ acts as a reducing agent in the presence of HCl

***17.** Generally transition elements and their salts are coloured due to the presence of unpaired electrons in metal ions. Which of the following compounds are coloured?

(A) $KMnO_4$ **(B)** $Ce(SO_4)_2$

(C) $TiCl_4$ **(D)** Cu_2Cl_2

***18.** Transition elements show magnetic moment due to spin and orbital motion of electrons. Which of the following metallic ions have almost same spin only magnetic moment?

(A) Co^{2+} **(B)** Cr^{2+}

(C) Mn^{2+} **(D)** Cr^{3+}

19. In the form of dichromate, Cr (VI) is a strong oxidising agent in acidic medium but Mo (VI) in MoO_3 and W (VI) in WO_3 are not because _____.

(A) Cr (VI) is more stable than Mo (VI) and W (VI)

(B) Mo (VI) and W (VI) are more stable than Cr (VI)

(C) Higher oxidation states of heavier members of group-6 of transition series are more stable

(D) Lower oxidation states of heavier members of group-6 of transition series are more stable

***20.** Which of the following actinoids show oxidation states upto $+7$?

(A) Am **(B)** Pu

(C) U **(D)** Np

***21.** General electronic configuration of actionoids is $(n-2)f^{1-14}(n-1)d^{0-2}ns^2$. Which of the following actinoids have one electrons in 6d orbital?

(A) U (Atomic number 92)

(B) Np (Atomic number 93)

(C) Pu (Atomic number 94)

(D) Am (Atomic number 95)

***22.** Which of the following lanthanoids show $+2$ oxidation state besides the characteristic oxidation state $+3$ of lanthanoids?

(A) Ce **(B)** Eu

(C) Yb **(D)** Ho

***23.** Which of the following ions show highest spin only magnetic moment value?

(A) Ti^{3+} **(B)** Mn^{2+}

(C) Fe^{2+} **(D)** Co^{3+}

***24.** Transition elements form binary compounds with halogens. Which of the following elements will form MF_3 type compounds?

(A) Cr **(B)** Co

(C) Cu **(D)** Ni

***25.** Which of the following will not act as oxidising agents?

(A) CrO_3 **(B)** MoO_3

(C) WO_3 **(D)** CrO_4^{2-}

***26.** Although +3 is the characteristic oxidation state for lanthanoids but cerium also show +4 oxidation state because_____.

(A) It has variable ionisation enthalpy

(B) It has a tendency to attain noble gas configuration

(C) It has a tendency to attain f^0 configuration

(D) It resembles Pb^{4+}

27. The equation which is balanced and represents the correct product(s) is :

(A) $Li_2O + 2KCl \longrightarrow 2LiCl + K_2O$

(B) $[CoCl(NH_3)_5]^+ + 5H^+ \longrightarrow Co^{2+} + 5NH_4^+ + Cl^-$

(C) $[Mg(H_2O)_6]^{2+} + (EDTA)^{4-} \xrightarrow{\text{excess NaOH}} [Mg(EDTA)^{2+} + 6H_2O]$

(D) $CuSO_4 + 4KCN \longrightarrow K_2[Cu(CN)_4] + K_2SO_4$

28. Which of the following arrangements does not represent the correct order of the property stated against it?

(A) $V^{2+} < Cr^{2+} < Mn^{2+} < Fe^{2+}$: paramagnetic behaviour

(B) $Ni^{2+} < Co^{2+} < Fe^{2+} < Mn^{2+}$: ionic size

(C) $Co^{3+} < Fe^{3+} < Cr^{3+} < Sc^{3+}$: stability in aqueous solution

(D) $Sc < Ti < Cr < Mn$: number of oxidation states

29. Four successive members of the first row transition element listed below with atomic numbers. Which one of them is expected to have the highest $E^\circ_{M^{3+}/M^{2+}}$ value?

(A) Cr(Z = 24) **(B)** Mn (Z = 25)

(C) Fe (Z = 26) **(D)** Co (Z = 27)

30. Iron exhibits +2 and +3 oxidation states. Which of the following statements about iron is incorrect?

(A) Ferrous oxide is more basic in nature than the ferric oxide

(B) Ferrous compounds are relatively more ionic than the corresponding ferric compounds

(C) Ferrous compounds are less volatile than the corresponding ferric compounds

(D) Ferrous compounds are more easily hydrolysed than the corresponding ferric compounds

31. Which of the following facts about the complex $[Cr(NH_3)_6]Cl_3$ is wrong?

(A) The complex involves d^2sp^3 hybridization and is octahedral in shape

(B) The complex is paramagnetic

(C) The complex is an outer orbital complex

(D) The complex gives white precipitate with silver nitrate solution

32. The outer electron configuration of Gd (At. no. 64) is :

(A) $4f^3, 5d^5, 6s^2$ **(B)** $4f^8, 5d^0, 6s^2$

(C) $4f^4, 5d^4, 6s^2$ **(D)** $4f^7, 5d^1, 6s^2$

33. The correct order of $E^\circ_{M^{2+}/M}$ value with negative sign for the four successive elements Cr, Mn, Fe and Co is :

(A) Mn > Cr > Fe > Co

(B) Cr > Fe > Mn > Co

(C) Fe > Mn > Cr > Co

(D) Cr > Mn > Fe > Co

34. Knowing that the chemistry of lanthanoids (Ln) dominated by its +3 oxidation state, which of the following statements is incorrect?

(A) Because of the large size of the Ln (III) ions the bonding in its compounds is predominantly ionic in character

(B) The ionic sizes of Ln (III) decrease in general with increasing atomic number

(C) Ln (III) compounds are generally colourless

(D) Ln (III) hydroxide are mainly basic in character

35. In context with the transition elements, which of the following statements is incorrect?

(A) In addition to the normal oxidation state, the zero oxidation state is also shown by these elements in complexes

(B) In the highest oxidation states, the transition metal shows basic character form cationic complexes

(C) In the highest oxidation states of the first five transition elements (Sc to Mn), all the 4s and 3d electrons are used for bonding

(D) Once d^5 configuration is exceeded, the tendency to involve all the 3d electrons in bonding decreases

36. Larger number of oxidation states are exhibited by the actinoids than those by the lanthanoids, the main reason being :

(A) 4f orbitals are more diffused than the 5f orbitals

(B) Lesser energy difference between 5f and 6d than between 4f and 5d orbitals

(C) More energy difference between 5f and 6d than between 4f and 5d orbitals

(D) More reactive nature of the actinoids than the lathanoids

37. Identify the incorrect statement among the following.

(A) d-block elements shown irregular and erratic chemical properties among themselves

(B) La and Lu have partially filled d-orbitals and no other partially filled orbitals

(C) The chemistry of various lanthanoids is very similar

(D) 4f and 5f orbitals are equally shielded

38. Most common oxidation states of Ce (Cerium) are :

(A) $+3, +4$ **(B)** $+2, +3$

(C) $+2, +1$ **(D)** $+3, +5$

39. Lanthanoid contraction is due to :

(A) The appreciable shielding on outer electrons by 4f electrons from the nuclear charge

(B) The appreciable shielding on outer electrons by 5d electrons from the nuclear charge

(C) The same effective nuclear charge from Ce to Lu

(D) The imperfect shielding on outer electrons by 4f electrons from the nuclear charge

40. On heating, mixture of Cu_2O and Cu_2S will give :

(A) Cu_2SO_3 **(B)** $CuO + CuS$

(C) $Cu + SO_3$ **(D)** $Cu + SO_2$

41. Calomel (Hg_2Cl_2) on reaction with ammonium hydroxide gives :

(A) HgO **(B)** Hg_2O

(C) $NH_2 - Hg - Hg - Cl$

(D) $HgNH_2Cl$

42. Which of the following ions has the maximum magnetic moment?

(A) Mn^{2+} **(B)** Fe^{2+}

(C) Ti^{2+} **(D)** Cr^{2+}

43. The lanthanide contraction responsible for the fact that :

(A) Zr and Zn have the same oxidation state

(B) Zr and Hf have about the same radius

(C) Zr and Nb have similar oxidation state

(D) Zr and Y have about the same radius

44. Cerium (Z = 58) is an important member of the lanthanides. Which of the following statements about cerium is incorrect?

(A) The common oxidation states of cerium are +3 and +4

(B) The +3 oxidation state of cerium is more stable than the +4 oxidation state

(C) The +4 oxidation state of cerium is not known in solutions

(D) Cerium (IV) acts as an oxidising agent

45. Of the following outer electronic configurations of atoms, the highest oxidation state is achieved by which one of them?

(A) $(n-1)d^8ns^2$ **(B)** $(n-1)d^5ns^1$

(C) $(n-1)d^3ns^2$ **(D)** $(n-1)d^5\ ns^2$

46. Which of the following groups of transition metals is called coinage metals?

(A) Cu, Ag, Au **(B)** Ru, Rh, Pd

(C) Fe, Co, Ni **(D)** Os, Ir, Pt

47. Which one of the following nitrates will leave behind a metal on strong heating?

(A) Ferric nitrate

(B) Copper nitrate

(C) Manganese nitrate

(D) Silver nitrate

48. For making good quality mirrors, plates of float glass are used. These are obtained by floating molten glass over a liquid metal which does not solidify before glass. The metal used can be :

(A) Mercury **(B)** Tin

(C) Sodium **(D)** Magnesium

49. Which one of the following statement is correct?

(A) Manganese salts give a violet borax bead test in the reducing flame

(B) From a mixed precipitate of AgCl and AgI, ammonia solution dissolves only AgCl

(C) Ferric ions give a deep green precipitate on adding potassium ferrocyanide solution

(D) On boiling a solution having K^+, Ca^{2+} and HCO_3^- ions, we get a precipitate of $K_2Ca(CO_3)_2$

50. A red solid is insoluble in water. However, it becomes, soluble if some KI is added to water. Heating the red solid in a test tube results in liberation of some violet coloured fumes and droplets of a metal appear on the cooler parts of the test tube. The red solid is :

(A) $(NH_4)_2Cr_2O_7$ **(B)** HgI_2

(C) HgO **(D)** Pb_3O_4

51. Ammonia forms the complex ion $[Cu(NH_3)_4]^{2+}$ with copper ions in the alkaline solutions but not in acidic solutions. What is the reason for it?

(A) In acidic solutions, hydration protects copper ions

(B) In acidic solutions, protons coordinate with ammonia molecules forming NH_4^+ ions and NH_3 molecules are not available

(C) In alkaline solutions, insoluble $Cu(OH)_2$ is precipitated which is soluble in excess of any alkali

(D) Copper hydroxide is an amphoteric substance

52. Gadolinium belongs to 4 f series. Its atomic number is 64. Which of the following is the correct electronic configuration of gadolinium ?

(A) [Xe] $4f^9\ 5s^1$ **(B)** [Xe] $4f^7 5d^1\ 6s^2$

(C) [Xe] $4f^6\ 5d^2\ 6s^2$ **(D)** [Xe] $4f^8\ 6d^2$

53. Because of lanthanoid contraction, which of the following pairs of elements have nearly same atomic radii ? (Numbers in the parenthesis are atomic numbers)

(A) Zr(40) & Hf(72) **(B)** Zr(40) & Ta(73)

(C) Ti(22) & Zr(40) **(D)** Zr(40) & Nb(41)

54. The reaction of aqueous $KMnO_4$ with H_2O_2 in acidic conditions gives :

(A) Mn^{4+} and O_2 **(B)** Mn^{2+} and O_2

(C) Mn^{2+} and O_3 **(D)** Mn^{4+} and MnP_2

55. Reason of lanthanoid contraction is :

(A) negligible screening effect of 'f '-orbitals

(B) increasing nuclear charge

(C) decreasing nuclear charge

(D) increasing screening effect

56 Which of the following statements about the interstitial compounds is incorrect ?

(A) They are much harder than the pure metal

(B) They have higher melting points than the pure metal

(C) They retain metallic conductivity

(D) They are chemically reactive

57. Which of the following lanthanoid ions is diamagnetic ? (At nos. Ce = 58, Sm = 62, Eu = 63, Yb = 70)

(A) Eu^{2+} **(B)** Yb^{2+}

(C) Ce^{2+} **(D)** Sm^{2+}

58. Identify the alloy containing a non-metal as a constituent in it.

(A) Invar **(B)** Steel

(C) Bell metal **(D)** Bronze

59. Which of the statements is not true ?

(A) On passing H_2S through acidified $K_2Cr_2O_7$ solution, a milky colour is observed

(B) $Na_2Cr_2O_7$ is preferred over $K_2Cr_2O_7$ in volumetric analysis

(C) $K_2Cr_2O_7$ solution in acidic medium is orange

(D) $K_2Cr_2O_7$ solution becomes yellow on increasing the pH beyond 7

60. Which of the following exhibits only + 3 oxidation state ?

(A) U **(B)** Th

(C) Ac **(D)** Pa

61. Which one of the following does not correctly represent the correct order of the property indicated against it ?

(A) Ti < V < Cr < Mn ; increasing number of oxidation states

(B) $Ti^{3+} < V^{3+} < Cr^{3+} < Mn^{3+}$; increasing magnetic moment

(C) Ti < V < Cr < Mn ; increasing melting points

(D) Ti < V < Mn < Cr ; increasing 2^{nd} ionization enthalpy

62. Four successive members of the first series of the transition metals are listed below. For which one of them the standard potential $\left(E^{\circ}_{M^{2+}/M}\right)$ value has a positive sign ?

(A) Co (Z = 27) **(B)** Ni (Z = 28)

(C) Cu (Z = 29) **(D)** Fe (Z = 26)

63. For the four successive transition elements (Cr, Mn, Fe and Co), the stability of + 2 oxidation state will be there in which of the following order ?

(A) Mn > Fe > Cr > Co

(B) Fe > Mn > Co > Cr

(C) Co > Mn > Fe > Cr

(D) Cr > Mn > Co > Fe

64. Which of the following ions will exhibit colour in aqueous solutions ?

(A) La^{3+} (Z = 57) **(B)** Ti^{3+} (Z = 22)

(C) Lu^{3+} (Z = 71) **(D)** Sc^{3+} (Z = 21)

65. Match Column-I (substances) with Column-II (processes) employed in the manufacture of the substances and select the correct option.

Column-I (Substances)		Column-II (Processes)	
(A)	Sulphuric acid	**(i)**	Haber's process
(B)	Steel	**(ii)**	Bessemer's process
(C)	Sodium hydroxide	**(iii)**	Leblanc process
(D)	Ammonia	**(iv)**	Contact process

(A) A – (i), B – (iv), C – (ii), D – (iii)

(B) A – (i), B – (ii), C – (iii), D – (iv)

(C) A – (iv), B – (iii), C – (ii), D – (i)

(D) A – (iv), B – (ii), C – (iii), D – (i)

66. More number of oxidation states are exhibited by the actionoids than by the lanthanoids. The main reason for this is :

(A) more active nature of the actionoids

(B) more energy difference between 5f and 6d orbitals than that between 4f and 5d orbitals

(C) lesser energy difference between 5f and 6d orbitals than that between 4f and 5d orbitals

(D) greater metallic character of the lanthanoids than that of the corresponding actionoids

67. The basic character of the transition metal monoxides follows the order

(Atomic no's. Ti = 22, V = 23, Cr = 24, Fe = 26)

(A) VO > CrO > TiO > FeO

(B) CrO > VO > FeO > TiO

(C) TiO > FeO > VO > CrO

(D) TiO > VO > CrO > FeO

68. Which of the following elements is responsible for oxidation of water to O_2 in biological processes ?

(A) Cu **(B)** Mo

(C) Fe **(D)** Mn

69. $K_2Cr_2O_7$ on heating with aqueous NaOH gives :

(A) CrO_7^{2-} **(B)** $Cr(OH)_2$

(C) CrO_4^{2-} **(D)** $Cr(OH)_3$

70. When calomel reacts with NH_4OH, we get :

(A) Hg_2O **(B)** HgO

(C) $HgNH_2Cl$

(D) $NH_2 - Hg - Hg - Cl$

71. Photographic films and plates have an essential ingredient of

(A) silver nitrate **(B)** silver bromide
(C) sodium chloride **(D)** oleic acid

72. A blue colouration is not obtained when

(A) ammonium hydroxide dissolves in copper sulphate
(B) copper sulphate solution reacts with $K_4[Fe(CN)_6]$
(C) ferric chloride reacts with sod. ferrocyanide
(D) anhydrous $CuSO_4$ is dissolved in water

73. Number of water molecules directly attached to $CuSO_4 \cdot 5H_2O$ are _____.

74. $Cu^{2+} + KCN \longrightarrow K_x[Cu(CN)_4]$. x is_____.

75. Total number of equivalent $Cr-O$ bond in $Cr_2O_7^{2-}$ are _____.

76. $I^- + MnO_4^- \xrightarrow{OH^-}$ Product.

Oxidation state of 'I' in product is _____.

77. The magnetic moment is associated with its spin angular momentum and orbital angular momentum. Spin only magnetic moment value of Cr^{3+} ion is _____.

78. The most common oxidation on state among the lanthanoids is _____.

79. The number of moles of $KMnO_4$ reduced by one mole of KI in alkaline medium is :

80. Electronic configuration of a transition element X in $+3$ oxidation state is $[Ar]3d^5$.

What is its atomic number is _____.

81. Total number of amphoteric oxides among Mn_2O_7, Cr_2O, CrO, Cr_2O_3, ZnO, V_2O_5, V_2O_3 are _____.

82. Total number of coloured compounds among $[KMnO_4, Cu_2Cl_2, CuSO_4$(anhydrous), $ZnSO_4 \cdot 7H_2O, TiCl_2, K_2Cr_2O_7, Ce(SO_4)_2, K_4[Fe(CN)_6]$ are _____.

83. Maximum oxidation state of Osmium is _____.

84. Highest oxidation state of manganese in fluoride is _____.

Coordination Compounds

CHOOSE THE CORRECT ALTERNATIVE. ONLY ONE CHOICE IS CORRECT. HOWEVER, QUESTIONS MARKED '*' MAY HAVE MORE THAN ONE CORRECT OPTION.

***1.** Atomic number of Mn, Fe and Co are 25, 26 and 27 respectively. Which of the following inner orbital octahedral complex ions are diamagnetic?

(A) $\left[Co(NH_3)_6\right]^{3+}$ **(B)** $\left[Mn(CN)_6\right]^{3-}$ **(C)** $\left[Fe(CN)_6\right]^{4-}$ **(D)** $\left[Fe(CN)_6\right]^{3-}$

***2.** Atomic number of Mn Fe, Co and Ni are 25, 26, 27 and 28 respectively. Which of the following outer orbital octahedral complexes have same number of unpaired electrons?

(A) $\left[MnCl_6\right]^{3-}$ **(B)** $\left[FeF_6\right]^{3-}$ **(C)** $\left[CoF_6\right]^{3-}$ **(D)** $\left[Ni(NH_3)_6\right]^{2+}$

***3.** Which of the following options are correct for $\left[Fe(CN)_6\right]^{3-}$ complex?

(A) $d^2 sp^3$ hybridisation **(B)** $sp^3 d^2$ hybridisation
(C) Paramagnetic **(D)** Diamagnetic

***4.** An aqueous pink solution of cobalt (II) chloride changes to deep blue on addition of excess of HCl. This is because_____.

(A) $\left[Co(H_2O_6)\right]^{2+}$ is transformed into $[CoCl_6]^{4-}$

(B) $\left[Co(H_2O)_6\right]^{2+}$ is transformed into $[CoCl_4]^{2-}$

(C) Tetrahedral complexes have smaller crystal field splitting than octahedral complexes

(D) Tetrahedral complexes have larger crystal field splitting than octahedral complex

***5.** Which of the following complexes are homoleptic?

(A) $\left[Co(NH_3)_6\right]^{3+}$ **(B)** $\left[Co(NH_3)_4Cl_2\right]^{+}$ **(C)** $\left[Ni(CN)_4\right]^{2-}$ **(D)** $\left[Ni(NH_3)_4Cl_2\right]$

***6.** Which of the following complexes are heteroleptic?

(A) $\left[Cr(NH_3)_6\right]^{3+}$ **(B)** $\left[Fe(NH_3)_4Cl_2\right]^{+}$ **(C)** $\left[Mn(CN)_6\right]^{4-}$ **(D)** $\left[Co(NH_3)_4Cl_2\right]$

***7.** Identify the optically active compounds from the following :

(A) $\left[Co(en)_3\right]^{3+}$ **(B)** *trans*-$\left[Co(en)_2Cl_2\right]^{+}$

(C) *cis*-$\left[Co(en)_2Cl_2\right]^{+}$ **(D)** $\left[Cr(NH_3)_5Cl\right]$

***8.** Identify the correct statements for the behaviour of ethane-1, 2-diamine as a ligand.

(A) It is a neutral ligand **(B)** It is a bidentate ligand

(C) It is a chelating ligand **(D)** It is a unidentate ligand

***9.** Which of the following complexes show linkage isomerism?

(A) $\left[Co(NH_3)_5(NO_2)\right]^{2+}$ **(B)** $\left[Co(H_2O)_5CO\right]^{3+}$

(C) $\left[Cr(NH_3)_5SCN\right]^{2+}$ **(D)** $\left[Fe(en)_2Cl_2\right]^{+}$

10. Given the following data about the absorption maxima of several complex ions, what is the order of Δ_o for these ions ?

Compound	λ_{max}
$[CrCl_6]^{3-}$	758
$[Cr(NH_3)_6]^{3+}$	465
$[Cr(H_2O)_6]^{3+}$	694

(A) $\Delta_0\left[CrCl_6\right]^{3-} < \Delta_0\left[Cr(NH_3)_6\right]^{3+} < \Delta_0\left[Cr(H_2O)_6\right]^{3+}$

(B) $\Delta_0\left[Cr(NH_3)_6\right]^{3+} < \Delta_0\left[Cr(H_2O)_6\right]^{3+} < \Delta_0\left[CrCl_6\right]^{3+}$

(C) $\Delta_0\left[CrCl_6\right]^{3-} < \Delta_0\left[Cr(H_2O)_6\right]^{3+} < \Delta_0\left[Cr(NH_3)_6\right]^{3+}$

(D) $\Delta_0\left[Cr(H_2O)_6\right]^{3+} < \Delta_0\left[Cr(NH_3)_6\right]^{3+} < \Delta_0\left[CrCl_6\right]^{3-}$

11. Predict the order of Δ_o for the following compounds :

I. $[Fe(H_2O)_6]^{2+}$ **II.** $[Fe(CN)_2(H_2O)_4]$ **III.** $[Fe(CN)_4(H_2O)_2]^{2-}$

(A) Δ_o (I) < Δ_o (II) < Δ_o (III) **(B)** Δ_o (II) < Δ_o (I) < Δ_o (III)

(C) Δ_o (III) < Δ_o (II) < Δ_o (I) **(D)** Δ_o (II) < Δ_o (III) < Δ_o (I)

12. From the information given in the passage, what is the most likely configuration of the cobalt d-electrons for the species ?

(A) $CoCl_6^{3-}$: low spin ; $Co(NO_2)_6^{3-}$: low spin **(B)** $CoCl_6^{3-}$: high spin ; $Co(NO_2)_6^{3-}$: low spin

(C) $CoCl_6^{3-}$: low spin ; $Co(NO_2)_6^{3-}$: high spin **(D)** $CoCl_6^{3-}$: high spin ; $Co(NO_2)_6^{3-}$: high spin

13. Which of the following has five donor (coordinating) sites ?

(A) Triethylene tetramine **(B)** Ethylenediamine tetracetate ion

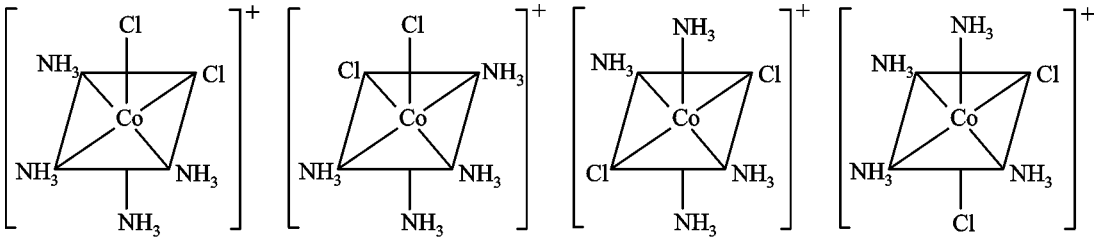
(C) Ethylenediamine triacetate ion **(D)** Diethylene triamine

14. Which one of the following coordination compounds exhibits ionization isomerism ?

(A) $[Cr(NH_3)_6]Cl_3$ **(B)** $[Cr(en)_3]Cl_3$

(C) $[Cr(en)_3]Cl_3$ **(D)** $[Co(NH_3)_5Br]SO_4$

15. Consider the following spatial arrangements of the octahedral complex ion $Co[(NH_3)_4Cl_2]^+$..



I II III IV

Which of the following statements is incorrect regarding these structures ?

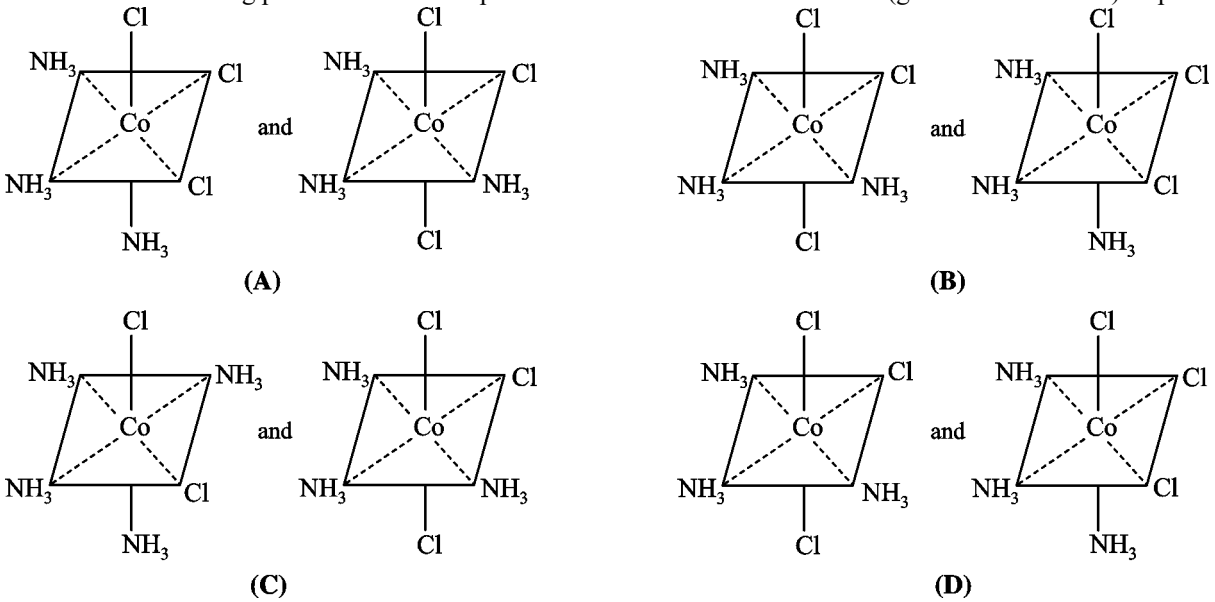
(A) I and II are enantiomers

(B) II and III are cis and trans isomers respectively

(C) III and IV are trans and cis isomers respectively

(D) II and IV have identical structures

16. Which of the following pairs of structures represent facial and meridional isomers (geometrical isomers) respectively?



(A) **(B)** **(C)** **(D)**

17. Which of the following statements is correct with regard to a complex ion ?

(A) A complex ion consists of a central ion bonded to two or more donor ions or molecules, usually does not dissociate into simple ions or molecules even in a solution, and exhibits properties different from its constituent ions or molecules

(B) The donor ions and molecules which coordinate with the central atom or ion in a complex are called ligands

(C) The sum of the number of electrons present in the central metal ion or atom and those donated by the ligands is called the effective atomic number of the central metal atom and this number is usually the same as the atomic number of the next higher noble gas

(D) All of these

18. Which of the following statements is not true for the reaction given below ?

$$[Cu(H_2O)_4]^{2+} + 4NH_3 \rightleftharpoons [Cu(NH_3)_4]^{2+} + 4H_2O$$

(A) It is a ligand-substitution reaction

(B) NH_3 is a relatively strong-field ligand while H_2O is a weak-field ligand

(C) During the reaction, there is a change in colour from light blue to dark blue

(D) $[Cu(NH_3)_4]^{2+}$ has a tetrahedral structure, and is paramagnetic

19. The IUPAC name for the coordination compound $Na_3[Ag(S_2O_3)_2]$ is :

(A) Sodium silverthiosulphate(I) **(B)** Sodium silverhyposulphate(I)

(C) Sodium bis[argentothiosulphate(I)] **(D)** Sodium di(thiosulphato)argentite(I)

20. The IUPAC name for the coordination compound $[CuCl_2(CH_3NH_2)_2]$ is :

(A) dimethylamine copper(II) chloride **(B)** bis(dimethylamine)copper(II) chloride

(C) dichlorobis(methylamine) copper(II) **(D)** dichlorobis(dimethylamine)copper(II)

21. The IUPAC name for $[Pt(Br)(Cl)(NH_3)_3(NO_2)]Cl$ is :

(A) triamminechlorobromonitroplatinum(IV) chloride

(B) triamminebromochloronitroplatinum(IV) chloride

(C) triammineitrochlorobromoplatinum(IV) chloride

(D) triamminechloronitrobromoplatinum(IV) chloride

22. The ionization isomer of $[Cr(H_2O)_4Cl(NO_2)]Cl$ is:

(A) $[Cr(H_2O)_4(O_2N)]Cl_2$ **(B)** $[Cr(H_2O)_4Cl_2](NO_2)$

(C) $[Cr(H_2O)_4Cl(ONO)]Cl$ **(D)** $[Cr(H_2O)_4Cl_2(NO_2)].H_2O$

23. Amongst $Ni(CO)_4$, $[Ni(CN)_4]^{2-}$ and $NiCl_4^{2-}$

(A) $Ni(CO)_4$ and $NiCl_4^{2-}$ are diamagnetic and $[Ni(CN)_4]^{2-}$ is paramatinetic

(B) $NiCl_4^{2-}$ and $[Ni(CN)_4]^{2-}$ are diamagnetic and $Ni(CO)_4$ is paramagnetic

(C) $Ni(CO)_4$ and $[Ni(CN)_4]^{2-}$ are diamagnetic and $NiCl_4^{2-}$ is paramagnetic

(D) $Ni(CO)_4$ is diamagnetic and $NiCl_4^{2-}$ and $[Ni(CN)_4]^{2-}$ are paramagnetic

24. The complex ion which has no 'd' electron in the central metal atom is :

(A) $[MnO_4]^-$ **(B)** $[Co(NH_3)_6]^{3+}$

(C) $[Fe(CN)_6]^{3-}$ **(D)** $[Cr(H_2O)_6]^{3+}$

25. In nitroprusside ion, the iron and NO exist as Fe^{II} and NO^{+} rather than Fe^{III} and NO. These forms can be differentiated by :

(A) Estimating the concentration of iron **(B)** Measuring the concentration of CN^{-}

(C) Measuring the solid state magnetic moment **(D)** Thermally decomposing the compound

26. In $[Fe(CN)_6]^{3-}$, the d-electrons occupy the :

(A) d_{xy}, d_{yz}, d_{zx} and d_z^2 orbitals **(B)** d_{xy}, d_{yz} and d_{xz} orbitals

(C) $d_{x^2-y^2}$ and d_{z^2} orbitals **(D)** d_{xy}, d_{yz}, d_{zx}, $d_{x^2-y^2}$ and d_z^2 orbitals

***27.** Amongst the following complexes, the chelates are :

(A) bis (ethylenediamine) copper (II) ion **(B)** ammoniumdiaminetetrathiocyanto-S-chromate (III)

(C) bis (dimethyl glyoximato) iron (II) **(D)** cis-diglycinato platinum (II)

Paragraph for Questions 28 - 30

The coordination number of Ni^{2+} is 4.

$NiCl_2$ + KCN (excess) $\longrightarrow$ A (cyano complex)

$NiCl_2$ + Conc. HCl (excess) $\longrightarrow$ B (chloro complex)

28. The IUPAC name of A and B are :

(A) Potassium tetracyanonickelate(II), Potassium tetrachloronickelate(II)

(B) Tetracyanopotassiumnickelate(II), tetrachloropotassiumnickelate(II)

(C) Tetracyanonickel(II), tetrachloronickel(II)

(D) Potassium tetracyanonickel(II), potassium tetrachloronickel(II)

29. Predict the magnetic nature of A and B :

(A) Both are diamagnetic

(B) A is diamagnetic and B is paramagnetic with one unpaired electron

(C) A is diamagnetic and B is paramagnetic with two unpaired electrons

(D) Both are paramagnetic

30. The hybridization of A and B are :

(A) dsp^2, sp^3 **(B)** sp^3, sp^3 **(C)** dsp^2, dsp^2 **(D)** sp^3d^2, d^2sp^3

31. The octahedral complex of a metal ion M^{3+} with four monodentate ligands L_1, L_2, L_3 and L_4 absorb wavelengths in the region of red, green, yellow and blue, respectively. The increasing order of ligand strength of the four ligands is :

(A) $L_4 < L_3 < L_2 < L_1$ **(B)** $L_1 < L_3 < L_2 < L_4$

(C) $L_3 < L_2 < L_4 < L_1$ **(D)** $L_1 < L_2 < L_4 < L_3$

32. Which of the following complex species is not expected to exhibit optical isomerism?

(A) $[Co(en)_3]^{3+}$ **(B)** $[Co(en)_2Cl_2]^{+}$ **(C)** $[Co(NH_3)_3Cl_3]$ **(D)** $[Co(en)(NH_3)Cl_2]^{+}$

33. Which among the following will be named as dibromidobis(ethylenediamine) chromium (III) bromide?

(A) $[Cr(en)_3]Br_3$ **(B)** $[Cr(en)_2Br_2]Br$ **(C)** $[Cr(en)Br_4]^{-}$ **(D)** $[Cr(en)Br_2]Br$

34. The formula of dichlorobis (urea) copper (II) is :

(A) Cu $\{O = C(NH_2)_2\}$ Cl]Cl **(B)** $[CuCl_2\{O = C(NH_2)_2\}_2]$

(C) [Cu $\{O = C(NH_2)_2\}$ Cl_2] **(D)** [Cu $\{O = C(NH_2)_2\}_2$] Cl_2

35. The magnetic moment (spin only) of $[NiCl_4]^{2-}$ is :

(A) 1.82 M **(B)** 5.46 BM **(C)** 2.82 BM **(D)** 1.41 BM

36. Among the ligands NH_3, en, CN^- and CO, the correct order of their increasing field strength is :

(A) $CO < NH_3 < en < CN^-$ **(B)** $NH_3 < en < CN^- < CO$

(C) $CN^- < NH_3 < CO < en$ **(D)** $en < CN^- < NH_3 < CO$

37. Which one of the following complex ions has geometrical isomers?

(A) $[Co(en)_3]^{3+}$ **(B)** $[Ni(NH_3)_5Br]^+$ **(C)** $[Co(NH_3)_2(en)_2]^{3+}$ **(D)** $[Cr(NH_3)_4(en)]^{3+}$

38. Which one of the following has an optical isomer? (en = ethylenediamine)

(A) $[Zn(en)(NH_3)_2]^{2+}$ **(B)** $[Co(en)_3]^{3+}$

(C) $[Co(H_2O)_4(en)]^{3+}$ **(D)** $[Zn(en)_2]^{2+}$

39. Which of the following has an optical isomer?

(A) $[Co(NH_3)_3Cl]^+$ **(B)** $[Co(en)(NH_3)_2]^{2+}$

(C) $[Co(H_2O)_4(en)]^{3+}$ **(D)** $[Co(en)_2(NH_3)_2]^{3+}$

40. Which of the following pairs represents linkage isomers?

(A) $[Cu(NH_3)_4][PtCl_4]$ and $[Pt(NH_3)_4][CuCl_4]$

(B) $[Pd(PPh_3)_2(NCS)_2]$ and $[Pt(PPh_3)_2(SCN)_2]$

(C) $[Co(NH_3)_5NO_3]SO_4$ and $[Co(NH_3)_5SO_4]NO_3$

(D) $[PtCl_2(NH_3)_4]Br_2$ and $[PtBr_2(NH_3)_4]Cl_2$

41. The coordination number and the oxidation state of the element 'E' in the complex $[E(en)_2(C_2O_4)]NO_2$ (where (en) is ethylene diamine) are respectively :

(A) 6 and 2 **(B)** 4 and 2 **(C)** 4 and 3 **(D)** 6 and 3

42. In which of the following octahedral complexes of Co (Atomic number 27), will the magnitude of Δ_0 be the highest?

(A) $[Co(CN)_6]^{3-}$ **(B)** $[Co(C_2O_4)_3]^{3-}$ **(C)** $[Co(H_2O)_6]^{3+}$ **(D)** $[Co(NH_3)_6]^{3+}$

43. Which one of the following has a square planar geometry? (Atomic number Co =27, Ni = 28, Fe =26, Pt = 78)

(A) $[CoCl_4]^{2-}$ **(B)** $[FeCl_4]^{2-}$ **(C)** $[NiCl_4]^{2-}$ **(D)** $[PtCl_4]^{2-}$

44. In Fe (CO_5), the Fe—C bond possesses :

(A) π-character only **(B)** both σ and π - character

(C) ionic character **(D)** σ - character only

45. The IUPAC name for the complex $[Co(NO_2)(NH_3)_5]Cl_2$ is :

(A) nitrito-N pentamminecobalt (III) chloride **(B)** nitrite-N-pentamminecobalt (II) chloride

(C) pentammine nitrito-N-cobalt (II) chloride **(D)** pentammine nitrito-N-cobalt (III) chloride

46. Nickel (Z = 28) combines with a uninegative monodentate ligand X^- to form a paramagnetic complex $[NiX_4]^{2-}$. The number of unpaired electron(s) in the nickel and geometry of this complex ion are, respectively :

(A) One, tetrahedral **(B)** Two, tetrahedral **(C)** One, square planar **(D)** Two, square planar

47. The value of the 'spin only' magnetic moment for one of the following is 2.84BM. The correct one is :

(A) d^5 (in strong liagnd field) **(B)** d^3 (in weak as well as in strong fields)

(C) d^4 (in weak ligand field) **(D)** d^4 (in strong ligand field)

48. The IUPAC name of the coordination compound $K_3[Fe(CN)_6]$ is :

(A) tripotassium hexacyanoiron (II) **(B)** potassium hexacyanoiron (II)

(C) potassium hexacyanoferrate (III) **(D)** potassium hexacyanoferrate (II)

49. Which one of the following cyano complexes would exhibit the lowest value of magnetic moment?
(At. no of Cr = 24, Mn = 25, Fe = 26, Co = 27)

(A) $[Co(CN)_6]^{3-}$ **(B)** $[Fe(CN)_6]^{3-}$ **(C)** $[Mn(CN)_6]^{3-}$ **(D)** $[Cr(CN)_6]^{3-}$

50. Which of the following compounds shown optical isomerism?

(A) $[Co(CN)_6]^{3-}$ **(B)** $[Cr(C_2O_4)_3]^{3-}$ **(C)** $[ZnCl_4]^{2-}$ **(D)** $[Cu(NH_3)_4]^{2+}$

51. The coordination number of a central metal atom in a complex is determined by :

(A) The number of ligands around a metal ion bonded by sigma bonds

(B) The number of ligands around a metal ion bonded by pi bonds

(C) The number of ligands around a metal ion bounded by sigma and pi bonds both

(D) The number of only anionic ligands bonded to the metal ion

52. Which one of the following has largest number of isomers? (R = alkyl group, en = ethylenediamine)

(A) $[Ru(NH_3)_4Cl_2]^+$ **(B)** $[Co(NH_3)_5Cl]^{2+}$ **(C)** $[Ir(PR_3)_2H(CO)]^{2+}$ **(D)** $[Co(en)_2Cl_2]^+$

53. The correct order of magnetic moments (spin only value in BM) among the following is:
(At. no of Mn = 25, Fe =26, Co = 27)

(A) $[MnCl_4]^2 > [CoCl_4]^2 > [Fe(CN)_6]^{4-}$ **(B)** $[MnCl_4]^{2-} > [Fe(CN)_6]^{4-} > [CoCl_4]^{4-}$

(C) $[Fe(CN)]_6]^{4-} > [MnCl_4]^{2-} > [CoCl_4]^{2-}$ **(D)** $[Fe(CN)_6]^{4-} > [CoCl_4]^{2-} > [MnCl_4]^{2-}$

54. Which one of the following complexes is an outer orbital complex?
(Atomic number of Mn = 25, Fe = 26, Co = 27, Ni = 28)

(A) $[Fe(CN)_6]^{4-}$ **(B)** $[Mn(CN)_6]^{4-}$ **(C)** $[Co(NH_3)_6]^{3+}$ **(D)** $[Ni(NH_3)_6]^{2+}$

55. One mole of the complex compound $Co(NH_3)_5Cl_3$, gives 3 moles of ions on dissolution in water. One mole of the same complex reacts with two moles of $AgNO_3$ solution of yield two moles of AgCl(s). The structure of the complex is :

(A) $[Co(NH_3)_5Cl]Cl_2$ **(B)** $[Co(NH_3)_3Cl_3]\cdot 2NH_3$

(C) $[Co(NH_3)_4Cl_2]Cl\cdot NH_3$ **(D)** $[Co(NH_3)_4Cl]Cl_2\cdot NH_3$

56. In the coordination compound, $K_4[Ni(CN)_4]$ the oxidation state of nickel is :

(A) -1 **(B)** 0 **(C)** $+1$ **(D)** $+2$

57. Type of isomerism shown by $[Cr(NH_3)_5NO_2]Cl_2$ is :

(A) optical **(B)** ionisation **(C)** geometrical **(D)** linkage

58. A square planar complex is formed by the hybridisation of the following atomic orbitals :

(A) s, p_x, p_y, p_z **(B)** s, p_x, p_y, p_z, d **(C)** d, s, p_x, p_y **(D)** s, p_x, p_y, p_z, d, d

59. The most stable ion is :

(A) $[Fe(OH)_5]^{3-}$ **(B)** $[FeCl_6]^{3-}$ **(C)** $[Fe(CN)_6]^{3-}$ **(D)** $[Fe(H_2O)_6]^{3+}$

60. The hybridization involved in complex $[Ni(CN)_4]^{2-}$ is (At. No. Ni = 28)

(A) sp^3 **(B)** d^2sp^2 **(C)** d^2sp^3 **(D)** dsp^2

61. The sum of coordination number and oxidation number of the metal M in the complex $[M(en)_2(C_2O_4)]Cl$ (where en is ethylenediamine)

(A) 6 **(B)** 7 **(C)** 8 **(D)** 9

62. Cobalt (III) chloride forms several octahedral complexes with ammonia. Which of the following will not give test for chloride ions with silver nitrate at 25°C?

(A) $CoCl_3.5NH_3$ **(B)** $CoCl_3.6NH_3$ **(C)** $CoCl_3.3NH_3$ **(D)** $CoCl_3.4NH_3$

63. Which of these statements about $[Co(CN)_6]^{3-}$ is true ?

(A) $[Co(CN)_6]^{3-}$ has four unpaired electrons and will be in a high – spin configuration.

(B) $[Co(CN)_6]^{3-}$ has no unpaired electrons and will be in a high spin configuration.

(C) $[Co(CN)_6]^{3-}$ has no unpaired electrons and will be in a low – spin configuration.

(D) $[Co(CN)_6]^{3-}$ has four unpaired electrons and will be in a low – spin configuration.

64. Among the following complexes the one which shows zero crystal filed stabilization energy (CFSE) is :

(A) $[Mn(H_2O)_6]^{3+}$ **(B)** $[Fe(H_2O)_6]^{3+}$ **(C)** $[Co(H_2O)_6]^{2-}$ **(D)** $[Co(H_2O)_6]^{3+}$

65. Which of the following complexes is used to be as an anticancer agent?

(A) $mer-[Co(NH_3)_3Cl_3]$ **(B)** $cis-[PtCl_2(NH_3)_2]$

(C) $cis-K_2[PtCl_2Br_2]$ **(D)** Na_2CoCl_4

66. Crystal field splitting energy for high spin d^4 octahedral complex is :

(A) $1.2\Delta_o$ **(B)** $-0.6\Delta_0$ **(C)** $-0.8\Delta_0$ **(D)** $-1.6\Delta_o$

67. In a particular isomer of $[Co(NH_3)_4Cl_2]^0$, the Cl – Co – Cl angle is 90°, the isomer is known as

(A) Optical isomer **(B)** cis-isomer **(C)** Position isomer **(D)** linkage isomer

68. The anion of acetylacetone (acac) forms $Co(acac)_3$ chelate with Co^{3+}. The rings of the chelate are

(A) five membered **(B)** four membered **(C)** six membered **(D)** three membered

69. The correct IUPAC name for $[CrF_2(en)_2]Cl$ is

(A) chloro difluorido ethylene diaminechromium (III) chloride

(B) difluoridobis (ethylene diamine) chromium (III) chloride

(C) difluorobis – (ethylene diamine) chromium (III) chloride

(D) chloro difluoridobis (ethylene diamine) chromium (III)

70. Which among the following is a paramagnetic complex ?

(A) $[Co(NH_3)_6]^{3+}$ **(B)** $[Pt(en)Cl_2]$ **(C)** $[CoBr_4]^{2-}$ **(D)** $Mo(CO)_6$

71. Red precipitate is obtained when ethanol solution of dimethylglyoxime is added to ammoniacal Ni(II). Which of the following statements is not true?

(A) Red complex has a square planar geometry. **(B)** Complex has symmetrical H-bonding.

(C) Red complex has a tetrahedral geometry. **(D)** Dimethylglyoxime functions as bridenate ligand.

72. Which of the following carbonyls will have the strongest C – O bond?

(A) $Mn(CO)_6^+$ **(B)** $Cr(CO)_6$ **(C)** $V(CO)_6^-$ **(D)** $Fe(CO)_5$

73. Which of the following complexes exhibits the highest paramagnetic behaviour?

(A) $[Co(ox)_2(OH)_2]^-$ **(B)** $[Ti(NH_3)_6]^{3-}$

(C) $[V(gly)_2(OH)_2(NH_3)_2]^+$ **(D)** $[Fe(en)(bpy)(NH_3]^{2+}$

74. $[Cr(H_2O)_6]Cl_3$(Atomic number of Cr = 24) has a magnetic moment of 3.83 B.M. The correct distribution of 3d electrons in the chromium of the complex is :

(A) $3d^1_{xy}, 3d^1_{yz}, 3d^1_{z^2}$ **(B)** $3d^1_{(x^2-y^2)}, 3d^1_{z^2}, 3d^1_{xz}$

(C) $3d^1_{xy}, 3d^1_{(x^2-y^2)}, 3^1_{yz}$ **(D)** $3d^1_{xy}, 3d^1_{yz}, 3^1_{xz}$

75. Which of the following does not have a metal-carbon bond?

(A) $Al(OC_2H_5)_3$ **(B)** C_2H_5MgBr **(C)** $K[Pt(C_2H_4)Cl_3]$ **(D)** $Ni(CO)_4$

76. Among the following which is not the π-bonded organometallic compound

(A) $K[PtCl)_3(\eta^2 - C_2H_4)]$ **(B)** $Fe(\eta^5 - C_5H_5)_2$

(C) $Cr(\eta^6 - C_6H_6)_2$ **(D)** $(CH_3)_4Sn$

77. In the silver plating of copper, $K[Ag(CN)_2]$ is used instead of $AgNO_3$. The reason is :

(A) A thin layer of Ag is formed on Cu **(B)** More voltage is required

(C) Ag^+ ions are completely removed from solution

(D) Less availability of Ag^+ ions, as Cu and not displace Ag from $[Ag(CN)_2]^-$

78. Which of the following will give maximum number of isomers ?

(A) $[Co(NH_3)_4Cl_2]$ **(B)** $[Ni(en)(NH_3)_4]^{2+}$ **(C)** $[Ni(C_2O_4)(en)_2]^{2-}$ **(D)** $[Cr(SCN)_2(NH_3)_4]^+$

79. The total number of possible structural isomers for the complex compound $[Cu^{II}(NH_3)_4][Pt^{II}Cl_4)]$ are:

(A) 5 **(B)** 6 **(C)** 3 **(D)** 4

80. The oxidation state of iron in $Na_4[Fe(CN)_5(NOS)]$ is _____.

81. If a complex $[Fe(CO)_x]$ follows EAN rule, value of x is _____.

82. On adding excess of $AgNO_3$ solution into 0.01 mole complex compound $MBr_4 \cdot x\,NH_4$, 0.03 mole yellow precipitate was obtained value of x is _____.

83. Secondary valency of complex $[Co(C_2O_4)_2(NH_3)_2]^-$ is _____.

84. Total number of stereoisomers of complex $[M(en)_2(SCN)(NO_2)]Cl$ are _____.

85. CFSE of complex $[Fe(CN)_6]^{3-}$ is _____.

86. Total number of geometrical isomers of complex $[Mab(AB)_2]$ are _____.

87. Spin only magnetic moment of complex $[Co(H_2O)_6]^{3+}$ is _____.

88. Total number of non-axial 'd' orbitals used in hybridisation in complex $Ni(CO)_4$ is _____.

89. The difference in number of unpaired electrons of Fe^{2+} ion in its high spin and low spin octahedral complex is_____.

90. Number of coloured complexes due to $d-d$ transition are _____.

$[Mn(H_2O)_6]^{2+}$, $CoCl_4^{2-}$, $[Fe(H_2O)_6]^{3+}$, $CuSO_4$, $KMnO_4$, AgBr, $Ni(dmg)_2$, brown ring complex.

91. Total number of EDTA required to form 1 octahedral complex is _____.

92. The number of rings in complex $[M(dien)(en)Cl_2]$ are _____.

93. Total number of Bridging CO in $Mn_2(CO)_{10}$ are _____.

94. Number of $M-M$ bonds in $Ir_4(CO)_{16}$ are _____.

Organic Halides & Organic Concepts

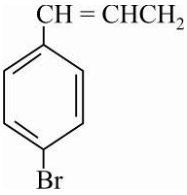
CHOOSE THE CORRECT ALTERNATIVE. ONLY ONE CHOICE IS CORRECT. HOWEVER, QUESTIONS MARKED '*' MAY HAVE MORE THAN ONE CORRECT OPTION.

1. In an S_N1 reaction when nucleophile approaches the substrate with chiral centre, there is :

(A) inversion more than retention leading to partial racemisation

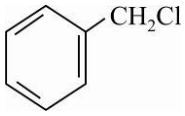
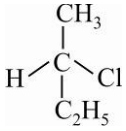
(B) 100 % retention **(C)** 100 % inversion **(D)** 100 % racemisation

2. The reaction of $C_6H_5CH=CHCH_3$ with HBr produces :

(A) $C_6H_5CH_2CH_2CH_2Br$ **(B)** 

(C) $C_6H_5\underset{\displaystyle Br}{\underset{|}{C}}HCH_2CH_3$ **(D)** $C_6H_5CH_2\underset{\displaystyle Br}{\underset{|}{C}}HCH_3$

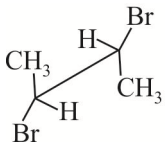
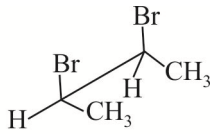
3. Which of the following compounds can undergo racemisation when react with aq. KOH :

(i)  (ii) $CH_3CH_2CH_2Cl$ (iii) $H_3C-\underset{\displaystyle CH_3}{\underset{|}{C}}H-CH_2Cl$ (iv) 

(A) (i) and (ii) **(B)** (ii) and (iv)

(C) (iii) and (iv) **(D)** (iv) only

4. Given :

 and 

I and II are :

(A) identical **(B)** a pair of conformers

(C) a pair of geometrical isomers **(D)** a pair of optical isomers

5. In the given substitution reaction : $R-I + M-F \longrightarrow R-F + M-I$

The reaction will be most favourable if M happens to be :

(A) Na **(B)** K

(C) Rb **(D)** Li

6. Consider the reactions :

I. $(CH_3)_2CH - CH_2Br \xrightarrow{C_2H_5OH} (CH_3)_2CH-CH_2OC_2H_5 + HBr$

II. $(CH_3)_2CH-CH_2Br \xrightarrow{C_2H_5O^-} (CH_3)_2CH - CH_2OC_2H_5 + Br^-$

The mechanisms of reactions (i) and (ii) are respectively :

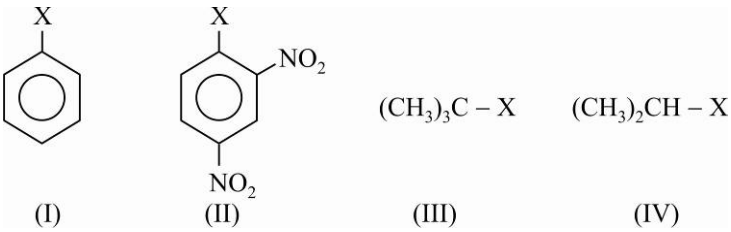
(A) S_N1 and S_N2 **(B)** S_N1 and S_N1 **(C)** S_N2 and S_N2 **(D)** S_N2 and S_N1

7. Which one is most reactive towards S_N1 reaction ?

(A) $C_6H_5CH(C_6H_5)Br$ **(B)** $C_6H_5CH(CH_3)Br$

(C) $C_6H_5C(CH_3)(C_6H_5)Br$ **(D)** $C_6H_5CH_2Br$

8. The correct order of increasing reactivity of compounds given below ($C-X$ bond cleavage) towards nucelophile is :



(A) I < II < IV < III **(B)** II < III < I < IV

(C) IV < III < I < II **(D)** III < II < I < IV

9. In the given reaction : $C_6H_5CH_2Br \xrightarrow[2.\ H_3O^+]{1.\ Mg\ /\ Ether} X$, the product 'X' is :

(A) $C_6H_5CH_2OCH_2C_6H_5$ **(B)** $C_6H_5CH_2OH$

(C) $C_6H_5CH_3$ **(D)** $C_6H_5CH_2CH_2C_6H_5$

10. Which of the following reactions is an example of nucleophilic substitution reaction?

(A) $2RX + 2Na \rightarrow R - R + 2\,NaX$

(B) $RX + H_2 \rightarrow RH + HX$

(C) $RX + Mg \rightarrow RMgX$

(D) $RX + KOH \rightarrow ROH + KX$

11. How many stereoisomers does the given molecule have? $CH_3CH = CHCH_2CHBrCH_3$

(A) 8 **(B)** 2 **(C)** 4 **(D)** 6

12. If there is no rotation of plane polarized light by a compound in a specific solvent, though having chiral centre(s), it may means that :

(A) the compound is certainly meso

(B) there is no compound in the solvent

(C) the compound may be a racemic mixture

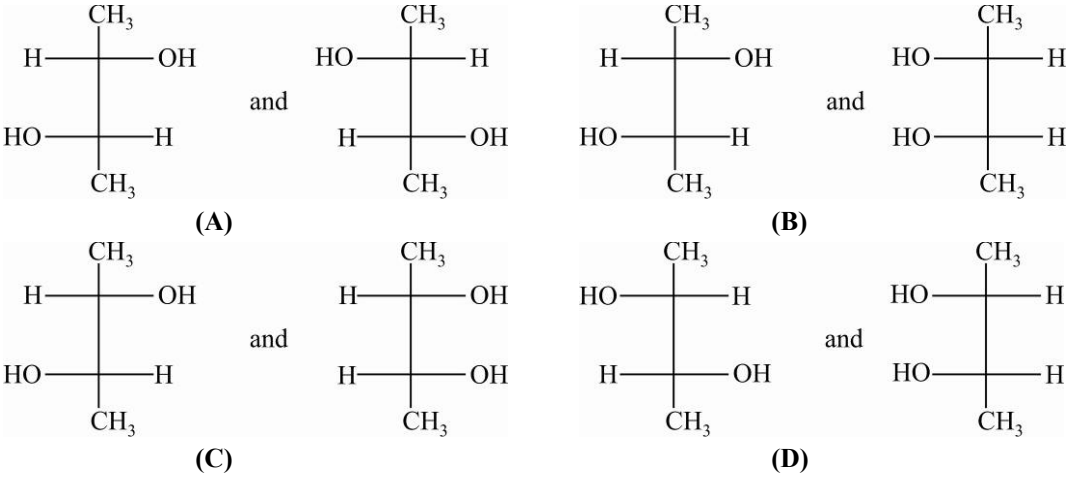
(D) the compound is certainly achiral

***13.** Which of the following is(are) chiral ?

(A) 2-Hydroxypropanoic acid **(B)** 2-Butanol

(C) 2, 3-Dibromopentane **(D)** 3-Bromopentane

14. Which of the following pairs of compounds are enantiomers ?



(A) **(B)** **(C)** **(D)**

15. Secondary butyl chloride obtained by chlorination of n-butane will be :

(A) meso form **(B)** racemic mixture **(C)** d-form **(D)** *l*-form

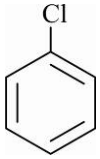
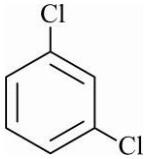
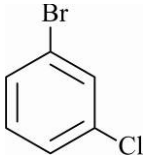
16. Which reagent will you use for the following reaction?

$$CH_3CH_2CH_2CH_3 \longrightarrow CH_3CH_2CH_2CH_2Cl + CH_3CH_2CHClCH_3$$

(A) Cl_2/UV light **(B)** $NaCl + H_2SO_4$

(C) Cl_2 gas in dark **(D)** Cl_2 gas in the presence of iron in dark

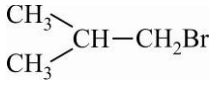
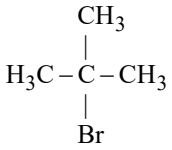
17. Arrange the following compounds in the increasing order of their densities.

I.  **II.**  **III.**  **IV.** 

The correct choice is :

(A) I < II < III < IV **(B)** I < III < IV < II **(C)** IV < III < II < I **(D)** II < IV < III < I

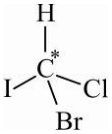
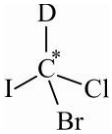
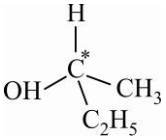
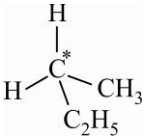
18. Arrange the following compounds in increasing order of their boiling points.

I.  **II.** $CH_3CH_2CH_2CH_2Br$ **III.** 

The correct choice is :

(A) II < I < III **(B)** I < II < III **(C)** III < I < II **(D)** III < II < I

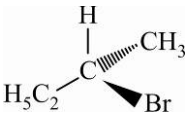
19. In which of the following molecules, carbon atom marked with asterisk $(*)$ is asymmetric?

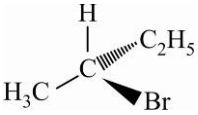
I.  II.  III.  IV. 

The correct choice is :

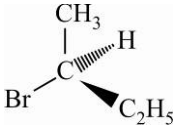
(A) I, II, III, IV **(B)** I, II, III **(C)** II, III, IV **(D)** I, III, IV

20. Which of the following structures is enantiomeric with the molecule (A) given ?

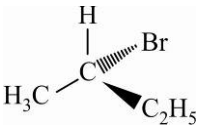




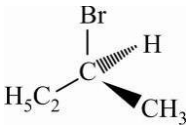
(A)



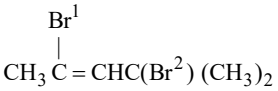
(B)



(C)



(D)

21. The position of $-Br^1$ and $-Br^2$ in the compound :  can be classified as _____ and ____ respectively.

(A) Allyl, vinyl **(B)** Aryl, allyl **(C)** Vinyl, allyl **(D)** Secondary, allyl

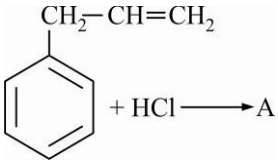
22. Ethylidene chloride is a(an)_____.

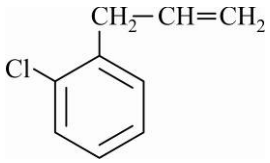
(A) *vic*-dihalide **(B)** *gem*-dihalide **(C)** allylic halide **(D)** vinylic halide

23. Which of the following alkyl halides will undergo S_N1 reaction most readily?

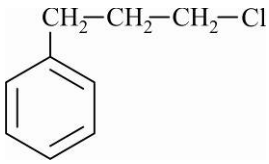
(A) $(CH_3)C-F$ **(B)** $(CH_3)_3C-Cl$ **(C)** $(CH_3)_3C-Br$ **(D)** $(CH_3)_3C-I$

24. What is 'A' in the following reaction?

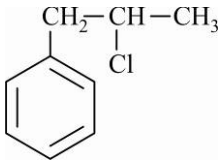




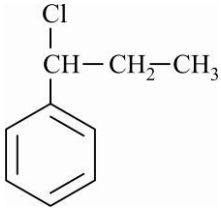
(A)



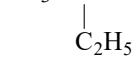
(B)



(C)



(D)

25. Which is the correct IUPAC name for  ?

(A) 1-Bromo-2-ethylpropane **(B)** 1-Bromo-2-ethyl-2-methylethane

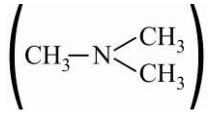
(C) 1-Bromo-2-methylbutane **(D)** 2-Methyl-1-bromobutane

26. What should be the correct IUPAC name for diethylbromomethane?

(A) 1-Bromo-1, 2-diethylmethane **(B)** 3-Bromopentane

(C) 1-Bromo-1-ethylpropane **(D)** 1-Bromopentane

27. Chloromethane on treatment with excess of ammonia yields mainly

(A) N, N-Dimethylmethanamine 

(B) N-methylmethanamine $(CH_3-NH-CH_3)$

(C) Methanamine (CH_3NH_2)

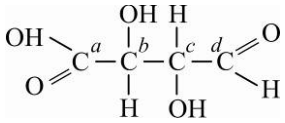
(D) Mixture containing all these in equal proportion

28. Reaction of $C_6H_5CH_2Br$ with aqueous sodium hydroxide follows_____.

(A) S_N1 mechanism **(B)** S_N2 mechanism

(C) Any of the above two depending upon the temperature of reaction **(D)** Saytzeff rule

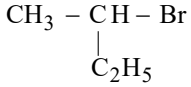
29. Which of the carbon atoms present in the molecule given below are asymmetric?

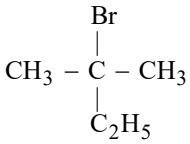


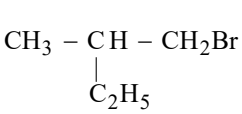
(A) *a, b, c, d* **(B)** *b, c*

(C) *a, d* **(D)** *a, b, c*

30. Which of the following compounds will give racemic mixture on nucleophilic substitution by OH^- ion?

I. 

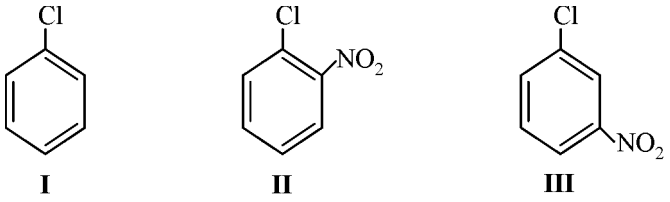
II. 

III. 

(A) I **(B)** I, II, III **(C)** II, III **(D)** I, III

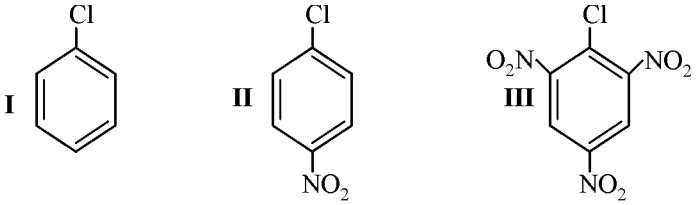
For Questions 31 - 33

Arrange the following in increasing order of ease of nucleophilic substitutions :

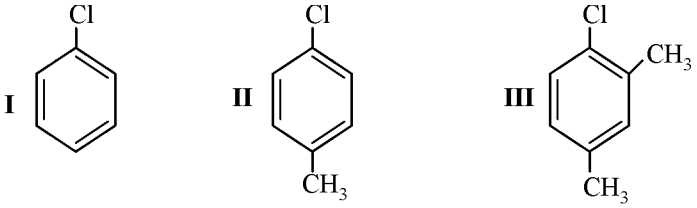
31. 

I **II** **III**

(A) I < II < III **(B)** III < II < I **(C)** I < III < II **(D)** III < I < II

32. 

(A) III < II < I **(B)** II < III < I **(C)** I < III < II **(D)** I < II < III

33. 

(A) I < II < III **(B)** II < I < III **(C)** III < II < I **(D)** I < III < II

34. Which is the correct increasing order of boiling points of the following compounds ?

1-Iodobutane, 1-Bromobutane, 1-Chlorobutane, Butane

(A) Butane < 1-Chlorobutane < 1-Bromobutane < 1-Iodobutane

(B) 1-Iodobutane < 1-Bromobutane < 1-Butane < 1-Chlorobutane

(C) Butane < 1-Iodobutane < 1-Bromobutane < 1-Chlorobutane

(D) Butane < 1-Chlorobutane < 1-Iodobutane < 1-Bromobutane

35. Which is the correct increasing order of boiling points of the following compounds ?

1-Bromoethane, 1-Bromopropane, 1-Bromobutane, Bromobenzene

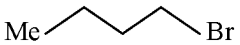
(A) Bromobenzene < 1-Bromobutane < 1-Bromopropane < 1-Bromoethane

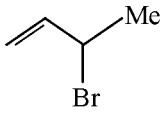
(B) Bromobenzene < 1-Bromoethane < 1-Bromopropane < 1-Bromobutane

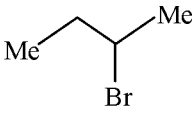
(C) 1-Bromopropane < 1-Bromobutane < 1-Bromoethane < Bromobenzene

(D) 1-Bromoethane < 1-Bromopropane < 1-Bromobutane < Bromobenzene

36. Consider the following :

(I) 

(II) 

(III) 

The correct order of reactivity by S_Nl mechanism for given substrates is:

(A) II > III > I **(B)** II > I > III **(C)** III > II > I **(D)** I > II > III

37. The organic chloro compound, which shows maximum reactivity for S_N2 mechanism is:

(A) $(C_2H_5)_2CHCl$ **(B)** $(CH_3)_3CCl$ **(C)** $(CH_3)_2CHCl$ **(D)** CH_3Cl

38. Trans-2-phenyl-1-bromocyclopentane on reaction with alcoholic KOH produces

(A) 4-pheylcyclopentene **(B)** 2-phenylcyclopentene

(C) 1-phenylcyclopentene **(D)** 3-phenylcyclopentene

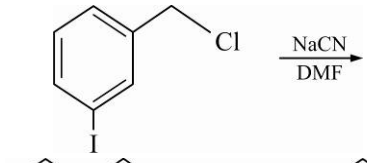
39. $CH_3Br + Nu^- \longrightarrow CH_3 - Nu + Br^-$

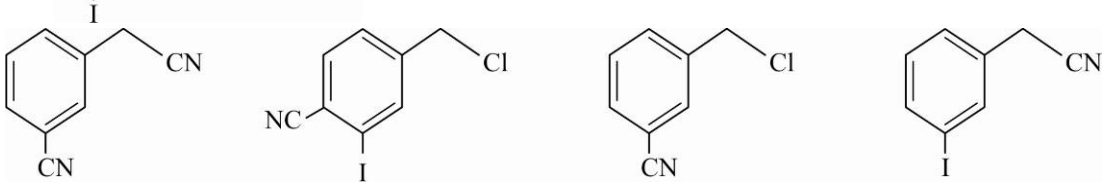
The decreasing order of the rate of the above reaction with given nucleophiles (Nu^-) is :

I. PhO^- **II.** AcO^- **III.** HO^- **IV.** CH_3O^-

(A) IV > III > I > II **(B)** IV > III > II > I **(C)** I > II > III > IV **(D)** II > IV > III > I

40. The structure of the major product formed in the following reaction is :





(A) **(B)** **(C)** **(D)**

41. Acetyl bromide reacts with excess of CH_3MgI followed by treatment with a saturated solution of NH_4Cl gives

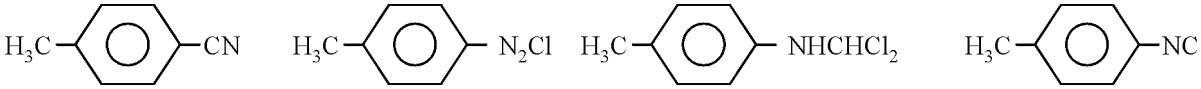
(A) acetone **(B)** acetamide

(C) 2-methyl-2-propanol **(D)** acetyl iodide

42. The compound formed on heating chlorobenzene with chloral in the presence of concentrated sulphuric acid is :

(A) gammexane **(B)** DDT **(C)** Freon **(D)** hexachloroethane

43. The reaction of chloroform with alcoholic KOH and p-toluidine form :



(A) **(B)** **(C)** **(D)**

44. An organic compound A (C_4H_9Cl) on reaction with Na/diethyl ether gives a hydrocarbon which on monochlorination gives only one chloro derivative the compound A is :

(A) t-butyl chloride **(B)** s-butyl chloride **(C)** iso butyl chloride **(D)** n-butyl chloride

45. A compound of molecular formula C_7H_{16} shows optical isomerism, compound will be :

(A) 2, 3-dimethylpentane **(B)** 2, 2-dimethylpentane

(C) 2-methylhexane **(D)** None of these

***46.** Which of the following compounds is(are) chiral ?

(A) CH_3CHDCH_2Cl **(B)** CH_3CH_2CHDCl **(C)** $DCH_2CH_2CH_2Cl$ **(D)** $CH_3CHClCH_2D$

47. Substitution of Cl-atom of chlorobenzene to give phenol requires drastic conditions. But chlorine of 2, 4-dinitrochlorobenzene is readily replaced :

(A) NO_2 donates e^- at meta position **(B)** NO_2 withdraw e^- from ortho/para positions

(C) NO_2 make ring electron rich at ortho and para **(D)** NO_2 withdraws e^- from meta position

48. Industrial preparation of chloroform employs acetone and

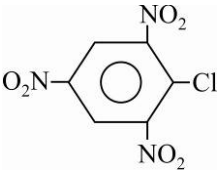
(A) phosgene **(B)** calcium hypochloride

(C) chlorine gas **(D)** sodium chloride

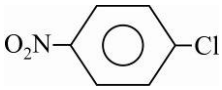
49. Chlorobenzene reacts with Mg in dry ether to give a compound (A) which further reacts with ethanol to yield :

(A) phenol **(B)** benzene **(C)** ethyl benzene **(D)** phenyl ether

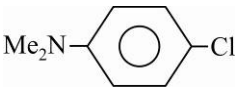
50. Which chloro derivative of benzene among the following would undergo hydrolysis most readily with aqueous sodium hydroxide to furnish the corresponding hydroxyl derivative ?



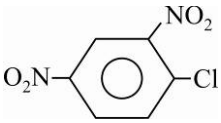
(A)



(B)



(C)



(D)

51. Phosgene is a common name for :

(A) Phosphoryl chloride **(B)** thionyl chloride

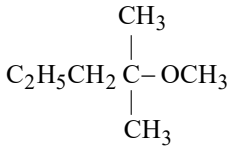
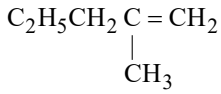
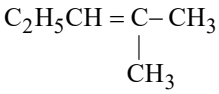
(C) carbon dioxide and phosphine **(D)** carbonyl chloride

52. Which one is formed when sodium phenoxide is heated with ethyl iodide ?

(A) Phenetole (ethyl phenyl ether) **(B)** Ethyl phenyl alcohol

(C) Phenol **(D)** None of these

53. 2-chloro-2-methylpentane on reaction with sodium methoxide in methanol can from:

(a)  **(b)**  **(c)** 

(A) (a) and (c) **(B)** (c) only

(C) (a) and (b) **(D)** All of these

54. The synthesis of alkyl flourides is best accomplished by :

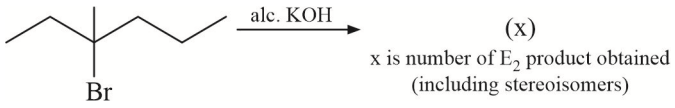
(A) Free radical fluorination **(B)** Sandmeyer's reaction

(C) Finkelstein reaction **(D)** Swartz reaction

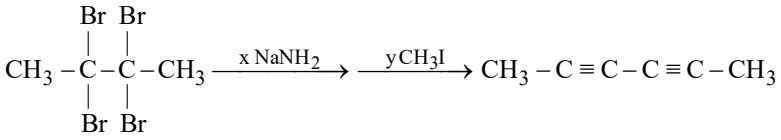
55. The major organic compound formed by the reaction of 1, 1, 1-trichloroethane with silver powder is:

(A) 2-Butene **(B)** Acetylene **(C)** Ethene **(D)** 2-Butyne

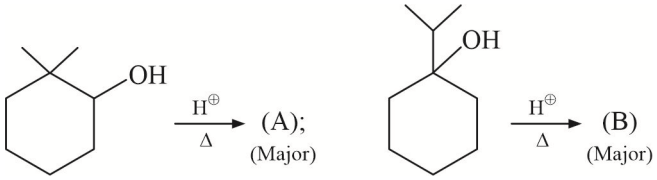
56. Increasing the concentration of an electrophile in a typical S_{N^2} reaction by a factor of 3 and the concentration of the nucleophile by a factor 3 will increase the reaction rate by a factor of _____.

57. 

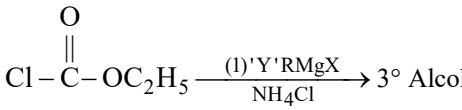
Find (x) _____.

58. 

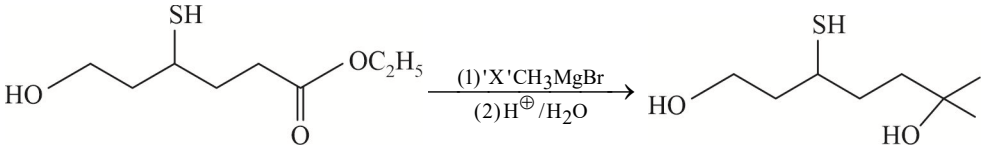
x and y mole consumed. Value of $x + y$ _____.

59. 

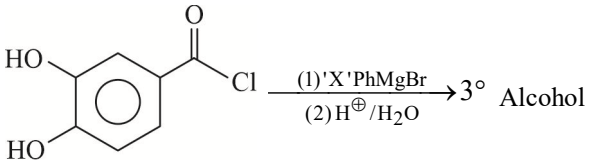
Sum of number α -hydrogen present in compound A and B is _____.

60. 

3° Alcohol. Find out value of 'Y'.

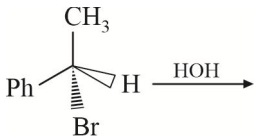
61. 

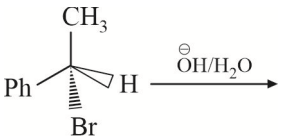
Find out value of 'X'.

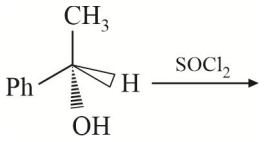
62. 

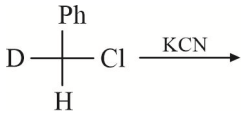
Alcohol

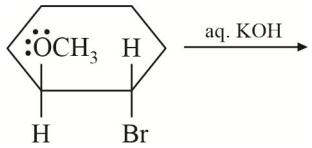
63. Find out number of reactions that can give product with retention of configuration.

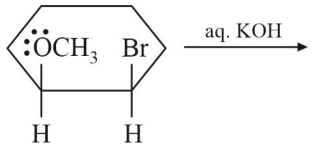
(a) 

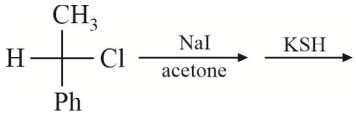
(b) 

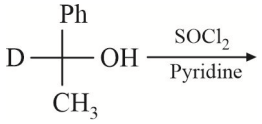
(c) 

(d) 

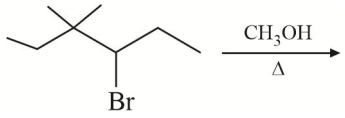
(e) 

(f) 

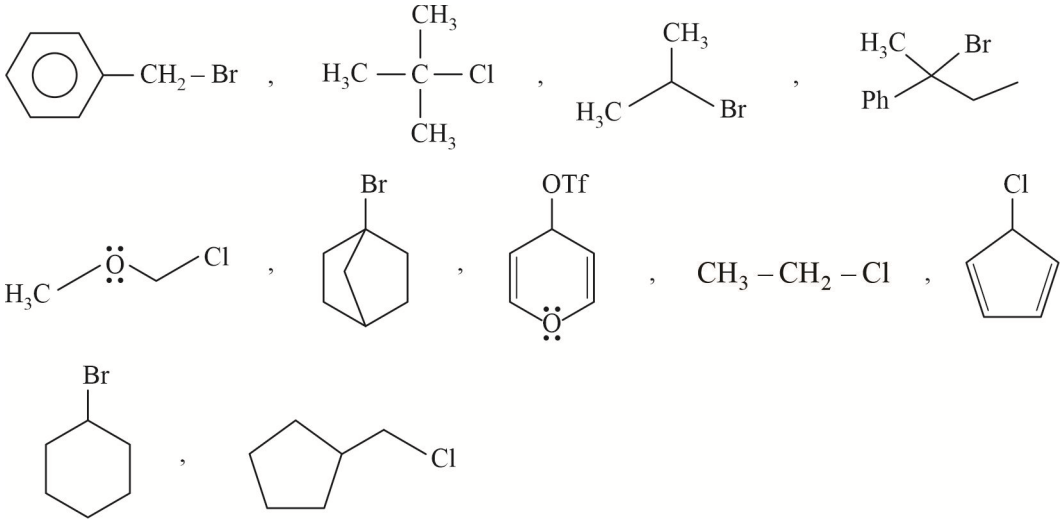
(g) 

(h) 

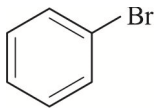
64. Find out numbers of possible E_1 products from following reaction.

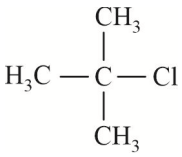


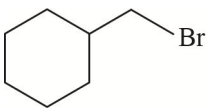
65. Identify number of substrate those can give S_N1 and S_N2 reaction both.



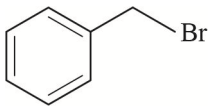
66. Examine the ten structures shown below and select those that satisfy each of the following condition.

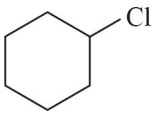
(a) 

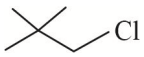
(b) 

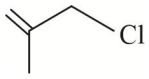
(c) 

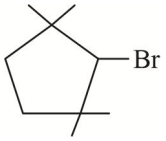
(d)

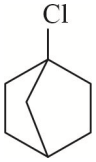
(e) 

(f) 

(g) 

(h) 

(i) 

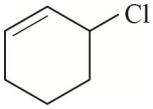
(j) 

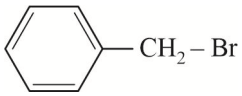
(i) How many compounds give S_N2 reaction on treatment with NaSH?

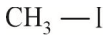
(ii) How many compounds give E_2 reaction on treatment with alcoholic KOH?

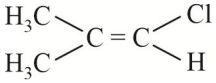
(iii) How many compounds do not react under either of the previous reaction conditions?

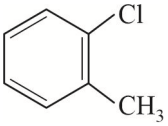
67. Examine the ten structures shown below and select those that satisfy each of the following condition.

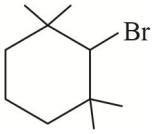
(a) 

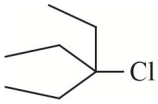
(b) 

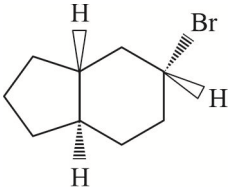
(c) 

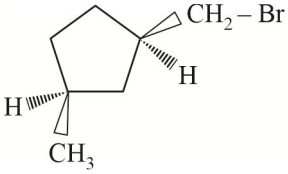
(d) 

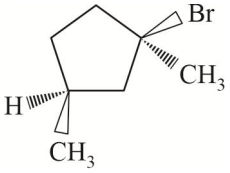
(e) 

(f) 

(g) 

(h) 

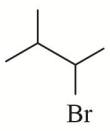
(i) 

(j) 

(i) How many compounds give substitution reaction with $CH_3\overset{\ominus\oplus}{S}Na$?

(ii) How many compounds give elimination reaction with $Na\overset{\oplus\ominus}{C}N$?

68. How many substrates will show rearrangement during S_N1 reaction?



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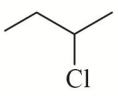

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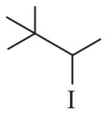

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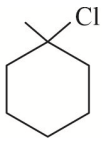

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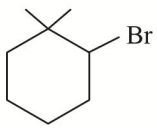

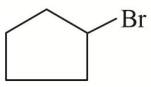

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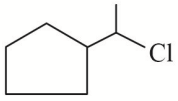

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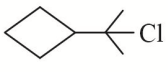

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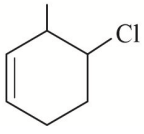

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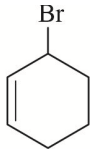


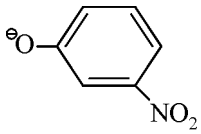
Alcohols, Phenols & Ethers

CHOOSE THE CORRECT ALTERNATIVE. ONLY ONE CHOICE IS CORRECT. HOWEVER, QUESTIONS MARKED '*' MAY HAVE MORE THAN ONE CORRECT OPTION.

1. How many alcohols with molecular formula $C_4H_{10}O$ are chiral in nature?

(A) 1 **(B)** 2 **(C)** 3 **(D)** 4

2. Which of the following species can act as the strongest base ?

(A) $^{\ominus}OH$ **(B)** $^{\ominus}OR$ **(C)** $^{\ominus}OC_6H_5$ **(D)** 

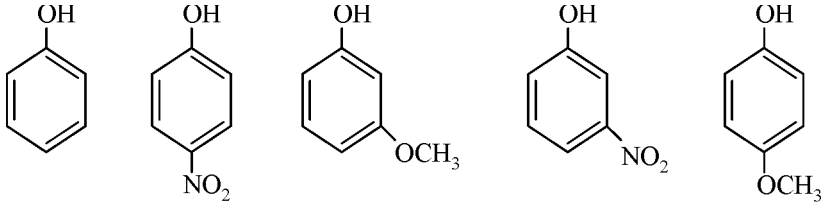
3. Phenol is less acidic than _____

(A) ethanol **(B)** o-nitrophenol **(C)** o-methylphenol **(D)** o-methoxyphenol

4. Which of the following is most acidic?

(A) Benzyl alcohol **(B)** Cyclohexanol **(C)** Phenol **(D)** m-Chlorophenol

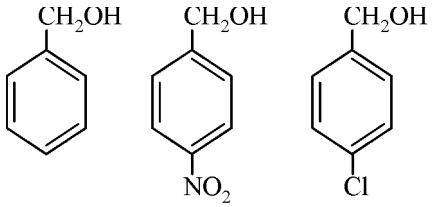
5. Mark the correct order of decreasing acid strength of the following compounds.



(a) **(b)** **(c)** **(d)** **(e)**

(A) e > d > b > a > c **(B)** b > d > a > c > e **(C)** d > e > c > b > a **(D)** b > d > c > a > e

6. Mark the correct increasing order of reactivity of the following compounds with HBr/HCl. (*Visualise S_N1 reaction*)



(a) **(b)** **(c)**

(A) a < b < c

(B) b < a < c

(C) b < c < a

(D) c < b < a

7. Arrange the following compounds in increasing order of boiling point. Propan-1-ol, butan-1-ol, butan-2-ol, pentan-1-ol.

(A) Propan-1-ol, butan-2-ol, butan-1-ol, pentan-1-ol

(B) Propan-1-ol, butan-1-ol, butan-2-ol, pentan-1-ol

(C) Pentan-1-ol, butan-2-ol, butan-1-ol, propan-1-ol

(D) Pentan-1-ol, butan-1-ol, butan-2-ol, propan-1-ol

***8.** Which of the following are used to convert RCHO into RCH_2OH?

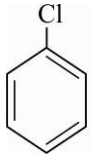
(A) H_2/Pd

(B) $LiAlH_4$

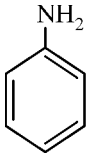
(C) $NaBH_4$

(D) Reaction with RMgX followed by hydrolysis

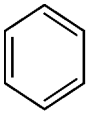
***9.** Which of the following reactions will yield phenol?

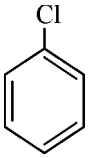
(A) 

(i) fusion with NaOH at high T & P
(ii) H_2O/H^+

(B) 

(i) $NaNO_2/HCl$
(ii) H_2O (Warming)

(C) 
(i) Oleum
(ii) NaOH, (Heating)
(iii) H^+

(D) 

(i) NaOH(aq.), 298k/1atm
(ii) HCl

***10.** Which of the following reagents can be used to oxidise primary alcohols to aldehydes?

(A) CrO_3 in anhydrous medium. **(B)** $KMnO_4$ in acidic medium.

(C) Pyridinium chlorochromate **(D)** Heat in the presence of Cu at 573 K.

***11.** Phenol can be distinguished from ethanol by the reactions with _____.

(A) Br_2/water **(B)** Na **(C)** Neutral $FeCl_3$ **(D)** All the above

For Questions 12 - 18

(A) Statement-1 is True, Statement-2 is True and Statement-2 is a correct explanation for Statement-1

(B) Statement-1 is True, Statement-2 is True and Statement-2 is NOT a correct explanation for Statement-1

(C) Statement-1 is True, Statement-2 is False **(D)** Statement-1 is False, Statement -2 is True

12. **Statement : 1** Addition reaction of water to but-1-ene in acidic medium yields butan-1-ol.
Statement : 2 Addition of water in acidic medium proceeds through the formation of carbocation.

13. **Statement : 1** p-nitrophenol is more acidic than phenol.
Statement : 2 Nitro group helps in the stabilization of the phenoxide ion by delocalisation of negative charge due to resonance.

14. **Statement : 1** Bond angle in ethers is slightly less than the tetrahedral angle.
Statement : 2 There is a repulsion between the two bulky (– R) groups.

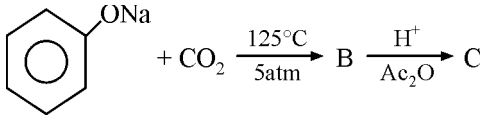
15. **Statement : 1** Like bromination of benzene, bromination of phenol is also carried out in the presence of Lewis acid.
Statement : 2 Lewis acid polarizes the bromine molecule.

16. **Statement : 1** o-Nitrophenol is less soluble in water than the m-and p-isomers.
Statement : 2 m- and p-Nitrophenols exist as associated molecules.

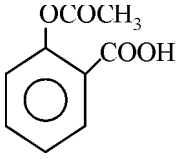
17. **Statement : 1** Ethanol is a weaker acid than phenol.
Statement : 2 Sodium ethoxide may be prepared by the reaction of ethanol with aqueous NaOH.

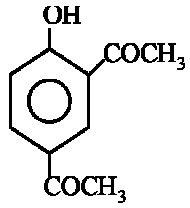
18. **Statement : 1** Phenol forms 2, 4, 6-tribromophenol on treatment with Br_2 in water.
Statement : 2 Bromine polarizes in carbon disulphide.

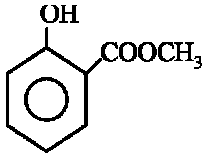
19. Sodium phenoxide when heated with CO_2 under pressure at 125°C yields a product which on acetylation produces C.

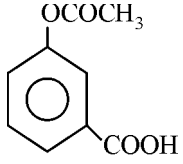


The major product C would be :

(A) 

(B) 

(C) 

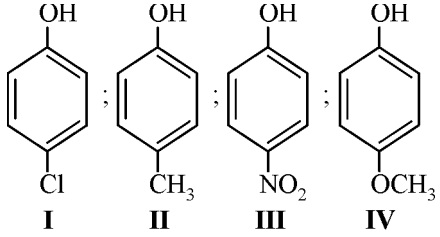
(D) 

20. The most suitable reagent for the conversion of $RCH_2OH \longrightarrow R - CHO$ is :

(A) $KMnO_4$ **(B)** $K_2Cr_2O_7$

(C) CrO_3/H_2SO_4/acetone **(D)** PCC [Pyridium chlorochromate]

21. Arrange the following compounds in the order of decreasing acidity



(A) II > IV > I > III **(B)** I > II > III > IV **(C)** III > I > II > IV **(D)** IV > III > I > II

22. An unknown alcohol is treated with the "Lucas reagent' to determine whether the alcohol is primary, secondary or tertiary. Which alcohol reacts fastest and by what mechanism?

(A) Secondary alcohol by S_N1 **(B)** Tertiary alcohol by S_N1

(C) Secondary alcohol by S_N2 **(D)** Tertiary alcohol by S_N2

23. Aspirin is known as :

(A) Acetyl salicylic acid **(B)** Phenyl salicylate

(C) Acetyl salicylate **(D)** Methyl salicylic acid

24. Ortho-nitrophenol is less soluble in water than p-and m-nitrophenols because :

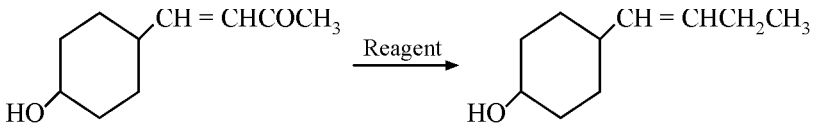
(A) o-nitrophenol is more volatile steam than those of m-and p-isomers

(B) o-nitrophenol shows intramolecular H-bonding

(C) o-nitrophenol shows intermolecular H-bonding

(D) Melting point of o-nitrophenol is lower than those m-and p-isomers

25. In the given transformation, which the following is the most appropriate reagent?



(A) $NH_2NH_2, \overset{\ominus}{O}H$ **(B)** Zn – Hg / HCl **(C)** Na, Liq. NH_3 **(D)** $NaBH_4$

26. Phenol is heated with a mixture of KBr and $KBrO_3$ in HCl. The major product obtained in the above reaction is :

(A) 2-bromophenol **(B)** 3-bromophenol

(C) 4-bromophenol **(D)** 2, 4, 6-tribromophenol

27. The correct order acid strength of the following compounds is :

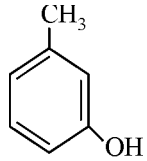
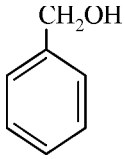
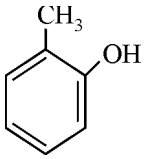
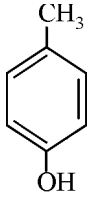
I. Phenol **II.** p-cresol **III.** m-nitrophenol **IV.** p-nitrophenol

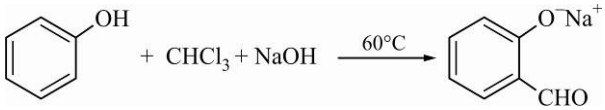
The correct choice is :

(A) III > II > I > IV **(B)** IV > III > I > II

(C) II > IV > I > III **(D)** I > II > IV > III

28. The structure of the compound that gives tribromo derivative on treatment with bromine water is :

(A)  **(B)**  **(C)**  **(D)** 

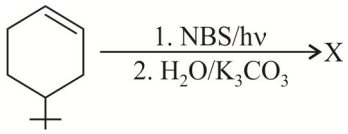
29. 

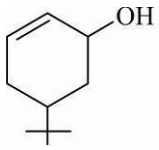
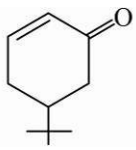
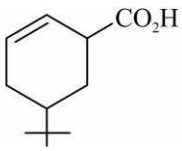
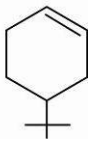
The electrophile involved in the above reaction is :

(A) Dichloromethyl cation ($\overset{\oplus}{C}HCl_2$) **(B)** Dichlorocarbene ($:CCl_2$)

(C) Trichloromethyl canion ($\overline{C}Cl_3$) **(D)** Formyl cation ($\overset{\oplus}{C}HO$)

30. The product of the reaction given below is :



(A)  **(B)**  **(C)**  **(D)** 

31. Which of the following reaction(s) can be used for the preparation of alkyl halides ?

I. $CH_3CH_2OH + HCl \xrightarrow{\text{anh. } ZnCl_2}$

II. $CH_3CH_2OH + HCl \longrightarrow$

III. $(CH_3)_3COH + HCl \longrightarrow$

IV. $(CH_3)_2CHOH + HCl \xrightarrow{\text{anh. } ZnCl_2}$

(A) I and II only **(B)** IV only

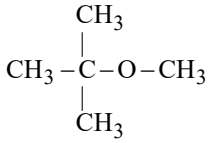
(C) III and IV only **(D)** I, III and IV only

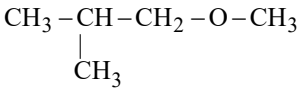
***32.** Which of the following will be soluble in sodium hydrogen carbonate ?

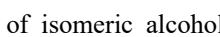
(A) 2, 4, 6-Trinitrophenol **(B)** Benzoic acid

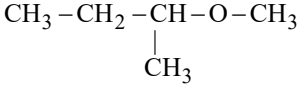
(C) o-Nitrophenol **(D)** Benzenesulphonic acid

***33.** Among the following ethers, which will produce methyl alcohol on treatment with hot concentrated HI ?

(A) 

(B) 

(C) 

(D) 

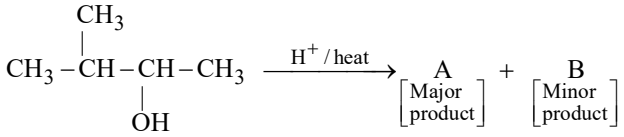
34. Number of isomeric alcohols of molecular formula $C_6H_{14}O$ which give positive iodoform test is (only structural isomers).

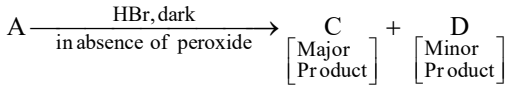
(A) three **(B)** four **(C)** five **(D)** two

35. Which of the following compounds can be used as antifreeze in automobile radiators ?

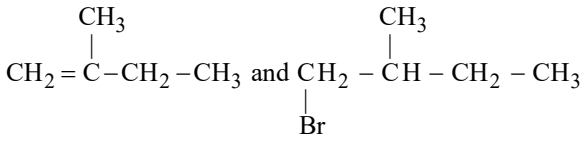
(A) Methyl alcohol **(B)** Glycol **(C)** Nitrophenol **(D)** Ethyl alcohol

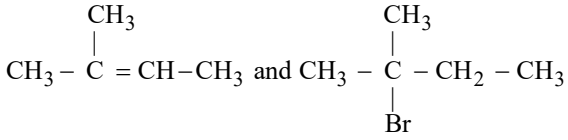
36. In the following reactions,

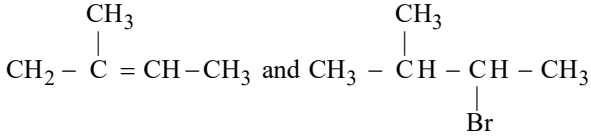
(i) 

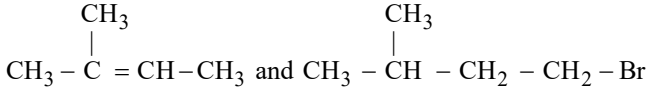
(ii) 

the major product (A) and (C) are respectively :

(A) 

(B) 

(C) 

(D) 

37. Given are cyclohexanol (I), acetic acid (II), 2, 4, 6-trinitrophenol (III) and phenol (IV). In these the order of decreasing acidic character will be :

(A) III > II > IV > I **(B)** II > III > I > IV **(C)** II > III > IV > I **(D)** III > IV > II > I

38. Among the following four compounds :

(i) Phenol **(ii)** Ortho Methyl phenol

(iii) Meta-nitrophenol **(iv)** Para-nitrophenol

The acidity order is :

(A) (iv) > (iii) > (i) > (ii) **(B)** (iii) > (iv) > (i) > (ii)

(C) (i) > (iv) > (iii) > (ii) **(D)** (ii) > (i) > (iii) > (iv)

39. When glycerol is treated with excess of HI, it produces :

(A) 2-iodopropane **(B)** allyl iodide **(C)** propene **(D)** glycerol triiodide

40. Match the compounds given in List I with their characteristic given in List II. Select the correct option :

	List-I		List-II
(a)	$CH_3(CH_2)_3NH_2$	**(i)**	Alkaline hydrolysis
(b)	$CH_3C\equiv CH$	**(ii)**	With KOH (alcohol) and $CHCl_3$ produces bad smell
(c)	$CH_3CH_2COOCH_3$	**(iii)**	Give white ppt. with ammoniacal $AgNO_3$
(d)	$CH_3CH(OH)CH_3$	**(iv)**	With Lucas reagent cloudiness appears after 5 minutes

(A) a – (ii), b – (i), c – (iv), d – (iii) **(B)** a – (iii), b – (ii), c – (i), d – (iv)

(C) a – (ii), b (iii), c – (i), d – (iv) **(D)** a – (iv), b – (ii), v – (iii), d – (i)

41. Consider the following reaction : Phenol $\xrightarrow{\text{Zn dust}}$ X $\xrightarrow[\text{anhyd. } AlCl_3]{CH_3Cl}$ Y $\xrightarrow[\text{2. } H^+]{\text{1. alkaline } KMnO_4}$ Z the product Z is :

(A) benzaldehyde **(B)** benzoic acid **(C)** benzene **(D)** toluene

42. In the reaction : $CH_3-\underset{\displaystyle CH_3}{\underset{|}{C}}H-CH_2-O-CH_2-CH_3 + HI \xrightarrow{\text{heated}}$

Which of the following compounds will be formed ?

(A) $CH_3-\underset{\displaystyle CH_3}{\underset{|}{C}}H-CH_2I + CH_3CH_2OH$ **(B)** $CH_3-\underset{\displaystyle CH_3}{\underset{|}{C}}H-CH_2OH + CH_3CH_2OH$

(C) $CH_3-\underset{\displaystyle CH_3}{\underset{|}{C}}H-CH_2OH + CH_3CH_2I$ **(D)** $CH_3-\underset{\displaystyle CH_3}{\underset{|}{C}}H-CH_2-I + CH_3CH_2I$

43. Ethylene oxide when treated with Grignard reagent yields :

(A) primary alcohol **(B)** secondary alcohol

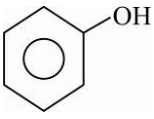
(C) tertiary alcohol **(D)** cyclopropyl alcohol

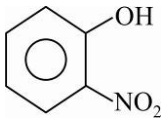
44. The major organic product in the reaction : $CH_3-O-CH(CH_3)_2 + HI \rightarrow$ products :

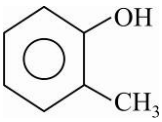
(A) $CH_3I + (CH_3)_2CHOH$ **(B)** $CH_3OH + (CH_3)_2CHI$

(C) $CH_3OH + (CH_3)_2CHOH$ **(D)** $CH_3I + (CH_3)_2CHI$

45. Which one of the following compounds is most acidic ?

(A) $Cl-CH_2-CH_2-OH$ **(B)** 

(C) 

(D) 

46. Which one of the following compounds is resistant to nucleophilic attack by hydroxyl ions ?

(A) Diethyl ether **(B)** Acetonitrile **(C)** Acetamide **(D)** Methyl acetate

47. Ethanol and dimethyl ether form a pair of functional isomers. The boiling point of ethanol is higher than that of dimethyl ether, due to the presence of :

(A) H-bonding in ethanol **(B)** H-bonding in dimethyl ether

(C) CH_3 group in ethanol **(D)** CH_3 group in dimethyl ether

48. Increasing order of acid strength among p-methoxyphenol, p-methylphenol and p-nitrophenol is :

(A) p-nitrophenol, p-methoxyphenol, p-methylphenol

(B) p-methylphenol, p-methoxyphenol, p-nitrophenol

(C) p-methylphenol, p-methylphenol, p-methoxyphenol

(D) p-methoxyphenol, p-methylphenol, p-nitrophenol

49. What is formed when a primary alcohol undergoes catalytic dehydrogenation ?

(A) Aldehyde **(B)** Ketone **(C)** Alkene **(D)** Acid

50. Methanol is industrially prepared by :

(A) oxidation of CH_4 by steam at $900\,^{\circ}C$ **(B)** reduction of HCHO using $LiAlH_4$

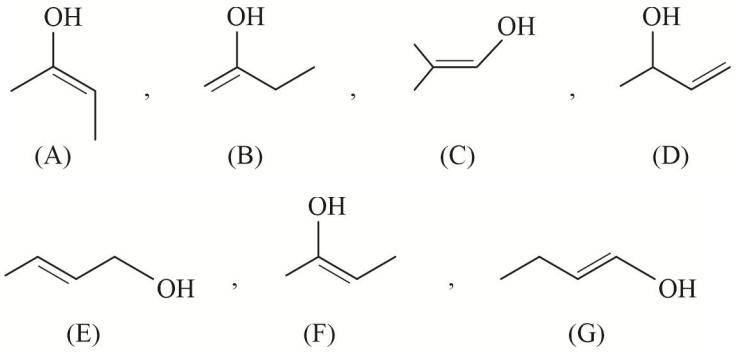
(C) reaction HCHO with a solution of NaOH **(D)** reduction of CO using H_2 and $ZnO-Cr_2O_3$

51. How many primary alcohols (including stereoisomers) are possible with formula $C_5H_{12}O$?

52. 0.092g of a compound with the molecular formula $C_3H_8O_3$ on reaction with an excess of CH_3MgI gives 67.2 mL of methane at STP. The number of active hydrogen atoms present in molecule of the compound is _____.

53. An unknown compound (A) (molar mass = 180) on acylation gives a product (molar mass = 390) than find the number of hydroxyl group present in compound (A) is _____.

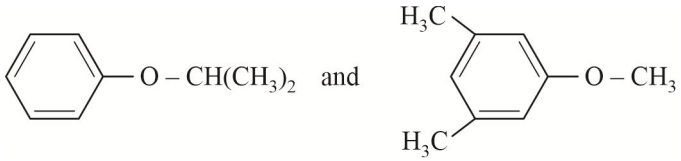
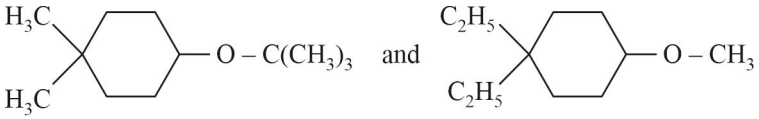
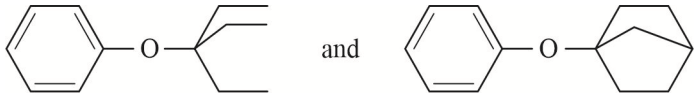
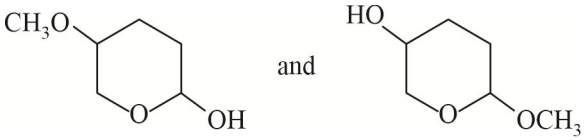
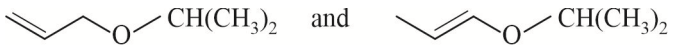
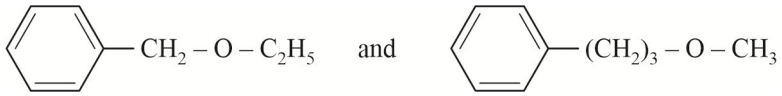
54. How many compounds from A to G are enol tautomers of 2-Butanone?



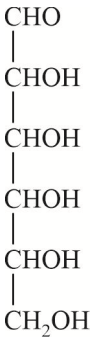
(A) (B) (C) (D)

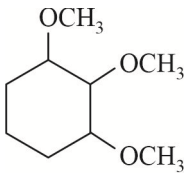
(E) (F) (G)

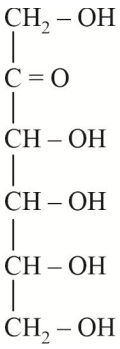
55. Consider the pairs of ethers from A to F shown below. To the right of each pairs is a description of reaction conditions to be applied to each. One compound of the pair will react more rapidly than the other. Find out number of reactions in which first ether more rapidly cleaved than second.

	Ether pairs	Conditions
(A)		Treated with HBr in CH_3-CN, 40°C
(B)		Treated with H_2SO_4 In CH_3CN, 40°C
(C)		Treated with H_2SO_4 In CH_3CN, 40°C
(D)		Treated with 5% Aqueous H_2SO_4, 25°C
(E)		Treated with 5% Aqueous H_2SO_4, 25°C
(F)		Treated with $H^{\oplus}/H_2O$

56. Find out number of moles of HIO_4 that will react with following compound.



57. How many moles of 'HI' will react with  ?

58. 

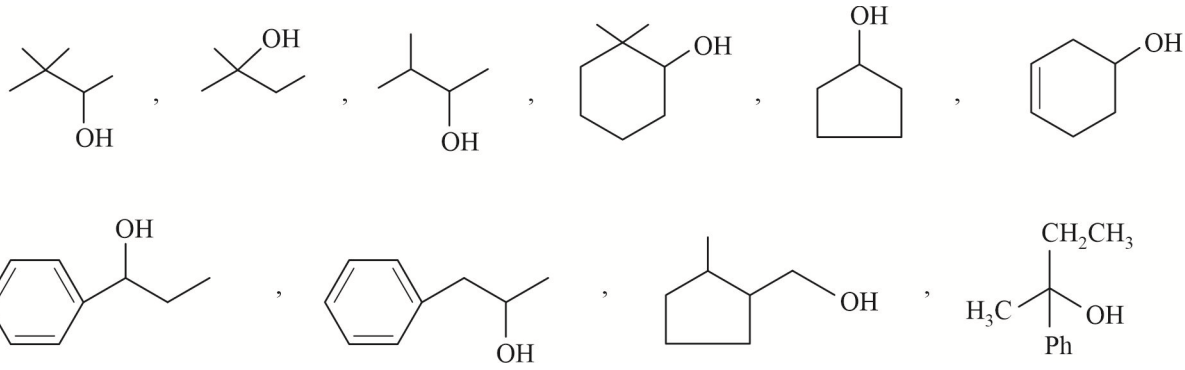
$\xrightarrow{5HIO_4}$ 'X' HCHO + 'Y' HCOOH + 'Z' CO_2 ,find out the value of 'Y'.

59. $R-CH_2-OH \xrightarrow{?} R-CH_2-Cl$

Find out number of reagents that can be used for above conversion, from following

$HCl \mid ZnCl_2$, PCl_3, PCl_5, $SOCl_2$, NaCl, TsCl

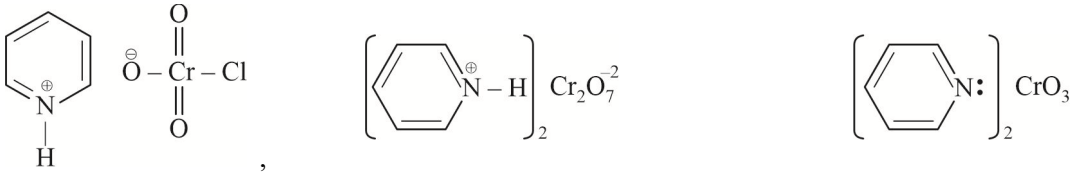
60. Identify numbers of alcohol those will show rearrangement during dehydration with concentrated H_2SO_4.



61. Find out number of reagents that converts 1° alcohol to aldehyde.

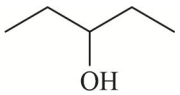
$KMnO_4 \mid H^{\oplus} \mid \Delta$, $K_2Cr_2O_7 \mid Dil.H_2SO_4$, Ceric ammonium nitrate

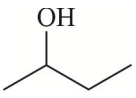
(A) (B) (C)

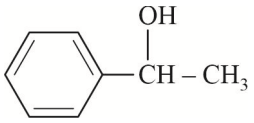


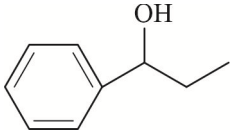
(D) (E) (F)

62. Find out number of alcohols that can give positive iodoform test.

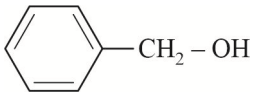
(a) 

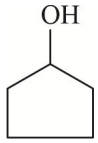
(b) 

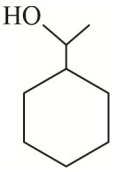
(c) 

(d) 

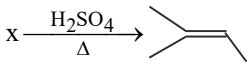
(e) CH_3-CH_2-OH

(f) 

(g) 

(h) 

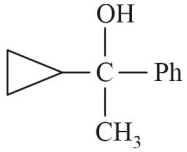
63. How many moles of HI reacts with glycerol to give 2-iodopropane?

64. 

x = number of alcohol including stereo isomers.

Find x :

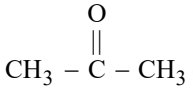
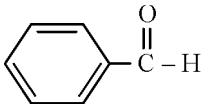
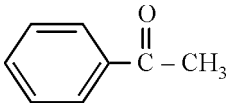
65. How many set of carbonyl compound and RMg X can produce 3° alcohol.



Aldehydes, Ketones & Carboxylic Acids

CHOOSE THE CORRECT ALTERNATIVE. ONLY ONE CHOICE IS CORRECT. HOWEVER, QUESTIONS MARKED '*' MAY HAVE MORE THAN ONE CORRECT OPTION.

1. Which of the following compounds is most reactive towards nucleophilic addition reactions?

(A)  **(B)**  **(C)**  **(D)** 

2. The correct order of increasing acidic strength is _____.

(A) Phenol < Ethanol < Chloroacetic aicd < Acetic acid

(B) Ethanol < Phenol < Chloroacetic acid < Acetic acid

(C) Ethanol < Phenol < Acetic acid < Chloroacetic acid

(D) Chloroacetic acid < Acetic acid < Phenol < Ethanol

3. Compound  can be prepared by the reaction of _____.

(A) Phenol and benzoic acid in the presence of NaOH

(B) Phenol and benzoyl chloride in the presence of pyridine

(C) Phenol and benzoyl chloride in the presence of $ZnCl_2$

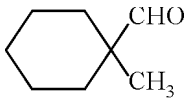
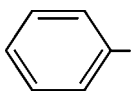
(D) Phenol and benzaldehyde in the presence of palladium

4. The reagent which does not react with both, acetone and benzaldehyde is :

(A) Sodium hydrogensulphite **(B)** Phenyl hydrazine

(C) Fehling's solution **(D)** Grignard reagent

5. Cannizaro's reaction is not given by _____.

(A)  **(B)**  **(C)** HCHO **(D)** CH_3CHO

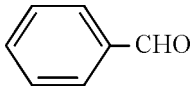
6. Compounds A and C in the following reaction are _____.

$$CH_3CHO \xrightarrow[(ii)\ H_2O]{(i)\ CH_3MgBr} (A) \xrightarrow{H_2SO_4,\ \Delta} (B) \xrightarrow[\text{oxidation}]{\text{Hydroboration}} (C)$$

(A) Identical **(B)** Positional isomers

(C) Functional isomers **(D)** Optical isomers

***7.** Which of the following compounds do not undergo aldol condensation?

(A) $CH_3 - CHO$ **(B)**  **(C)** $CH_3 - \overset{\overset{O}{\|}}{C} - CH_3$ **(D)** $CH_3 - \overset{\overset{CH_3}{|}}{\underset{\underset{CH_3}{|}}{C}} - CHO$

***8.** Treatment of compound $Ph - O - \overset{\overset{O}{\|}}{C} - Ph$ with NaOH solution yields :

(A) Phenol **(B)** Sodium phenoxide

(C) Sodium benzoate **(D)** Benzophenone

***9.** Which of the following conversions can be carried out by Clemmensen Reduction?

(A) Benzaldehyde into benzyl alcohol **(B)** Cyclohexanone into cyclohexane

(C) Benzoyl chloride into benzaldehyde **(D)** Benzophenone into diphenyl methane

***10.** Through which of the following reactions, number of carbon atoms can be increased in the chain?

(A) Grignard reaction **(B)** Cannizaro's reaction

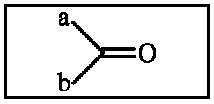
(C) Aldol condensation **(D)** HVZ reaction

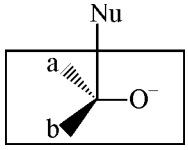
***11.** Benzophenone can be obtained by _____.

(A) Benzoyl chloride + Benzene + $AlCl_3$ **(B)** Benzoyl chloride + Diphenyl cadmium

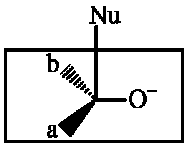
(C) Benzoyl chloride + Phenyl magnesium chloride **(D)** Benzene + Carbon monoxide + $ZnCl_2$

***12.** Which of the following is the correct representation for intermediate of nucleophilic addition reaction to the given carbonyl compound (A) :

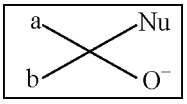




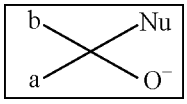
(A)



(B)



(C)



(D)

For Questions 13 - 15

(A) Statement-1 is True, Statement-2 is True and Statement-2 is a correct explanation for Statement-1.

(B) Statement-1 is True, Statement-2 is True and Statement-2 is NOT a correct explanation for Statement-1.

(C) Statement-1 is True, Statement-2 is False. **(D)** Statement-1 is False, Statement -2 is True.

13. **Statement : 1** Formaldehyde is planar molecule.

Statement : 2 It contains sp^2 hybridised carbon atom.

14. **Statement : 1** The α -hydrogen atom in carbonyl compounds is acidic.

Statement : 2 The anion formed after the loss of α – hydrogen atom is resonance stabilized.

15. **Statement : 1** Aromatic aldehydes and formaldehyde undergo Cannizaro reaction.

Statement : 2 Aromatic aldehydes are almost as reactive as formaldehyde.

16. Which of the following test can be applied to distinguish between CH_3CHO and CH_3COCH_3

(A) Addition of HCN **(B)** Fehling Solutions

(C) Polymerisation **(D)** None of these

17. In the reaction, $CH_3COOH \xrightarrow{LiAlH_4} A \xrightarrow{PCl_5} B \xrightarrow{alc.KOH} C$ the product C is :

(A) Acetaldehyde **(B)** Acetylene **(C)** Ethylene **(D)** Acetylchloride

18. Which of the following reagents may be used to distinguish between phenol and benzoic acid ?

(A) Aqueous NaOH **(B)** Tollen's reagent **(C)** Molisch reagent **(D)** Neutral $FeCl_3$

***19.** Trichloroacetaldehyde was subject to Cannizzaro's reaction by using NaOH. The mixture of the products contains sodium trichloroacetate ion and another compound. The other compound is :

(A) 2, 2, 2-trichlorethanol **(B)** Trichloromethanol

(C) 2, 2, 2-trichloropropanol **(D)** Chloroform

20. In Cannizzaro reaction given below $2HCHO \xrightarrow{OH^{\ominus}} CH_3OH + HCO_2^{\ominus}$ the slowest step is :

(A) The attack of $OH^{\ominus}$ at the carboxyl group

(B) The transfer of hydride to the carbonyl group

(C) The abstraction of proton from the carboxylic group

(D) The deprotonation of $PhCH_2OH$

21. When $CH_2 = CH - COOH$ is reduced with $LiAlH_4$, the compound obtained will be :

(A) $CH_3 - CH_2 - COOH$ **(B)** $CH_2 = CH - CH_2OH$

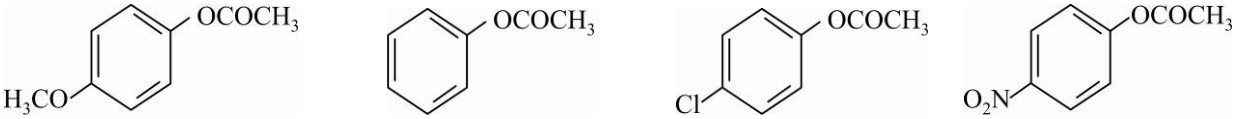
(C) $CH_3 - CH_2 - CH_2OH$ **(D)** $CH_3 - CH_2 - CHO$

22. The oxidation of benzene by V_2O_5 in the presence of air produces :

(A) maleic anhydride **(B)** benzoic acid

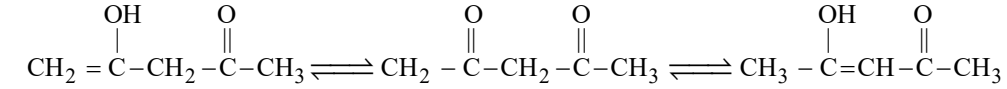
(C) benzaldehyde **(D)** benzoic anhydride

23. Which one of the following esters gets hydrolysed most easily under alkaline conditions ?



(A) **(B)** **(C)** **(D)**

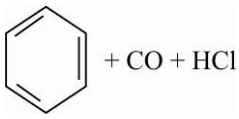
24. The order of stability of the following tautomeric compounds is :

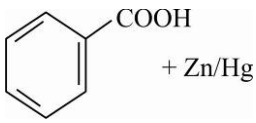


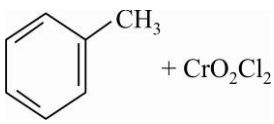
[I] [II] [III]

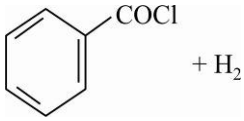
(A) II > I > III **(B)** II > III > I **(C)** I > II > III **(D)** III > II > I

***25.** Which of the following reactions can prepare benzaldehyde ?

(A)  in presence of anhydrous $AlCl_3$

(B)  and conc. HCl

(C)  in CS_2 followed by H_3O^+

(D)  in Presence of $Pd\text{-}BaSO_4$

26. The correct order of decreasing acid strength of trichloroacetic acid (A), trifluoroacetic acid (B), acetic acid (C) and formic acid (D) is :

(A) B > A > D > C **(B)** B > D > C > A **(C)** A > B > C > D **(D)** A > C > B > D

27. The given reaction is an example of : $RCHO + NH_2NH_2 \rightarrow RCH = N - NH_2$

What sort of reaction is it ?

(A) Electrophilic addition-elimination reaction

(B) Free radical addition-elimination reaction

(C) Electrophilic substitution-elimination reaction

(D) Nucleophilic addition-elimination reaction

28. Match the compounds gives in List-I with List-II and select the suitable option using the code given below.

	Column-I		**Column-II**
(A)	Benzaldehyde	**(i)**	Phenolphthalein
(B)	Phthalic anhydride	**(ii)**	Benzoin
(C)	Phenyl benzoate	**(iii)**	Oil of wintergreen
(D)	Methyl salicylate	**(iv)**	Fries rearrangement

(A) (A) – (iv), (B) – (i), (C) – (iii), D – (ii) **(B)** (A) – (iv), (B) – (ii), (C) – (iii), D – (i)

(C) (A) – (ii), (B) – (iii), (C) – (iv), D – (i) **(D)** (A) – (ii), (B) – (i), (C) – (iv), D – (iii)

***29.** Which of the following reactions will result in the formation of carbon-carbon bonds ?

(A) Reimer-Tiemann reaction **(B)** Cannizzaro reaction

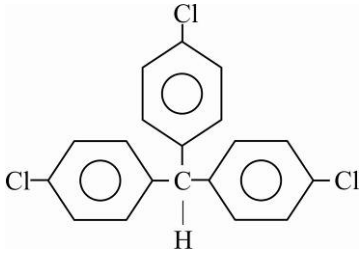
(C) Wurtz reaction **(D)** Friedel-Crafts acylation

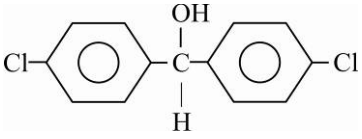
30. Among the given compounds, the most susceptible to nucleophilic attack at the carbonyl group is :

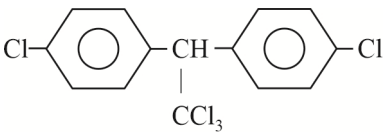
(A) CH_3COOCH_3 **(B)** CH_3CONH_2

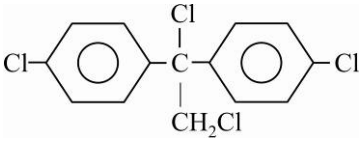
(C) $CH_3COOCOCH_3$ **(D)** CH_3COCl

31. Trichloroacetaldehyde, CCl_3CHO reacts with chlorobenzene in presence of sulphuric acid and produces :

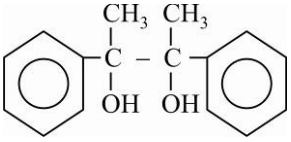
(A) 

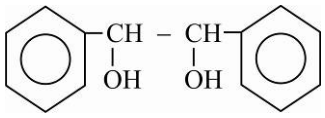
(B) 

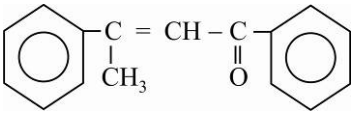
(C) 

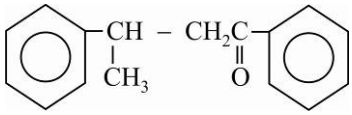
(D) 

32. Acetophenone when reacted with a base, C_2H_5ONa and heated, yields a stable compound which has the structure :

(A) 

(B) 

(C) 

(D) 

33. A strong base abstracts an α – hydrogen from _____to form a stable carbanian.

(A) ketone **(B)** alkane **(C)** alkene **(D)** alcohol

34. Consider the following compounds :

(i) C_6H_5COCl **(ii)** 

(iii)  **(iv)** 

The correct decreasing order of their reactivity towards hydrolysis is :

(A) (i) > (ii) > (iii) > (iv) **(B)** (iv) > (ii) > (i) > (iii)

(C) (ii) > (iv) > (i) > (iii) **(D)** (ii) > (iv) > (iii) > (i)

35. Which of the following represents the correct order of the acidity in the given compounds ?

(A) $FCH_2COOH > CH_2COOH > BrCH_2COOH > ClCH_2COOH$

(B) $BrCH_2COOH > ClCH_2COOH > FCH_2COOH > CH_3COOH$

(C) $FCH_2COOH > ClCH_2COOH > BrCH_2COOH > CH_3COOH$

(D) $CH_3COOH > BrCH_2COOH > ClCH_2COOH > FCH_2COOH$

***36.** A carbonyl compound reacts with hydrogen cyanide to form cyanohydrin which on hydrolysis forms a racemic mixture of α – hydroxy acid . The carbonyl compound is :

(A) formaldehyde **(B)** acetaldehyde **(C)** acetone **(D)** benzaldehyde

37. Self condensation of two moles of ethyl acetate in presence of sodium ethoxide yields :

(A) ethyl propionate **(B)** ethyl butyrate **(C)** acetoacetic ester **(D)** methyl acetoacetate

38. $\bar{C}H_2-\underset{\underset{O}{\|}}{C}-CH_3$ and $CH_2=\underset{\underset{\underline{O}}{|}}{C}-CH_3$ are :

(A) resonating structures **(B)** tautomers

(C) geometrical isomers **(D)** optical isomers

39. Which of the following give positive Fehling solution test ?

(A) Sucrose **(B)** Glucose **(C)** Fats **(D)** Protein

40. Polarisation in acrolein can be described as :

(A) $\overset{+\delta}{CH_2}=CH-\overset{+\delta}{CHO}$ **(B)** $\overset{-\delta}{CH_2}=CH-\overset{+\delta}{CHO}$

(C) $\overset{+\delta}{CH_2}=CH-\underset{+\delta}{CHO}$ **(D)** $\overset{+\delta}{CH_2}=CH-\underset{-\delta}{CHO}$

41. In the reaction $CH_3CN + 2[H] \xrightarrow[\text{Ether}]{HCl} X \xrightarrow{H_2O/H^+} Y$; the compound Y is :

(A) acetaldehyde **(B)** ethanamine **(C)** acetone **(D)** acetic acid

***42.** Which one of the following ester cannot undergo Claisen self-condensation ?

(A) $C_6H_5CH_2COOC_2H_5$ **(B)** $C_6H_5COOC_2H_5$

(C) $CH_3CH_2CH_2CH_2COOC_6H_5$ **(D)** $HCOOC_2H_5$

43. An ester (A) with molecular formula, $C_9H_{10}O_2$ was treated with excess of CH_3MgBr and the complex so formed, was treated with H_2SO_4 to give an olefin (B). Ozonolysis of (B) gave a ketone with molecular formula C_8H_8O which shows +ve idodoform test. The structure of (A) is :

(A) $CH_3CH_2COOC_6H_5$ **(B)** $C_2H_5COOC_6H_5$

(C) $C_6H_5COOC_2H_5$ **(D)** $p-H_3CO-C_6H_4-COCH_3$

44. Ketone [RCOR] can be obtained in one step by :

(A) oxidation of tertiary alcohol **(B)** reaction of acid halide with alcohols

(C) hydrolysis of esters **(D)** oxidation of primary alcohol

45. Phenylmethanol can be prepared by reducing the benzaldehyde with :

(A) CH_3Br and Na **(B)** CH_3I and Mg **(C)** CH_3Br **(D)** $LiAlH_4$

46. Compound A has a molecular formula C_2Cl_3OH. It reduces Fehling's solution and on oxidation, it gives a monocarboxylic acid B. If A is obtained by the action of chlorine on ethyl alcohol, then compound A is :

(A) methyl chloride **(B)** monochloro acetic acid

(C) chloral **(D)** chloroform

***47.** Which of the following compound will undergo self aldol condensation in the presence of dilute alkali ?

(A) $C_6H_5CH_2CHO$ **(B)** $CH_2 = CHCHO$ **(C)** C_6H_5CHO **(D)** CH_3CH_2CHO

48. Sodium formate on heating yields :

(A) oxalic acid and H_2 **(B)** sodium oxalate and H_2

(C) CO_2 and NaOH **(D)** sodium oxalate

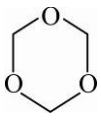
49. $(CH_3)_2C = CHCOCH_3$ can be oxidized to $(CH_3)_2C = CHCOOH$ by :

(A) chromic acid **(B)** NaOI **(C)** Cu at $300^\circ C$ **(D)** $KMnO_4$

***50.** In which of the following, the number of carbon atoms does not remain same when carboxylic acid is obtained by oxidation with strong oxidising agent such as $KMnO_4^+/H^+/\Delta$.

(A) CH_3COCH_3 **(B)** CCl_3CH_2CHO **(C)** $CH_3CH_2CH_2OH$ **(D)** $C_6H_5CH_2CHO$

51. The polymers shown is obtained when formaldehyde is allowed to stand. It is a white solid. The polymer is :



(A) trioxane **(B)** formose

(C) paraformaldehyde **(D)** metaldehyde

52. The compound formed when malonic acid is heated with urea is :

(A) cinnamic acid **(B)** butryric acid **(C)** barbituric acid **(D)** crotonic acid

53. If formaldehyde and KOH are heated, then we get ;

(A) methane **(B)** methyl alcohol **(C)** ethyl formate **(D)** acetylene

54. In the following sequence of reactions $\text{Toluene} \xrightarrow{KMnO_4} A \xrightarrow{SOCl_2} B \xrightarrow[BaSO_4]{H_2/Pd} C$, the product C is:

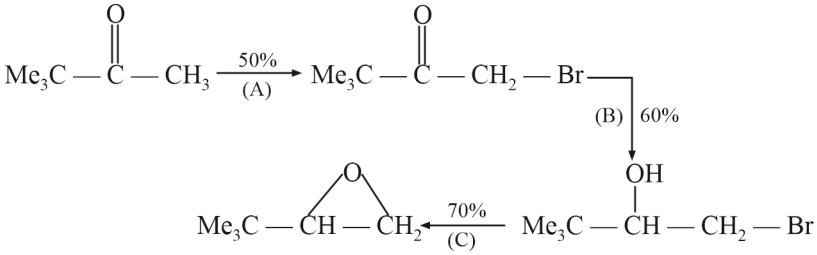
(A) C_6H_5COOH **(B)** $C_6H_5CH_3$ **(C)** $C_6H_5CH_2OH$ **(D)** C_6H_5CHO

***55.** CH_3CHO and $C_6H_5COCH_3$ can be distinguished chemically by :

(A) Benedict's test **(B)** Iodoform test

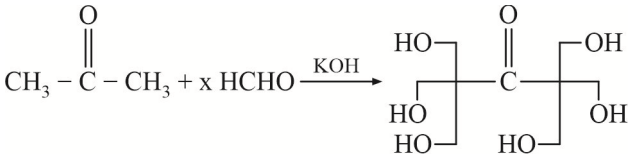
(C) Tollen's reagent test **(D)** Fehling's solution test

56



Yield of each step as actually carried out in the laboratory is given above. The overall yield of reaction is _____.

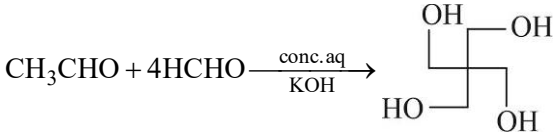
57.



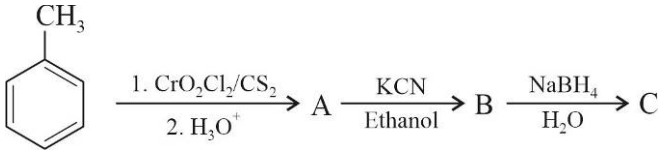
x = moles of HCHO consumed. Value of (x) will be _____.

58. $(CH_2)_n$; For what value of n, the given carboxylic acid is known as acidic acid _____.

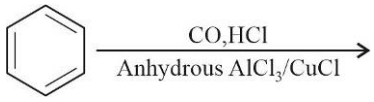
59. The total number of aldol reaction (s) and cannizaro reaction (s) that occurs in the given transformation is :

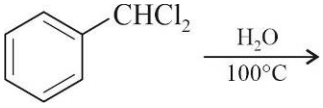


60. Find the number of stereoisomer in the end product (C) in the given reaction set up.

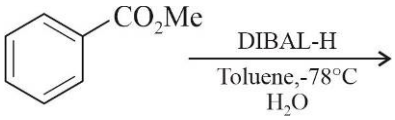


61. Among the following, the number of reaction(s) that produce(s) benzaldehyde is:

(i) 

(ii) 

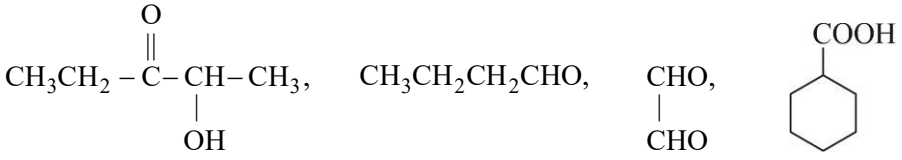
(iii) 

(iv) 

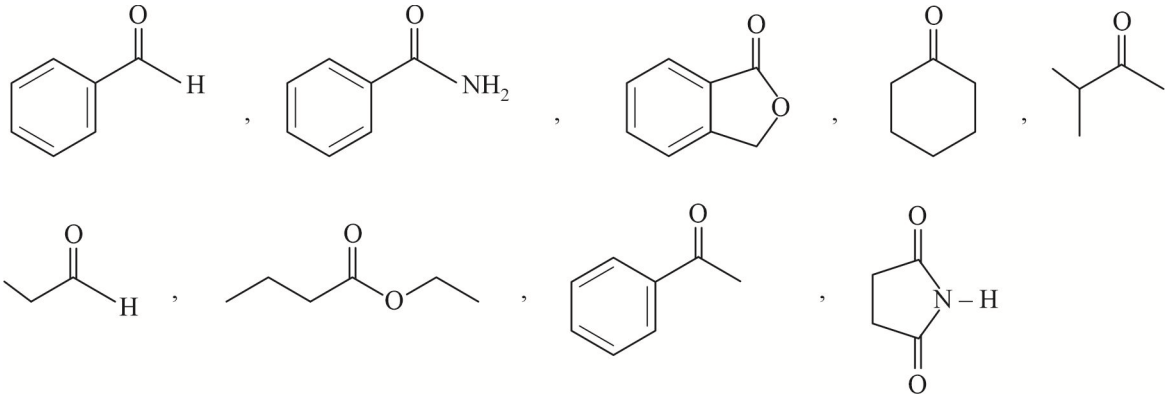
62. What is the molecular weight of a compound that undergoes an aldol self-condensation reaction to result in a β – hydroxy ketone with a molecular weight of 144?

63. Total number of species that can give silver mirror test with Tollen's reagent is/are

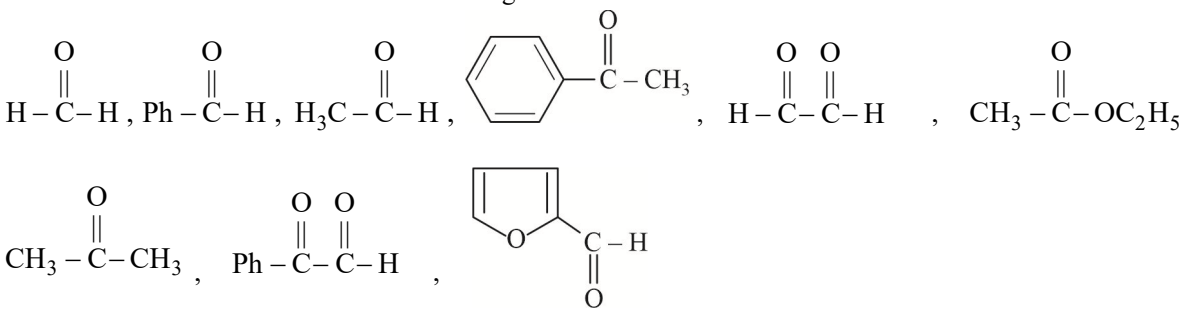
C_6H_5CHO, CH_3CHO, CH_3COCH_3, $HCOOH$, $C_6H_5COCH_3$, CH_3CH_2OH



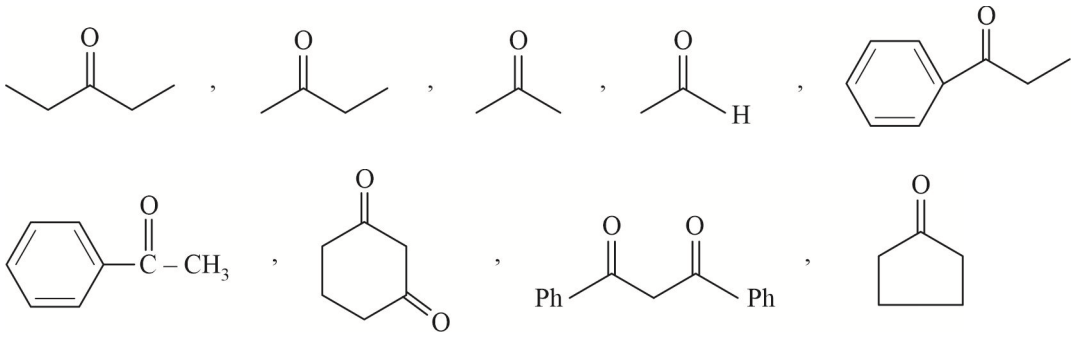
64. Examine the structural formulas given below and identify number of compounds which are reduced by $NaBH_4$



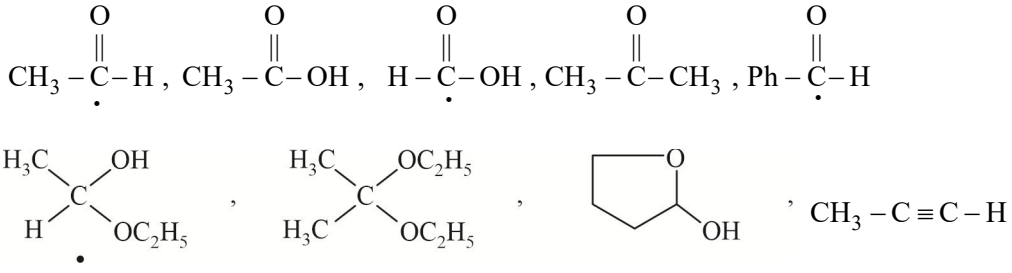
65. Find out number of substrates which can undergo Cannizzaro's reaction.



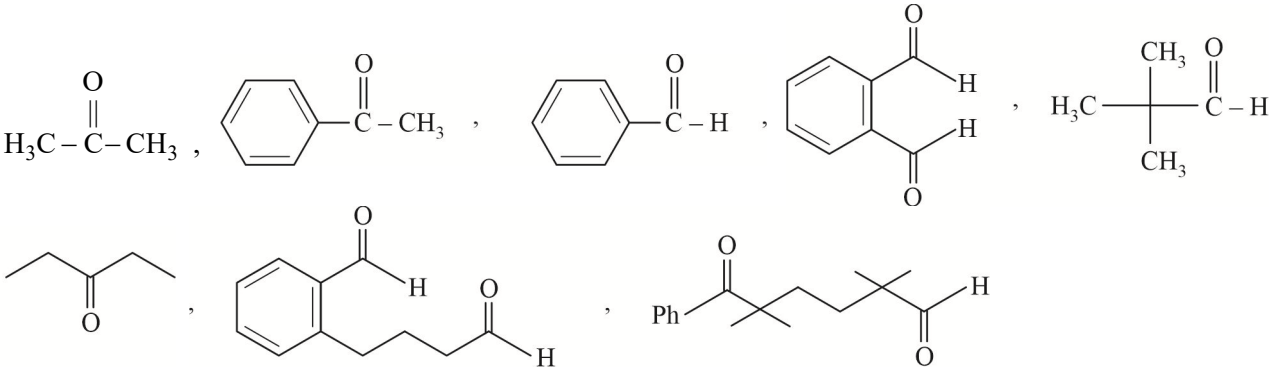
66. Examine the structural formulas of compounds given below and identify number of compounds which show positive iodoform test.



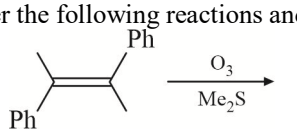
67. Of the following compounds, how many would give positive test with Tollen's reagent ?

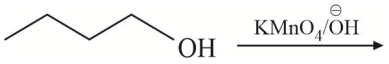


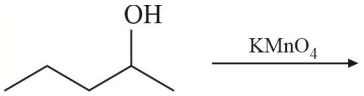
68. Of the following carbonyl compounds, how many would give aldol condensation reaction ?

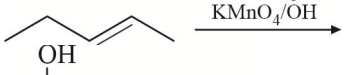


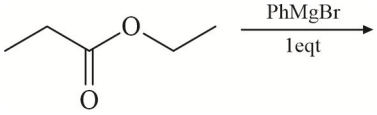
69. Consider the following reactions and identify how many reactions can give carbonyl compounds as major product.

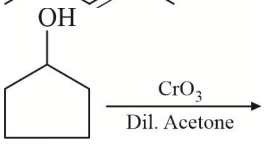
(a) 

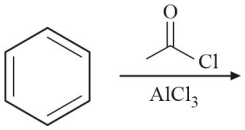
(b) 

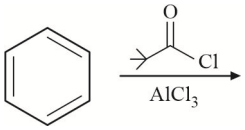
(c) 

(d) 

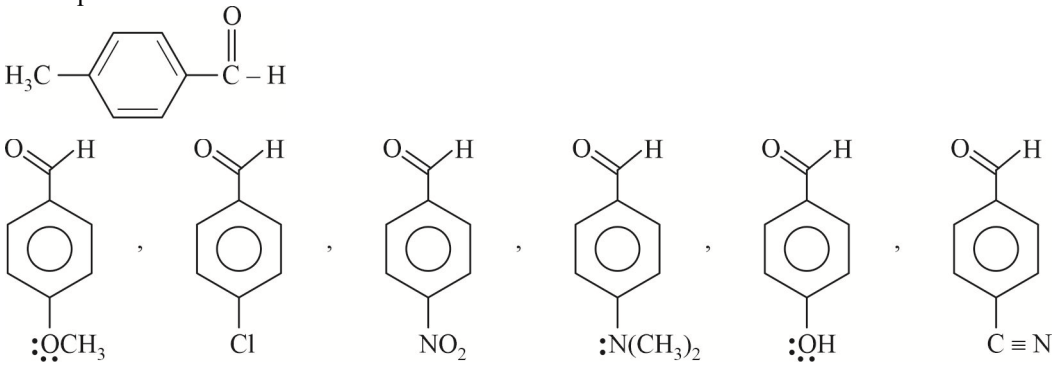
(e) 

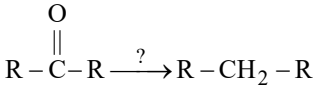
(f) 

(g) 

(h) 

70. Examine the structural formulas of following compounds and find out number of compounds which show higher rate of nucleophilic addition than



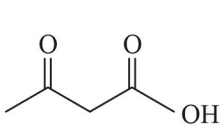
71. 

Identify numbers of reagent that can be used for above conversion.

(a) $Zn-Hg/HCl$ **(b)** $LiAlH_4$ **(c)** $CHCl_3 + NaOH$

(d) $N_2H_4/\overset{\ominus}{O}H$ **(e)** $\begin{matrix}CH_2-SH\\|\\CH_2-SH\end{matrix}$, H_2/Ni **(f)** SeO_2

72. Examine the structure of following compounds, and find out number of compounds that will readily undergo decarboxylation in presence of heat.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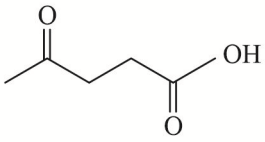
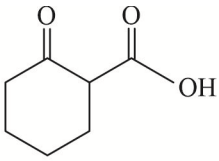

,

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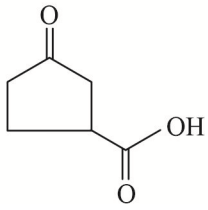

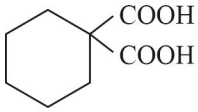
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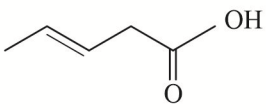
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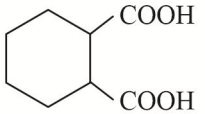
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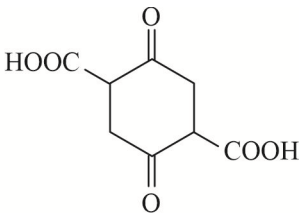
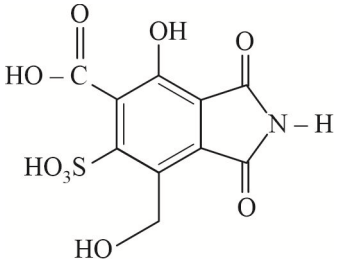
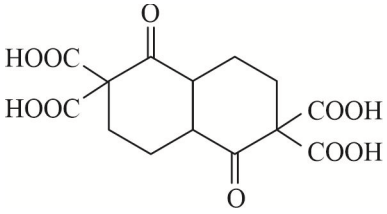


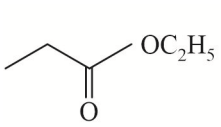
73. How many moles of NaOH would be required for complete neutralization of following compound?



74. How many moles of CO_2 will released when 1 mol of following compound is heated.



75. Examine the structural formulas of following compounds and find out how many compounds can show Claisen condensation reaction.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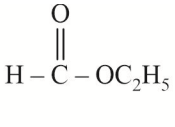
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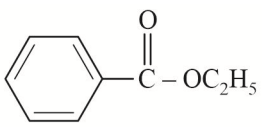

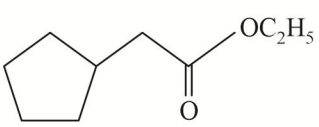
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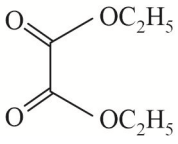
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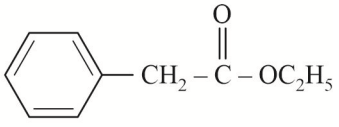
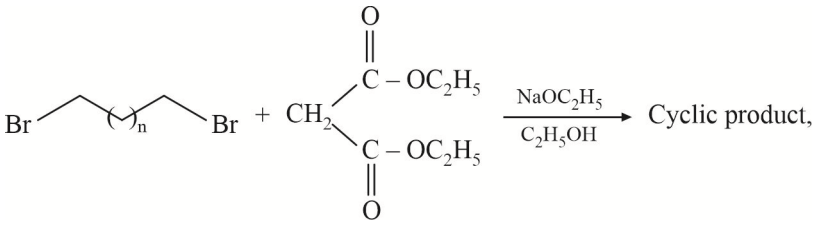
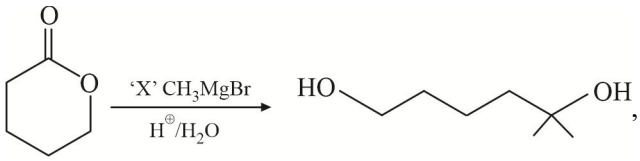
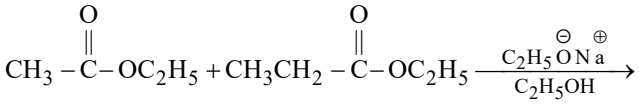


76. 

At what value of 'n' the formation of six membered ring take place?

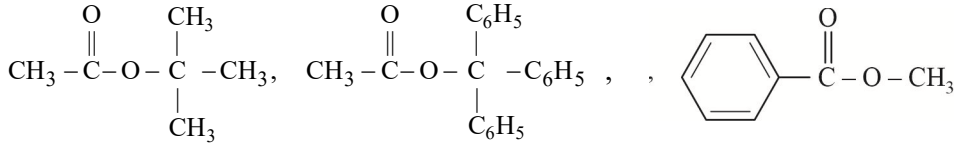
77. 

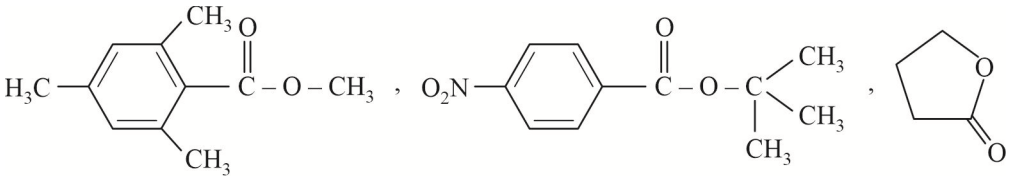
, Find out value of 'X'.

78. 

How many different condensation products would be formed by above reaction?

79. How many of following esters show A_{AL}^{-1} hydrolysis (Acid catalyzed, unimolecular and alkyl-oxygen fission ester hydrolysis)?





Nitrogen Containing Organic Compounds

CHOOSE THE CORRECT ALTERNATIVE. ONLY ONE CHOICE IS CORRECT. HOWEVER, QUESTIONS MARKED '*' MAY HAVE MORE THAN ONE CORRECT OPTION.

1. Which of the following is a 3° amine?

(A) 1-methylcyclohexylamine **(B)** Triethylamine

(C) tert-butylamine **(D)** N-methylaniline

2. The correct IUPAC name for $CH_2 = CHCH_2NHCH_3$ is :

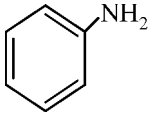
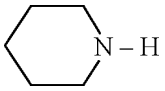
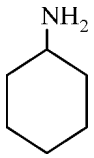
(A) Allylmethylamine **(B)** 2-amino-4-pentene

(C) 4-Aminopent-1-ene **(D)** N-methylprop-2-en-1-amine

3. Amongst the following, the strongest base in aqueous medium is _____.

(A) CH_3NH_2 **(B)** $NCCH_2NH_2$ **(C)** $(CH_3)_2NH$ **(D)** $C_6H_5NHCH_3$

4. Which of the following is the weakest Brönsted base ?

(A)  **(B)**  **(C)**  **(D)** CH_3NH_2

5. Which of the following reagents would not be a good choice for reducing an aryl nitro compound to an amine?

(A) H_2(excess)/Pt **(B)** $LiAlH_4$ in ether **(C)** Fe and HCl **(D)** Sn and HCl

6. The best regent for converting 2-phenylpropanamide into 2-phenylpropanamine is _____.

(A) Excess H_2 **(B)** Br_2 in aqueous NaOH

(C) Iodine in the presence of red phosphorus **(D)** $LiAlH_4$ in ether

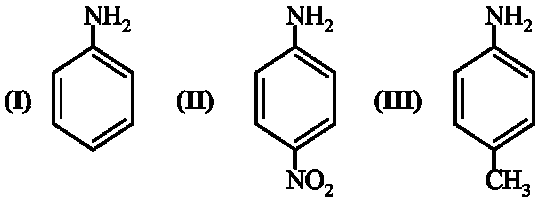
7. The correct increasing order of basic strength for the following compounds is _____.

(A) II < III < I

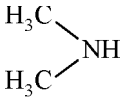
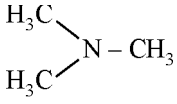
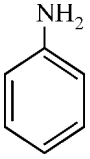
(B) III < I < II

(C) III < II < I

(D) II < I < III



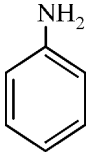
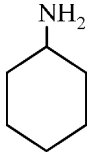
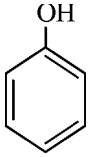
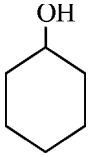
8. The most reactive amine towards dilute hydrochloric acid is _____.

(A) $CH_3 - NH_2$ **(B)**  **(C)**  **(D)** 

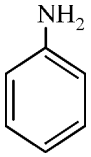
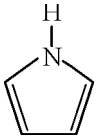
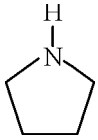
9. Which of the following compound will not undergo diazo coupling reaction with benzene diazonium chloride?

(A) Aniline **(B)** Phenol **(C)** Anisole **(D)** Nitrobenzene

10. Which of the following compounds is the weakest Brönsted base ?

(A)  **(B)**  **(C)**  **(D)** 

11. Among the following amines, the strongest Brönsted base is _____.

(A)  **(B)** NH_3 **(C)**  **(D)** 

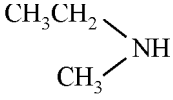
12. The correct decreasing order of basic strength of the following species is _____.

H_2O, NH_3, OH^-, NH_2^-

(A) $NH_2^- > OH^- > NH_3 > H_2O$ **(B)** $OH^- > NH_2^- > H_2O > NH_3$

(C) $NH_3 > H_2O > NH_2^- > OH^-$ **(D)** $H_2O > NH_3 > OH^- > NH_2^-$

13. Which of the following should be most volatile?

I. $CH_3CH_2CH_2NH_2$ **II.** $(CH_3)_3N$ **III.**  **IV.** $CH_3CH_2CH_3$

The correct choice is :

(A) II **(B)** IV **(C)** I **(D)** III

***14.** Which of the following methods of preparation of amines will give same number of carbon atoms in the chain of amines as in the reactant?

(A) Reaction of nitrile with $LiAlH_4$

(B) Reaction of amide with $LiAlH_4$ followed by treatment with water

(C) Heating alkylhalide with potassium salt of phthalimide followed by Hydrolysis

(D) Treatment of amide with bromine in aqueous solution of sodium hydroxide

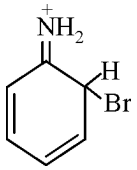
***15.** Reduction of nitrobenzene by which of the following reagent gives aniline?

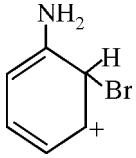
(A) Sn/HCl **(B)** Fe/HCl **(C)** H_2 – Pd **(D)** Sn/NH_4OH

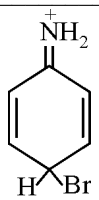
***16.** The reagents that can be used to convert benzenediazonium chloride to benzene are _____.

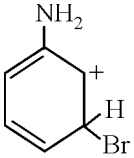
(A) $SnCl_2/HCl$ **(B)** CH_3CH_2OH **(C)** H_3PO_2 **(D)** $LiAlH_4$

***17.** Arenium ion involved in the bromination of aniline is _____.

(A) 

(B) 

(C) 

(D) 

***18.** Which of the following amines can be prepared by Gabriel synthesis.

(A) Isobutyl amine **(B)** 2-Phenylethylamine

(C) N-methylbenzylamine **(D)** Aniline

***19.** Under which of the following reaction conditions, aniline gives p-nitro derivative as the only major product?

(A) Acetyl chloride / pyridine followed by reaction with conc. H_2SO_4 + conc. HNO_3

(B) Acetic anhydride / pyridine followed by conc. H_2SO_4 + conc. HNO_3

(C) Dil. HCl followed by reaction with conc. H_2SO_4 + conc. HNO_3

(D) Reaction with conc. HNO_3 + conc. H_2SO_4

***20.** Which of the following reactions belong to electrophilic aromatic substitution?

(A) Bromination of acetanilide **(B)** Coupling reaction of aryldiazonium salts

(C) Diazotisation of aniline **(D)** Acylation of aniline

For Questions 21 - 26

(A) Statement-1 is True, Statement-2 is True and Statement-2 is a correct explanation for Statement-1

(B) Statement-1 is True, Statement-2 is True and Statement-2 is NOT a correct explanation for Statement-1

(C) Statement-1 is True, Statement-2 is False **(D)** Statement-1 is False, Statement-2 is True

21. **Statement : 1** Hoffmann's bromamide reaction is given by primary amides.
Statement : 2 Primary amines are more basic than secondary amines.

22. **Statement : 1** N-Ethylbenzene sulphonamide is soluble in alkali.
Statement : 2 Hydrogen attached to nitrogen in sulphonamide is quite acidic.

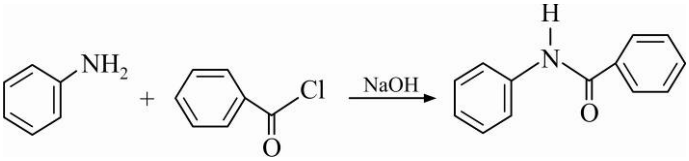
23. **Statement : 1** N, N-Diethylbenzene sulphonamide is insoluble in alkali.
Statement : 2 Sulphonyl group attached to nitrogen atom is strong electron withdrawing group.

24. **Statement : 1** Only a small amount of HCl is required in the reduction of nitro compounds with iron scrap and HCl in the presence of steam.
Statement : 2 $FeCl_2$ formed gets hydrolysed to release HCl during the reaction.

25. **Statement : 1** Aromatic 1° amines cannot prepared by Gabriel Phthalimide Synthesis.
Statement : 2 Aryl halides undergo nucleophilic substitution with anion formed by phthalimide.

26. **Statement : 1** Acetanilide is less basic than aniline.
Statement : 2 Acetylation of aniline results in decrease of electron density on nitrogen.

27. The following reaction :



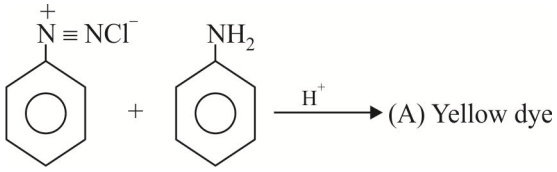
is known by the name :

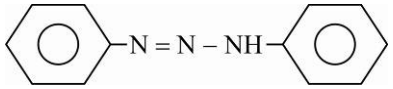
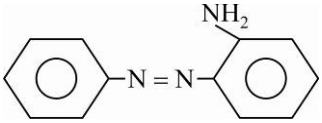
(A) Perkin's reaction **(B)** Acetylation reaction
(C) Schotten-Baumann reaction **(D)** Friedel-Craft's reaction

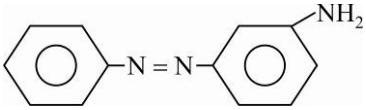
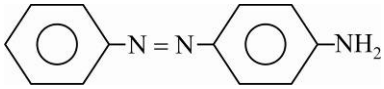
***28.** Aniline can be prepared by :

(A) degradation of benzamide with bromine in alkaline solution
(B) reduction of nitrobenzene with H_2/Pd in ethanol
(C) potassium salt of phthalimide treated with chlorobenzene followed by hydrolysis with aqueous NaOH solution
(D) hydrolysis of phenylisocyanide in acidic solution

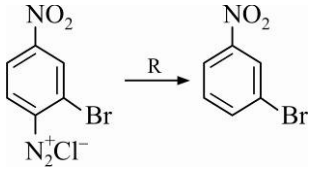
29. In the following reaction, the product (A) is :



(A)  **(B)** 

(C)  **(D)** 

30. In the reaction :



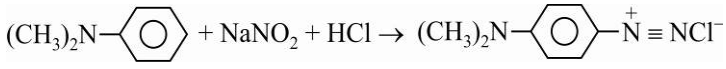
The reagent R is :

(A) H_3PO_2 and H_2O **(B)** H^+/H_2O **(C)** $HgSO_4/H_2SO_4$ **(D)** Cu_2Cl_2

31. On hydrolysis of a compound (X), two compounds are obtained. One of which on treatment with sodium nitrite and hydrochloric acid gives a product which does not respond to iodoform test. The second one reduces Tollen's reagent and Fehling's solution. The compound (X) is :

(A) $CH_3CH_2CH_2NC$ **(B)** $CH_3CH_2CH_2CN$ **(C)** $CH_3CH_2CH_2ON=O$ **(D)** $CH_3CH_2CH_2CON(CH_3)_2$

***32.** Which of the following reactions of amines is(are) correct ?

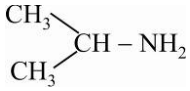
(A) 

(B) $CH_3CH_2NH_2 + HNO_2 \rightarrow CH_3CH_2OH + N_2$

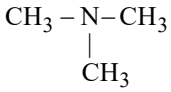
(C) $CH_3NH_2 + C_6H_5SO_2Cl \rightarrow CH_3NHSO_2C_6H_5$

(D) $(CH_3)_2NH + NaNO_2 + HCl \rightarrow (CH_3)_2N-N=O$

33. An organic compound (C_3H_9N) (A), when treated with nitrous acid, gave an alcohol and N_2 gas was evolved. (A) on warming with $CHCl_3$ and caustic potash gave (C) which on reduction gave isopropylmethylamine. Predict the structure of (A).

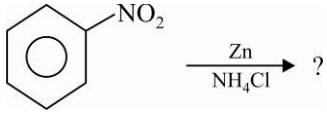
(A) 

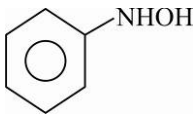
(B) $CH_3CH_2-NH-CH_3$

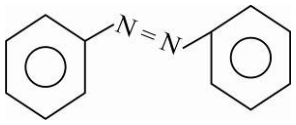
(C) 

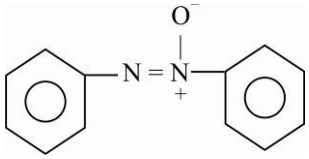
(D) $CH_3CH_2CH_2-NH_2$

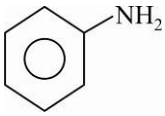
34. What is the product obtained in the following reaction ?



(A) 

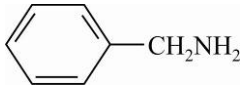
(B) 

(C) 

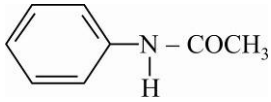
(D) 

35. Which of the following compounds is most basic ?

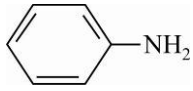
(A)



(B)



(C)



(D)

***36.** Which of the following statements about primary amines is(are) true ?

(A) Alkyl amines are stronger bases than aryl amines

(B) Alkyl amines react with nitrous acid to produce alcohols

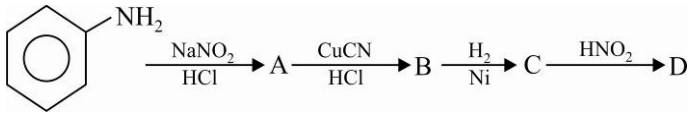
(C) Aryl amines react with nitrous acid to produce phenols

(D) Alkyl amine are stronger bases than ammonia

37. Nitrobenzene can be prepared from benzene by using a mixture of conc. HNO_3 and conc. H_2SO_4. In the mixture, nitric acid acts as a/an :

(A) acid **(B)** base **(C)** catalyst **(D)** reducing agent

38. Aniline in a set of reactions yielded a product D.

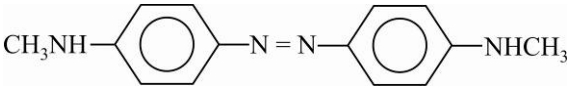


The structure of the product D would be :

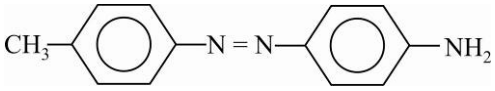
(A) C_6H_5NHOH **(B)** $C_6H_5NHCH_2CH_3$

(C) $C_6H_5CH_2NH_2$ **(D)** $C_6H_5CH_2OH$

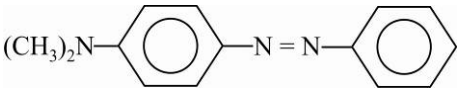
39. Aniline when diazotized in cold and then treated with dimethyl aniline gives a coloured product. Its structure would be :



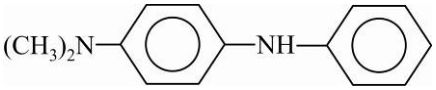
(A)



(B)



(C)



(D)

40. On heating an aliphatic primary amine with chloroform and ethanolic potassium hydroxide, the organic compound formed is :

(A) an alkanol **(B)** an alkanediol **(C)** an alkyl cyanide **(D)** an alkyl isocyanide

41. Considering the basic strength of amines in aqueous solution, which one has the smallest pK_b value?

(A) $(CH_3)_2NH$ **(B)** CH_3NH_2 **(C)** $(CH_3)_3N$ **(D)** $C_6H_5NH_2$

42. An organic compound A on reacting with NH_3 gives B. On heating B gives C. C in the presence of KOH reacts with Br_2 to give $CH_3CH_2NH_2$. A is :

(A) $CH_3 - \underset{\displaystyle CH_3}{\overset{\displaystyle |}{C}}H - COOH$ **(B)** $CH_3CH_2CH_2CH_2COOH$

(C) CH_3CH_2COOH **(D)** CH_3COOH

43. A compound with molecular mass 180 amu is acylated with CH_3COCl, to get a compound with molecular mass 390 amu . The number of amino groups present per molecule of the former compound is :

(A) 6 **(B)** 2 **(C)** 5 **(D)** 4

44. Which one of the following is the strongest base in aqueous solution ?

(A) Trimethylamine **(B)** Aniline **(C)** Dimethylamine **(D)** Methylamine

45. In the chemical reaction : $CH_3CH_2NH_2 + CHCl_3 + 3KOH \longrightarrow (A) + (B) + 3H_2O$ the compounds (A) and (B) are respectively :

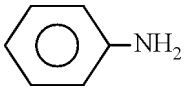
(A) C_2H_5CN and 3KCl **(B)** $CH_3CH_2CONH_2$ and 3KCl

(C) C_2H_5NC and 3KCl **(D)** C_2H_5NC and HCl

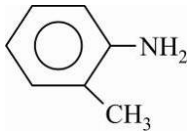
46. Amongst the following the most basic compound is :

(A) p-nitroaniline **(B)** acetanilide **(C)** aniline **(D)** benzylamine

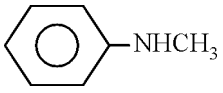
47. Which of the following is the strongest base ?



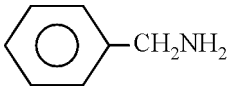
(A)



(B)



(C)



(D)

48. The correct order of increasing basic nature for the bases NH_3, CH_3NH_2 and $(CH_3)_2NH$ in gas phase is :

(A) $CH_3NH_2 < NH_3 < (CH_3)_2NH$ **(B)** $(CH_3)_2NH < NH_3 < CH_3NH_2$

(C) $NH_3 < CH_3NH_2 < (CH_3)_2NH$ **(D)** $CH_3NH_2 < (CH_3)_2NH < NH_3$

49. Intermediates formed during reaction of $R - CONH_2$ with Br_2 and KOH are :

(A) RCONHBr and RNCO **(B)** RNHCOBr and RNCO

(C) RNH – Br and RCONHBr **(D)** $RCONBr_2$

50. Aniline is reacted with bromine water and the resulting product is treated with an aqueous solution of sodium nitrite in presence of dilute hydrochloric acid. The compound so formed is converted into a tetrafluoroborate which is subsequently heated dry. The final product is :

(A) p-bromoaniline **(B)** p-bromofluorobenzene

(C) 1, 3, 5-tribrobenzene **(D)** 2, 4, 6-tribromofluorobenzene

51. When aniline reacts with oil of bitter almonds (C_6H_5CHO) condensation takes place and benzal derivative is formed. This is known as :

(A) Schiff's base **(B)** Benedict's reagent **(C)** Million's base **(D)** Fehling reagent

***52.** Which of the following order(s) is(are) correct, with respect to the property indicated ?

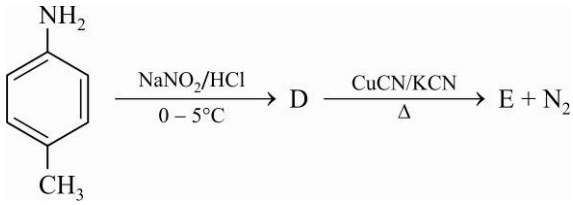
(A) Benzoic acid > phenol > cyclohexanol (acid strength)

(B) Aniline > cyclohexylamine > benzamide (basic strength)

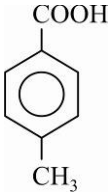
(C) Formic acid > acetic acid > propanoic acid (acid strength)

(D) Fluoroacetic acid > chloroacetic acid > bromoacetic acid (acid strength)

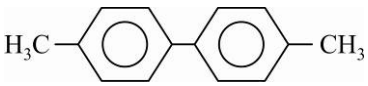
53. In the reaction



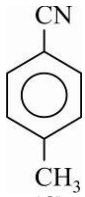
the product E is :



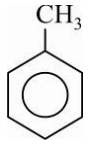
(A)



(B)



(C)



(D)

54. In the Hofmann bromamide degradation reaction, the number of moles of NaOH and Br_2 used per mole of amine produced are:

(A) Four moles of NaOH and two moles of Br_2 **(B)** Two moles of NaOH and two moles of Br_2

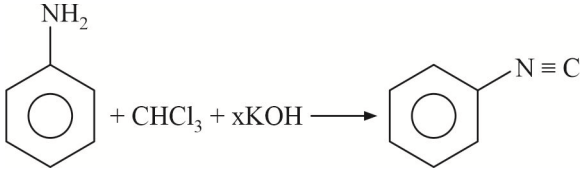
(C) Four moles of NaOH and one mole of Br_2 **(D)** One mole of NaOH and one mole of Br_2

***55.** Indicate which nitrogen compound amongst the following would undergo Hoffmann's rearrangement reaction ?

(A) $RCONHCH_3$ **(B)** $RCOONH_4$ **(C)** $RCONH_2$ **(D)** $PhCONH_2$

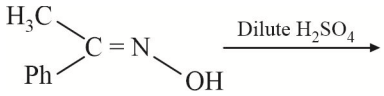
56. $R-\overset{\overset{O}{\|}}{C}-NH_2 + x\,NaOH + Br_2 \longrightarrow R-NH_2 + NaBr + Na_2CO_3 + H_2O$

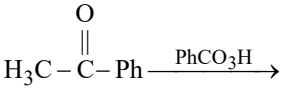
Number of moles of NaOH used in above Hoffmann bromide reaction is _____.

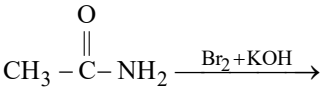
57. 

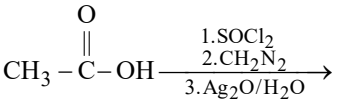
x = moles of KOH consumed is _____.

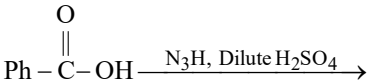
58. Find out number of reactions which involve electron deficient nitrogen during reaction mechanism.

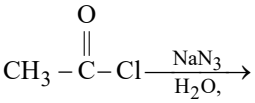
(a) 

(b) 

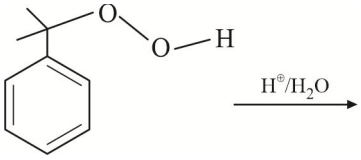
(c) 

(d) 

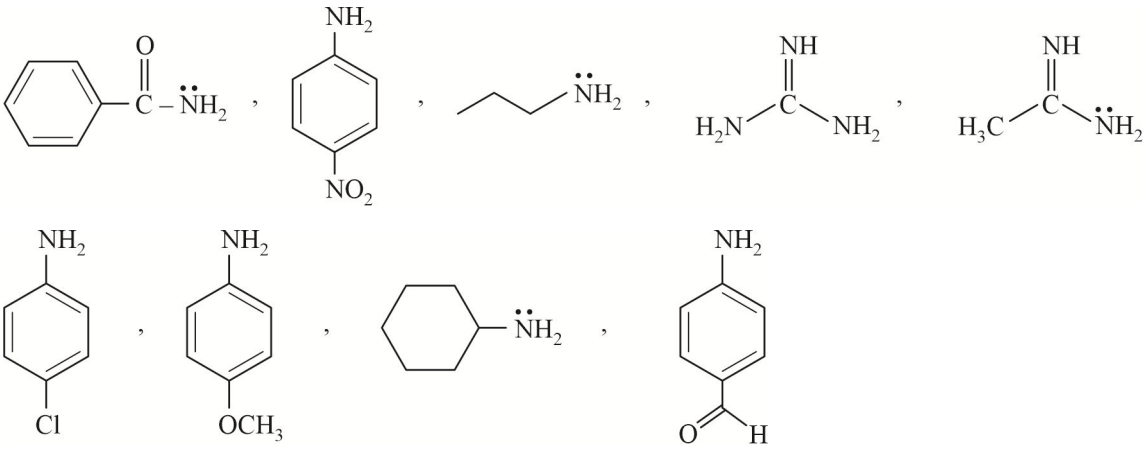
(e) 

(f) 

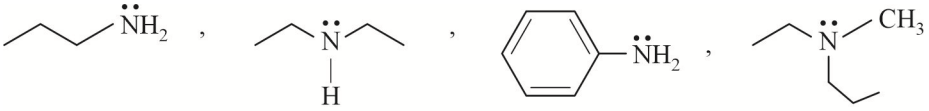
(g) 

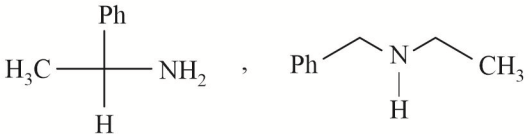
(h) 

59. Examine the structural formulas of following compounds and identify how many compounds are more basic than aniline.



60. Of the following amines how many can give carbylamine reaction?

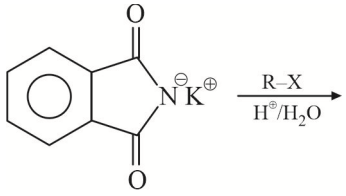
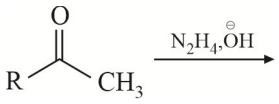




61. Of the following reactions, how many reaction, are used for the preparation of amines ?

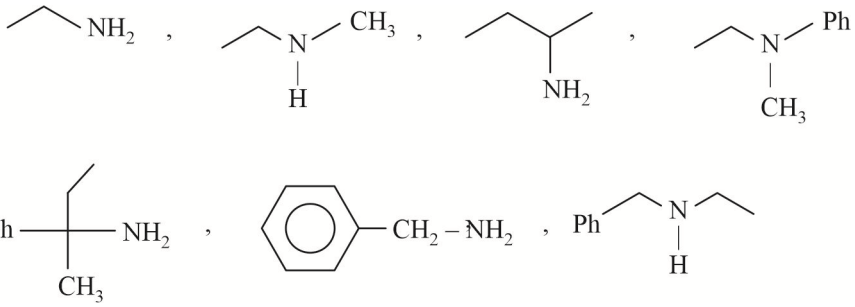
(a) $R-C\equiv N \xrightarrow{LiAlH_4}$ (b) $R-\overset{O}{\overset{\|}{C}}-NH_2 \xrightarrow{LiAlH_4}$

(c) $R-\overset{O}{\overset{\|}{C}}-NH_2 \xrightarrow{Br_2+\overset{\ominus}{O}H}$ (d) $R-\overset{O}{\overset{\|}{C}}-CH_3 + H_3C-NO_2 \xrightarrow{NaOH}$

(e)  (f) 

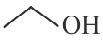
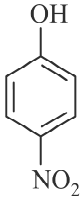
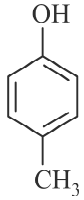
(g) $R-\overset{O}{\overset{\|}{C}}-NH_2 \xrightarrow{P_2O_5}$ (h) $R-CH_2-NO_2 \xrightarrow{H_2,Ni}$

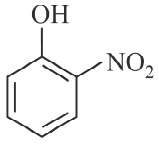
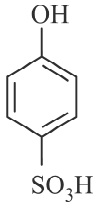
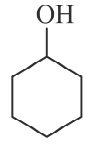
62. Of the following amines how many can give Hoffmann's mustard reaction?



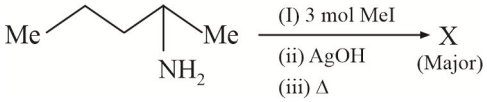
63. The total number of structural 2° amines possible having formula $C_5H_{13}N$, is :

64. Phenol is less acidic than how many of the compounds given below.

(a) CH_3COOH (b)  (c)  (d) 

(e)  (f)  (g) 

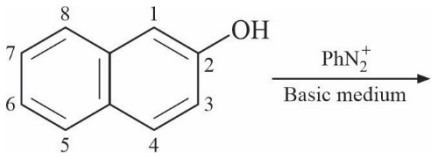
65. What is the maximum number of compounds with the molecular formula $C_4H_{11}N$, which give an alkali soluble precipitate with benzenyl sulfonyl chloride?

66. 

Number of hyperconjugative hydrogens in X are

67. Certain nitrogeneous compound with molecular mass 180 shows an increase in its molecular mass to 348 after treatment with acetyl chloride. The number of — NH_2 groups in the molecule is _____.

68. Consider the following reaction.



The position number at which PhN_2^+ attacks to form major product is :

69. Ketone P (having minimum molar mass) on reaction with NH_2OH form two oxime Q and R that are geometrical isomer (P contain only C, H and O)

$$Q \xrightarrow{H_2SO_4} \underset{(V)}{\text{Amide}} \xrightarrow[(ii)\ H_3O^+]{\text{(i) Basic hydrolysis}} \underset{(I)}{\text{Acid}} + \text{Amine}$$

$$R \xrightarrow{H_2SO_4} \underset{(W)}{\text{Amide}} \xrightarrow[(ii)\ H_3O]{\text{(i) Basic hydrolysis}} \underset{(II)}{\text{Acid}} + \text{Amine}$$

The difference in molar mass of Acid I and II is :

70. In a given reaction sequence

$$CH_3 - C \equiv N \xrightarrow[(ii)\ H_3O^+]{\text{(i) } CH_3MgBr} A \xrightarrow[(ii)\ H_2O]{Br_2 / NaOH} B \xrightarrow{\text{Red P} + Br_2} C$$

Number of lone pair in end product (C) is x then the value of 2x will be :

Biomolecules & Polymers

CHOOSE THE CORRECT ALTERNATIVE. ONLY ONE CHOICE IS CORRECT. HOWEVER, QUESTIONS MARKED '*' MAY HAVE MORE THAN ONE CORRECT OPTION.

1. Glycogen is a branched chain polymer of α-D-glucose units in which chain is formed by glycosidic linkage whereas branching occurs by the formation of C1-C6 glycosidic linkage. Structure of glycogen is similar to _____ .

(A) Amylose **(B)** Amylopectin **(C)** Cellulose **(D)** Glucose

2. Which of the following polymer is stored in the liver of animals ?

(A) Amylose **(B)** Cellulose **(C)** Amylopectin **(D)** Glycogen

3. Sucrose (cane sugar) is a disaccharide. One molecule of sucrose on hydrolysis gives _____.

(A) 2 molecules of glucose

(B) 2 molecules of glucose + 1molecule of fructose

(C) 1 molecule of glucose +1 molecule of fructose

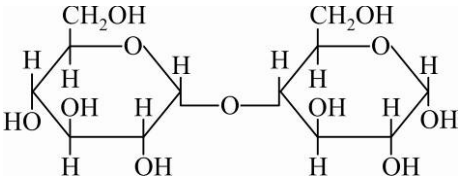
(D) 2 molecules of fructose

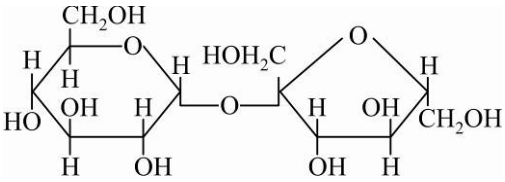
4. Proteins are found to have two different types of secondary structures viz. α-helix and β-pleated sheet structure. α-helix structure of protein is stabilised by :

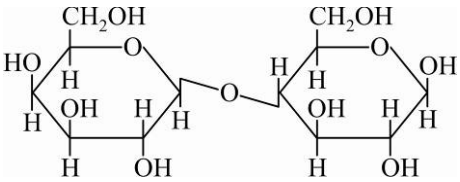
(A) Peptide bonds **(B)** van der Waals forces

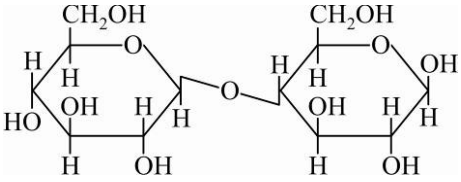
(C) Hydrogen bonds **(D)** Dipole-dipole interaction

5. In disaccharides, if the reducing groups of monosaccharides i.e. aldehydic or ketonic groups are bonded, these are non-reducing sugars. Which of the following disaccharide is a non-reducing sugar ?

(A) 

(B) 

(C) 

(D) 

6. Which of the following acids is a vitamin ?

(A) Aspartic acid **(B)** Ascorbic acid **(C)** Adipic acid **(D)** Saccharic acid

7. Dinucleotide is obtained by joining two nucleotides together by phosphodiester linkage. Between which carbon atoms of pentose sugars of nucleotides are these linkages present ?

(A) 5′ and 3′ **(B)** 1′ and 5′ **(C)** 5′ and 5′ **(D)** 3′ and 3′

8. Nucleic acids are the polymers of _____ .

(A) Nucleosides **(B)** Nucleotides **(C)** Bases **(D)** Sugars

9. Which of the following statements is not true about glucose ?

(A) It is an aldohexose **(B)** On heating with HI it forms n-hexane

(C) It is present in furanose form **(D)** It does not give 2, 4-DNP test

10. Each polypeptide in a protein has aminoacid linked with each other in a specific sequence. This sequence of amino acids is said to be _____.

(A) Primary structure of proteins **(B)** Secondary structure of proteins

(C) Tertiary structure of proteins **(D)** Quaternary structure of proteins

11. DNA and RNA contain four bases each. Which of the following bases is not present in RNA ?

(A) Adenine **(B)** Uracil **(C)** Thymine **(D)** Cytosine

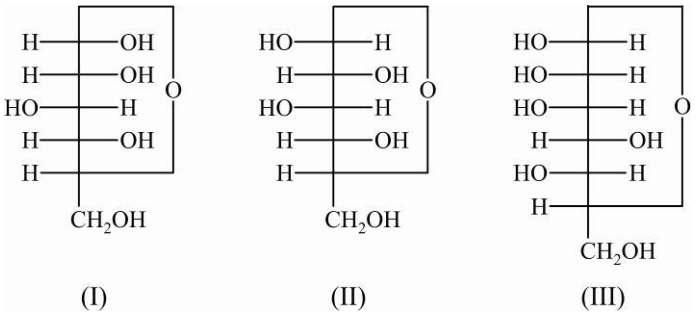
12. Which of the following B group vitamins can be stored in our body ?

(A) Vitamin B_1 **(B)** Vitamin B_2 **(C)** Vitamin B_6 **(D)** Vitamin B_{12}

13. Which of the following bases is not present in DNA ?

(A) Adenine **(B)** Thymine **(C)** Cytosine **(D)** Uracil

14. Three cyclic structures of monosaccharides are given below. Which of these are anomers?



(I) (II) (III)

(A) I and II **(B)** II and III **(C)** I and III **(D)** III is anomer of I and II

15. Which of the following reactions of glucose can be explained only by its cyclic structure ?

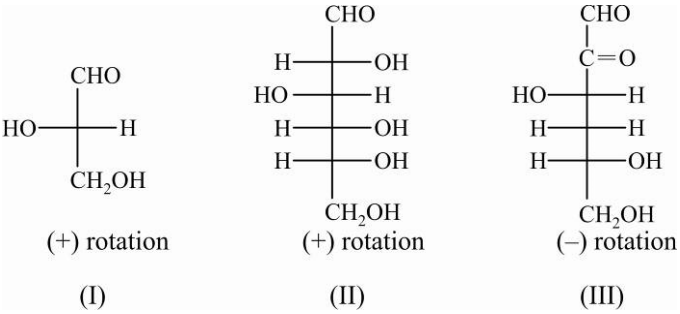
(A) Glucose forms pentaacetate

(B) Glucose reacts with hydroxylamine to form an oxime

(C) Pentaacetate of glucose does not react with hydroxylamine

(D) Glucose is oxidised by nitric acid to gluconic acid

16. Optical rotations of some compounds along with their structures are given below which of them have D configuration.



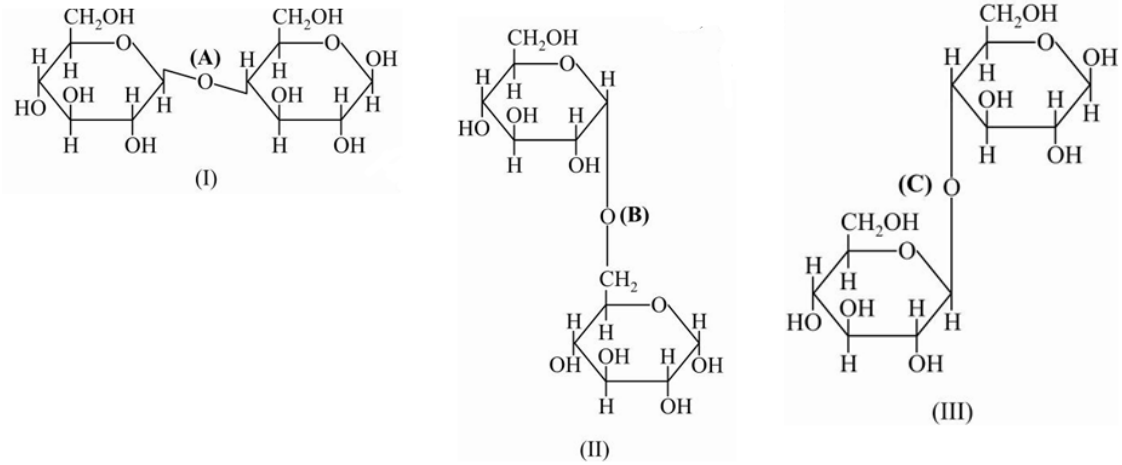
(A) I, II, III **(B)** II, III **(C)** I, II **(D)** III

17. RNA contains :

(A) Ribose sugar and thymine **(B)** Ribose sugar and uracil

(C) Deoxyribose sugar and uracil **(D)** Deoxyribose sugar and thymine

18. Three structures are given below in which two glucose units are linked. Which of these linkages between glucose units are between C1 and C4 and which linkages are between C1 and C6 ?



(A) (A) is between C1 and C4, (B) and (C) are between C1 and C6

(B) (A) and (B) are between C1 and C4, (C) is between C1 and C6

(C) (A) and (C) are between C1 and C4, (B) is between C1 and C6

(D) (A) and (C) are between C1 and C6, (B) is between C1 and C4

19. Which of the following polymers of glucose is stored by animals ?

(A) Cellulose **(B)** Amylose **(C)** Amylopectin **(D)** Glycogen

20. Which of the following is not a semisynthetic polymer ?

(A) Cis-polyisoprene **(B)** Cellulose nitrate

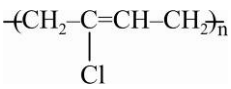
(C) Cellulose acetate **(D)** Vulcanised rubber

21. The commercial name of polyacrylonitrile is _____.

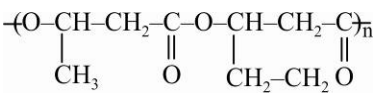
(A) Dacron **(B)** Orlon (acrilan)

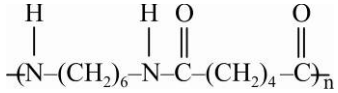
(C) PVC **(D)** Bakelite

22. Which of the following polymer is biodegradable ?

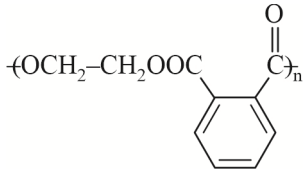
(A) 

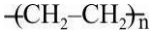
(B) 

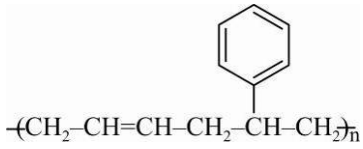
(C) 

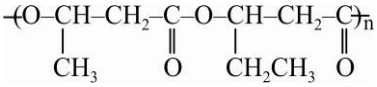
(D) 

23. In which of the following polymers ethylene glycol is one of the monomer units ?

(A) 

(B) 

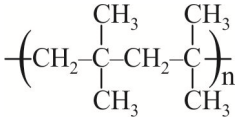
(C) 

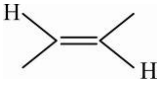
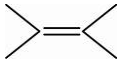
(D) 

24. Which of the following statements is not true about low density polythene ?

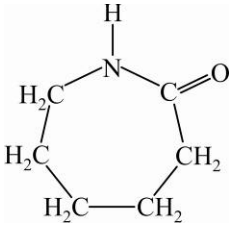
(A) Tough **(B)** Hard

(C) Poor conductor of electricity **(D)** Highly branched structure

25.  is a polymer having monomer units _____ .

(A)  **(B)**  **(C)**  **(D)** 

26. Which of the following polymer can be formed by using the following monomer unit ?



(A) Nylon 6, 6

(B) Nylon 2-nylon 6

(C) Melamine polymer

(D) Nylon-6

27. Which one is classified as a condensation polymer?

(A) Dacron **(B)** Neoprene **(C)** Teflon **(D)** Acrylonitrile

28. Which one of the following bases is not present in DNA?

(A) Quinoline **(B)** Adenine **(C)** Cytosine **(D)** Thymine

29. Synthesis of each molecule of glucose in photosynthesis involves

(A) 18 molecules of ATP **(B)** 10 molecules of ATP

(C) 8 molecules of ATP **(D)** 6 molecules of ATP

30. The species which can best serve as an initiator for the cationic polymerization is

(A) $LiAlH_4$ **(B)** HNO_3 **(C)** $AlCl_3$ **(D)** BaLi

31. Which of the following compounds can be detected by Molish's test?

(A) Nitro compounds **(B)** Sugars

(C) Amines **(D)** Primary alcohols

32. The presence or absence of hydroxy group on which carbon atom of sugar differentiates RNA and DNA?

(A) 1st **(B)** 2nd **(C)** 3rd **(D)** 4th

33. The change in the optical rotation of freshly prepared solution of glucose is known as

(A) tautomerism **(B)** racemization **(C)** specific rotation **(D)** mutarotation

34. Thermosetting polymer, bakelite is formed by the reaction of phenol with

(A) CH_3CH_2CHO **(B)** CH_3CHO **(C)** HCHO **(D)** HCOOH

35. Biuret test is not given by :

(A) Carbohydrates **(B)** Polypeptides **(C)** Urea **(D)** Proteins

36. The polymer containing strong intermolecular forces e.g., hydrogen bonding, is :

(A) Teflon **(B)** Nylon 66 **(C)** Polystyrene **(D)** Natural rubber

37. The two functional groups present in a typical carbohydrate are :

I. – OH and – COOH **II.** – CHO and – COOH

III. C = O and – OH **IV.** – OH and – CHO

The correct choice is :

(A) I, II **(B)** III, IV **(C)** III **(D)** IV

38. Buna-N synthetic rubber is a copolymer of :

(A) $H_2C = CH - \overset{\overset{Cl}{|}}{C} = CH_2$ and $H_2C = CH - CH = CH_2$

(B) $H_2C = CH - CH = CH_2$ and $H_5C_6 = CH = CH_2$

(C) $H_2C = CH - CN$ and $H_2C = CH - CH = CH_2$

(D) $H_2C = CH - CN$ and $H_3C - \overset{\overset{CH_3}{|}}{C} = CH_2$

39. Which one of the following is used to make 'non-stick' cookware?

(A) Poly-ethylene terephthalate **(B)** Polytetrafluoroethylene

(C) PVC **(D)** Polystyrene

40. $\alpha - D(+)$-glucose and $\beta - D - (+)$ - glucose are :

(A) Conformers **(B)** Epimers **(C)** Anomers **(D)** Enantiomers

41. The secondary structure of a protein refers to :

(A) α -helical backbone **(B)** Hydrophobic interactions

(C) Sequence of α -amino acids **(D)** Fixed configuration of the polypeptide backbone

42. The term anomers of glucose refers to :

(A) Isomers of glucose that differ in configurations at carbons one and four (C – 1 and C – 4)

(B) A mixture of (D)-glucose and (L)-glucose

(C) Enantiomers of glucose

(D) Isomers of glucose that differ in configuration at carbon one (C – 1)

43. The pyrimidine bases present in DNA are :

(A) Cytosine and adenine **(B)** Cytosine and guanine

(C) Cytosine and thymine **(D)** Cytosine and uracil

44. Which of the following is fully fluorinated polymer ?

(A) PVC **(B)** Thiokol **(C)** Teflon **(D)** Neoprene

45. Which of the following is a polyamide ?

(A) Bakelite **(B)** Terylene **(C)** Nylon-66 **(D)** Teflon

46. In both DNA and RNA, heterocylic base and phosphate ester linkages are at :

(A) C_5' and C_1' respectively of the sugar molecule

(B) C_1' and C_5' respectively of the sugar molecule

(C) C_2' and C_5' respectively of the sugar molecule

(D) C_5' and C_2' respectively of the sugar molecule

47. Identify the correct statement regarding enzymes.

(A) Enzymes are specific biological catalysts that can function normally at very high temperatures (T ~ 1000K)

(B) Enzymes are normally heterogeneous catalysts that are very specific in their action

(C) Enzymes are specific biological catalysts that cannot be poisoned

(D) Enzymes are specific biological catalysts that possess well defined active sites.

48. Insulin production and its action in human body are responsible for the level of diabetes. This compound belongs to which of the following categories?

(A) A coenzyme **(B)** A hormone

(C) An enzyme **(D)** An antibiotic

49. Which base is present in RNA but not in DNA?

(A) Uracil **(B)** Cytosine

(C) Guanine **(D)** Thymine

50. The reason for double helical structure of DNA is operation of :

(A) van der Waals' forces **(B)** dipole-dipole interaction

(C) hydrogen bonding **(D)** electrostatic attractions

51. Nylon threads are made up of :

(A) Polyvinyl polymer **(B)** Polyester polymer

(C) Polyamide polymer **(D)** Polyethylene polymer

52. Complete hydrolysis of cellulose gives :

(A) D-fructose **(B)** D-ribose

(C) D-glucose **(D)** L-glucose

53. Monomers are converted to polymer by :

(A) Hydrolysis of monomers **(B)** Condensation reaction between monomers

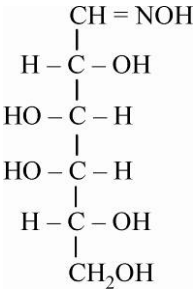
(C) Protonation of monomers **(D)** None of the above

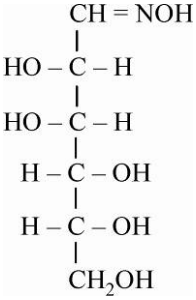
54. A substance form Zwitter ion. It can have functional groups.

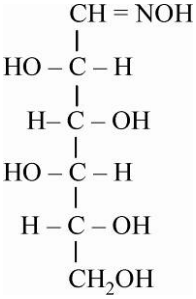
(A) $-NH_2$, – COOH **(B)** $- NH_2$, $-SO_3H$

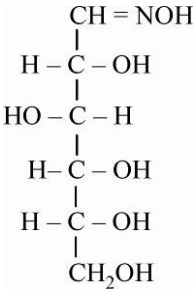
(C) Both (A) and (B) **(D)** None of the above

55. D(+)-glucose reacts with hydroxyl amine and yields an oxime. The structure of the oxime would be :

(A) 

(B) 

(C) 

(D) 

56. In DNA, the linkages between different nitrogenous bases are

(A) phosphate linkage **(B)** H-bonding

(C) glycosidic linkage **(D)** peptide linkage

57. Deficiency of vitamin B_1 causes the disease

(A) convulsions **(B)** beri-beri **(C)** cheilosis **(D)** sterility

58. Which one of the following sets of monosaccharides forms sucrose ?

(A) α -D-galactopyranose and α -D glucopyranose

(B) α -D-glucopyranose and β-D-fructofuranose

(C) β -D-glucopyranose and α -D-fructofuranose

(D) α -D-glucopyranose and α -D-fructopyranose

59. Which one of the following statements is not true regarding (+) lactose ?

(A) On hydrolysis (+) lactose gives equal amount of D(+) glucose and D(+) galactose.

(B) (+) lactose is a β -glucoside formed by the union of a molecule of D(+) glucose and a molecule of D(+) galactose.

(C) (+) Lactose is a reducing sugar and does not exihibit mutarotation.

(D) (+) Lactose, $C_{12}H_{22}O_{11}$ contains 8-OH groups

60. Which of the statements about "Denaturation" given below are correct ?

(1) Denaturation of proteins causes loss of secondary and tertiary structures of the protein.

(2) Denaturation leads to the conversion of double stand of DNA into single strand.

(3) Denaturation affects primary structure which gets distorted.

(A) (2) and (3) **(B)** (1) and (3) **(C)** (1) and (2) **(D)** (1), (2) and (3)

61. Which one of the following does not exhibits the phenomenon of mutarotation ?

(A) (+) Sucrose **(B)** (+) lactose **(C)** (+) Maltose **(D)** (–) Fructose

62. Fructose reduces Tollen's reagent due to

(A) asymmetric carbons **(B)** primary alcoholic group

(C) secondary alcoholic group

(D) enolisation of fructose followed by conversion to aldehyde by base.

63. In DNA, the complimentary bases are

(A) adenine and guanine ; thymine and cytosine **(B)** uracil and adenine ; cytosine and guanine

(C) adenine and thymine ; guanine and cytosine **(D)** adenine and thymine ; guanine and uracil

64. RNA and DNA are chiral molecules, their chirality is due to

(A) Chiral bases **(B)** chiral phosphate ester units

(C) D-sugar compound **(D)** L-sugar component

65. During the process of digestion, the proteins present in food materials are hydrolysed to amino acids. The two enzymes involved in the process : proteins $\xrightarrow{\text{enzyme(A)}}$ polypeptides $\xrightarrow{\text{enzyme (B)}}$ amino acids , are respectively.

(A) invertase and zymase **(B)** amylase and maltase
(C) diastase and lipase **(D)** pepsin and trypsin

66. Which functional group participates in disulphide bond formation in proteins ?

(A) Thioester **(B)** Thioether **(C)** Thiol **(D)** Thiolactone

67. Number of chiral carbons in $\beta-D-(+)$ glucose is :

(A) five **(B)** six **(C)** three **(D)** four

68. The helical structure of protein is stabilized by :

(A) dipeptide bonds **(B)** hydrogen bonds **(C)** ether bonds **(D)** peptide bonds

69. Which is the correct statement ?

(A) Starch is a polymer of α -glucose
(B) Amylose is a component of cellulose
(C) Proteins are composed of only one type of amino acid
(D) In cyclic structure of fructose, there are five carbons and one oxygen atom

70. $-\overset{\overset{O}{\|}}{C}-\overset{\bullet\bullet}{N}H-$ (peptide bond).

Which statement is incorrect about peptide bond?

(A) C – N bond length in proteins is longer than usual bond length of N – N bond, structure
(B) Spectroscopic analysis shows planarity of $-\overset{\overset{O}{\|}}{C}-NH-$ group
(C) C – N bond length in proteins is smaller than usual bond length of C – N bond
(D) None of the above

71. Bakelite is prepared by the reaction between

(A) phenol and formaldehyde **(B)** phenol and tetramethylene glycol
(C) urea and formaldehyde **(D)** phenol and ethylene glycol

72. Glucose molecule reacts with X number of molecules of phenyl hydrazine to yield osazone. The value of X is :

(A) two **(B)** one **(C)** four **(D)** three

73. Haemoglobin is

(A) a vitamin **(B)** a carbohydrate **(C)** an enzyme **(D)** a globular protein

74. The α -D-glucose and β -D-glucose differ from each other due to difference in carbon atom with respect to its.

(A) number of OH groups **(B)** size of hemiacetal ring
(C) conformation **(D)** configuration

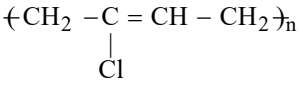
75. Caprolactam is used for the manufacture of :

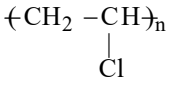
(A) teflon **(B)** terylene **(C)** nylon-6,6 **(D)** nylon-6

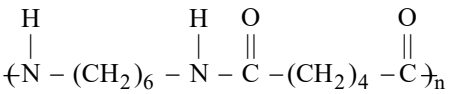
76. Biodegradable polymer which can be produced from glycine and aminocaproic acid is :

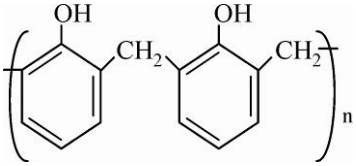
(A) buna-N **(B)** nylon-6,6 **(C)** nylon-2-nylon 6 **(D)** PHBV

77. Which one of the following is an example of thermosetting polymer?

(A) 

(B) 

(C) 

(D) 

78. Which of the following organic compounds polymerizes to form the polyester Dacron?

(A) Propylene and para HO – (C_6H_4) – OH

(B) Benzoic acid and ethanol

(C) Terphthalic acid and ethylene glycol

(D) Benzoic acid and para HO – (C_6H_4) – OH

79. Which one of the following is not a condensation polymer ?

(A) Melamine **(B)** Glyptal **(C)** Dacron **(D)** Neoprene

80. Which of the following statements is false ?

(A) Artificial silk is derived from cellulose

(B) Nylon-6, 6 is an example of elastomer

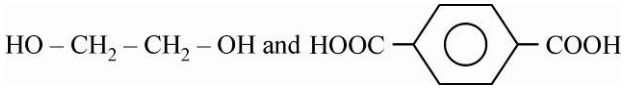
(C) The repeat unit in natural rubber is isoprene

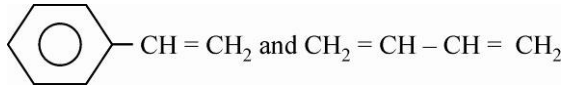
(D) Both starch and cellulose are polymers of glucose

81. Which one of the following sets form a biodegradable polymer ?

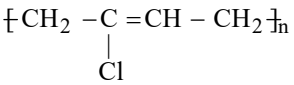
(A) $CH_2 = CH - CN$ and $CH_2 = CH - CH = CH_2$

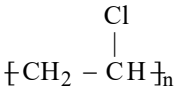
(B) $H_2N - CH_2 - COOH$ and $H_2N - (CH_2)_5 - COOH$

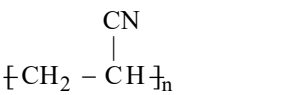
(C) 

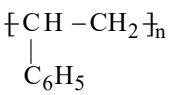
(D) 

82. Which of the following structures represents neoprene polymer ?

(A) 

(B) 

(C) 

(D) 

83. $\{NH(CH_2)_6NHCO(CH_2)_4CO\}$ is a :

(A) homopolymer **(B)** copolymer

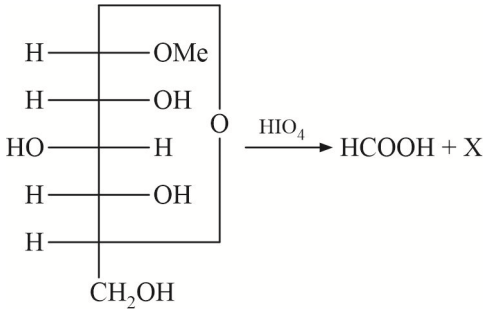
(C) addition polymer **(D)** thermosetting polymer

84. Which one of the following is a chain growth polymer ?

(A) Starch **(B)** Nucleic acid

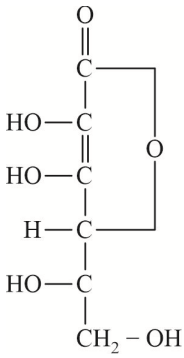
(C) Polystyrene **(D)** Protein

85. The number of moles of HIO_4 required for the following reaction is :



86. What is the number of functional groups present in α -amino acid having molecular formula $C_3H_7NO_3$?

87. Consider the following compound :



How many of the following statements are correct regarding it ?

1. It is a γ - lactone **2.** It has furanose structure

88. Glucose molecule reacts with 'x' number of molecule of phenylhydrazine to yield osazone. The value of 'x' is :

89. The number of chiral carbons present in β - D(+) - glucose is :

90. How many of the following are addition polymers ?
Polyethylene, Polypropylene, Bakelite, Polyether, Terylene, Polyamide

91. Maltose is composed of 2α - D - glucose units joined together by $C_1 - C_x$ glycosidic linkage x is :

Chemistry in Everyday Life

CHOOSE THE CORRECT ALTERNATIVE. ONLY ONE CHOICE IS CORRECT. HOWEVER, QUESTIONS MARKED '*' MAY HAVE MORE THAN ONE CORRECT OPTION.

1. Which of the following statements is not correct ?

(A) Some antiseptics can be added to soaps

(B) Dilute solutions of some disinfectants can be used as antiseptic

(C) Disinfectants are antimicrobial drugs

(D) Antiseptic medicines can be ingested

2. Which is the correct statement about birth control pills?

(A) Contain estrogen only

(B) Contain progesterone only

(C) Contain a mixture of estrogen and progesterone derivatives

(D) Progesterone enhances ovulation

3. Which statement about aspirin is not true ?

(A) Aspirin belongs to narcotic analgesics **(B)** It is effective in relieving pain

(C) It has anti-blood clotting action **(D)** It is a neurologically active drug

4. The most useful classification of drugs for medicinal chemists is_____.

(A) On the basis of chemical structure **(B)** On the basis of drug action

(C) On the basis of molecular targets **(D)** On the basis of pharmacological effect

5. Which of the following statements is correct?

(A) Some Tranquilizers function by inhibiting the enzymes which catalyse the degradation of noradrenaline

(B) Tranquilizers are narcotic drugs

(C) Tranquilizers are chemical compounds that do not affect the message transfer from nerve to receptor

(D) Tranquilizers are chemical compounds that can relive pain and fever

6. Salvarsan is arsenic containing drug which was first used for the treatment of_____.

(A) Syphilis **(B)** Typhoid **(C)** Meningitis **(D)** Dysentery

7. A narrow spectrum antibiotic is active against_____.

(A) Gram positive or gram negative bacteria **(B)** Gram negative bacteria only

(C) Single organism or one disease **(D)** Both gram positive and gram negative bacteria

8. The compound that causes general antidepressant action on the central nervous system belongs to the class of_____.

(A) Analgesics **(B)** Tranquilizers **(C)** Narcotic analgesics **(D)** Antihistamines

9. Compound which is added to soap to impart antiseptic properties is_____.

(A) Sodium lauryl sulphate **(B)** Sodium dodecylbenzenesulphonate

(C) Rosin **(D)** Bithional

10. Equanil is_____.

(A) Artificial sweetener **(B)** Tranquilizer

(C) Antihistamine **(D)** Antifertility drug

11. Which of the following enhances lathering property of soap?

(A) Sodium carbonate **(B)** Sodium rosinate

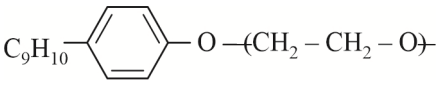
(C) Sodium stearate **(D)** Trisodium phosphate

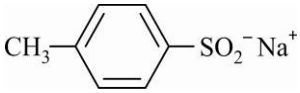
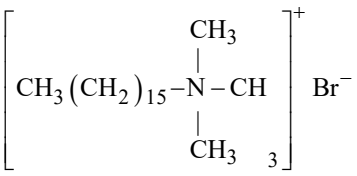
12. Glycerol is added to soap. It functions_____

(A) As a filler **(B)** To increase leathering

(C) To prevent rapid drying **(D)** To make soap granules

13. Which of the following is an example of liquid dishwashing detergent?

(A) $CH_3(CH_2)_{10}-CH_2OSO_3^-Na^+$ **(B)** 

(C)  **(D)** 

14. Polyethyleneglycols are used in the preparation of which type of detergents?
(A) Cationic detergents **(B)** Aniodic detergents
(C) Non-ionic detergents **(D)** Soaps

15. Which of the following is not a target molecule for drug function in body?
(A) Carbohydrates **(B)** Lipids **(C)** Vitamins **(D)** Proteins

16. Which of the following statements is not true about enzyme inhibitors?
(A) Inhibit the catalytic activity of the enzyme **(B)** Prevent the binding of substrate
(C) Generally a strong covalent bond is formed between an inhibitor and an enzyme
(D) Inhibitors can be competitive or non-competitive

17. Which of the following chemicals can be added for sweetening of food items at cooking temperature and does not provide calories?
(A) Sucrose **(B)** Glucose **(C)** Aspartame **(D)** Sucrolose

18. Which of the following will not enhance nutritional value of food?
(A) Minerals **(B)** Artificial sweeteners
(C) Vitamins **(D)** Aminoacids

***19.** Which of the following statements are incorrect about receptor proteins?
(A) Majority of receptor proteins are embedded in the cell membranes
(B) The active site of receptor proteins are embedded in the cell membranes
(C) Chemical messengers are received at the binding sites of receptor proteins
(D) Shape of receptor doesn't change during attachment of messenger

20. Which of the following are not used as food preservatives?
(A) Table salt **(B)** Sodium hydrogen carbonate
(C) Cane sugar **(D)** Benzoic acid

***21.** Compounds with antiseptic properties are_____.
(A) $CHCl_3$ **(B)** CHI_3
(C) Boric acid **(D)** 0.3ppm aqueous solution of Cl_2

***22.** Which of the following statements are correct about barbiturates?
(A) Hypnotics or sleep producing agents **(B)** These are tranquilizers
(C) Non-narcotic analgesics **(D)** Pain reducing without disturbing the nervous system

***23.** Which of the following are sulpha drugs?
(A) Sulphapyridine **(B)** Prontosil **(C)** Salvarsan **(D)** Nardil

***24.** Which of the following are antidepressants?
(A) Iproniazid **(B)** Phenelzine **(C)** Equanil **(D)** Salvarsan

***25.** Which of the following statements are incorrect about penicillin?
(A) An antibacterial fungus
(B) Ampicillin is its synthetic modification
(C) It has bacteriostatic effect
(D) It is a broad spectrum antibiotic

***26.** Which of the following compounds are administered as antacids?
(A) Sodium carbonate **(B)** Sodium hydrogen carbonate
(C) Aluminium carbonate **(D)** Magnesium hydroxide

***27.** Amongst the following antihistamines, which are antacids?

(A) Ranitidine **(B)** Brompheniramine

(C) Terfenadine **(D)** Cimetidine

***28.** Veronal and luminal are derivatives of barbituric acid which are_____.

(A) Tranquilizers **(B)** Non-narcotic analgesic

(C) Anti-allergic drugs **(D)** Neurologically active drugs

***29.** Which of the following are anionic detergents?

(A) Sodium salts of sulphonated long chain alcohol

(B) Ester of stearic acid and polyethylene glycol

(C) Quaternary ammonium salt of amine with acetate ion

(D) Sodium salts of sulphonated long chain hydrocarbons

***30.** Which of the following statements are correct?

(A) Cationic detergents have germicidal properties

(B) Bacteria can degrade the detergents containing highly branched chains

(C) Some synthetic detergents can give foam even in ice cold water

(D) Synthetic detergents are not soaps

31. The gas leaked from a storage tank of the Union Carbide plant in Bhopal gas tragedy was :

(A) Methyl-isocyanate **(B)** Methylamine

(C) Ammonia **(D)** Phosgene

32. What is DDT among the following?

(A) Green house gas **(B)** A fertilizer

(C) Biodegradable pollutant **(D)** Non biodegradable pollutant

33. Identify the incorrect statement from the following :

(A) Oxides of nitrogen in the atmosphere can cause the depletion of ozone layer

(B) Ozone absorbs the intense ultraviolet radiations of the sun

(C) Depletion of ozone layer is because of its chemical reactions with chlorofluoro alkanes

(D) Ozone absorbs infrared radiations

34. Identify the wrong statements in the following

(A) Chlorofluorocarbons are responsible for ozone layer depletion

(B) Green house effect is responsible for global warming

(C) Ozone layer does not permit infrared radiation from the sun to reach the earth

(D) Acid rain is mostly because of oxides nitrogen and sulphur

35. The smog is essentially caused by the presence of :

(A) O_2 and O_3 **(B)** O_2 and N_2

(C) Oxides of sulphur and nitrogen **(D)** O_3 and N_2

36. When rain is accompanied by a thunderstorm, the collected rain water will have a pH value :

(A) Slightly lower than that of rain water without thunderstorm

(B) Slightly higher than that when the thunderstorm is not there

(C) Uninfluenced by occurrence of thunderstorm

(D) Which depends on the amount of dust in air

37. For the estimation of nitrogen, 1.4g an organic compound was digested by Kjeldahl's method and the evolved ammonia was absorbed in 60 mL of M/10 sulphuric acid. The unreacted acid required 20 mL of M/10 sodium hydroxide for the complete neutralization. The percentage of nitrogen in the compound is :

(A) 6% **(B)** 10% **(C)** 3% **(D)** 5%

38. 29.5 mg of an organic compound containing nitrogen was digested according to Kjeldahl's method and the evolved ammonia was absorbed in 20 mL of 0.1 M HCl solution. The excess of the acid required 15 ML of 0.1 M NaOH solution for complete neutralization. The percentage of nitrogen in the compound is :

(A) 59.0 **(B)** 47.4 **(C)** 23.7 **(D)** 29.5

39. How many EDTA (ethylenediamine tetraacetic acid) molecules are required to make on octahedral complex with a Ca^{2+} ion?

(A) Six **(B)** Three **(C)** One **(D)** Two

40. Which one of the following types of drugs reduces fever ?

(A) Tranquilizer **(B)** Antibiotic **(C)** Antipyretic **(D)** Analgesic

41. Coordination compounds have great importance in biological systems. In this context, which of the following statements is incorrect ?

(A) Chlorophyll is green pigment in plant and contain calcium

(B) Haemoglobin is the red pigment of blood and contains iron

(C) Cyanocobalamin is vitamin B_{12} and contains cobalt

(D) Carboxypeptidase-A is an enzyme and contains zinc

42. The compound formed in the positive test for nitrogen with the Lassigne solution of an organic compound is :

(A) $Fe_4[Fe(CN)_6]_3$ **(B)** $Na_3[Fe(CN)_6]$ **(C)** $Fe(CN)_3$ **(D)** $Na_4[Fe(CN)_5NOS]$

43. Which of the following could act as a propellant for rockets ?

(A) Liquid hydrogen + liquid nitrogen **(B)** Liquid oxygen + liquid argon

(C) Liquid hydrogen + liquid oxygen **(D)** Liquid nitrogen + liquid oxygen

44. If Fe^{3+} and Cr^{3+} both are present in group III of qualitative analysis, then distinction can be made by :

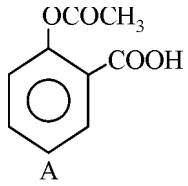
(A) Addition of NH_4OH in the presence of NH_4Cl when only $Fe(OH)_3$ is precipitated

(B) Addition of NH_4OH in presence of NH_4Cl when $Cr(OH)_3$ and $Fe(OH)_3$ both are precipitated and on adding Br_2 water and NaOH, $Cr(OH)_3$ dissolves

(C) Precipitate of $Cr(OH)_3$ and $Fe(OH)_3$ as obtained in (b) are treated with conc. HCl when only $Fe(OH)_3$ dissolves

(D) Both (B) and (C)

45. Compound A given below is :



A

(A) Antiseptic **(B)** Antibiotic

(C) Analgestic **(D)** Pesticide

46. Bithional is generally added to the soaps as an additive to function as a/an

(A) buffering agent **(B)** antiseptic **(C)** softner **(D)** alitame

47. Artificial sweetner which is stable under cold conditions only is:

(A) saccharine **(B)** sucralose **(C)** aspartame **(D)** alitame

48. Antiseptics and disinfectants either kill or prevent growth of microorganism. Identify which of the following statements is not true.

(A) Dilute solutions of boric acid and hydrogen peroxide are strong antiseptics

(B) Disinfectants harm the living tissues

(C) A 0.2% solution of phenol is an antiseptic while 1% solution acts as a disinfectant

(D) Chlorine and Lysol are used as strong disinfectants

49. Which one of the following is employed as Antihistamine?

(A) Chloramphenicol **(B)** Diphenylhydramine

(C) Norothindrone **(D)** Ompeprazole

50. Chloropicrin is obtained by the reaction of

(A) Steam on carbon tetrachloride **(B)** nitric acid on chlorobenzene

(C) chlorine on picric acid **(D)** nitric acid on chloroform

51. Which of the following forms cationic micelles above certain concentration ?

(A) Sodium dodecyl sulphate **(B)** Sodium acetate

(C) Urea **(D)** Cetyltrimethylammonium bromide

52. Which one of the following statements is not true ?

(A) Ampicillin is a natural antibiotic

(B) Aspirin is both analgesic and antipyretic

(C) Sulphadiazine is a synthetic antibacterial drug

(D) Some disinfectants can be used as antiseptics

53. Which of the following is an anionic detergent?

(A) Sodium lauryl sulphate **(B)** Cetyltrimethyl ammonium bromide

(C) Glyceryl oleate **(D)** Sodium stearate

54. The distillation technique most suited for separating glycerol from spent-lye in the soap industry is:

(A) Fractional distillation **(B)** Steam distillation

(C) Distillation under reduced pressure **(D)** Simple distillation

55. The concentration of fluoride, lead, nitrate and iron in a water sample from an underground lake was found to be 1000 ppb, 40 ppb, 100 ppm and 0.2 ppm, respectively. This water is unsuitable for drinking due to high concentration of:

(A) Lead **(B)** Nitrate **(C)** Iron **(D)** Fluoride

56. How many of the following compounds are used as tranquilizers ?
Brompheniramine, Valium, Serotonin, Ranitidine, Codeine

57. How many of the following compounds has $-N=N-$ linkage ?
Salvarsan, Prontosil, Sulphanilamide, Sulphapyridine

58. How many of the following are bacteriostatic antibiotics ?
Erythromycin, Ofloxacin, Penicillin, Tetracycline, Chloramphenicol

59. How many of the following compounds contain an amide linkage ?
Pencillin, Salvarsan, Prontosil, Chloramphenicol

60. How many of the following compounds contain a phenolic group ?
Chloroxylenol, Terpineol, Bithionol

61. How many of the following compounds are used as artificial sweeteners ?
Aspartame, Saccharin, Sucrolose, Alitame, Terpineol