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PRACTICE PAPER 04 (2024-25)

CHAPTER 02 IS MATTER AROUND US PURE?

(ANSWERS)

SUBJECT: SCIENCE **MAX. MARKS : 40**

CLASS : IX **DURATION : 1½ hrs**

General Instructions:

(i). **All** questions are compulsory.

(ii). This question paper contains 2**0** questions divided into five Sections A, B, C, D and E.

(iii). **Section A** comprises of **10 MCQs** of **1 mark** each. **Section B** comprises of 4 questions of **2 marks** each. **Section C** comprises of 3 questions of **3 marks** each. **Section D** comprises of 1 question of **5 marks** each and **Section E** comprises of 2 Case Study Based Questions of **4 marks** each.

(iv). There is no overall choice.

(v). Use of Calculators is not permitted

SECTION – A

Questions 1 to 10 carry 1 mark each.

1. 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)
Ans. (c) (i), (iii) and (iv)
Rusting of iron is a chemical process where iron reacts with water and oxygen to produce iron oxide, whereas other processes are physical changes.

2. 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)
Ans. (c) (i), (iii) and (iv)
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.

3. Identify any two statements that are true for pure substances among the following:
(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.
Options:
(a) (I) and (II) (b) (III) and (IV)
(c) (II) and (III) (d) (I) and (III)
Ans. (d) (I) and (III)

Following are the Characteristics of Pure substances:
(i) A pure substance comprises only one type of particles which can be atoms, molecules or elements.
(ii) A pure substance cannot be divided into other types of matter by any physical process, but a mixture can, because it is impure and contains multiple particles. For example salt solutions.
(iii) A pure substance has a consistent composition and melting and boiling points. For example salt.
(iv) As pure nickel is an element with just one type of particles.

4. Two chemical species, X and Y, combine together to form a product P which contains both X and Y

$$X + Y \rightarrow P.$$

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)
Ans. (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.

5. In sugar solution:
(a) Sugar is solute, water is solvent
(b) Sugar is solvent, water is solute
(c) Both are solutes
(d) Both are solvents
Ans. (a) Sugar is solute, water is solvent
Sugar solution is made up of water and sugar. The solvent is the component of a solution that dissolves other components in it and is usually present in larger quantities. Water dissolves sugar in it so it, is a solvent. The solute is the component of a solution which is dissolved in the solvent and is usually present in smaller quantities. Sugar is present in smaller quantities so it is a solute.

6. 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
Ans. (d) iodine in alcohol
Tincture of iodine is a solution of iodine as a solute and alcohol as a solvent.

7. A small amount of mud was mixed with water in a beaker and left undisturbed for some time. The mixture was filtered after some time, the filtrate will be:
(a) a true solution
(b) a colloidal solution
(c) can be a true solution or a colloidal solution
(d) a suspension
Ans. (b) a colloidal solution
The filtrate will be a colloidal solution with some mud particles in it. A true solution is a homogenous mixture of two or more substances in which the material dissolved (solute) in the solvent has a particle size of less than 1 nm.
A colloid is a combination in which insoluble particles are microscopically distributed in one material and suspended in another.

8. Select the best option about gel and sols.
(a) Gel and sols are colloids that are solid-solid.
(b) Gel is a liquid-solid colloid while sol is a solid-liquid colloid.
(c) Gel is a solid-liquid colloid, while sol is a solid-solid colloid.
(d) Gel is a solid-liquid colloid while sol is a liquid-solid colloid.
Ans. (b) Gel is a liquid-solid colloid while sol is a solid-liquid colloid.
A sol is a colloid consisting of solid particles suspended in a liquid medium.
For examples: Paints, mud, etc. A gel is a form of a colloid solution with a liquid as a dispersed phase and a solid as a dispersion medium. Curd, cheese, and jellies are a few examples.

In the following questions 9 and 10, a statement of assertion (A) is followed by a statement of Reason (R). Choose the correct answer out of the following choices.
(a) Both the Assertion and the Reason are correct and the Reason is the correct explanation of the Assertion.
(b) Both the Assertion and the Reason are correct but the Reason is not the correct explanation of the Assertion.
(c) Assertion is true but the Reason is false.
(d) Assertion is false but the Reason is true.

9. **Assertion (A):** Alloys are a heterogeneous mixture of metal.
Reason (R): Alloys can be separated into their components using chemical methods.
Ans. (d) Assertion is false but the Reason is true.
Alloys are homogenous mixtures of two or more metals in a fixed proportion. Thus, their separation is not possible by physical methods.

10. **Assertion (A):** Elements and compounds are pure substances.
Reason (R): Properties of compounds are different from those of its constituent elements.
Ans. (b) Both the Assertion and the Reason are correct but the Reason is not the correct explanation of the Assertion.
A pure substance may either contain constituent particles of only one kind or of different kinds. A pure substance has a fixed composition. Thus, elements and compounds are example of pure substances. Properties of compounds are different from those of its constituent elements.

SECTION – B

Questions 11 to 14 carry 2 marks each.

11. Ramya was making tea. Her brother asked her to make a list of the steps that she had taken to make tea by using the terms solution, solvent, solute, dissolve, soluble, insoluble, filtration and residue to describe her solution.
Ans. Ramya used the following steps for making tea:
(i) As a solvent, boil 100 mL of water for a few minutes.
(ii) Stir in 1 teaspoon of sugar and 1 teaspoon of tea leaves, into 50 mL of milk. Sugar, tea leaves, and milk are examples of solutes.
(iii) Boil it for a few minutes more to dissolve the sugar in the solution, as sugar is soluble in water.
(iv) Filter the solution. In a cup, collect the filtrate. The tea leaves that are insoluble will be left behind as residue.

12. Define a solute and solvent.
Ans. **Solute:** The component of the solution that is dissolved in the solvent (usually present in the lesser quantity) is solute.
Solvent: The component of a solution that dissolves the other component in it (usually the component present in larger amounts) is called solvent.

13. You are provided with a solution of substances 'X'. How will you test whether it is saturated or unsaturated with respect to 'X' at a given temperature? What happens when a hot saturated solution is allowed to cool?
Ans. When no more quantity of 'X' substance can be dissolved in a solution at a given temperature, then the solution is saturated with respect to 'X'. When a hot saturated solution is allowed to cool, crystals of substance separate out from the solution.

14. Explain what is observed when a strong beam of light is focused on a colloidal solution of starch in water. Name the phenomenon.
Ans. When a strong beam of light is passed through colloidal solution of starch, the path of light becomes visible, which scatters through the solution. This phenomenon is known as Tyndall effect.

OR

A solution contains 40 g of common salt in 320 g of water. Calculate the concentration in terms of mass by mass percentage of the solution.
Ans. Mass of solute (salt) = 40 g
Mass of solvent (water) = 320 g
We know, Mass of solution = Mass of solute + Mass of solvent
= 40 g + 320 g = 360 g
Mass percentage of solution
Mass of solute/Mass of solution × 100
= 40/360 × 100 = 11.1%

SECTION – C

Questions 15 to 17 carry 3 marks each.

15. What would you observe when
(i) a saturated solution of potassium chloride prepared at 60°C is allowed to cool at room temperature?
(ii) an aqueous sugar solution is heated to dryness?
(iii) a mixture of iron filings and sulphur powder is heated strongly?
Ans. (i) Solid potassium chloride will separate out.
(ii) Initially the water will evaporate and then sugar will get charred.
(iii) Iron sulphide will be formed.

16. (a) Why path of light is not visible in a solution when a beam of light is passed through it ?
(b) Classify each of following as solution, colloid or suspension:
(i) A mixture whose particles are big enough to scatter a beam of light passing through it.
(ii) A mixture whose particles settle down when it is left undisturbed.
Ans. (a) Because of very small particle size, they do not scatter a beam of light passing through the solution. So, the path of light is not visible in a solution.
(b) (i) Colloids
(ii) Suspension

OR

Calculate the mass of sodium sulphate required to prepare its 20% (mass per cent) solution in 100 g of water.
Ans. Let the mass of sodium sulphate required be x g.
The mass of solution would be $(x + 100)$ g.
x g of solute is dissolved in (x + 100) g of solution.
Given, concentration in mass percentage = 20%
∵ Concentration in mass percentage = Mass of solute/Mass of solution × 100

$$\therefore 20 = \frac{x}{x+100} \times 100$$

$\Rightarrow 20x + 2000 = 100x \Rightarrow 80x = 2000$
$\Rightarrow x = 2000/80 = 25$ g
$\therefore$ Required mass of sodium sulphate = 25 g

17. (i) Define solubility. How does the solubility of a solute in solvent change with an increase in temperature?
(ii) Is the amount of salt and sugar or barium chloride, that can be dissolved in water at a given temperature, the same?
Ans. (i) The maximum amount of solute that can be dissolved in 100 grams of a solvent at a given temperature is called as solubility of that solute in the given solvent. The solubility of a solute in solvent will increase with the increase in temperature.
(ii) The amount of salt and sugar or barium chloride that can be dissolved in water at a given temperature would be different.

18. On heating, calcium carbonate breaks down 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.
Ans Calcium carbonate decomposes into calcium oxide and carbon dioxide when heated. This procedure is used to make quick lime, which is a critical ingredient in a variety of industries.

$$CaCO_3 \rightarrow CaO + CO_2$$

(a) Chemical change is demonstrated in the given process.
(b) By dissolving the products into water, acidic and basic solutions can be made.
A basic solution will be formed by calcium oxide.

$$CaO + H_2O \rightarrow Ca(OH)_2 \text{ (Basic solution)}$$

Carbon dioxide will react with water to generate an acidic solution.

$$CO_2 + H_2O \rightarrow H_2CO_3 \text{ (Acidic Solution)}$$

SECTION – D

Questions 18 carry 5 marks each.

19. Based on the following characteristics distinguish in tabular form the behaviour of true solution, suspension and colloidal solution.
Ans.

True Solution	Colloidal Solution	Suspension
(i) A true solution is a homogeneous mixture of solute and solvent.	A colloidal solution appears to be homogeneous but actually it is a heterogeneous mixture of solute and solvent.	It is a heterogeneous mixture.
(ii) It is transparent.	It is translucent.	It is opaque.
(iii) The solute particles are very small, i.e., less than 1 nm.	The solute particles are between 1-100 nm.	The solute particles are quite large, i.e., more than 100 nm.
(iv) The particles are not visible even with a powerful microscope.	The particles are visible with the help of microscope.	The particles are visible even with naked eye.
(v) The entire solution passes through filter paper as well as semi-permeable membrane.	The particles can pass through ordinary filter paper but not through a semi-permeable membrane.	The particles cannot pass through either a filter paper or through a semipermeable membrane.
(vi) The solute particles do not show Tyndall effect.	The particles show Tyndall effect.	The particles may or may not show Tyndall effect.
(vii) The particles do not settle due to gravity, e.g., salt in	The particles do not settle due to gravity, e.g., blood.	The particles may settle due to gravity, e.g., chalk powder in

water solution.		water.

OR

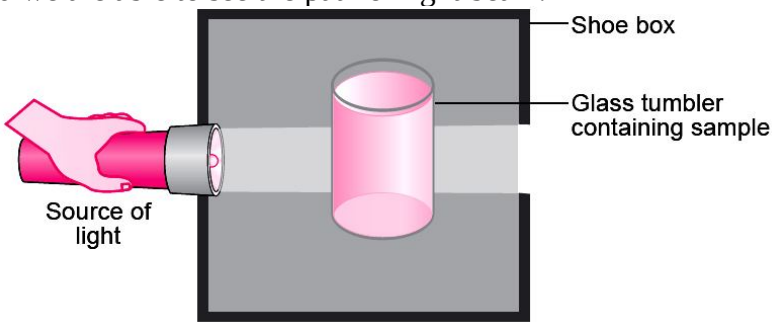
A group of students took an old shoe box and covered it with a black paper from all sides. They fixed a source of light (a torch) at one end of the box by making a hole in it and made another hole on the other side to view the light. They placed a milk sample contained in a beaker/tumbler in the box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

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

(ii) Same results were not observed with a salt solution. Explain.

(iii) Can you suggest two more solutions which would show the same effect as shown by the milk solution?

Ans. (i) Milk is a colloid. If a beam of light is put on a milk sample contained in a beaker, the path of light beam is illuminated and becomes visible when seen from the other side. This is because the colloidal particles are big enough to scatter light falling on them. This scattered light enters our eyes and we are able to see the path of light beam.



The scattering of light by colloidal particles is known as Tyndall effect.

(ii) Salt solution is a true solution. If a beam of light is put on a salt solution kept in a beaker in a dark room, the path of light beam is not visible inside the solution when seen from the other side. This is because salt particles present in it are so small that they cannot scatter light rays falling on them.

(iii) Detergent solution, sulphur solution.

SECTION – E (Case Study Based Questions)

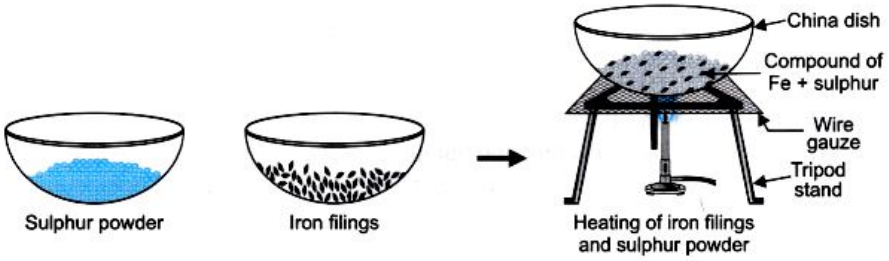
Questions 19 to 20 carry 4 marks each.

20. Read the following information and answer the questions based on information and related studied concepts.

According to Ayushi, when solid X is put into water, it dissolves with evolution of heat and causes a small explosion to produce the two products Y and Z. The characteristics of Y and Z products differ significantly from those of solid X and water. Furthermore, solid X and water cannot be transformed back into products Y and Z.

When another solid P is dissolved in water, it absorbs a small amount of heat and forms the product Q, which cools down. The qualities of both solid P and water are represented by the product Q. Product Q can also be turned into solid P and water.
(a) What type of change is found in solid X when dissolved in water? (1)
(b) What type of change is found in solid P when dissolved in water? (1)
(c) Name the solid P. (1)
(d) Identify the process through which solid P can be recovered from Q. (1)
Ans: (a) Chemical change
Chemical change is shown because the properties of products Y and Z don't exhibit the property of solid X or water.
(b) Physical change
Physical change is shown because the properties of product Q exhibit the property of both solid P and water.
(c) Solid P – Ammonium chloride
Solid P is ammonium chloride.
(d) Evaporation
Solid P (Ammonium chloride) can be recovered from Q with the help of the process of Evaporation.

21. Read the given passage and answer the questions that follow based on the passage and related studied concepts.
Rishika and Aditi were exploring different processes for separating different components from a mixture. They were given the mixture of iron filings and sulphur powder. Rishika heated the mixture strongly and she observed that a new substance was formed. Aditi did not do anything with the Iron filings and the sulphur powder that was given to her.



(a) Name a technique to separate iron filling and sulphur powder.
(b) What will be the colour of the compound formed when Rishika heated the mixture?
(c) Tine added dilute hydrochloric acid to a mixture of iron fillings and sulphur. Rishika added the same acid to the compound formed after heating the mixture. What will they observe?
Ans. (a) Magnetic separation technique can be used to separate the mixture as iron is magnetic and can therefore be easily removed from the sulphur.
(b) The compound will turn into black colour.
(c) When dilute hydrochloric acid was added to a mixture of iron filings and sulphur by Aditi, she observed that the bubbles are formed from the gas which she tested by taking a burning matchstick. The gas burns with a pop sound indicating that hydrogen gas is given out and sulphur remain unaffected.