IS MATTER AROUND US PURE

Question (1): Define an element.

Answer: A pure substance that cannot be broken into two or more simpler substances by physical and chemical means is called an element.

Question (2): Mention whether the following statements are true or false. Correct the false statements.

a) An aqueous solution of copper sulphate is homogeneous.

b) Milk is a pure substance.

c) A molecule of sulphur is monoatomic.

Answer:

a) True

b) False. Milk is a mixture and thus an impure substance

c) False. A molecule of sulphur is polyatomic i.e., it has 8 atoms per molecule.

Question (3): Classify the following as element, compound or mixture.

(i) Zinc amalgam (ii) Sea water (iii) Iodine vapour (iv) Gold coin (v) Water.

Answer: i) Mixture

ii) Mixture

iii) Element

iv) Mixture

v) Compound.

Question (4): Give the characteristics of a pure substance.

Answer: A pure substance is,

a) Homogeneous in nature

b) Has a definite set of properties

c) Has a composition, which cannot be altered by physical means.

Question (5): How would you separate a mixture of ammonia and hydrogen?

Answer: Passing the mixture through water can separate the mixture of ammonia and hydrogen. Ammonia being highly soluble dissolves in water while H_2 passes out as gas.

Question (7): Give one example for each of the following mixtures:

i) Solid/solid (homogeneous)
ii) Solid/solid (heterogeneous)
iii) Liquid/liquid (homogeneous)
iv) Liquid/liquid (heterogeneous)
v) Gas/liquid (homogeneous).

Answer: i) Brass
ii) Clay
iii) Ethyl alcohol + water
iv) Oil and water
v) Soda water.

Question (8): Action of heat on blue vitriol is a physical as well as chemical change. Justify.

Answer:

When blue vitriol is a gradually heated to about 800^{o}C, it undergoes a physical change to form a white powder. On adding a drop of water to the white powder, it changes back to blue. Thus the change is a physical change.

On strongly heating, copper sulphate (blue vitriol) decomposes to give new substances like copper oxide and sulphur dioxide. On cooling these, copper sulphate cannot be re-obtained. Thus it is a chemical change.

Question (9): How would you separate a mixture of NH_4Cl and I_2?

Answer:

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 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.

Question (10): How can you prove that air is a mixture?

Answer: 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 can 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.

Question (11): Describe a method for separation of the constituents of gunpowder.

Answer: Gunpowder is a mixture of sulphur, charcoal and potassium nitrate (nitre). When water is added to the mixture potassium nitrate dissolves. The mixture is then filtered. The filtrate is potassium nitrate solution while the residue is a mixture of sulphur and charcoal. The filtrate is evaporated on a sand bath to obtain nitre 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.

Question (12): Write down the technique used to separate.

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

Answer: i) Chromatography
ii) Evaporation
iii) Filtration
iv) Fractional distillation

Question (13): 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.

Answer: This procedure will succeed, as $CaCO_3$ is insoluble in water while NaCl is soluble in water. On filtering the residue will be $CaCO_3$.

Question (14): Give four characteristics of a physical change

Answer: a) A physical change is temporary and is usually reversible.

b) No new substances are formed during a physical change.

c) There is no change in mass of the substance during a physical change.

d) There is no net absorption or release of energy during a physical change.

Question (15): How would you remove?

i) Grease spots from clothes.
ii) Obtain pure water from seawater.
iii) Obtain hydrogen from a mixture of H_2 and Cl_2.
iv) Iodine stains.

Answer: i) Grease spots from clothes can be removed by using turpentine oil in which grease dissolves.

ii) Distillation.

iii) Pass the mixture of H_2 and Cl_2 into a porous pot. H_2 diffuses in faster than Cl_2 into the porous pot. Most of the Cl_2 remains outside the porous pot.

iv) Iodine dissolves in ethyl alcohol.

Question (16): In the formation of sodium chloride from its constituent elements, do the properties of its elements change. Explain.

Answer: Sodium is a very reactive metal that reacts exothermically with water. If we were to ingest a pinch of sodium, it would burn our intestines. Chlorine is a greenish yellow gas with a characteristic irritating odour and pungent taste.

When sodium and chlorine combine to form sodium chloride, the properties of the elements are totally changed. Sodium chloride is a white substance totally safe to be ingested and is used to add flavour to our food.

Question (17): Give an example of each of the following types of mixtures.

(a) Solid and liquid

(b) Solid and gas

(c) Liquid and solid

(d) Liquid in gas

Answer: a) Tea leaves in water.
b) Dust particles in air.
c) Amalgam of mercury and copper.
d) Clouds carrying moisture.

Question (18): Describe how you would obtain the substances mentioned below, from the given mixtures.

a) Iodine from tincture of iodine.

b) Lead chloride from a mixture of lead chloride and silver chloride.

Answer: a) Iodine dissolved in alcohol is called tincture of iodine. Alcohol is a volatile liquid. So the mixture can be kept open or warmed in a water bath. Alcohol will evaporate leaving behind the iodine crystals.

b) Add hot water to the mixture of lead chloride and silver chloride. Lead chloride ($PbCl_2$) is soluble in hot water and it dissolves. Silver chloride (AgCl) is insoluble in hot water and so the mixture should be filtered immediately. The filtrate is the solution of $PbCl_2$ and the residue is AgCl. The filtrate is heated to obtain crystals of $PbCl_2$.

Question (20): Briefly describe how to separate,

i) Sulphur from a mixture of sulphur and sand.
ii) Black CuO from a mixture of CuO and ZnO.

Answer:

i) Add a solvent to the mixture of sulphur and sand. Sulphur dissolves in carbon disulphide while sand does not. When filtered, the residue is sand. The filtrate is kept open, carbon disulphide evaporates and the sulphur crystals form.

ii) Add a solvent to the mixture of CuO and ZnO that dissolves only one component e.g. sodium hydroxide. When sodium hydroxide is added to the mixture, ZnO dissolves. Filter to obtain the residue of CuO.

Question (21): Classify the following properties as those belonging to compounds and mixtures.

a) A chemical change.

b) Always homogeneous.

c) Particles are of different kinds.

d) No energy change involved in its formation.

Answer: a) Compound

b) Compound

c) Mixture

d) Mixture.

Question (22): What is the difference between?

i) A mixture of iron filings and sulphur and
ii) sulphur heated with iron?

Answer: When iron filings and sulphur are mixed, the mixture formed has both the components. They retain their individual distinct properties. They need not be present in any fixed proportion by mass.

In contrast, when iron filings and sulphur are heated together they form a new compound, iron sulphide that has distinct properties when compared to the combining elements. Iron and sulphur in a mixture can be separated using a magnet. The compound iron sulphide cannot be separated into its elements.

Question (23): What is the concentration of a solution in terms of mass percentage if it contains 20 g of a salt in 250 g of water?

Answer: Mass of the solute (salt) = 20 g

Mass of the solvent (water) = 250 g

Mass of the solution = Mass of the solute + Mass of the solvent

= 20 + 250 = 270 g

Mass percentage of solution = $\frac{\text{Mass of solute}}{\text{Mass of solvent}} \times 100$

$\frac{20}{270} \times 100$

= 7.4%

Question (25): If salt is added to water, is the mixture homogeneous or heterogeneous. Give reasons for your Answer.

Answer: The mixture is homogeneous because

a) The salt particles do not form a separate layer.

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

c) Also every portion of the solution is equally salty, as the solution has salt uniformly dispersed in it.

Question (26): Classify as physical or chemical change.

a) Tearing of paper.

b) Production of biogas

c) Butter going rancid.

d) Magnetisation of iron

e) Clotting of blood.

Answer: a) Physical - No change in mass.

b) Chemical - New substances with new properties are produced.

c) Chemical - New substances are formed and the original substances cannot be re-obtained.

d) Physical - Temporary, no new substance is formed.

e) Chemical - New substance with new properties is produced. Unclotted blood cannot be re-obtained in this change.

(Q.) Distinguish between physical changes and chemical changes.

(3 Marks)

(Ans)

	Physical Changes	Chemical Changes
1.	No new substance is formed.	New substance having different properties is formed.

2.	It is reversible.	It is irreversible.
3.	Example – Freezing of water (to form ice), Glowing of an electric bulb etc.	Example – Burning of paper, Rusting of iron, etc.

(Q.) Differentiate between homogeneous and heterogeneous mixtures.

(3 Marks)

(Ans)

	Homogeneous mixture		Heterogeneous mixture
1.	It has a uniform composition throughout its mass.	1.	It does not have a uniform composition throughout the mass.
2.	No visible boundaries of separation between the various constituents .	2.	Visible boundaries of separation between the various constituents.
3.	e.g. Salt in water, alcohol in water etc.	3.	e.g. Sand in sugar, oil in water etc.

(Q.) Distinguish between compound and mixture.

(5 Marks)

(Ans)

Sl.No.	Compound	Mixture
1.	Two or more elements combine to form new compound .	Elements or compounds just mix together to form a mixture and no new compound is formed.
2.	The new substance has totally different properties.	It shows the properties of the constituent substances.
3.	The composition of each new substance is always fixed.	It has a variable composition.
4.	The constituents can be separated only by chemical or electrochemical reactions.	The constituents can be separated by physical methods.
5.	e.g: H_2O, CO_2 etc.	e.g: Salt, sand, milk etc.

(Q.) Write the differences between a mixture and a compound.

(5 Marks)

(Ans)

Mixture	Compound
a) The constituents can be separated by physical method.	(a) There is no physical method to seperate a compound.

(b) It does not have a fixed melting point and boiling point.	(b) A compound has fixed melting point and boiling point.
(c) A mixture shows the properties of its constituents.	(c) Constituents lose their properties in compounds.
(d) A mixture does not have a definite formula.	(d) A compound has definite formula.
(e) e.g.sand and sulphur	(e)e.g. sodium chloride,ethyl alcohol