## Short Answer Type Questions

**Q1.** Suggest separation technique(s) one would need to employ to separate the following mixtures.
(1) Mercury and water
(2) Potassium chloride and ammonium chloride
(3) Common salt, water and sand
(4) Kerosene oil, water and salt

**Answer:**

| S. No. | Mixture | Separation Technique |
|---|---|---|
| 1. | Mercury and water | Decantation |
| 2. | Potassium chloride and ammonium chloride | Sublimation |
| 3. | Common salt, water and sand | Filtration and evaporation |
| 4. | Kerosene oil, water and salt | Decantation and evaporation |

**Q2.** Which tubes in Fig. 2.1 (a) and (b) will be more effective as a condenser in the distillation apparatus?

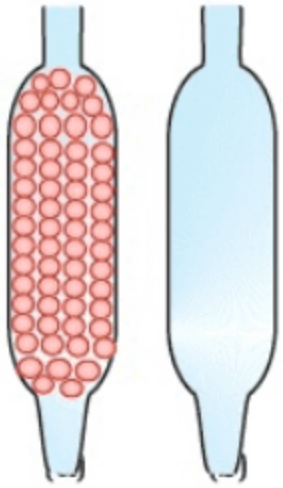


*Fig. 2.1*

**Answer:**

Tube (a) will benefit a condenser in the distillation apparatus. The marbles' presence increases the surface area that comes in contact with the vapours. This allows more time for condensation of steam, and hence the first column would be more valuable than the second column without marbles.

**Q3.** Salt can be recovered from its solution by evaporation. Suggest some other technique for the same?

**Answer:**

Crystallisation can be used to separate salt from its solution.
Crystallisation is a separation technique used to separate a solid in a solution. The solution is warmed in an open container, allowing the solvent to evaporate, leaving a saturated solution.

**Q4.** Seawater can be classified as a homogeneous and heterogeneous mixture. Comment.

**Answer:**

The seawater contains a mixture of salt and some other bigger size impurities and a mixture of several gases. Due to different bigger sizes of contaminants, seawater is classified as a heterogeneous mixture. In contrast, it is classified as a homogeneous mixture due to a combination of several gases and salt in seawater.

**Q5.** While diluting a solution of salt in water, a student added acetone (boiling point 56°C) by mistake. What technique can be employed to get back the acetone? Justify your choice.

**Answer:**

Distillation can be operated to get back the acetone. As acetone is more volatile, it will separate first.

**Q6.** What would you observe when
(a) a saturated solution of potassium prepared at 60°C is allowed to cool to room temperature.
(b) an aqueous sugar solution is heated to dryness.
(c) a mixture of iron filings and sulphur powder is heated strongly.

**Answer:**

(a) When a saturated solution of potassium chloride prepared at 60°C is allowed to cool at room temperature, it will form potassium chloride crystals.
(b) When the aqueous sugar solution is heated, the water will evaporate. When the solution is heated to dryness, the sugar will get charred.

(c ) When iron filings and sulphur powder are mixed and heated, they undergo a chemical reaction, and the ferrous sulphide (FeS) compound is formed with properties utterly different from its constituent.

**Q7.** Explain why particles of a colloidal solution do not settle down when left undisturbed, while they do in the case of a suspension.

**Answer:**

The size of colloidal particles is more petite than suspension. They continue to move in a zig-zag pattern, avoiding the gravitational force and do not settle down. However, because the suspended particles are more prominent, they settle down under gravity's influence.

**Q8.** Smoke and fog both are aerosols. In what way are they different?

**Answer:**

The dispersion medium is identical to smoke and fog, i.e., air, but they differ in the dispersed phase. In smoke, solid carbon particles are dispersed in the air, while in fog, liquid water particles are dispersed in the air.

**Q9.** Classify the following as physical or chemical properties
(a) The composition of a steel sample is 98% iron, 1.5% carbon and 0.5% other elements.
(b) Zinc dissolves in hydrochloric acid with the evolution of hydrogen gas.
(c) Metallic sodium is soft enough to be cut with a knife.
(d) Most metal oxides form alkalis on interacting with water.

**Answer:**

(a) The composition of a steel sample is 98% iron, 1.5% carbon and 0.5% other elements is a physical property as no new compound is formed because steel is an alloy. The alloy is a homogeneous mixture of two or more metals or non-metallic elements.
(b) Zinc dissolves in hydrochloric acid with the evolution of hydrogen gas is a chemical property. A chemical reaction between zinc and hydrochloric acid occurs with the evolution of hydrogen gas, and a zinc chloride compound is formed.
$Zn\ (s) + 2\ HCl\ (dil) \rightarrow ZnCl_2\ (aq) + H_2\ (g)$
(c) Metallic sodium is soft enough to be cut with a knife is physical property because cutting with a knife does not form a new substance.
(d) Most metal oxides form alkalis on interacting with water is chemical property as the new compound is formed by metal oxide and water reaction.

**Q10.** The teacher instructed three students, 'A', 'B' and C', respectively, to prepare a 50% (mass by volume) sodium hydroxide (NaOH) solution. 'A' dissolved 50g of NaOH in 100 mL of water, 'B' dissolved 50g of NaH in 100g of water while C' dissolved 50g of NaOH in water to make 100 mL of solution. Which one of them has made the desired solution and why?

**Answer:**

Student C has made the desired solution.
Students A and B prepare 150 ml solution, so student C makes the desired solution because he adds water to make 100 ml solution.

**Q11.** Name the process associated with the following
(a) Dry ice is kept at room temperature and at one atmospheric pressure.
(b) A drop of ink placed on the water's surface contained in a glass spreads throughout the water.
(c) A potassium permanganate crystal is in a beaker and water is poured into the beaker with stirring.
(d) An acetone bottle is left open and the bottle becomes empty.
(e) Milk is churned to separate cream from it.
(f) Settling of sand when a mixture of sand and water is left undisturbed for some time.
(g) A fine beam of light entering through a small hole in a dark room illuminates the particles in its paths.

**Answer:**

| S. No. | Method | Process |
|---|---|---|
| 1. | Dry ice is kept at room temperature and at one atmospheric pressure. | Sublimation |
| 2. | A drop of ink placed on the water's surface contained in a glass spreads throughout the water. | Diffusion |
| 3. | A potassium permanganate crystal is in a beaker, and water is poured into the beaker with stirring. | Diffusion |
| 4. | An acetone bottle is left open, and the bottle becomes empty. | Evaporation |
| 5. | Milk is churned to separate cream from it. | Centrifugation |
| 6. | Settling of sand when a mixture of sand and water is left undisturbed for some time. | Sedimentation |

| | | |
|---|---|---|
| 7. | A fine beam of light entering through a small hole in a dark room illuminates the particles in its paths. | Tyndall effect |

**Q12.** You are given two water samples labelled as 'A' and 'B'. Sample 'A' boils at 100°C, and sample "B' boils at 102°C. Which sample of the water will not freeze at 0°C? Comment.

**Answer:**

The boiling point is 100°C at 1 atm pressure for pure water, and the melting point is 0°C at 1 atm pressure. If the water has some impurities, the boiling point is raised, and the melting point is lowered. If some salt is added boiling point is raised by 2°C, and the melting point is lowered.
Thus, sample B will not freeze at 0°C.

**Q13.** What are the favourable qualities given to gold when it is alloyed with copper or silver to make omaments?

**Answer:**

Pure gold is very soft. It is alloyed with silver or copper to impart strength to make ornaments. An alloy that contains 20 parts of gold and 4 parts of silver is used to make ornaments.

**Q14.** An element is sonorous and highly ductile. Under which category would you classify this element? What other characteristics do you expect the element to possess?

**Answer:**

A metal is sonorous and ductile. Thus if an element possesses these qualities, we will keep this under the category of metals.
Some other characteristics of metals are as follows:

- Metals are highly malleable.
- Metals have a high melting and boiling point.
- Metals are lustrous.
- Metals have a high density and thus are hard.
- Metals are a good conductor of heat and electricity.

**Q15.** Give an example of each mixture having the following features. Suggest a suitable method to separate the components of these mixtures
(a) A volatile and a non-volatile component.
(b) Two volatile components with an appreciable difference in boiling points.

(c) Two immiscible liquids.
(d) One of the components changes directly from solid to gaseous state.
(e) Two or more coloured constituents were soluble in some solvent.

**Answer:**

(a) An example of a volatile and a non-volatile component is a mixture of acetone and water. It can be separated by distillation.
(b) An example of two volatile components with an appreciable difference in boiling points is a mixture of petrol and kerosene. It can be separated by distillation.
(c) An example of two immiscible liquids is a mixture of oil and water. It can be separated by fractional distillation.
(d) An example of one of the components that change directly from solid to gaseous state is a mixture of naphthalene and ammonium chloride. We can separate naphthalene by filtration and ammonium chloride from water by evaporation.
(e) An example of two or more coloured constituents were soluble in some solvent is a mixture of pigments from a flower petal extract. It can be separated by chromatography.

**Q16.** Fill in the blanks
(a) A colloid is a ____ mixture whose components can be separated by the technique known as _____.
(b) Ice, water and water vapour look different and display different _____ properties but are _____ the same.
(c) A mixture of chloroform and water is taken in a separating funnel is mixed and left undisturbed for some time. The upper layer in the separating funnel will be of _____, and the lower layer will be that of _____.
(d) A mixture of two or more miscible liquids, for which the difference in the boiling points is less than 25 K, can be separated by the process called _____.
(e) When light is passed through water containing a few drops of milk, it shows a bluish tinge. This is due to the ____ of light by milk, and the phenomenon is called _____. This indicates that milk is a _____ solution.

**Answer:**

(a) A colloid is a heterogeneous mixture, and its components can be separated by the technique known as centrifugation.
(b) Ice, water and water vapour look different and display different physical properties but are chemically the same.
(c) A mixture of chloroform and water is taken in a separating funnel is mixed and left undisturbed for some time. The upper layer in the separating funnel will be water, and the lower layer will be that of chloroform.

(d) A mixture of two or more miscible liquids, for which the difference in the boiling points is less than 25 K, can be separated by the process called fractional distillation.
(e) When light is passed through water containing a few drops of milk, it shows a bluish tinge. This is due to the scattering of light by milk, and the phenomenon is called the Tyndall effect. This indicates that milk is a colloidal solution.

**Q17.** Sucrose (sugar) crystals obtained from sugarcane and beétroot are mixed together. Will it be a pure substance or a mixture? Give reasons for the same.

**Answer:**

It is a pure substance as the chemical composition of sugar crystals emanated from sugarcane and beetroot will remain the same.

**Q18.** Give some examples of Tyndall effect observed in your surroundings?

**Answer:**

An example of the Tyndall effect we observe in our surroundings is the visible beam of headlights in fog. Scattering by the water droplets making the headlight beams visible is also an example of the Tyndall effect. Milk is a colloid that also exhibits the Tyndall effect.

**Q19.** Can we separate alcohol dissolved in water by using a separating funnel? If yes, then describe the procedure. If not, explain.

**Answer:**

Water and alcohol are miscible liquids. Hence, we cannot use a separating funnel to separate them from their mixture.

**Q20.** On heating, calcium carbonate gets converted into calcium oxide and carbon dioxide.
(a) Is this a physical or a chemical change?
(b) Can you prepare one acidic and one basic solution by using the products formed in the above process? If so, write the chemical equation involved.

**Answer:**

(a) Heating calcium carbonate to get calcium oxide and carbon dioxide is a chemical change because a new substance with different compositions and properties is formed.
$CaCO_3 \rightarrow CaO + CO_2$
(b) We can prepare acidic and basic solutions by dissolving the products of the above process in water.

When CaO is dissolved in water, it forms calcium hydroxide, a basic solution.
$CaO + H_2O \rightarrow Ca(OH)_2$
When $CO_2$ (g) is dissolved in water, it forms carbonic acid, an acidic solution.
$CO_2 + H_2O \rightarrow H_2CO_3$

**Q21.** Non-metals are usually poor conductors of heat and electricity. They are non-lustrous, non-sonorous, non-malleable and are coloured.
(a) Name a lustrous non-metal.
(b) Name a non-metal which exists as a liquid at room temperature.
(c) The allotropic form of a non-metal is a good conductor of electricity. Name the allotrope.
(d) Name a non-metal which is known to form the largest number of compounds.
(e) Name a non-metal other than carbon which shows allotropy.
(f) Name a non-metal which is required for combustion.

**Answer:**

| S. No. | Property | Name of the Nonmetal |
|---|---|---|
| 1. | Lustrous non-metal | Iodine |
| 2. | Non-metal, which exists as a liquid at room temperature. | Bromine |
| 3. | The allotropic form of a non-metal is a good conductor of electricity. | Graphite |
| 4. | Non-metal, which is known to form the largest number of compounds | Carbon |
| 5. | Non-metal other than carbon which shows allotropy | Sulphur and Phosphorous |
| 6. | Non-metal, which is required for combustion | Oxygen |

**Q22.** Classify the substances given in Fig. 2.2 into elements and compounds

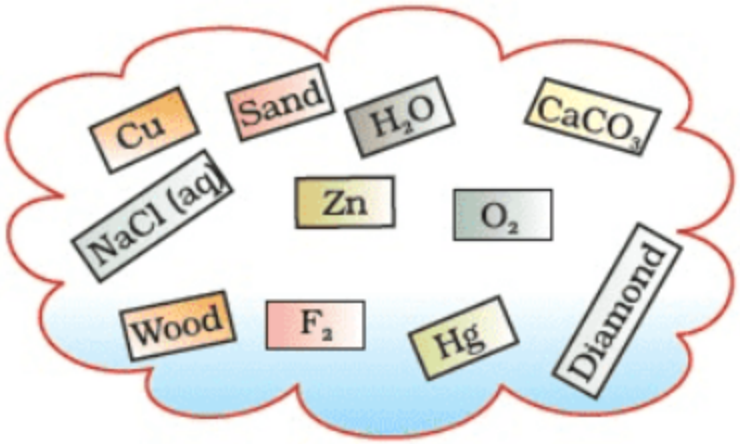



*Fig. 2.2*

**Answer:**

| S. No. | Elements | Compounds |
|---|---|---|
| 1. | Zn | NaCl (aq) |
| 2. | $O_2$ | Wood |
| 3. | $F_2$ | Sand |
| 4. | Hg | $H_2O$ |
| 5. | Diamond | $CaCO_3$ |
| 6. | Cu | |

**Q23.** Which of the following are not compounds?
(a) Chlorine gas
(b) Potassium chloride
(c) Iron
(d) Iron sulphide
(e) Aluminium
(f) Iodine
(g) Carbon
(h) Carbon monoxide

(i) Sulphur powder

**Answer:**

Chlorine gas, Iron, Aluminium, Iodine, Carbon, and Sulphur powder are not compounds.

## Long Answer Type Questions

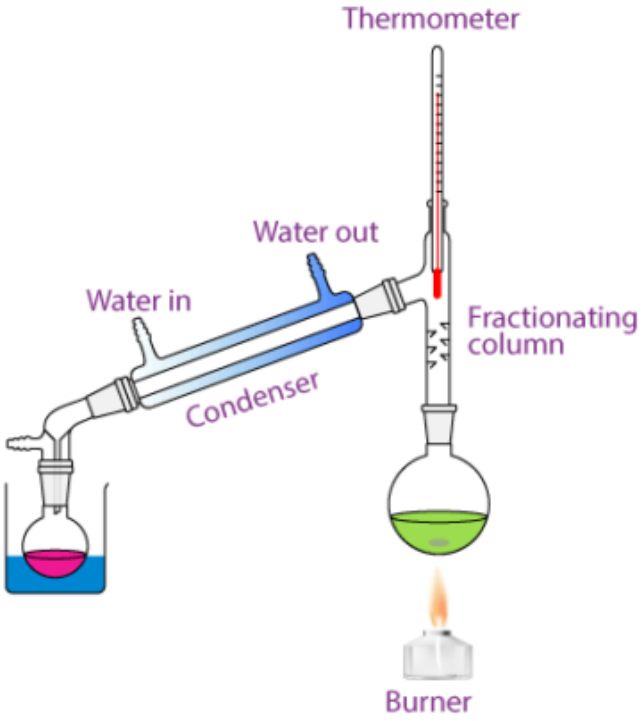
**Q1.** Fractional distillation is suitable for separating miscible liquids with a boiling point difference of about 25 K or less. What part of the fractional distillation apparatus makes it efficient and possesses an advantage over a simple distillation process. Explain using a diagram.

**Answer:**

The fractionating column is the most critical part of the fractional distillation apparatus. It has glass beads in it.
It helps to obstruct the upward movement of the vapours of the two liquids. The steam of high boiling liquid gets condensed earlier. The energy (latent heat) released helps take the vapours of low boiling liquid to a height in the fractionating column. The advantages of fractional distillation over ordinary distillation are enlisted below.

- This process can separate the liquids with a less than 25 K boiling point difference.
- During the procedure, both evaporation and condensation co-occur.
- Mixtures (like petroleum) can also be separated by the fractional distillation process, containing many components.

## FRACTIONAL DISTILLATION




**Q2.** (a) Under which category of mixtures will you classify alloys and why?
(b) A solution is always a liquid. Comment.
(c) Can a solution be heterogeneous?

**Answer:**

(a) We can classify alloys under homogenous mixtures because alloys are made up of a concrete combination of metals.
(b) No, solutions are not always liquid. They can be solid or even gas.
Example: Alloy is a solid solution, and Air is a gas solution example.
(c ) No, a solution can not be heterogenous because heterogeneous mixtures have no specific composition, but a solution has a fixed composition. The solution can only be colloids or suspensions.

**Q3.** Iron filings and sulphur were mixed together and divided into two parts, 'A' and 'B'. Part 'A' was heated strongly while Part 'B' was not heated. Dilute hydrochloric acid was added to both the Parts and the evolution of gas was seen in both the cases. How will you identify the gases evolved?

**Answer:**

**Part A:**
When iron filings and sulphur powder are mixed and heated, they undergo a chemical reaction and form ferrous sulphide (FeS) with properties entirely different from its constituent.
$Fe + S \rightarrow FeS$
When HCl is added to this mixture, ferric chloride is produced, and Hydrogen Sulphide gas is produced.

- The foul rotten egg smell of Hydrogen sulphide is the indicator of $H_2S$ production.

**Part B:**
When dilute HCl is added to setup B, Hydrogen gas is evolved, and sulphur does not take part in the reaction.

- When a burning match stick is brought near the evolved gas, the matchstick burns with a pop. It is the indication of Hydrogen gas liberation.

**Q4.** A child wanted to separate the mixture of dyes constituting an ink sample. He marked a line by the ink on the filter paper and placed the filter paper in a glass containing water, as shown in Fig. 2.3. The filter paper was removed when the water moved near the top of the filter paper.

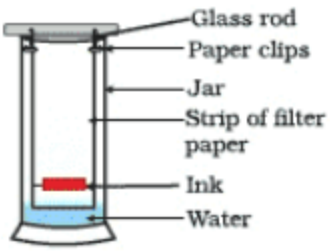


*Fig. 2.3*

(i) What would you expect to see if the ink contains three different coloured components?
(ii) Name the technique used by the child.
(iii) Suggest one more application of this technique.

**Answer:**

(a) If the ink contains three different coloured components, we see spots of different colours at different heights on the filter paper. The most soluble part appears in the highest position, the less soluble part appears in the middle part, and the least soluble part appears at the lowest on the chromatograph.
(b) The child uses the chromatography method.
(c) This technique is also used to separate and identify amino acids obtained by hydrolysis of blood.

**Q5.** A group of students took an old shoe box and covered it with a black paper from all sides. They fixed a source of light (a torch) at one end of the box by making a hole in it and made another hole on the other side to view the light. They placed a milk sample contained in a beaker/tumbler in the box as

shown in the Fig.2.4. They were amazed to see that milk taken in the tumbler was illuminated. They tried the same activity by taking a salt solution but found that light simply passed through it?

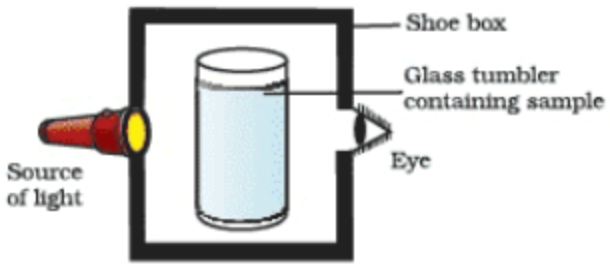



*Fig. 2.4*

(a) Explain why the milk sample was illuminated. Name the phenomenon involved.
(b) The same results were not observed with a salt solution. Explain.
(c) Can you suggest two more solutions which would show the same effect as shown by the milk solution?

**Answer:**

(a) Tyndall effect phenomenon is involved. Milk is a colloidal substance. In milk, particulate matter makes the light scatter, which results in the Tyndall effect.
(b) Saltwater is a homogenous solution. It has small particles that do not scatter light rays; hence there will be no Tyndall effect. Thus, light is not illuminated.
(c) Detergent solution and sulphur solution also exhibit the Tyndall effect like milk.

**Q6.** Classify each of the following, as a physical or a chemical change. Give reasons.
(a) Drying of a shirt in the sun.
(b) Rising of hot air over a radiator.
(c) Burning of kerosene in a lantern.
(d) Change the colour of black tea by adding lemon juice to it.
(e) Churning of milk cream to get butter.

**Answer:**

(a) Drying a shirt in the sun is a physical change because no reaction or new product is formed while drying.
(b) The rising of hot air over a radiator is a physical change because the water in a radiator converts to steam. Thus, hot air becomes lighter and rises. No new product is formed while rising. Thus it is a physical change.

(c) The burning of kerosene in a lantern is a chemical change because it uses atmospheric oxygen and liberates carbon dioxide.
(d) Changing the colour of black tea by adding lemon juice is a chemical change because lemon juice is a source of ascorbic acid, which reacts with Flavin antioxidants present in black tea to change the colour of the tea.
(e) Churning milk cream to get butter is a physical change because centrifugation's principal principle turns the milk cream into butter.

**Q7.** The students were asked to prepare a 10% (Mass / Mass) sugar solution in water during an experiment. Ramesh dissolved 10 g of sugar in 100 g of water while Sarika prepared it by dissolving 10 g of sugar in water to make 100 g of the solution.
(a) Are the two solutions of the same concentration
(b) Compare the mass % of the two solutions.

**Answer:**

(a) No, the two solutions are not of the same concentration.
(b) Comparison of the mass % of the two solutions
Mass Percent = Mass of Solute X 100 / (Mass of Solute + Mass of Solvent)
The solution made by Ramesh-
Mass Percent = 10 X 100 / (100+10)
Mass Percent = 1000 / 110
Mass Percent = 9.09%
The solution made by Sarika-
Mass Percent = 10 X 100 / 100
Mass Percent = 1000 / 100
Mass Percent = 10%
∴ Both have different concentrations.

**Q8.** You are provided with a mixture containing sand, iron filings, ammonium chloride and sodium chloride. Describe the procedures you would use to separate these constituents from the mixture?

**Answer:**

We can separate a mixture containing sand, iron filings, ammonium chloride and sodium chloride by the following methods.
Method 1: Separating iron filings with the help of a magnet by rolling them over the mixture.
Method 2: Sublimation of the leftover mixture separates ammonium chloride.
Method 3: Adding water to the remaining mixture, stirring and filtering out sand by filtration.
Method 4: Filtrate is evaporated to get sodium chloride back.

**Q9.** Arun has prepared a 0.01 % (by mass) sodium chloride solution in water. Which of the following correctly represents the composition of the solutions?
(a) 1.00 g of NaCl + 100g of water
(b) 0.11g of NaCl + 100g of water
(c) 0.01 g of NaCl + 99.99g of water
(d) 0.10 g of NaCl + 99.90g of water

**Answer:**

(c ) 0.01 g of NaCl + 99.99g of water is the correct representation of 0.01 % (by mass) sodium chloride solution in water.

**Q10.** Calculate the mass of sodium sulphate required to prepare its 20 % (mass per cent) solution in 100g of water?

**Answer:**

Let the mass of sodium sulphate be x g.
Then, the solution mass will be (x + 100) g.
x g of solute is present in (x + 100) g of solution.
Mass Percent = 20 %
Mass Percent = Mass of Solute X 100 / (Mass of Solute + Mass of Solvent)
20 % = x X 100 / (x + 100)
20 X (x + 100) = 100x
20x + 2000 = 100x
80x = 2000
x = 2000 / 80
x = 25 g.

## CBSE Class 9 Science Chapter 2 Extra Questions

**Q1.** What are the solute and solvent in the tincture of iodine?

**Answer:**

Iodine is solute, and alcohol is the solvent in the tincture of iodine.

**Q2.** Give three properties of colloid. Differentiate between a true solution and a colloid.

**Answer:**

Properties of colloids:

- Colloids are relatively stable in nature.
- Colloids require ultrafilters for filtration.
- Colloids appears to be homogenous but are heterogeneous in nature.

Difference between true solution and colloid

| S. No. | True Solution | Colloid |
|---|---|---|
| | **A true solution is a homogenous mixture of two or more substances.** | **A colloidal solution is a heterogeneous mixture of two or more substances.** |
| | **It is transparent.** | **It is translucent.** |
| | **The size of the particles is less than 1 nm.** | **The size of the particles ranges from 1 nm to 100 nm.** |
| | **Filter paper can't separate true solutions.** | **Filter papers with minute holes can filter colloidal solution.** |
| | **Particles do not settle down at the bottom.** | **Particles can settle down at the bottom by centrifugation.** |
| | **Particles are invisible to naked eyes and powerful microscopes.** | **Particles are invisible to naked eyes but are visible under powerful microscopes.** |
| | **The Brownian effect can not be observed in a true solution.** | **The Brownian effect can be observed in a colloidal solution.** |
| | **Example: Sugar Water** | **Example: Milk** |

**Q3.** What do you observe when an aqueous sugar solution is heated to dryness?

**Answer:**

When the aqueous sugar solution is heated, the water will evaporate. When the solution is heated to dryness, the sugar will get charred.