Chemistry

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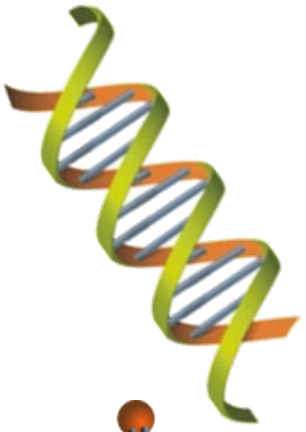
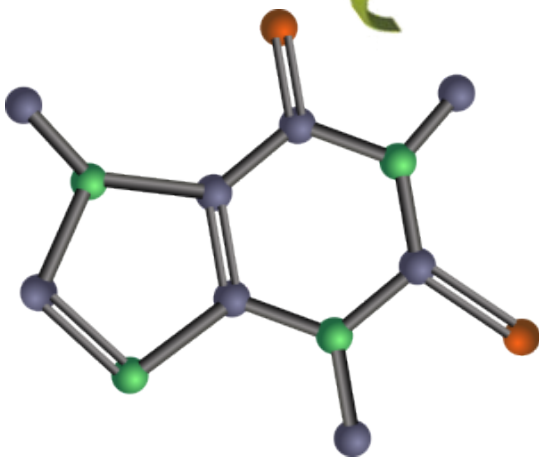




Submitted By:

Harsh Kumar

Class :

XII Sci.

ACKNOWLEDGEMENT

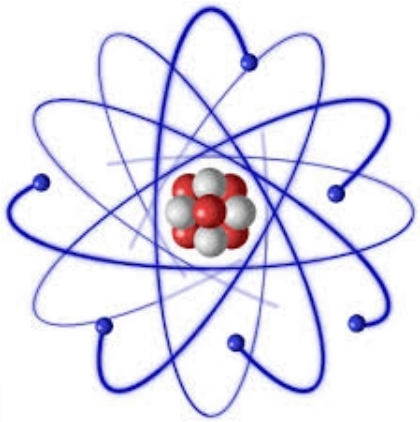
In the accomplishment of this project successfully, many people have best owned upon me their blessings and the heart pledged support, this time I am utilizing to thank all the people who have been concerned with project.

Primarily I would thank god for being able to complete this project with success. Then I would like to thank my principal Mr. YESHDEEP ROHILLA and Chemistry teacher Mr. S.P.GUPTA, whose
valuable guidance has been the ones that helped me patch this project and make it full proof success his suggestions and his instructions has served as the major contributor towards the completion of the project.

Then I would like to thank my parents and friends who have helped me with their valuable suggestions and guidance has been helpful in various phases of the completion of the project.

Last but not the least I would like to thank my classmates who have helped me a lot.

Study Of Constituents Of Alloys



-: Certificate :-

- Guided By :- **Mr. S.P. Gupta**
- Class :- XII Sci.
- Year :- 2016- 2017
- Roll No :- _____
- School :- Kendriya Vidyalaya, Khagaria

This is to certify that **Harsh Kumar**, a student of class **XII Sci.** has successfully completed the research on the below mentioned project under the guidance of **Mr. S.P.Gupta** (Subject Teacher) during the year 2016-17 in partial fulfillment of chemistry practical examination conducted by CBSE.

EXAMINER

Date :-_____

-: INDEX :-

INTRODUCTION

An **Alloy** is a homogenous mixture of two or more metals or a non-metal.

An alloy of mercury with another metal is called amalgam.

Alloys are usually harder than their components but very often less ductile and less malleable. Thus the hardness of gold is increased by addition of copper to it. The melting point of an alloy is always lower than the melting points of the constituent metals. Other properties such as reactivity towards atmospheric oxygen and moisture, mechanical strength, ductility, colour etc. also under goes a change when an alloy is made from its constituents (metals). This change of properties is very useful and makes an alloy beneficial.

Some of the alloys along with their composition is given below.

1.Brass :

It consists Copper 50-90%, Zinc 20-40% and small amounts of tin, lead and iron.

3.Bronze :

It consists Copper 60-90%, Tin 5-35% and also contains small amounts of lead, iron and zinc.

4.Duralumin :

It consists Al 95%, Cu 4%, Mn 0.5%, Mg 0.5%

6.Gun Metal :

It consists Copper 85 - 90%, Zinc 1-3%, Tin 8-12%

The composition of alloys may differ slightly depending upon the quality of the alloy though the main components remain the same.

SOME COMMON ALLOYS :-

Amalgam

Any alloy of mercury is called an **amalgam.** Most metals are soluble in mercury, but some (such as iron)are not. Amalgams are commonly used in dental fillings because they have been relatively cheap, easy to use, and durable. In addition, until recently, they have been regarded as safe. They are made by mixing mercury with silver ,copper ,tin , and other metals. The mercury content of dental fillings has recently stirred controversy, based on the potentially harmful effects of mercury.

Mercury amalgams have also been used in the process of mining gold and silver, because of the ease with which mercury amalgamates with them. In addition , thallium amalgam is used as the liquid material in thermometers, because it freezes at -58°C,whereas pure mercury freezes at -38°C.

Brass

A decorative brass paperweight (left), along with zinc and copper samples.

Brass is the term used for alloys of copper and zinc in a solid solution. It has a yellow color, somewhat similar to gold. It was produced in prehistoric times, long before zinc was discovered, by melting copper with calamine, a zinc ore.

The amount of zinc in brass varies from 5 to 45 percent, creating a range of brasses, each with unique properties. By comparison, bronze is principally an alloy of copper and tin.

Despite this distinction, some types of brasses are called bronzes. Brass is relatively resistant to tarnishing and is often used for decorative purposes. Its malleability and acoustic properties have made it the metal of choice for musical instruments such as the

trombone, tuba, trumpet, and euphonium. Although saxophones And harmonicas are made out of brass, the saxophone is a woodwind instrument, and the harmonica, a free reed aero phone. In organ pipes designed as "reed" pipes, brass strips are used as the "reed."

Aluminum makes brass stronger and more corrosion-resistant. It forms a transparent, self-healing, protective layer of aluminum oxide (Al_2O_3) on the surface. Tin has a similar effect and finds its use especially in seawater applications (naval brasses). Combinations of iron, aluminum, silicon, and manganese make brass resistant to wear and tear.

Bronze

Bronze refers to a broad range of copper alloys, usually with tin as the main additive, but sometimes with other element s such as phosphorus,manganese,aluminum, or silicon. Typically, bronze is about 60 percent copper and 40 percent tin. The use of bronze was particularly significant for early civilizations, leading to the name "Bronze Age." Tools, weapons, armor, and building materials such as decorative tiles were made of bronze, as they were found to be harder and more durable than their stone and copper predecessors.

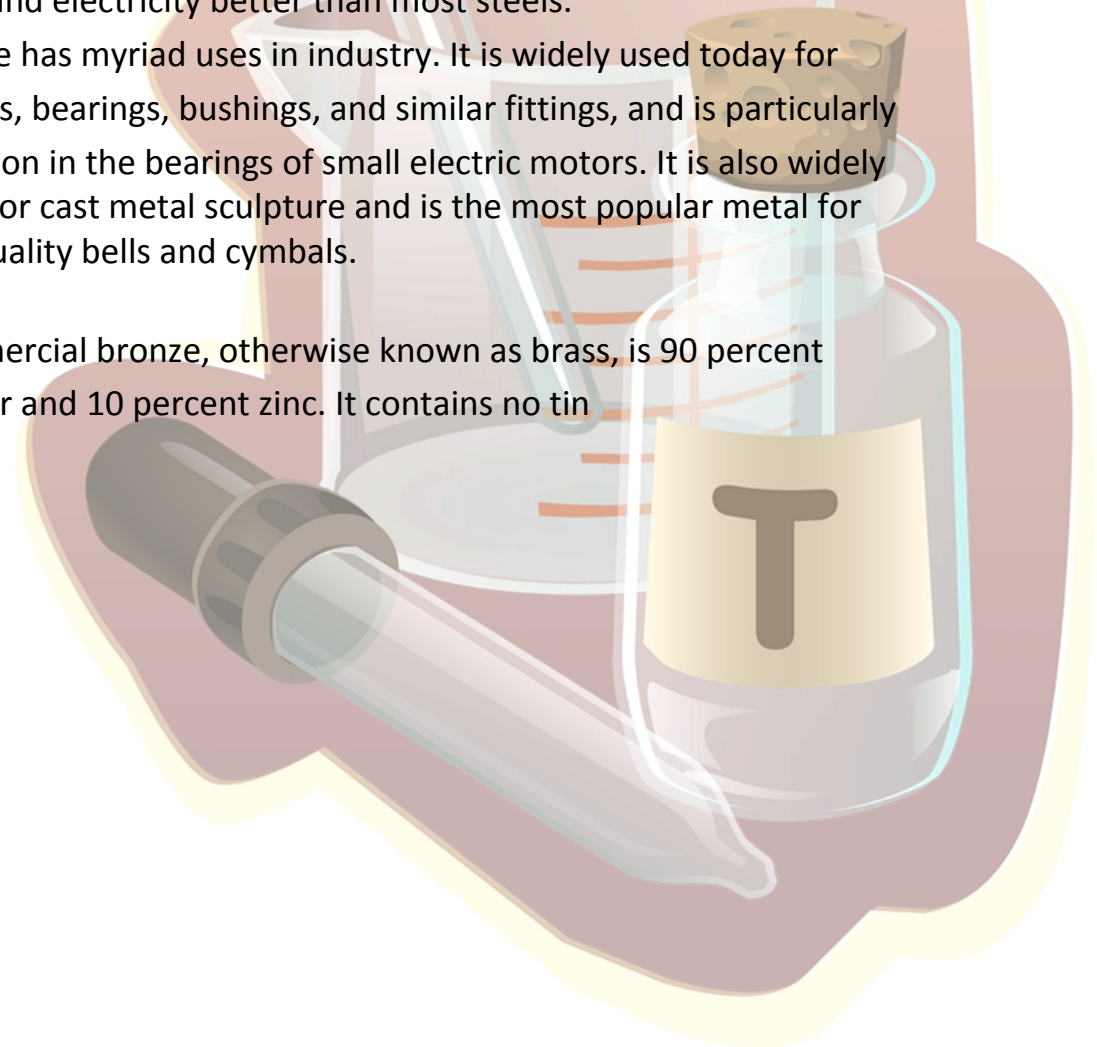
In early use, the natural impurity arsenic sometimes created a superior natural alloy, called "arsenical bronze."

Though not as strong as steel, bronze is superior to iron in nearly every application. Bronze develops a patina (a green coating on the exposed surface), but it does not oxidize beyond the surface. It is considerably less brittle than iron and has a lower casting temperature. Several bronze alloys resist corrosion (especially by seawater) and metal fatigue better than steel; they also conduct

Heat and electricity better than most steels.

Bronze has myriad uses in industry. It is widely used today for springs, bearings, bushings, and similar fittings, and is particularly common in the bearings of small electric motors. It is also widely used for cast metal sculpture and is the most popular metal for top-quality bells and cymbals.

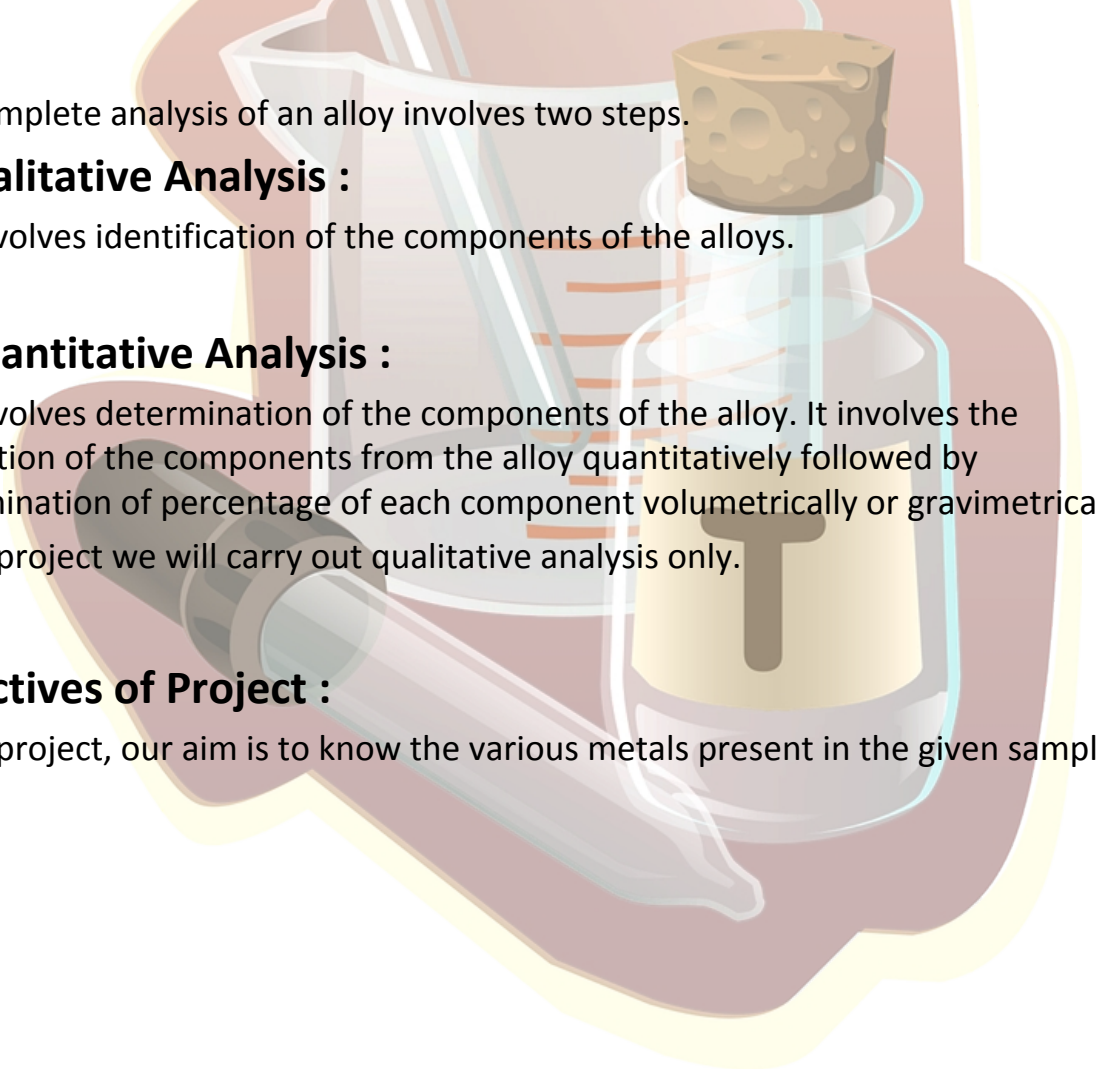
Commercial bronze, otherwise known as brass, is 90 percent copper and 10 percent zinc. It contains no tin



PREPARATION OF ALLOYS

Alloys are prepared from the techniques of fusion, compression or simultaneous electro - deposition. Generally the components are mixed together in proper properties in a fuse clay crucible, melted and stirred with a piece of charcoal to avoid oxidation. The molten mixture is now allowed to cool. When an alloy is obtained e.g. brass is prepared by above melted.

ANALYSIS OF AN ALLOY



The complete analysis of an alloy involves two steps.

1. Qualitative Analysis :

This involves identification of the components of the alloys.

2. Quantitative Analysis :

This involves determination of the components of the alloy. It involves the separation of the components from the alloy quantitatively followed by determination of percentage of each component volumetrically or gravimetrically.

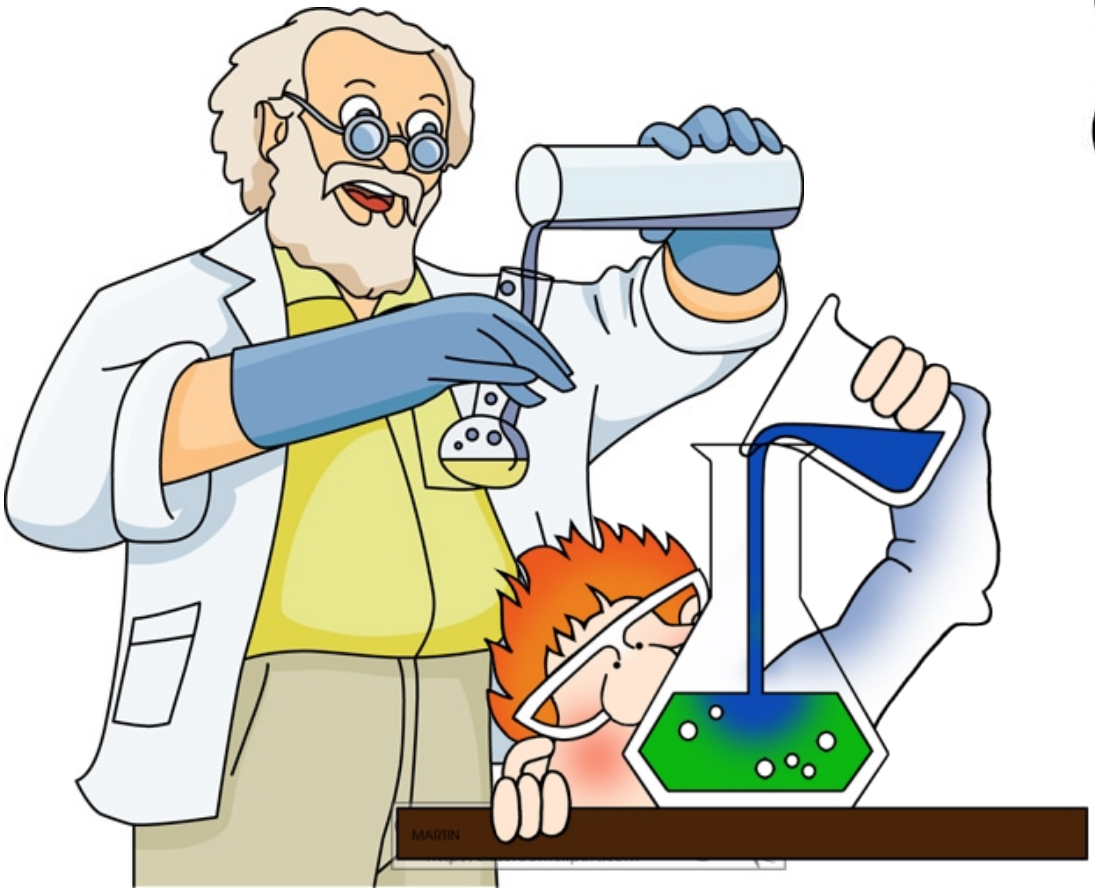
In this project we will carry out qualitative analysis only.

Objectives of Project :

In this project, our aim is to know the various metals present in the given sample of alloy.

Experiment

To analyze a sample of bronze



Aim : To analyze a sample of bronze qualitatively.

Requirements : China dish, test-tube funnel, filter paper and common laboratory reagents.

Theory :

Bronze is an alloy of copper and tin with the following.

Composition :

Cu = 88-96% and Sn. = 4-12%.

Thus copper and zinc. form the main constituents of bronze. Both these metals dissolved in nitric acid.

$3\ Cu + 8H^+ + 2NO_3^- \rightarrow 3\ Cu^{2+} + 2NO + 4H_2O$

$4Sn + NO_3^- + 10\ H^+ \rightarrow 4\ Sn^{+2} + NH_4^+ + 3H_2O$

(Cold and Dil. Acid)

$Sn + 4NO_3^- + 4H^+ \rightarrow H_2Sn\ O_3 + 2NO_2 + H_2O$

(Conc. acid) (Metastannic Acid)

Excess of nitric acid is removed by heating the solution. The resulting solution now would contain Cu^{+2} ions and metastannic acid. This solution is acidified with dil. HCl and H_2S gas is passed when the sulphides of copper and tin are formed.

$Cu^{+2} + S^{2-} \rightarrow CuS$ (Black ppt.)

$H_2SnO_3 + 2H_2S \rightarrow SnS_2$ (Black ppt.) $+ 3H_2O$

The sulphides are separated by boiling the ppt. with yellow ammonium sulphide when SnS_2 goes into solution as thiostannate where as CuS is not affected.

$SnS_2 + (NH_4)_2S \rightarrow (NH_4)_2\ SnS_2$ (Soluble)

Ammonium thiostannate.

$CuS + (NH_4)_2S \rightarrow CuS$ (Unaffected)

Black ppt.

The soluble black ppt. is tested for Cu^{+2} ions and the solution is tested for Sn^{2+} ions as in elementary qualitative analysis.

Procedure :

1. Take about 1g. of small pieces of bronze in a china dish and add to it 5-10 ml. of dil. HNO_3.

2. Heat the contents slowly to dissolve copper and tin completely and then boil the contents to a paste to remove excess of HNO_3. All this is carried out in cup board.

3. Dissolve this dry mass in distilled water containing HCl (1:1) to get a clear solution.

4. Transfer the solution in a test tube and pass H2S in excess i.e. till the precipitation is complete. Filter and reject the filtrate.

5. Take the black ppt. in a test tube and add to it 2-3 ml. of yellow ammonium sulphide and heat. Filter the contents. Black residue is tested for Cu+2 ions and filtrate is tested for Sn+2ions.

6. Analysis of black residue :

Transfer a little of the black ppt. into a test tube. Add to it 2-3 ml. of 50%. HNO3 and boil the contents of the tube. A light blue or green sol. indicates the presence of Cu+2. Divide this sol. into two parts.

(a) To one part add excess of NH4OH a deep blue coloration confirms the presence of Cu+2 ions.

(b) Acidify the second part with acetic acid and add K4 [Fe (CN)6] i.e. potassium ferrocyanide solution. A reddish brown ppt. confirms the presence of Cu+2 ions.

7. Analysis of filtrate :

Boil the filtrate with 1 ml. of dil. HCl. A yellow ppt. is obtained. Dissolve in 1 ml. conc. HCl. To this solution add 0.5 g. of zinc. dust and boil it for 2-3 minutes. Filter and to filtrate add 1-2 ml. of mercuric chloride solution. A white ppt. turning grey on standing confirms the presence of Sn+4 ions.

Result :

The given sample of bronze contains - Cu and Sn as the main constituents.

USES OF ALLOYS :-

i) To modify chemical reactivity :-

When sodium is used as reducing agent it is too reactive to be used but its allay with mercury, called sodium amalgam can be safely used as reducing agent.

ii) To increase hardness :-

Hardness of gold is increased by adding copper to it. Also zinc is added to copper to make copper hard in form of brass.

iii) To increase tensile strength :-

Nickeloy, an alloy of Nickel (1%), Copper (4%) and aluminium (95%) has high tensile strength.

iv) To lower the melting point :-

Solder metal which is an alloy of Sn(30%) and Pb(70%) has very less meting point as compared to melting points of Sn and Pb.

v) To modify the colour :-

Aluminium bronze an alloy of Cu and Al has beautiful golden colour.

vi) To resist corrosion:-

Iron gets rusted and corroded. Its corrosion takes place with time but stainless steel, an alloy of iron and carbon get not rusted the composition of stainless steel is :

Iron - 98%

Carbon - 2%

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