MULTIPLE-CHOICE QUESTIONS

1. Which of the following statements is true for pure substances?

(i) Pure substances contain only one kind of particles

(ii) Pure substances may be compounds or mixtures

(iii) Pure substances have the same composition throughout

(iv) Pure substances can be exemplified by all elements other than nickel

(a) (i) and (ii)

(b) (i) and (iii)

(c) (iii) and (iv)

(d) (ii) and (iii)

Solution:

The answer is b) (i) and (iii)

2. Rusting of an article made up of iron is called

(a) corrosion, and it is a physical as well as chemical change

(b) dissolution, and it is a physical change

(c) corrosion, and it is a chemical change

d) dissolution, and it is a chemical change

Solution:

The answer is c) corrosion, and it is a chemical change.

Explanation :

Rusting of iron is corrosion, and it's a chemical change because rust is a chemical compound called hydrated iron oxide Fe_2O_3. nH_2O, iron(III), which is different from elemental iron.

Physical changes are those changes in which substance identity is not changed, and it can get back to its original form. For example, water freezing to ice can be melted back to waste, whereas chemical changes are those in which the original substance identity is changed, and they cannot be restored to their original form.

On adding solid solutes to the solvent, some solute dissolves, and their concentration increases in the solution. This process is known as dissolution.

Crystallisation is a process in which solute particles in a solution collide with the solid solute particles to get separated out of the solution.

3. A mixture of sulphur and carbon disulphide is

(a) heterogeneous and shows the Tyndall effect

(b) homogeneous and shows the Tyndall effect

(c) heterogeneous and does not show the Tyndall effect

(d) homogeneous and does not show the Tyndall effect

Solution:

The answer is a) heterogeneous and shows the Tyndall effect.

Explanation:

A mixture of sulphur and carbon disulphide is a heterogeneous colloid and shows the Tyndall effect because, in a colloidal solution, the particles are big enough to scatter light. The scattering of light by colloidal particles is known as the Tyndall effect. Colloids are actually heterogeneous in nature though they appear to be homogeneous.

4. Tincture of iodine has antiseptic properties. This solution is made by dissolving

(a) iodine in potassium iodide

(b) iodine in vaseline

(c) iodine in water

(d) iodine in alcohol

Solution:

The answer is (d) iodine in alcohol

Explanation:

The tincture is prepared by using 2-7% elemental iodine and either potassium iodide or sodium dissolved in alcohol. Since alcohol is a good solvent and iodine does not dissolve in water answer should be alcohol.

5. Which of the following are homogeneous in nature?

(i) ice

(ii) wood

(iii) soil

(iv) air

a. (i) and (iii)

b. (ii) and (iv)

c. (i) and (iv)

d. (iii) and (iv)

Solution:

The answer is (c) (i) and (iv)

Explanation

Air and ice are homogeneous mixtures because their elements are not visible and cannot be distinguished from one another.

6. Which of the following are physical changes?

(i) Melting of iron metal

(ii) Rusting of iron

(iii) Bending of an iron rod

(iv) Drawing a wire of iron metal

(a) (i), (ii) and (iii)

(b) (i), (ii) and (iv)

(c) (i), (iii) and (iv)

(d) (ii), (iii) and (iv)

Solution:

The answer is (c) (i), (iii) and (iv)

Explanation

Rusting of iron is a chemical process where iron reacts with water and oxygen to produce iron oxide, whereas other processes are physical changes.

7. Which of the following are chemical changes?

(i) Decaying of wood

(ii) Burning of wood

(iii) Sawing of wood

(iv) Hammering of a nail into a piece of wood

(a) (i) and (ii)

(b) (ii) and (iii)

(c) (iii) and (iv)

(d) (i) and (iv)

Solution:

The answer is (a) (i) and (ii)

Explanation

Decaying of wood and burning of wood, because there will be a change of chemical composition and wood cannot be restored to its original form.

Sawing of wood and hammering of nails into a piece of wood are physical processes where the chemical composition of compounds is not changed.

8. Two substances, A and B, were made to react to form a third substance, A_2B, according to the following reaction $2A + B \rightarrow A_2B$. Which of the following statements concerning this reaction are incorrect?

(i) The product A_2B shows the properties of substances A and B

(ii) The product will always have a fixed composition

(iii) The product so formed cannot be classified as a compound

(iv) The product so formed is an element

(a) (i), (ii) and (iii),

(b) (ii), (iii) and (iv)

(c) (i), (iii) and (iv)

(d) (ii), (iii) and (iv)

Solution:

The answer is (c) (i), (iii) and (iv)

Explanation:

A_2B is a compound made up of two elements, A and B, in a fixed ratio. The properties of a compound (For example, A_2B) are entirely different from those of its constituent elements (i,e.g A and B). The composition of a compound is fixed.

9. Two chemical species, X and Y, combine together to form a product P which contains both X and Y X + Y → P. X and Y cannot be broken down into simpler substances by simple chemical reactions. Which of the following concerning the species X, Y and P are correct?

(i) P is a compound

(ii) X and Y are compounds

(iii) X and Y are elements

(iv) P has a fixed composition

(a) (i), (ii) and (iii),

(b) (i), (ii) and (iv)

(c) (ii), (iii) and (iv)

(d) (i), (iii) and (iv)

Solution:

The answer is (d) (i), (iii) and (iv)

Here, X and Y cannot be further broken down into simpler substances. Hence, X and Y are elements, and P can be broken down into its elements, P is a compound with a fixed composition.

SHORT ANSWER QUESTIONS

10. Suggest separation technique(s) one would need to employ to separate the following mixtures.

(a) Mercury and water

(b) Potassium chloride and ammonium chloride

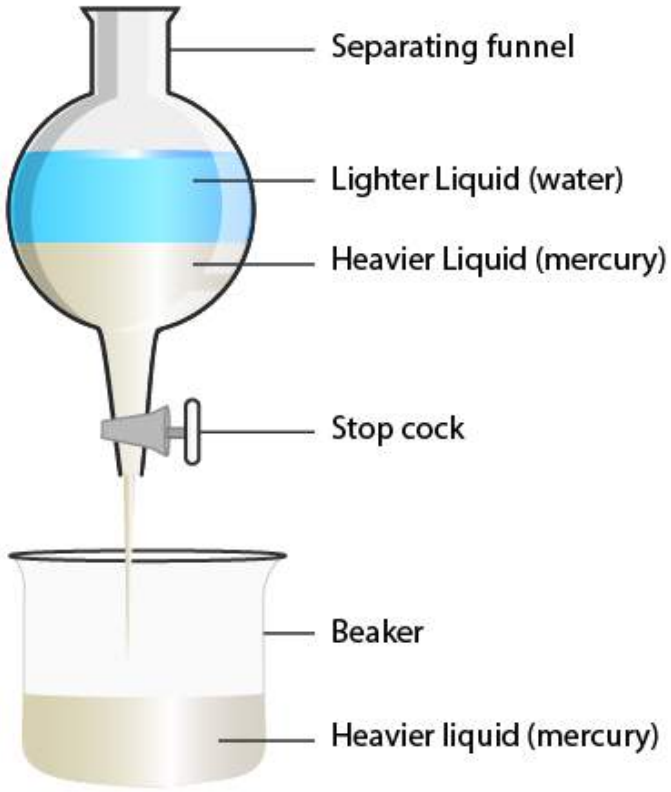
(c) Common salt, water and sand

(d) Kerosene oil, water and salt

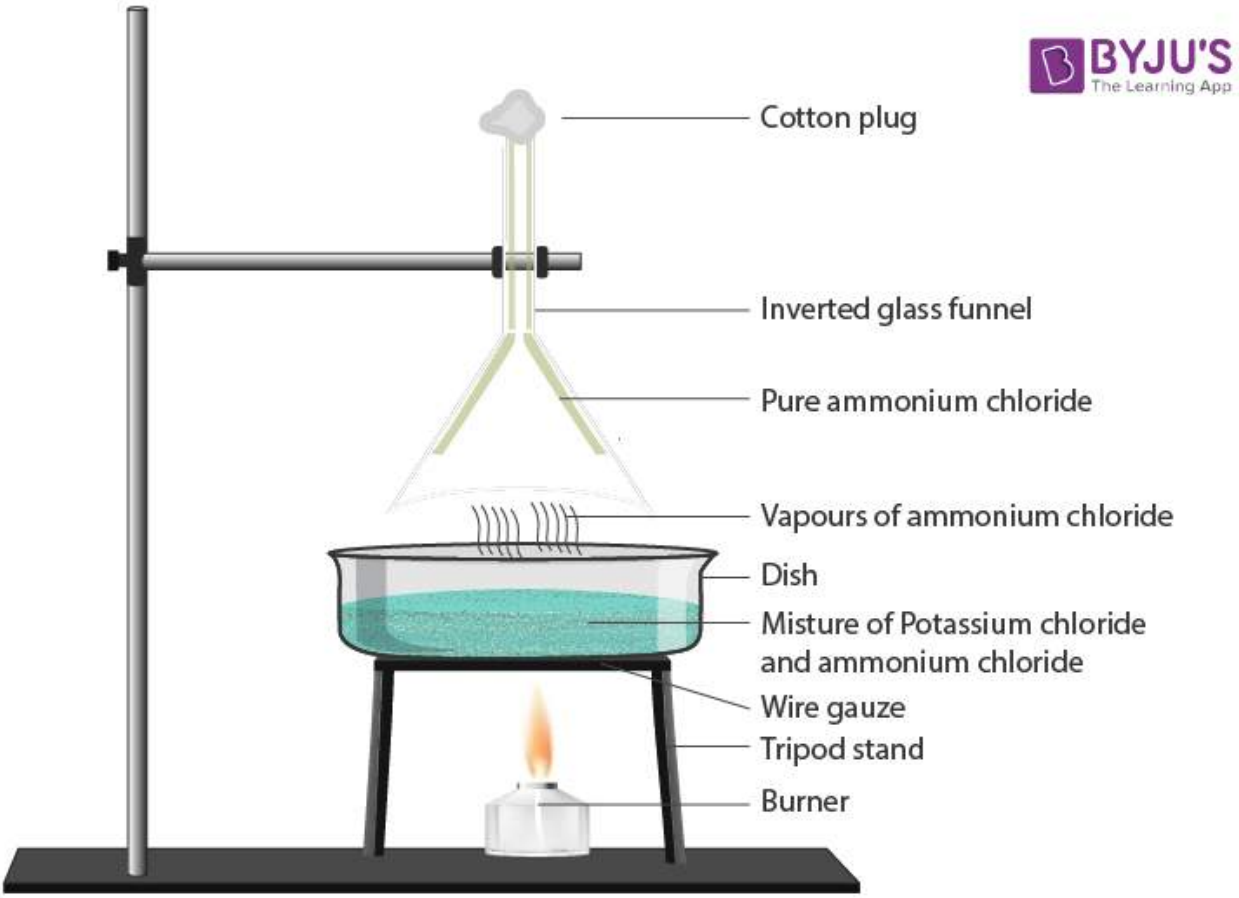
Solution:

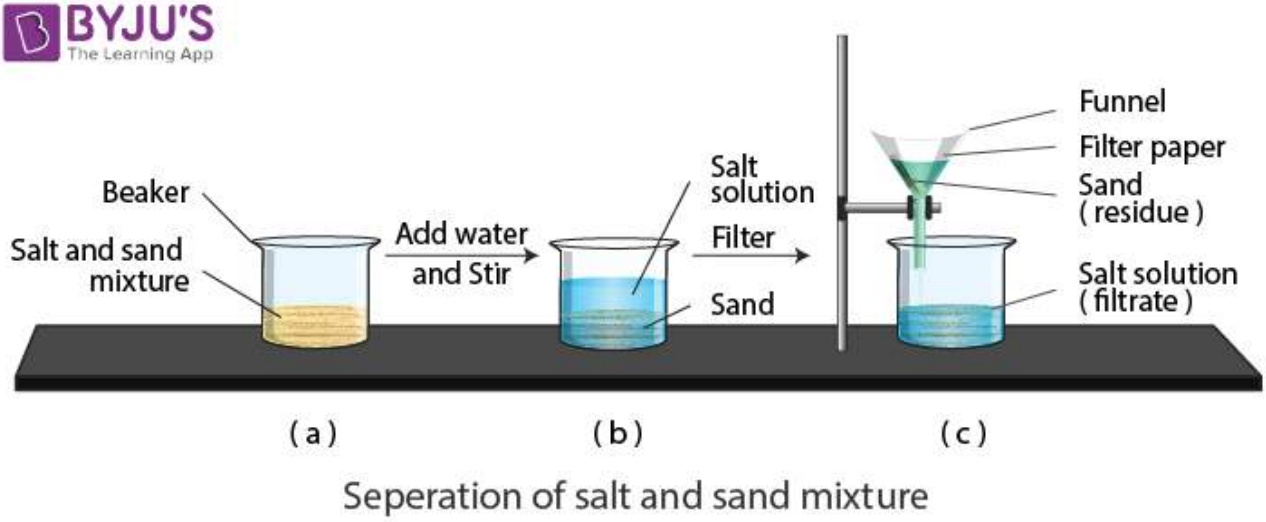
Answers are a) decantation, b) Sublimation, c) Filtration and evaporation, d) decantation and evaporation

Explanation
a) Decantation method is used to separate the mixture of Mercury and water. Here Mercury is heavier than water hence it forms a separate layer which can be easily separated in a separating funnel.



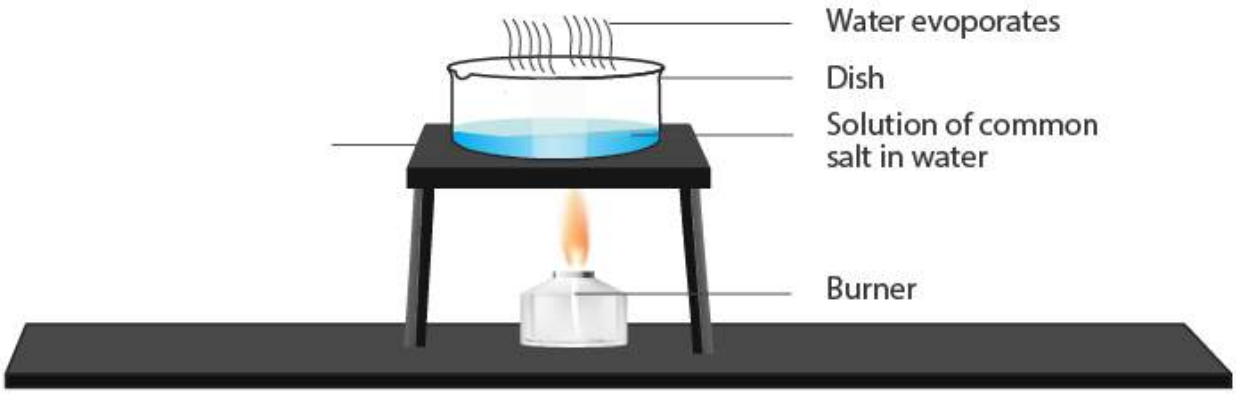
b) Potassium chloride and ammonium chloride are separated by sublimation method because ammonium chloride is a sublimate, sublimes leaving behind the potassium chloride.





Seperation of salt and sand mixture

c) Common salt, water and sand are separated by filtration and evaporation processes. Common salt, water and sand are filtrated to separate the sand from the salt solution. Then, salt solution is heated to evaporate the water leaving behind salt.

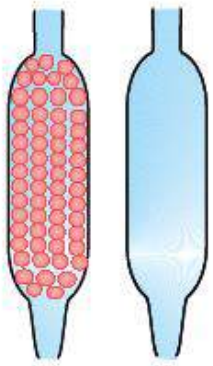


Seperation of common salt dissolved in water by evoporation

(d) Kerosene is separated from salt solution in water by decantation using a separating funnel. Kerosene being heavier, forms a separate layer. Salt from water is further removed by evaporation.

11. Which of the tubes in Fig. 2.1

(a) and (b) will be more effective as a condenser in the distillation apparatus?



Solution:

The answer is: tube (a)

Explanation

Beads in tube A provide an increased surface area for cooling of the vapours that come in contact with them. Hence, it is a good condenser.

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

Solution:

Answer is crystallization

Explanation:

Salt can be recovered from its solution by crystallization. Crystallization is a more efficient process as it removes soluble impurities, which cannot be done by evaporation.

13. The 'seawater' can be classified as a homogeneous as well as heterogeneous mixture. Comment.

Soln

If we consider the seawater on the surface, it comprises water and salts hence it is a homogenous mixture. If we consider the seawater from the deep sea, it consists of salts, water, mud, decayed plants etc, which will be a heterogeneous mixture.

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

Solution:

Fractional Distillation can be used to separate acetone from the mixture of salt and water.

Explanation

There are considerable differences in the boiling points of acetone (56°C) and water (100°C). When the solution is heated, acetone evaporates first. The water is collected in the distillation flask. The vapours of acetone are then condensed to obtain acetone.

15. What would you observe when

(a) a saturated solution of potassium chloride 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?

Solution:

a) Sodium potassium chloride will separate from the saturated solution when the temperature of the solution is reduced from 60°C to room temperature. The solubility of the solid state is affected by the change in temperature.
b) When aqueous sugar solution is heated, first water gets evaporated up to some extent then sugar gets charred.
c) Iron combines with sulphur and forms iron sulphide (FES).

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

Solution:

The size of the particles in suspension is relatively larger than the size of the particles in a solution. Moreover, in suspension, molecular interaction is weaker to keep the molecules in suspended form. Hence the particles settle down. Similarly, in colloidal solution, molecular interaction is strong hence they remain in suspended form.

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

Solution:

Both smoke and fog have gas as the dispersion medium (continuous phase). But the difference lies in the dispersed phase. The dispersed phase in fog is liquid, whereas, in smoke, it is solid (particulate matter).

18. Classify the following as physical or chemical properties:

(a) The composition of a sample of steel 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.

Solution:

Answers: Physical properties are a) and c). Chemical properties are b) and d)

Explanation

a) Composition of a sample of steel is 98% iron, 1.5% carbon and 0.5% other elements. It is a chemical property because no new compound is formed as steel is an alloy and alloy and is a homogeneous mixture of two or more metals or of metallic elements with non-metallic elements.

b) It is a chemical property because zinc reacts with HCL to give out zinc chloride and hydrogen gas.

c) The cutting knife will not involve any chemical reaction and did not form a new compound hence it is a physical property.

d) It is chemical property as the new compound is formed by the interaction of metal oxides with alkalis.

19. The teacher instructed three students, 'A', 'B' and 'C', respectively, to prepare a 50% (mass by volume) solution of sodium hydroxide (NaOH). 'A' dissolved 50g of NaOH in 100 mL of water, 'B' dissolved 50g of NaOH 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?

Solution:

The answer is student C because both B and A have made the solution of 150 ml, whereas student C prepared the required quantity.

Explanation

Students A and B prepared 150 ml solution, so student c made the desired solution because he added water to make 100 ml solution and from the calculation,

%w/v = 100 × weight of sub (solute)

volume of solution

∴ %50 = 100 × weight of sub / 100 ml

weight of sub = 50 ×100 ml / 100

∴ weight of sub = 50 g

Here the 50g NaOH required for 50% w/v 100ml solution of NaOH

20. 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 surface of water 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) Fine beam of light entering through a small hole in a dark room illuminates the particles in its paths

Solution:

Answers a) sublimation

b) Diffusion

c) Dissolution/ diffusion

d) Evaporation

e) Centrifugation

f) Sedimentation

g) Tyndall effect (Scattering of light)

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

Solution:

The answer is sample B

Explanation

Sample B may consist of impurities. At 1 atm, the boiling point of water is 100°C and the freezing point is 0°C. Hence sample B, which will not boil at 102°C, will not freeze at 0°C.

22. What are the favourable qualities given to gold when it is alloyed with copper or silver for the purpose of making ornaments?

Solution:

Pure gold (24 karats) is soft and does not have strength. In order to give strength to gold, silver and copper are alloyed to gold. An alloy that has 20 parts of gold and 4 parts of silver is known as 24-karat gold.

23. 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?

Solution:

An element which is sonorous and highly ductile can be classified as metal. Other characteristics include lustre, malleability, heat and electrical conductivity.

24. Give an example, each for the mixture having the following characteristics. Suggest a suitable method to separate the components of these mixtures

(a) A volatile and a non-volatile component.

(b) Two volatile components with appreciable differences in boiling points.

(c) Two immiscible liquids.

(d) One of the components changes directly from a solid to a gaseous state.

(e) Two or more coloured constituents soluble in some solvent.

Solution:

(a) Mixture of acetone and water. It can be separated by distillation.

(b) Mixture of petrol and kerosene. It can be separated by distillation.

(c) Mixture of oil and water. It can be separated by fractional distillation.

(d) Mixture of naphthalene and ammonium chloride. Separating naphthalene by filtration and then separation of ammonium chloride from water by evaporation.

(e) Mixture of pigments from a flower petal extract. It can be separated by chromatography.

25. Fill in the blanks

(a) A colloid is a ——— mixture, and its components can be separated by the technique known as ———.

(b) Ice, water and water vapour look different and display different —— properties, but they are ——— the same.

(c) A mixture of chloroform and water 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.

Solution:

Answers

a) Heterogeneous, centrifugation

b) Physical, chemically

c) Water, Chloroform

d) Distillation

e) Scattering, Tyndall effect, colloidal

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

Solution:

It will be a pure substance because the chemical structure of the sugar remains the same despite the change in the source of their extraction.

27. Give some examples of the Tyndall effect observed in your surroundings?

Solution:

1. The beam of light passing on screen in a theatre.
2. When light passes through a dark room.

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

Solution:

We cannot separate alcohol dissolved in water by separating the funnel as they both are miscible solvents.

29. 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

Solution:

Answers:

a) It is a chemical change

$CaCO_3 + H_2O \rightarrow CaO + CO_2$

b) Acidic and basic solutions can be prepared by dissolving the products of the above process in water,

$CaO + H_2O \rightarrow Ca(OH)_2$ (basic solution) $CO_2 + H_2O \rightarrow H_2CO_3$ (acidic solution)

30. 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.

Solution:

Answers

a) **Iodine** is a lustrous non-metal.

b) **Bromine** is liquid at room temperature

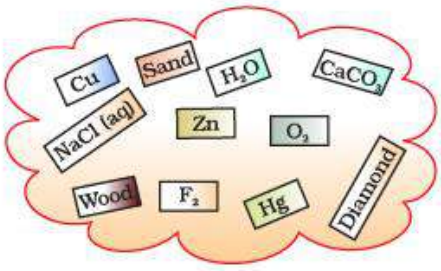
c) **Graphite** is an allotropic form of Carbon (non-metal), which is a good conductor of electricity.

d) **Carbon** is a non-metal which can form the largest number of compounds.

e) **Sulphur and Phosphorous** are the non-metals which show allotropy.

f) **Oxygen** is a non-metal which is required for combustion.

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



Solution:

Answer

Elements-Copper(Cu), Zinc(Zn), Oxygen(O2), Fluoride(F2), Mercury(Hg), Diamond

Compounds-NACL(Aq), Wood, Sand, H2O, CaCO3

32. 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

Solution:

Answers

a.Chlorine gas

c.Iron

e. Aluminium

f. Iodine

g.Carbon

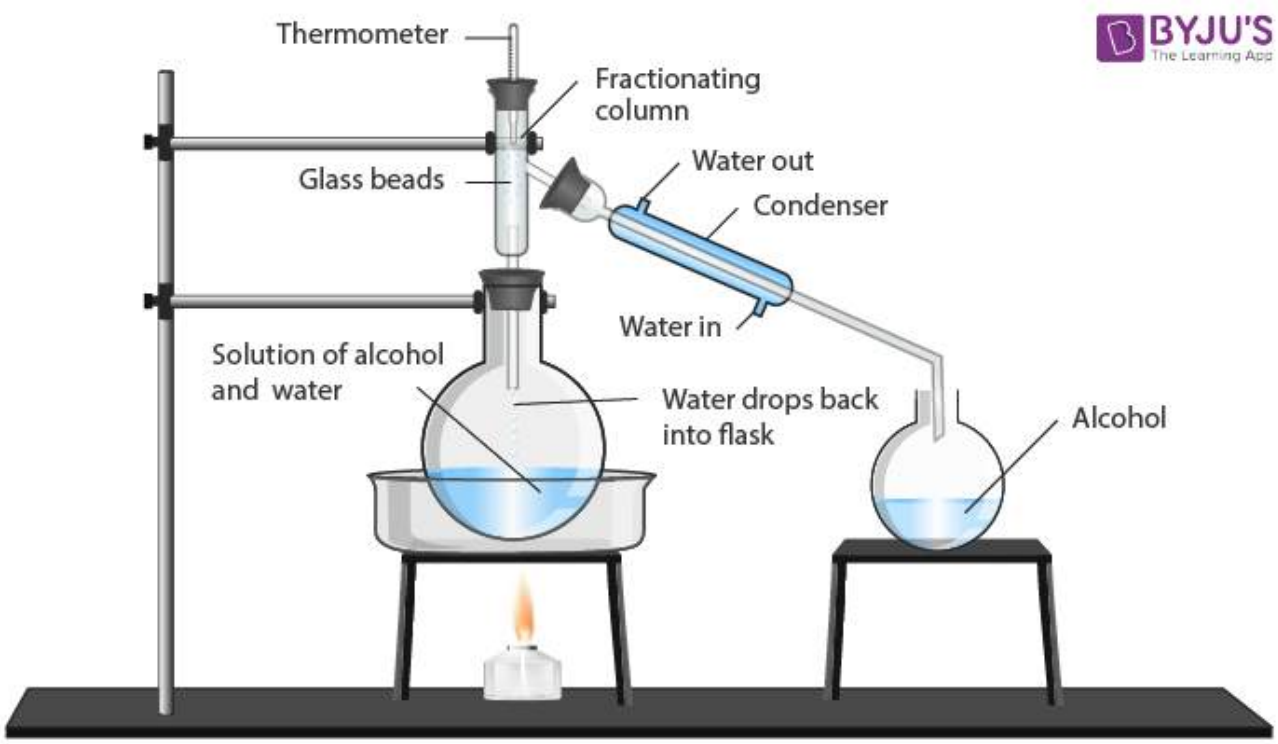
i.Sulphur powder

LONG ANSWER QUESTIONS

33. Fractional distillation is suitable for the separation of 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.

Solution:

The fractional column is the most important part of the fractional distillation apparatus. It is provided with glass beads in it. This column helps to obstruct the upward movement of the vapours of the two liquids. The vapours of high boiling liquid get condensed earlier at a lower level. Latent heat released helps to take the vapours of low boiling liquid to a height in the fractionating column.



Separation of miscible liquids

The advantages are as given below:

1. This method can separate the liquids with a boiling point difference of about or less than 25 K,
2. During the process, both evaporation and condensation take place simultaneously.
3. A mixture (like petroleum) can also be separated by the fractional distillation process, which contains several components.

34.

(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?

Solution:

a) An alloy is a homogenous mixture of two or more elements. Elements can be two metals or metals with non-metals.

An alloy is classified as a homogenous mixture because it shows the properties of two or more elements it is made of. Its constituents are in varied compositions. For example, brass is an alloy which shows characteristics of copper and Zinc, and their composition varies from 20 to 35 %.

b) The solution is usually a liquid, but not always. It might also include a mixture of two solids, like in alloys, and a mixture of gases, such as air.

(c) Yes, solutions can be heterogeneous.

35. 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 Parts and the evolution of gas was seen in both cases. How will you identify the gases evolved?

Solution:

When iron fillings and sulphur is heated, it will give the following reaction

$Fe(s)+S(s) \rightarrow FeS$

When HCl is added to this mixture, ferric chloride is produced, and Hydrogen Sulphide gas is produced. A foul rotten egg smell of Hydrogen sulphide is the indicator of H_2S production.

When dilute HCL is added to setup B, Hydrogen gas is evolved, and sulphur does not take part in the reaction. When a burning matchstick is brought near the evolved gas, the matchstick burns with a pop. This is the indication of the production of Hydrogen gas.

36. A child wanted to separate the mixture of dyes constituting a sample of ink. 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.

(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.

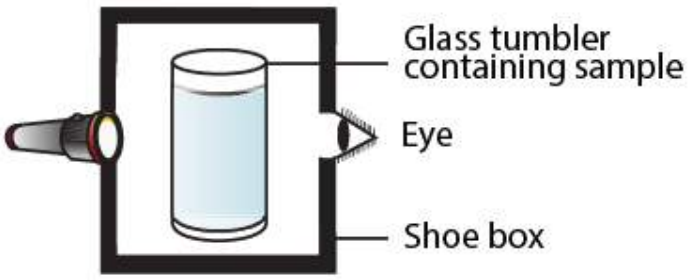
Solution:

(i) If the ink contains three different coloured components, then you can observe three different bands on the paper

(ii) Child uses the technique of paper chromatography

(iii) Paper chromatography is used to separate different pigments present in the chlorophyll.

37. 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 making 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 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.



(a) Explain why the milk sample was illuminated. Name the phenomenon involved.

(b) 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 in the milk solution?

Solution:

a) Milk is a colloidal substance. Particulate matter present in the milk makes the light scatter, which results in the Tyndall effect. Because of the Tyndall effect, the milk got illuminated.

b) Salt is a homogenous solution. Small particles present in salt solution do not scatter light rays hence there will be no Tyndall effect. Since the salt solution did not exhibit the Tyndall effect, light is not illuminated.

c) Detergent solution and sulphur solution exhibit the Tyndall effect.

38. 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 in the colour of black tea by adding lemon juice to it.

(e) Churning of milk cream to get butter.

Solution:

a) Drying of the shirt in the sun is a physical phenomenon because there are no chemical reactions or any chemical changes involved in this process.

b) Rising of hot air over the radiator is a physical change. Water in a radiator converts to vapours. Hot air becomes lighter and rises.

c) Burning of kerosene in a lantern is a chemical change because kerosene burns by using atmospheric oxygen and produces carbon dioxide.

d) Change in the colour of black tea on adding lemon juice to it is a chemical change. Lemon juice is a source of citric acid, ascorbic acid and malic acid. This acid reacts with Flavin antioxidants present in black tea to change the colour of the tea.

e) Churning of milk cream to get butter is a physical change as there is no involvement of a chemical reaction. Here, the principle is centrifugation which turns the milk cream into butter.

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

Solution:

Mass % = Mass of solute Mass of solute + Mass of solvent ×100

The solution made by Ramesh

Mass % = 10/ 100 +10 x 100 = 10 /110 x100 = 9.09%

Solution made by Sarika = Mass % = 10 /100 ×100 = 10%

The solution prepared by Sarika has a higher mass % than that prepared by Ramesh.

40. 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.

Solution:

1. Using Magnet: Move the magnet over the mixture, which will result in the sticking of iron fillings to the magnet. Like this, iron fillings get separated from the mixture.
2. Sublimation: The remaining mixture is heated in a china dish. Ammonium chloride is a sublimating substance, and it will evaporate without passing through the liquid phase. Ammonium chloride can collect an inverted funnel over china-dish.
3. Sedimentation, decantation and filtration: The remaining mixture is dissolved in water and allowed to settle down. Sand will settle at the bottom. The liquid should be decanted into another beaker. Then it is filtered to remove traces of sand.
4. The filtered solution is heated to evaporate the water. Once all the water gets evaporated, salt remains in the beaker.

41. Arun has prepared a 0.01% (by mass) solution of sodium chloride 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) 0.0l g of NaCl + 99.99g of water

(d) 0.10 g of NaCl + 99.90g of water

Solution:

Here,

$$\text{Mass\%} = \frac{\text{mass of solute} \times 100}{(\text{mass of solute} + \text{mass of solvent})}$$

$$= \frac{0.01\text{g} \times 100}{(0.01 + 99.99)\text{g}} = \frac{0.01 \times 100}{100.00} = 0.01\%$$

which is equal to the percentage of sodium chloride in water prepared by Arun. So, option (c) is correct.

In option (a), mass% =

$$\frac{1.00g \times 100}{(1.00+100)g} = \frac{1.00 \times 100}{101.00} = 0.99\%$$

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

Solution:

In option (b), mass% =

$$\frac{0.11g \times 100}{(0.11+100)g} = \frac{11}{100.11} = 0.11\%$$

In option (d), mass% =

$$\frac{0.1g \times 100}{(0.1+99.90)g} = \frac{10}{100} = 0.1\%$$

Hence, the other three representations are incorrect.