Roll No. _____ **Code : 112014-043-A**

Please check that this question paper contains **26** questions and **7** printed pages.

CLASS-XI
CHEMISTRY (THEORY)

Time Allowed : 3 Hrs. **Maximum Marks : 70**

General Instructions :

(i) *All questions are compulsory.*

(ii) *There are 26 questions in all. Questions 1 to 5 carry one mark each, Questions 6 to 10 carry two marks each, questions 11 to 22 carry three marks each, question 23 carries four marks and questions 24 to 26 carry five marks each.*

(iii) *There is no overall choice. However an internal choice has been provided in one question of two marks, one question of three marks and all the three questions of five marks each. You have to attempt only one of the choices in such questions.*

(iv) *Fifteen minutes time has been allotted to read this question paper. During this time, the students will read the question paper only and will not write any answer on the answer script.*

(v) *Use log tables, if necessary. Use of calculator is not allowed.*

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1. Consider the reaction

   $N_2O_4\ (g) \rightleftharpoons 2NO_2(g)\ \Delta H = (+)ive$

   What will be the effect of increasing the temperature on the concentration of N_2O_4 at equilibrium ?

2. Why is fusion of an organic compound with sodium metal required in Lassaigne's extract ?

3. Define viscosity. How viscosity varies with temperature ?

4. How many 2-centered 2-electron bonds and 3-centered-2-electron bonds are there in the structure of diborane ?

5. Under what conditions will a reaction be spontaneous if both ΔH and ΔS are negative ?

6. Consider the reaction :

   $2A\ (g) + 4B\ (g) \rightarrow 3\ ((g) + 4D\ (g)$

   When 5 moles of A and 6 moles of B are mixed together

   (a) Which one is the limiting reagent ?

   (b) Calculate the amount (no. of moles) of 'C' formed.

7. Give the names and structures of the product formed when 2, 3-Dimethyl-but-1-ene is treated with ozone followed by reduction with zinc and water.

OR

   Convert

   (a) Acetylene to Acetaldehyde

   (b) Phenol to Cyclohexane

8. (a) Write the IUPAC name and symbol for the element with atomic number 119.

   (b) An element 'X' belongs to the third period of the p-block. It has four electrons in the outermost shell. Deduce the atomic number of element 'X'.

9. (a) State First Law of Thermodynamics.

   (b) Which one would have more entropy H_2O (at 298 K, 1 atm) or H_2O (at 330 K, 1 atm) Explain.

10. (a) Arrange the following ions in the order of increasing ionic radii :

    Na^+, Mg^{2+}, O^{2-}, F^-

    (b) Why chlorine has higher negative electron gain enthalpy than fluorine ?

11. (a) Plot a graph of pressure of a gas, p Vs $\frac{1}{V}$ at constant temperature.

    (b) State Dalton's law of partial pressure. A gaseous mixture contains 2.2 bar He, 1.1 bar H_2 and 4.2 bar N_2. What is the mole fraction of N_2 ?

12. Account for the following :

(a) Temporary hardness of water can be removed by boiling.

(b) Hydrogen is relatively inert at room temperature.

(c) Hydrogen peroxide cannot be stored in presence of light.

13. (a) What will happen to the wavelength associated with a moving particle, if its velocity is doubled ?

(b) Give the values of all the quantum numbers for an unpaired electron in copper (Z = 29) ?

14. The combustion of one mole of butane (C_4H_{10}) takes place at 298 K and 1 atm. After combustion CO_2 (g) and H_2O (l) are produced and 2878.7 kJ mol.$^{-1}$ of heat is liberated. Compute the standard enthalpy of formation of butane. Given that standard enthalpies of formation of CO_2 (g) and H_2O (l) are – 393.5 kJ mol^{-1} and – 285.8 kJ mol^{-1} respectively.

15. (a) Why molarity of a solution does not change with temperature ?

(b) The density of a solution prepared by dissolving 120 g of urea (molecular mass = 60) in 1000 g of water is 1.15 g ml^{-1}. Calculate the molarity of this solution.

16. (a) Given the standard electrode potentials

$K^+ | k = - 2.93$ V; $Ag^+ | Ag = + 0.8$ V; $Mg^{2+} | Mg = - 2.37$ V

Arrange these metals in order of increasing reducing power.

(b) Balance the following equation in acidic medium :

$$Cr_2O_7^{2-} + SO_2(g) \longrightarrow Cr^{3+}(aq) + SO_4^{2-}(aq)$$

OR

(a) Depict the galvanic cell in which the following reaction takes place :

$Zn\ (s) + Cu^{+2}\ (aq)\ (aq) \rightarrow Zn^{2+}\ (aq) + Cu\ (s)$

(b) Which of the electrode acts as a cathode and which one acts as an anode.

(c) What is the function of the salt bridge in the electrochemical cells ?

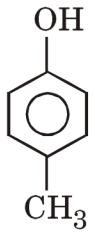
17. (a) Which series of hydrogen spectrum lies in (i) visible region (ii) ultraviolet region ?

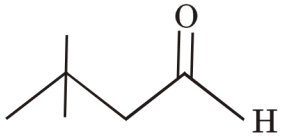
(b) What is the energy and frequency of a photon emitted during a transition from n = 5 state to the n = 2 state in the hydrogen atom ?

(Given Planck's constant h = 6.63×10^{-34} Js)

18. (a) Name a suitable technique of separation of aniline from aniline-water mixture.

(b) Write the IUPAC names of :

(i) 

(ii) 

19. (a) Why the statues and monuments in India are affected by acid rain ?

(b) Distinguish between photochemical smog and classical smog ?

20. (a) What is dehydrohalogenation reaction ? Write chemical equation.

(b) Explain the mechanism of addition of HBr to propene in the presence of peroxide.

21. (a) Draw the resonance structures for phenol.

(b) 0.1254 g of an organic compound gave 0.1292 g of barium sulphate in the estimation of sulphur by Carius method. Find out the percentage of sulphur in the given organic compound (At mass Ba = 137; S = 32; O = 16)

22. (a) Explain why  is not aromatic ?

(b) What effect does branching of an alkane chain has on its boiling point ?

(c) Draw the cis and trans isomer of CHCl = CHCl

23. Last Christmas, Rahul and his friends had gone to Kasauli on a school trip. On their visit they found that the locals used to light coal fire in their ill-ventilated houses at night to keep them warm. Rahul and his friends explained to them how the gas released on burning coal in limited oxygen was dangerous and that it could even cost them their lives.

(a) How does the gas produced by incomplete burning of coal lead to loss of human life ?

(b) What is water gas ? How is it prepared ?

(c) What values are associated with Rahul and his friends behaviour ?

24. (a) Write chemical equations for the preparation and also one use of each of the following :

(i) Plaster of Paris

(ii) Slaked lime

(b) Give reasons :

(i) Potassium carbonate cannot be prepared by Solvay's process.

(ii) Solution of sodium carbonate is alkaline.

(iii) Beryllium and magnesium do not impart colour to flame.

OR

(a) What happens when :

(i) Quick lime is heated with silica

(ii) Chlorine reacts with slaked lime

Write the reactions involved

(b) Explain why :

(i) Sodium is less reactive than potassium

(ii) Beryllium shows anamolous behaviour

(iii) Alkali metals dissolved in liquid ammonia to give deep blue colour solution

25. (a) Describe the change in hybridization of Al atom in the reaction

$AlCl_3 + Cl^- \rightarrow AlCl_4^-$

(b) Although NH_3 and H_2O both have distorted tetrahedral geometries, bond angle in NH_3 water is less than ammonia. Why ?

(c) Why $BeCl_2$ has a zero dipole moment although Be-Cl bonds are polar.

(d) Write the molecular orbital configuration of N_2 and N_2^+. Also calculate their bond order.

OR

(a) Draw the orbital overlap diagram showing the triple bond formation in ethyne.

(b) On the basis of VSEPR theory predict the shape of XeF_4 and ClF_3.

(c) Explain the different types of hydrogen bonds with examples ?

26. (a) Write the conjugate base of H_3PO_4

(b) For the equilibrium

$2NOCl\ (g) \rightleftharpoons 2NO\ (g) + Cl_2\ (g)$

the value of equilibrium constant $K_C = 3.75 \times 10^{-6}$ at 500 K. Calculate the value of K_P at this temperature.

(c) The solubility product for silver chloride is 1.2×10^{-10} at 298 K. Calculate the solubility of silver chloride at 298 K.

OR

(a) For the reaction

N_2 (g) + $3H_2$(g) $\rightleftharpoons$ $2NH_3$ (g), K_P = 51

Find the value of K_P for the reaction

$2NH_3$ (g) $\rightleftharpoons$ N_2 (g) + $3H_2$ (g)

(b) What do you understand by common ion effect ?

(c) Calculate the pH of 2 g of T*l*OH dissolved in water to give 2*l* of solution.

(Molecular mass of T*l*OH = 221 g mol^{-1})