Is Matter Around Us Pure

Assess Yourself

Q.1. Write one property of colloids.

Answer: Colloids are stable heterogeneous mixture that does not settle down when left undisturbed. Colloidal particles are too small to be visible to the naked eye but are large enough to scatter a beam of light that passes through it and makes the path visible, phenomenon known as Tyndall effect.

Q.2. Name the process used for obtaining pure Copper sulphate from an impure sample.

Answer: Crystallization is the method of choice for obtaining pure Copper sulphate from an impure sample. In this process the sample is dissolved in minimum amount of water and impurities are filtered out. Then the water is evaporated and pure sample is obtained.

Q.3. Which one amongst the following will show Tyndall effect?

(i) Common salt solution

(ii) Copper sulphate solution

(iii) Milk

Answer:

iii) Milk will show Tyndall effect as milk is a colloid.

Common salt solution and copper sulphate solution does not show Tyndall effect as they are less than 1nm in diameter and cannot be seen by naked eye. Due to its small particle size, they do not scatter a beam of light passing through the solution.

Q.4. How do we test purity of substance?

Answer: A pure substance is made of constituent particles that are same in their chemical structure. They have a fixed melting and boiling point and as such the purity can be tested by comparing the melting point of the impure substance with a pure standard.

Q.5. How can we separate particles of colloidal solution? Name the process.

Answer: Particles of a colloidal solution can be separated by centrifugation. The process employs the principle that particles that are dense settle at the bottom whereas the lighter particles stay at the top when spun rapidly.

Centrifuge
(a device for centrifugation)

Q.6. When blue ink is heated, what do you think has got evaporated from the watch glass?

Answer: On heating the blue ink which is a mixture of water (volatile) and dye (non-volatile), the solvent water got evaporated from the watch glass leaving the solute, dye. The process involved is evaporation of water.

Q.7. What will be the residue left on the watch glass on heating blue ink in it?

Answer: The residue left on the watch glass is the solute, dye. Due to heating of the ink the water, solvent in the ink got evaporated leaving behind the dye, the solute.

Q.8. Is ink a pure substance or mixture? Give reason.

Answer: A pure substance is made of constituent particles that are the same in their chemical structure whereas mixtures consist of more than one kind of pure form of matter. Thus, ink is a mixture since it is made of two substances i.e. water (solute) and dye (solvent).

Q.9. Does blue ink consist of a single colour or more than one colour?

Answer: Blue ink consists of two or more colour. Separation of individual colour components can be done through the use of chromatography. In this technique, the component that is more soluble with the solvent moves faster as compared with the less soluble ones and as such gets separated.

Q.10. How is pure sugar obtained from sugar solution?

Answer: Pure sugar can be obtained from sugar solution by the process of crystallization. It involves heating which leads to evaporation of water to make the solution saturated. The saturated solution when left undisturbed convert to pure crystals of the sugar.

Q.11. What do you observe in the china dish during crystallization?

Answer: The process of crystallization involves dissolving the impure substance in a minimum amount of water in a china dish. It is followed by filtration of the same, and

finally evaporating the water to obtain the saturated solution. The saturated solution when left undisturbed convert to pure crystals of the substance. Thus, one observes crystals of pure substance in the china dish.

Q.12. Do the crystals look pure?

Answer: The crystals look similar and as such, they are pure since the impurity has already been removed in the filtration step where prior to evaporation the solution was filtered to remove any impurity.

Q.13. How will you separate the crystals from the liquid in china dish?

Answer: The solution obtained after dissolving the substance in a minimum amount of water is first filtered. Then, the water in the solution is evaporated to obtain a saturated solution. The solution is left undisturbed, covered with a filter paper to cool slowly, which leads to the formation of crystals of the substance.

Q.14. What is the need to heat solution?

Answer: During the process of crystallization the solution is heated after filtering it as heating evaporates the water that is used to dissolve the impure substance. It does coverts the unsaturated solution into a saturated one.

Q.15. Which method is mostly used for purification of solids?

Answer: Crystallization is the most commonly used method for the process of purification of solids. In this method, impure substances are dissolved in minimum amount of water and then filtered. The filtered solution is then heated to obtain a saturated solution. It is then cooled overnight to obtain crystals of the substance.

Q.16. Why is sodium a metal whereas carbon non-metal?

Answer: Sodium is a metal because it is a good conductor of electricity, malleable and ductile. It can lose electron easily from the valence shell whereas carbon is a bad conductor of electricity not lustrous or malleable. It does not lose electrons easily.

Q.17. What are the metalloids?

Answer: Metalloids are substances that show the properties of both metal and non-metal. Examples of metalloids include boron, silicon, germanium etc. They are situated between the metals and the nonmetals in the periodic table.

Q.18. What is meant by man-made elements?

Answer: Man-made elements are elements that do not occur naturally but are produced in the laboratory. There are 24 man-made elements that were synthesized in the

laboratory and find place in the periodic table. They are unstable and radioactive in nature. Examples include Dermstadtium, Technetium etc.

Q.19. Name one non-metal which is liquid.

Answer: Bromine is a nonmetal which is a liquid at room temperature. It is a red fuming brown liquid at room temperature. Its electrons are spread away from the nucleus and so it exists in the liquid state.

Q.20. Name a metal which is liquid.

Answer: Mercury is a metal which is liquid at room temperature. It has the lowest melting point among metals and as such is a liquid at room temperature. It is silvery white in colour.

Q.21. What is the difference between the smell of H_2S gas and H_2 gas?

Answer: Hydrogen gas is a colourless, odourless gas and is also combustible whereas hydrogen sulphide, H_2S is a colourless gas with the smell of rotten eggs. It is produced by bacteria.

Q.22. Give one example of each of the following:

(a) Aerosol

(b) Solution

Answer:

(a) Aerosol: Fog

Fog is an aerosol which has liquid as the disperged phase and gas as the dispersing medium.

(b) Solution: Lemonade water

In lemonade water, the sugar and the salt are evenly distributed giving rise to a homogeneous mixture of the same.

Q.23. Give the names of the elements present in the following compounds:

(a) Quick lime

(b) Hydrogen bromide

(c) Baking powder

(d) Potassium sulphate

Answer: (a) Quick lime: Quick lime is calcium oxide (CaO) and the elements present are calcium and oxygen.

(b) Hydrogen bromide: Hydrogen bromide (HBr) consists of elements hydrogen and bromine.

(c) Baking powder: Baking powder or sodium bicarbonate ($NaHCo_3$) consists of elements sodium, hydrogen, carbon and oxygen.

(d) Potassium sulphate: Potassium sulphate (K_2SO_4) consists of elements potassium, sulphur and oxygen.

Q.24. 10ml of H_2SO_4 is dissolved in 90 ml of water. Calculate mass by volume percentage of solution.

Answer:

Given:

Volume of H_2SO_4 = 10ml

Density of H_2SO_4 = 1.84 g/ml

Now, we know,

Mass = Density × Volume

= (10 ml × 1.84 g/ml) g

= 18.4g

Total volume of the solution= (10+90) ml

= 100ml

Mass by volume percentage $= \frac{\text{Mass of solution}}{\text{Volume of the solution}} \times 100$

$= \frac{18.4\text{ g} \times 100}{100\text{ ml}}\ \%$

= 18.4 %

Hence, the mass by volume percentage of the solution is **18.4 %**

Q.25. How are emulsions different from Gels? Give one example of each.

Answer: Emulsions are colloids where both dispersed phase and dispersing phase are liquid. In case of gels dispersed phase is liquid and dispersing medium is solid.

Example of emulsion is milk and example of gel is jelly.

Q.26. You are provided with soda water, milk and muddy water. How can you differentiate between them in terms of (i) Homogeneity (ii) Filtration (iii) Tyndall effect?

Answer: (**i) Homogeneity:** Soda water is a solution and as such it can be differentiated based on the property of homogeneity.

(ii) Filtration: Muddy water is a heterogeneous mixture and can be separated by filtration

(iii) Tyndall effect: Milk is a colloid and exhibits the property of Tyndall effect

Q.27. Which separation techniques will you apply for the separation of the following?

(a) The different pigments from an extract of flower petals

(b) Butter from curd

(c) Oil from water

(d) Tea leaves from tea

(e) Iron pins from sand

(f) Wheat grains from husk

(g) Fine mud particles floating in water.

Answer:

(a) The different pigments from an extract of flower petals: Chromatography can be applied for separation of the components from a mixture.

(b) Butter from curd: Centrifugation can be applied for the separation of butter from curd. The principle is that denser particles are forced to the bottom and lighter particles stay at the top.

(c) Oil from water: For separation of oil from water, the mixture is poured in a separating funnel and is let to stand undisturbed, the water and oils separate into layers the stop clock of the funnel is opened and water is poured out from the lower layer separating the two.

Since oil and water differ in their densities, they separate based on it.

(d) Tea leaves from tea: Filtration is the process used to separate tea leaves from tea.

(e) Iron pins from sand: Magnetic property of iron is used to separate iron pins from sand. Irons pins get attracted to the magnet and as such get separated from the sand.

(f) Wheat grains from husk: Wheat grains can be separated from husk by the process of winnowing.

(g) Fine mud particles floating in water: Centrifugation can be applied for separation of mud particles from water.

Q.28 A. Give any one point of difference between true solution, colloidal solution and suspension.

Answer:

True solution	Colloidal solution	Suspension
A true solution is a homogeneous mixture of particles that are smaller than 1 nm in diameter. The solute particles do not settle down when left undisturbed.	The particles of a colloid are uniformly spread throughout the solution. Due to their relatively small size the solution appears to be homogeneous. The particles do not settle when left undisturbed, Distinctive property is Tyndall effect.	A suspension is a heterogeneous mixture in which the solute particles do not dissolve but are suspended throughout the bulk of the medium. The particles settle down when left undisturbed hence are unstable.

Q.28 B. 20g of sodium chloride is dissolved in 100 mL of water. How will you test whether the given solution is saturated or unsaturated at the given temperature?

Answer: A solution is said to be saturated if it has with the maximum possible amount of solute that it can dissolve whereas a solution is said to be unsaturated if a solution contains less than the maximum amount of solute. Thus, to test if a solution is saturated or not, we need to add sodium chloride, if it dissolves then it is not saturated and if it does not dissolve then its unsaturated.

Q.28 C. Suggest any one method by which we can increase the solubility of saturated solutions.

Answer: The solubility of a saturated solution can be increased by increasing the temperature.

Q.29.

(a) List any three characteristics of colloid.

(b) Name the two components of a colloid.

(c) Identify colloid from the following mixtures:

Muddy water, sugar in water, ink, blood, soda water, foam

Answer:

(a) 1. Colloids are a heterogeneous mixture consisting of two phases dispersed phase and dispersing phase.

2. Its size is too small to be seen by the naked eye

3. But they are large enough to be scattering a beam of light and makes the path visible.

(b) A colloid is a mixture consisting of dispersed phase and dispersing phase.

(c) Foam is a colloid consisting of dispersed phase gas and dispersing medium solid.

Q.30 A. Enumerate any two differences between sample distillation and fractional distillation.

Answer:

Sample Distillation	Fractional Distillation
It is used for separation of components of mixture having sufficient difference in their boiling points	Used to separate a mixture of two or more miscible liquids which have a less than 25K of difference in their boiling point.
Acetone and water can be separated by use of sample distillation.	It is used to separate petroleum products.

Q.30 B. Draw a labelled diagram showing the process of fractional distillation.

Answer:

1. Fractional distillation is used to separate a mixture of two or more miscible liquids in which have a boiling point difference of less than 25K.

2. Fractional distillation is performed using a fractionating column.

3. Petroleum products are purified using fractional distillation and vapours condense at different temperatures.

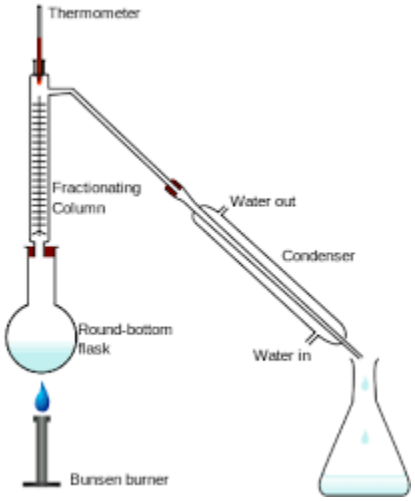

Fig: Fractional Distillation

Q.31 A. Calculate the mass of potassium sulphate required to prepare its 10% solution in 100 g of water.

Answer: Let x g be the mass of potassium sulphate.

We know that

Mass by mass percentage of a solution $= \frac{\text{Mass of the solute}}{\text{Mass of the solution}} \times 100$

$$\frac{10}{100} = \frac{x}{100 + x}$$

X=11.1g

Q.31 B. Differentiate between physical and chemical change. Give one example of each. Give one example where both physical and chemical change is taking place.

Answer:

Physical Change	Chemical Change
1. Change that occurs without a change in chemical composition. 2. No new substance is formed only the state changes 3. It is a temporary process. E.g. Change of state ice to water to gas	1. Chemical change brings difference in chemical properties. 2. New substances are formed. 3. It is a permanent process. E.g. Burning

Burning of candle exhibit both physical (melting of wax) and chemical (burning of candle) change.

Q.32 A. What volume of ethyl alcohol and water must be mixed together to prepare 250 ml of 60% volume by volume solution of alcohol in water?

Answer:

Mass by mass percentage of solution = $\frac{\text{Mass of the solute}}{\text{Mass of the solution}} \times 100$

$\frac{x}{250+x}$

X=187.5 g

Q.32 B. Mention any two differences between compounds and mixtures.

Answer:

Compounds	Mixtures
1. Compounds are composed of two or more elements combined in a fixed proportion 2. Properties of a compound are different from the element it contains	1. Mixtures are constituted by one or more substance without any fixed proportion. 2. Mixtures retain the properties of the individual substances

Q.32 C. Which separation technique will you apply for separating the following mixtures:

(i) Butter from curd.

(ii) Different pigments from extracts of flower petals

Answer:

(i) Butter from curd.

Centrifugation is the method of choice for separation of butter from curd. In this process the mixture is spun at a specific speed to differentiate the components. The principle is that denser particles are forced to the bottom and lighter particles stay at the top.

(ii) Different pigments from extracts of flower petals

Chromatography can be used for separation of pigments from extracts of plants. It is based on the difference in solubility of the pigments with the solute, which leads to differentiation.