Is Matter Around us Pure

MATTER

Q.1 Define matter?

Ans : Anything which has mass and occupies space is called **matter**. It may be solid, liquid or gas.

Matter is of 2 types

• Pure Matter

• Impure substances

Q.2 What are pure substances?

Ans : Pure substances may be defined as material which contains only one kind of atoms or molecules.

Pure substances are of 2 kinds

• **Elements**

Pure substances which are made up of only one kind of atoms are known as elements. All atoms in an element are identical. Atoms of different elements are different.

• **Compounds**

Pure substances which are made up of only one kind of molecules are known as compounds. Atoms constituting are from two or more different elements. The different elements are combined in fixed proportion in a compound.

Q.3 What are mixtures, explain its type with example?

Ans : Impure matters are also called **mixture.** A mixture is a material which contains two or more different kinds of particles (atoms or molecules) which do not react chemically but are physically mixed together in any proportion.

Mixtures are of 2 types

• **Homogeneous mixtures**

A mixture is said to be homogeneous if all the components of the mixture are uniformly mixed and there are no boundaries of separation between them. For example- Salt in water etc.

• **Heterogeneous mixtures**

A mixture is sad to be heterogeneous if all the components of the mixture are not thoroughly mixed and there are visible boundaries of separation between them. For example- Sand in water etc.

Q.4 List important properties of compound?

Ans : Properties of Compounds

•A compound is a homogeneous substance.

• A compound has a definite composition.

• A compound has definite melting point or boiling point.

• Energy is absorbed or evolved in the form of heat or light during the formation of a compound.

• The properties of compound are entirely different from those of its constituents.

For example – If we mix Iron and Sulphur in a watch glass, we get a mixture. This is then heated till a black mass is formed. This leads to formation of compound called Iron Sulphide.

$$Fe + S \xrightarrow[\text{Heat}]{\Delta} FeS \ \ (\text{Compound})$$

Q.5 list important properties of mixtures?

Ans : Properties of Mixtures

• A mixture may be homogenous or heterogeneous.

• The composition of a mixture is variable.

• A mixture does not have a definite melting point or boiling point.

• Energy is neither absorbed nor evolved during the formation of a mixture.

• The properties of mixture are the properties of its constituents.

• The constituents of mixture can be separated by simple physical methods

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Q.6 Differentiate between physical change and chemical change?

Ans :

Physical Change	Chemical Change
1. A physical change brings about change in physical properties such as physical state, shape, size etc.	1. A chemical change brings about change in chemical properties.
2. There is no change in chemical composition of a substance during physical change.	2. There is always a change in chemical composition of a substance during chemical change.
3. No new substance is formed.	3. A new substance is always formed.
4. It is temporary and hence reversible.	4. It is permanent and hence irreversible.

Q.7 Explain Tyndall effect with example?

Ans : Tyndall Effect

If a light is passed through a medium and its path can be seen, then the substance is said to show Tyndall effect.

Example When a beam of sunlight enters a dark room through some hole in the window, path of light becomes visible due to scattering of light by the colloidal dust particles present in the air of cinema hall. This shows Tyndall effect.

Q.8 How is blood a heterogeneous substance?

Ans : Blood is a heterogeneous mixture because it is a mixture of plasma, blood cells, glucose, proteins, mineral ions, hormones and many different salts dissolved in it. Thus the dispersed phase and dispersed medium are in different physical state and hence blood is a heterogeneous mixture.

Q.9 If salt is added to water, is the mixture homogeneous or heterogeneous. Give reasons for your Answer?

Ans : The mixture is homogeneous because the salt particles do not form a separate layer and the particles cannot be separated from the water by filtration. Also every portion of the solution is equally salty, as the solution has salt uniformly dispersed in it.

Q.10 Classify each of the following as a homogeneous or heterogeneous mixture: soda water, wood, air, soil, vinegar, filtrated tea?

Ans : Homogeneous mixture - soda water, air, vinegar, filtered tea.

Heterogeneous mixture - wood, soil.

Q.11 How would you confirm that a colourless liquid given to you is pure water?

Ans : We judge the boiling point of the liquid because every liquid has a characteristic boiling point at 1 atmospheric pressure and if the given colourless liquid boils exactly at 373 K at 1 atmospheric pressure, then it is pure water. If the boiling point is different than the water is contaminated.

Q.12 Which of the following materials fall in the category of a 'pure substance'?

Ans : (a) Ice

(b) Milk

(c) Iron

(d) Hydrochloric acid

(e) Calcium oxide

(f) Mercury

(g) Brick

(h) Wood

(i) Air

(a), (c), (d), (e) and (f) are pure substances.

Q.13 Which of the following will show "Tyndall effect"?

Ans : (a) Salt solution

(b) milk

(c) copper sulphate solution

(d) starch solution.

(b) and (d) will show Tyndall Effect because they are colloids.

Q.14 Classify the following into elements, compounds and mixtures.

Ans : (a) sodium

(b) soil

(c) sugar solution

(d) silver

(e) calcium carbonate

(f) tin

(g) silicon

(h) coal

(i) air

(j) soap

(k) methane

(l) carbon dioxide

(m) blood

Elements sodium, silver, tin, silicon.

Compounds calcium carbonate, methane, carbon dioxide.

Mixtures soil, sugar solution, coal, air, soap, blood.

Q.15 If sugar is added to water, is the mixture homogeneous or heterogeneous. Give reasons for your answer?

Ans : The mixture of sugar and water is a homogeneous mixture as explained below:

(a) The sugar particles do not form a separate layer.

(b) The sugar particles cannot be separated from the water by filtration.

(c) every portion of the solution is equally sweet ,as the solution has sugar uniformly dispersed in it.

Solutions, Suspensions and Colloids

Q.1 Define solution?

A solution is defined as a homogeneous mixture of two or more chemically non-reacting substances whose composition can be varied within limits.

A solution as 2 components

• **Solute** The component which is dissolved or which is present in small amount is called solute. It is also called dispersive medium.

• **Solvent** The component which is present in larger amount is called solvent. It is also called dispersion medium.

Q.2 Write down the types of solutions with example?

Types of solutions

(1) **Solid in Liquid** Like sugar in water, tincture of iodine (in it iodine is dissolved in alcohol) etc.

(2) **Liquid in Liquid** Like alcohol in water etc.

(3) **Gas in Liquid** Like CO_2 dissolved in water in cold-drinks.

(4) **Solid in Solid** Like Alloys such as Brass (copper + zinc), Bronze (copper + tin) etc.

(5) **Gas in Gas** Like in air, various gases are mixed such as O_2, N_2 etc.

(6) **Liquid in Solid** Like copper sulphate in dental amalgam.

(7) **Gas in Solid** Gas is adsorbed over the surface of metal.

(8) **Solid in Gas** Like camphor in air.

(9) **Liquid in Gas** Like clouds and fog.

Q.3 List important properties of solution?

Properties of Solutions

• A solution is a homogeneous mixture.

• Size of particles is smaller than 1 nm (10^{-9} m).

• The particles cannot be seen by microscope.

• It is a stable mixture, solute does not settle down over a period of time.

• If solution is passed through filter paper, solute and solvent do not separate.

• It does not scatter light i.e. it do not show Tyndall effect.

Q.4 Define suspension?

Suspensions

A suspension is a heterogeneous mixture in which the solute particles do not dissolve but remain suspended throughout the bulk of medium.

Q.5 Write down the properties of suspension?

Properties of Suspension

• It is a heterogeneous mixture.

• Size of the particles is greater than 100 nm.

• Particles can be seen by naked eyes.

• It is unstable mixture. Solute settle down at the bottom over period of time.

• If the solution is passed through filter paper, solute and solvent gets separated.

• It scatters light when light is passed through the solution i.e. it shows Tyndall effect.

Q.6 Define colloids?

Colloids

Solutions in which the size of particles lies in between those of true solutions and suspensions are called colloidal solutions or simply colloids.

Q.7 Write down the types of colloids?

Types of colloids

Dispersed	Dispersion	Type	Examples
2. Solid	Liquid	Sol	Muddy water
3. Solid	Gas	Solid aerosol.	Smoke
4. Liquid	Solid	Gel	Jelly
5. Liquid	Liquid	Emulsion	Milk
6. Liquid	Gas	Aerosol	Fog
7. Gas	Solid	Solid foam	Pumice stone
8. Gas	Liquid	Foam	Shaving cream

Q.8 Enlist the properties of colloids?

Properties of Colloids

• It is a heterogeneous mixture

• Size of particles is smaller than suspensions but greater than solutions (1 nm to 100 nm).

• Particles can be seen by microscope.

• It is a stable mixture. Particles do not settle down at the bottom over a period of time.

• When the solution passes through the filter paper, the solute and solvent do not separate.

• No Tyndall effect is observed

Q.9 Define the term solubility?

Solubility

The maximum amount of solute that can be dissolved in 100 gm of solvent is called solubility of that solute in that solvent at a particular temperature.

Alternatively, we can say that

The amount of solute needed to make saturated solution of 100 gm of solvent is called solubility of that solute in that solvent at a particular temperature.

Q.10 Explain the effect of temperature on solubility?

Effect of Temperature on Solubility -

(a) Solubility of Solid solute in Liquid:

• As temperature increases, solubility also increases.

• Saturated solution becomes unsaturated.

• If saturated solution is cooled down, some dissolved solute separates.

(b) Solubility of Gas in Liquid:

• As temperature increases, solubility decreases.

Q.11 Explain the effect of pressure on solubility and explain the reason why cold drink is packaged at high pressure?

Effect of Pressure on Solubility -

(a) Solid solute in Liquid

• As temperature increases, solubility increases.

• Pressure has no effect on solubility in case of solid solute in liquid.

(b) Gas in Liquid

• As temperature increases, solubility decreases.

• As pressure increases, solubility increases.

This is the reason that cold drinks are packaged at high pressure.

Q.12 Define concentration of a solution?

Concentration is the measure of amount. It is the amount of solute present in the amount of solution.

(a) Solid in Liquid

$$Concentration = \frac{Mass\ of\ Solute}{Mass\ of\ Solution} \times 100$$

(b) Liquid in Liquid

$$Concentration = \frac{Volume\ of\ Solute}{Volume\ of\ Solution} \times 100$$

Q.13 Define solute and solvent?

Solute The component which is dissolved or which is present in small amount is called solute. It is also called dispersive medium.

Solvent The component which is present in larger amount is called solvent. It is also called dispersion medium.

Q.14 What are saturated and unsaturated solutions?

Unsaturated and saturated solution

• A solution that can dissolve more solute in it at a given temperature is called unsaturated solution.

• A solution which contains maximum amount of solute dissolved in a given quantity of solvent at the given temperature and which cannot dissolve any more solute at that temperature is called saturated solution.

Q.15 Calculate the mass of sodium sulphate required to prepare its 20% (mass percent) solution in 100g of water?

Mass % of Sodium sulphate in the solution = 20%

If the total mass of the solution = 100g

Then mass of sodium sulphate = (20/100)x100 = 20 gMass of water = 100-20 = 80 g.

Q.16 Ayush has prepared 0.01% (by mass) solution of sodium chloride in water, calculate the composition of soltution. How do you do it ?

Mass % of solute = 0.01 % of NaCl in water

Mass % of solute = [Mass of solute in grams / Mass of solution in grams] x 100.

Let us suppose that mass of the solution is 100 g.

Therefore mass of NaCl = 0.01 g

Mass of water = 100-0.01 = 99.99 g

Q.17 Acetone evaporates in normal room temp. Why do we have to heat it to its boiling point?

At room temperature the rate of evaporation of acetone is slow, to speed up the process to evaporate all the acetone in the mixture, we supply heat.

Q.18 Which separation techniques will apply for the separation of the following?

(a) Sodium chloride from its solution in water.

(b) Ammonium Chloride from a mixture containing Sodium Chloride and Ammonium Chloride.

(c) Small pieces of metal in the engine oil of a car.

(d) Different pigments from an extract of flower petals.

(e) Butter from curd.

(f) Oil from water.

(g) Fine mud particles suspended in water.

(a) Crystallization or Evaporation.

(b) Sublimation.

(c) Centrifugation or Sedimentation.

(d) Chromatography.

(e) Centrifugation.

(f) Separating funnel.

(g) Centrifugation.

Q.19 Why light can’t pass through a solution?

The size of particles in the solution is very small and when light is incident on the solution, its particles are not able to deflect the path of light. Therefore, the path of light is not visible, when light passes through the solution.

Q.20 What is difference between solution and true solution?

• Solution is a mixture of solute in solvent that is homogeneous or heterogeneous but a true solution is a homogeneous mixture in which the size of particles is very small and is not visible under a powerful microscope.

• A true solution does not scatter light but solution scatters light.

Q.21 What would happen if you were to take a saturated solution at a certain temperature and cool it slowly?

Different substance in a given solvent have different solubilities at the same temperature. So on cooling substances start to precipitate out.

SEPARATION OF MIXTURES

Q.1 How can we separate cream from milk?

Ans : Centrifugation is a method for separating the suspended particles of a substance from a liquid in which the mixture is rotated (or spun) at high speed in a centrifuge.
As the mixture rotates rapidly, a force acts on heavier suspended particles in it and brings them down to the bottom. The clear liquid being lighter remains on the top. This process is used to separate cream from milk.

Q.2 How to separate components from mixture containing sulphur, charcol, potassium nitrate?

Ans : The mixture containing sulphur, charcoal and potassium nitrate can be separated by **Filtration technique**

•Add water to the mixture. Potassium nitrate will dissolve in water. Filter the solution.

• Filtrate is solution of potassium nitrate and residue contains sulphur and charcoal.

• Evaporate the filtrate, water will vaporize leaving behind potassium nitrate.

• To the residue containing sulphur and charcoal add carbon disulphide, this will dissolve sulphur.

• Filter this solution.

• The filtrate will contain sulphur dissolved in carbon disulphide and residue will be charcoal's

• Evaporate the filtrate, to obtain crystals of Sulphur.

Q.3 How would you separate a mixture of NH_4Cl and I_2?

Ans : Heating cannot separate the mixture, as both substances sublime on heating. However, when water is added to the mixture, NH_4Cl dissolves but (I_2) iodine does not. The mixture is filtered. The filtrate is a solution of NH_4Cl, while the residue is iodine. The filtrate is heated to obtain NH_4Cl crystals.

Q.4 Describe a method for separation of the constituents of gunpowder?

Ans : Gunpowder is a mixture of sulphur, charcoal and potassium nitrate. When water is added to the mixture potassium nitrate dissolves. The mixture is then filtered. The filtrate is potassium nitrate solution while a mixture of sulphur and charcoal left behind. The filtrate is evaporated on a sand bath to obtain potassium nitrate back. When carbon disulphide is added to the residue, sulphur dissolves. When this mixture is filtered the filtrate is sulphur solution while the residue is charcoal. Leaving it open evaporates the sulphur solution. Carbon disulphide evaporates and sulphur crystals are left behind.

Q.5 Write down the technique used to separate these mixtures?

Ans : (i) The constituents of the colouring matter in ink.

(ii) Hydrated copper (II) sulphate from its aqueous solution.

iii) Unused zinc, after reacting the excess with dilute sulphuric acid.

(iv) Benzene (boiling point 80^0C) and aniline (boiling point 184^0 C).

(i) Chromatography

(ii) Evaporation

(iii) Filtration

(iv) Fractional distillation

Q.6 A pupil decides to separate powdered calcium carbonate from powdered sodium chloride by shaking the mixture with water and filtering. Would this procedure succeed? Explain.

Ans : Yes, he will succeed, as calcium carbonate is insoluble in water while sodium chloride is soluble in water. On filtering the residue will be calcium carbonate.

Q.7 Explain air is a mixture or not?

Ans : Yes, air is a mixture as explained below:-

(a) The composition of air is variable. The composition varies from place to place and with altitude. For instance, at higher altitudes, there is less oxygen in the air. In industrial areas, due to the waste gases coming out of industrial chimneys in the form of smoke more impurities are added in the air.

(b) Air has no definite set of properties. Its properties are an average of its constituents. For e.g., vapour density of oxygen is 16, vapour density of nitrogen is 14 and vapour density of air is 14.4

(c) The components of air can be separated by physical means. Fractional distillation of liquid air cans separat$_2$and O_2. Boiling point of a liquid N_2= -196^0 C, Boiling point of a liquid O_2 = -183^0 C

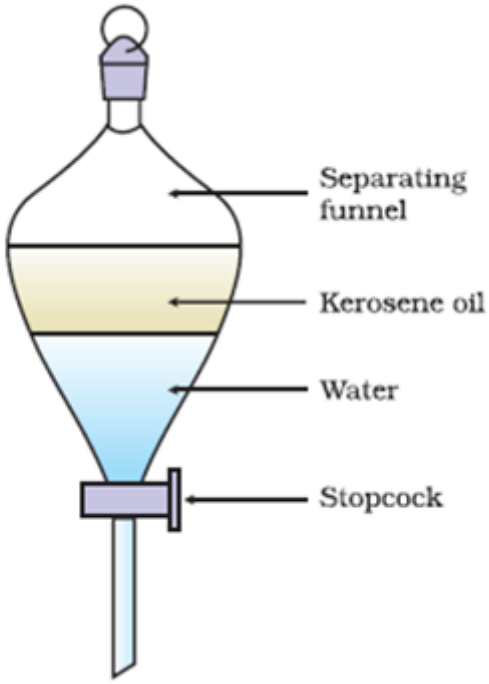
(d) The formation of air does not involve any energy change. No energy is released or absorbed when the constituents of air are mixed in the right proportion. e) Air cannot be assigned a fixed chemical formula.

Q.8 Describe a method for separation of the kerosene oil and water?

Ans : This process is used to separate 2 liquids which don't mix into one another. These two immiscible liquids are separated through separating funnel.

A separating funnel is a type of funnel which has a stopcock in its stem to allow the flow of liquid from it , or to stop the flow of liquid from it. The separation of two immiscible liquids depends on the difference in their densities. Example -Kerosene Oil and water.

Figure below shows separation of Kerosene oil and water.



Kerosene Oil having low density settles to the top of water and water is easily obtained by opening the stopcock of the funnel.

Q.9 How can we separate colour component from ink (mixture.)?

Ans : We can separate colour component from ink by **evaporation method**, Water (Solvent) gets evaporated and residue color left over.

Q.10 Write down the uses of centrifugation process?

Ans : Uses of centrifugation process

• Used in diagnostic laboratories for blood and urine tests.

• Used in dairies and home to separate butter from cream.

• Used in washing machines to squeeze out water from wet clothes

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Q.11 How can we separate mixture of salt and ammonium chloride?

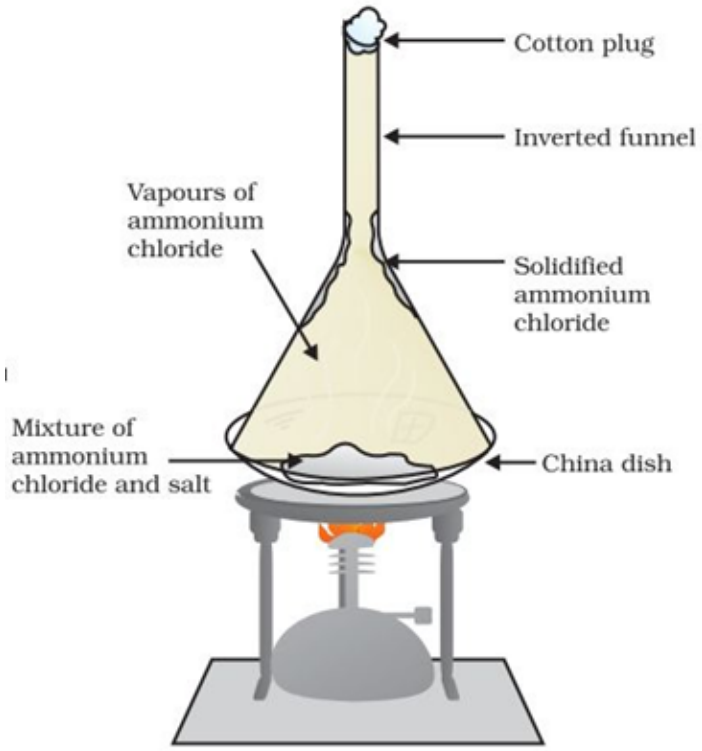
Ans : We separate mixture of salt and ammonium chloride by sublimation process

• Take a mixture of common salt and ammonium chloride in a china dish placed on a tripod stand.

• Cover the china dish with an inverted glass funnel and put a cotton plug on the open end of the funnel to prevent vapours going to the atmosphere.

• Heat the mixture using burner. On heating, ammonium chloride changes into white vapours which rise up and get converted into solid ammonium chloride on coming in contact with cold inner walls of the funnel.

• Here, pure ammonium collects on thinner walls of the funnel in the form of the sublimate and can be removed. Since common salt is not prone to sublimation so it remains behind in the china dish.



Q.12 Explain various methods to clean water for drinking purpose?

Ans : METHODS TO CLEAN WATER FOR DRINKING PURPOSE

To have clean water we need to pass the water obtained from lake through a

Long process. It is as follows

● **SEDIMENTATION TANK -** Heavy impure particles settle down when water is left for some time.

● **LOADING TANK -** Alum is mixed with water. Even small suspended particles settle down.

● **FILTRATION TANK -** It has 3 layers of fine sand, coarse sand & tiny stones. When water passes through them, it is further cleaned.

● **CHLORINATION TANK -** Chlorine is mixed with water in the tank. It kills gems. Now water is sent to home.

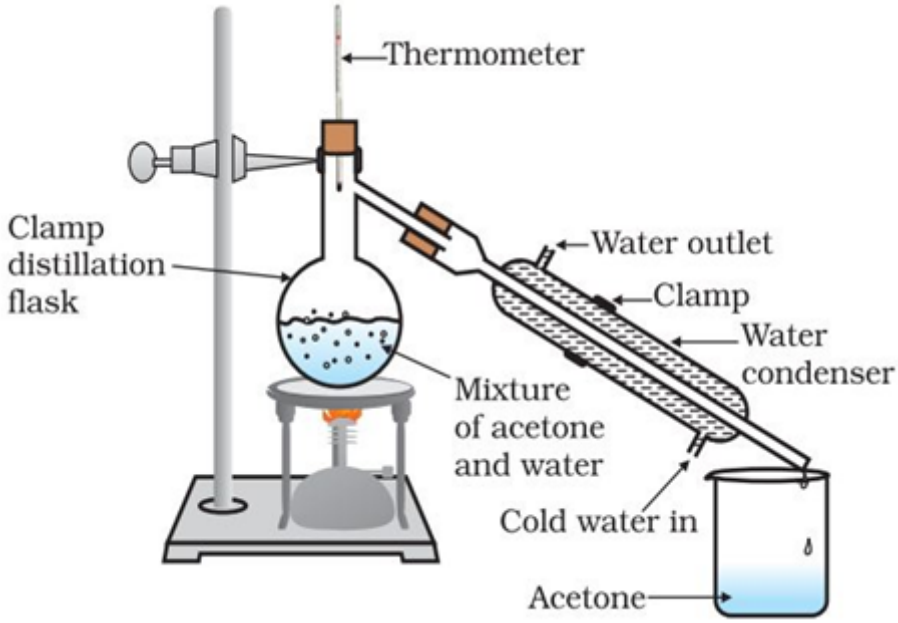
Q.13 Explain the distillation process?

Ans : Distillation process

This process is used to separate 2 liquids which are miscible i.e. they mix into each other in all proportions and form a single layer when put in a container. In this method, we start heating a liquid to form vapour , then cooling the vapour to get back liquid. The liquid obtained by

condensing the the vapour is called distillate. This process is used for those liquids which have sufficient difference in their boiling points.

Figure below shows the process of distillation.



Q.14 Explain chromatography?

Ans : Chromatography is a technique used for separation of those solutes that dissolve in same solvent in very small quantities, the most common being paper chromatography. This separation is based on the fact that though two or more substances are soluble in same solvent (say water) but their solubility may be different.

It can be used to separate dye from ink. The method for separation is as follows:-- Take a thin and long strip of filter paper. Draw a pencil line on it, about three centimeters from one end.

• Put a small drop of black ink on filter paper strip at the centre of the pencil line. Let the ink dry.

• When the drop of ink has dried, the filter paper strip is lowered into a tall glass jar containing some water in its lower part (keeping the pencil line at the bottom). The strip should be held vertical. Please note that though the lower end should dip in water but pencil line should remain above the water level.

• When the water reaches the top end, the strip is removed from the jar and dried. The paper containing separate coloured spots is obtained.

Q.15 Explain crystallization process?

Ans : Crystallization

It is a process of cooling a hot, concentrated solution of a substance to obtain crystals is called crystallization. The process of crystallization is used for obtaining a pure solid substance from impure sample. This is done as follows

• The impure solid substance is dissolved in the minimum amount of water to form a solution.

• The solution is filtered to remove insoluble impurities.

• The clear solution is heated gently on a water bath till a concentrated or a saturated solution is obtained. Then stop heating.

•Allow the hot, concentrated solution to cool slowly.

•Crystals of pure solid are formed. Impurities remain dissolved in the solution.Separate the crystals of pure solid by filtration and dry

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Q.16 Explain the evaporation process for the separation of mixture?

Ans : Evaporation is a process which is used to separate a substance that has dissolved in water(or any other liquid).The use of process of evaporation for separating a mixture is based on the fact that liquids vaporize easily whereas solids do not vaporize easily.

Evaporation is used for recovering dissolved solid substances from liquid mixtures (or solutions) but the liquid itself cannot be recovered by this method. The liquid vaporizes and get lost to the air. Due to evaporation, ink which is a mixture of dye and water, we can obtain its constituents separately.

Q.17 Write the steps you would use for making tea. Use the words - solution, solvent, solute, dissolve, soluble, insoluble, filtrate and residue?

Ans : Take the solvent, water, in a kettle. Heat it. When the solvent boils, add the solute, milk. Milk and water forms a solution. Then pour some tea leaves over a sieve. Pour slowly hot solution of milk over tea leaves. Tea leaves provides the colour to the solution and it act as a filtrate. The remaining tea leaves being insoluble remains as residue. Add requisite sugar which dissolves and the tea is ready.

Q.18 Define the term Miscible liquid?

Ans : Miscibility is a term in chemistry that refers to the property of liquids to mix in all proportions, forming a homogeneous solution. This term is also applicable to other phases (solids and gases), but the main focus is on the solubility of one liquid in another. For example, water and ethanol are miscible in all proportions.

CLASSIFICATION OF MATTER

Q.1 Differentiate between metals and non-metals

Ans :

Metals	Non-metals
Metals are luster.	Non – metals do not have luster .
They are generally grey or golden colour	They posses multiple colours.
They conduct heat & electricity.	They do not conduct heat & electricity
They are malleable i.e. they can be beaten into thin sheets.	They are non malleable i.e. they canno be beaten into thin sheets.
They are ductile i.e. they can be drawn into thin wires.	They are non ductile i.e. they cannot be drawn into thin wires.
They are sonorous i.e. they produce sound when hit.	They are non sonorous i.e. they do not produce sound when hit.

Q.2 Define metalloids?

Metalloids

Ans : They are those elements which have properties of both metal and non-metal. For example - Germanium, Silicon etc.