

* Choose the correct alternative from those given below question

[11]

1. You pour oil into a glass containing some water. The oil floats on top. What does this tell you?

- (A) Oil is denser than water. (B) Water is denser than oil.
(C) Oil and water have the same density. (D) Oil dissolves in water.

Ans. : (B) Water is denser than oil.

2. Which of the following is an example of a solution?

- (A) Sugar in water (B) Sand in water (C) Muddy water (D) Oil and water

Ans.: (A) Sugar in water

3. What is the role of a solvent in a solution?

- (A) To be dissolved (B) To dissolve another substance
(C) To separate substances (D) To create a heterogeneous mixture

Ans. : (B) To dissolve another substance

4. Which of the following is a characteristic of a solute?

- (A) It is present in the largest quantity.
(B) It is the substance that does the dissolving.
(C) It is dissolved in the solvent.
(D) It forms a heterogeneous mixture.

Ans. : (C) It is dissolved in the solvent.

5. Which of the following is NOT a type of solution based on the physical state of the solvent?

- (A) Gaseous solution (B) Liquid solution
(C) Solid solution (D) Heterogeneous solution

Ans. : (D) Heterogeneous solution

6. A solution that contains the maximum amount of solute that can be dissolved at a given temperature is called:

- (A) Unsaturated solution (B) Saturated solution
(C) Supersaturated solution (D) Dilute solution

Ans. : (B) Saturated solution

7. Which of the following is an example of a solid solution?

- (A) Sugar dissolved in water



- (B) Salt dissolved in water
- (C) Gold dissolved in copper
- (D) Carbon dioxide dissolved in water

Ans. : (C) Gold dissolved in copper

8. What is the main difference between a solution and a suspension?
- (A) Solutions are homogeneous, while suspensions are heterogeneous.
 - (B) Solutions have larger particles than suspensions.
 - (C) Solutions cannot be separated by filtration, while suspensions can.
 - (D) Solutions scatter light, while suspensions do not.

Ans.: (A) Solutions are homogeneous, while suspensions are heterogeneous.

9. Which of the following is NOT a colligative property?
- (A) Boiling point elevation
 - (B) Freezing point depression
 - (C) Vapour pressure lowering
 - (D) Solubility

Ans. : (D) Solubility

10. What is a universal solvent?
- (A) A solvent that can dissolve any substance
 - (B) A solvent that can dissolve only a few substances
 - (C) Water
 - (D) Alcohol

Ans. : (C) Water

11. If a solution has a high concentration of solute, it is considered:
- (A) Dilute (B) Concentrated (C) Saturated (D) Unsaturated

Ans. : (B) Concentrated

* Answer the following as requested in detail. [20]

12. Explain the term density, giving its units and dependence on temperature and pressure.

Ans. : Density is defined as the mass present in a unit volume of a substance.

$$\text{Density} = \frac{\text{Mass}}{\text{Volume}}$$

The units in which density is expressed will depend upon the units of mass and volume.

If the units of mass and volume are kilogram (kg) and cubic metre (m³) respectively.

The SI unit of density is kilogram per cubic metre (kg/m³).



For liquid units of density is used in grams per milliliter (g/mL).

The density of a substance is independent of its shape and size but depends on temperature and pressure. The effect of pressure on the density of solids and liquids is negligible, but the density of gases decreases. If we compare the density of two substances, it is called relative density. It is a number without units. For example, the mass of an aluminium block is 27 g and its volume is 10 cm³, so its density is 2.7 g/cm³. But its relative density with respect to water is 2.7, i.e., it is 2.7 times heavier than water.

13. What is mass? How is it measured?

Ans. : Mass is the quantity of matter present in any object. It can be measured as follows using a digital weighing balance:

- Switch on the digital balance.
- Observe the initial reading on the digital balance display.
- See that it is zero. If not, use the button to bring it to zero.
- Now, place a clean and dry watch glass on the pan.
- Note the reading on the digital balance; let it be A.
- Now, carefully place the solid object, such as a stone, on the watch glass.
- Note the reading displayed on the balance; let it be B.
- Mass of the stone = (B - A) g.
- The mass of a liquid may be measured by replacing the watch glass with a beaker and putting the liquid into it.

14. Define volume. How is it measured?

Ans. : Volume is the space occupied by an object. The common apparatus used to measure the volume of liquids is a measuring cylinder. It is a narrow, transparent, cylindrical container with one side open and the other side closed. These are mostly made of a transparent body. Measuring cylinders are available in different sizes to measure volumes: 5 mL, 10 mL, 25 mL, 50 mL, 100 mL, 250 mL, etc. We can measure up to an accuracy of 0.1 mL. Now proceed as follows:

- Place a clean, dry measuring cylinder on a flat surface.
- Pour liquid slowly into the measuring cylinder.
- The liquid in the cylinder forms a curved surface.
- Read the marks on the measuring cylinder with the bottom of the meniscus for water and other colourless liquids, and the upper meniscus in case of coloured liquids.
- The reading on the cylinder gives the volume of the liquid in mL.
- You can choose a cylinder of any size depending on the amount of liquid to be measured.

Volume of Solids

A. Volume of regular shape solids can be calculated by the following formula:

$$\text{Volume} = l \times w \times h = \text{cm}^3$$



B. Volume of irregular solids can be measured by the following steps:

- Fill a measuring cylinder up to half its capacity. Record the initial reading. Let it be V_1 .
- Tie the object, say a stone, with a thread and lower it in the measuring cylinder.
- Record the final reading. Let it be V_2 .
- Volume of object = $(V_2 - V_1) \text{ cm}^3$

15. What are solutions? How are these helpful in medicinal formulations?

Ans. : Solutions refer to the presence of dissolved substances in solvents, mostly water. We can have a dilute solution or a concentrated solution. These are comparative terms. A dilute solution can be a small amount of dissolved substance, and a concentrated solution contains a higher amount of dissolved substances. We can also have an unsaturated solution and a saturated solution. A saturated solution has the maximum amount of solute dissolved at a fixed temperature. But an unsaturated solution can have more solute dissolved at a given temperature.

A saturated solution becomes unsaturated at higher temperatures. Conversely, an unsaturated solution becomes saturated at a lower temperature. For medicinal formulations, only dilute solutions are used. Generally, drug formulations are prepared using water as a solvent. The Indian system of medicine also refers to the use of oil, ghee, milk, and other substances as solvents for drug formulations to achieve the beneficial strength of the drug. In some cases, some solvents are used to extract and isolate important compounds from plants. Asima Chatterjee was given the Shanti Swarup Bhatnagar Award for her work on the isolation of important medicinal compounds from plants.

* Fill in the blanks:

[14]

16. The volume of a solid can be measured by the method of displacement, where the solid is _____ in water and the rise in water level is measured.

Ans. : placed; rise

17. The maximum amount of _____ dissolved in _____ at a particular temperature is called solubility at that temperature.

Ans. : solute, solvent

18. Generally, the density _____ with increase in temperature.

Ans. : decrease

19. The solution in which glucose has completely dissolved in water, and no more glucose can dissolve at a given temperature, is called a _____ solution of glucose.

Ans. : saturated



20. A solution is a homogeneous mixture of two or more substances, typically made up of a _____ and a _____

Ans. : Solute, Solvent

21. The substance that dissolves in a solution is called the _____

Ans. : Solute

22. The substance that dissolves the solute is called the _____

Ans. : Solvent

23. In a sugar solution, sugar is the _____ and water is the _____

Ans. : Solute, Solvent

24. Water is often called the universal _____ because it can dissolve many substances.

Ans. : Solvent

25. The particles in a solution are so small that they cannot be distinguished from the _____

Ans. : Solvent

26. The amount of solute dissolved in a given amount of solvent is called the _____ of the solution.

Ans. : Concentration

27. A solution that can dissolve more solute at a given temperature is called an _____ solution.

Ans. : Unsaturated

28. When a solute is dissolved in water, the solution is called an _____ solution.

Ans. : Aqueous

29. The particles in a solution do not _____ a beam of light passing through it.

Ans. : Scatter

*** Answer the following questions in short.**

[36]

30. Which one of the following is the most appropriate statement, and why are the other statements not appropriate?

(i) A saturated solution can still dissolve more solute at a given temperature.

(ii) An unsaturated solution has dissolved the maximum amount of solute possible at a given temperature.

(iii) No more solute can be dissolved into the saturated solution at that temperature.

(iv) A saturated solution forms only at high temperatures.

Ans. : Statement (iii) is most appropriate.

(i) It is not appropriate as a saturated solution cannot dissolve more solute at a given temperature.

(ii) An unsaturated solution can have more solute dissolved at a given temperature.

(iii) Correct.

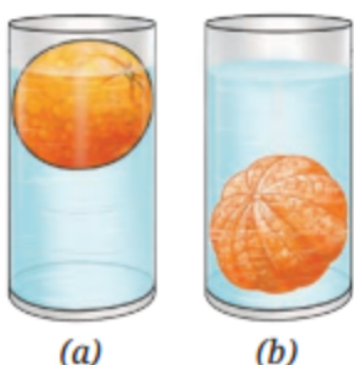
(iv) A Saturated solution can be formed at all temperatures.

31. An object has a mass of 400 g and a volume of 40 cm³. What is its density?

$$\text{Density} = \frac{\text{mass}}{\text{volume}}$$

$$\begin{aligned}\text{Ans. :} &= \frac{400}{40} \\ &= 10\text{g/cm}^3\end{aligned}$$

32. Analyse Figures (a) and (b). Why does the unpeeled orange float, while the peeled one sinks? Explain.



Ans. : An unpeeled orange displaces more water, and so it floats. Peeled orange displaces less water than its weight, so it sinks.

33. Object A has a mass of 200 g and a volume of 40 cm³. Object B has a mass of 240 g and a volume of 60 cm³. Which object is denser?

$$\text{Ans. : Density of object A} = \frac{200}{40} = 5\text{g/cm}^3$$

$$\text{Density of object B} = \frac{240}{60} = 4\text{g/cm}^3$$

Conclusion: Object A is denser, having more density than B.

34. A block of iron has a mass of 600 g and a density of 7.9 g/cm³. What is its volume?

$$\text{We know density} = \frac{\text{mass}}{\text{volume}}$$

$$\begin{aligned}\text{Ans. :} \quad \therefore \text{Volume} &= \frac{\text{mass}}{\text{density}} \\ &= \frac{600\text{g}}{7.9\text{g/cm}^3} \\ &= 75.94\text{cm}^3\end{aligned}$$

35. Define a solution.

Ans. : self

36. What is a solute?

Ans. : self



37. What is a solvent?

Ans. : self

38. Why is water called the universal solvent?

Ans. : self

39. Give one example of a solution.

Ans. : self

40. Explain the difference between a solute and a solvent with an example.

Ans. : self

41. How does temperature affect the solubility of most solids in liquids?

Ans. : self

42. Why do gases dissolve better in liquids at lower temperatures?

Ans. : self

43. Differentiate between a dilute and a concentrated solution.

Ans. : self

44. What is an aqueous solution? Give an example.

Ans. : self

45. Describe what a solution is and explain its key characteristics. Discuss how solutions differ from suspensions and colloids in terms of particle size, appearance, and stability.

Ans. : self

46. Explain the concept of solubility and the various factors that affect it.

Ans. : self

47. Imagine you are preparing a saturated sugar solution at room temperature. Describe the steps you would take and explain what would happen if you then: (a) heated the solution, and (b) added more sugar and stirred without changing the temperature.

Ans. : self

* State whether the following sentences are true or false. Correct the false sentences and rewrite them. [15]

48. Oxygen gas is more soluble in hot water than in cold water.

Ans. : false: Oxygen is more soluble in cold water.

49. A mixture of sand and water is a solution.

Ans. : false: A Mixture of sand and water is not a solution. Sand does not dissolve in water but settles down.

50. The amount of space occupied by any object is called its mass.
Ans. : false: The amount of space occupied by any object is called its volume.
51. An unsaturated solution has more solute dissolved than a saturated solution.
Ans. : false: A saturated solution has more solute dissolved than an unsaturated solution.
52. The mixture of different gases in the atmosphere is also a solution.
Ans. : true
53. A solution is a homogeneous mixture.
Ans. : true
54. The substance that dissolves is called the solvent.
Ans. : false
55. Water is often called the universal solvent.
Ans. : true
56. Solute particles in a solution are visible to the naked eye.
Ans. : false
57. A solution cannot contain more than one solute.
Ans. : false
58. The solubility of most solids increases with an increase in temperature.
Ans. : true
59. The solubility of gases in liquids increases with an increase in temperature.
Ans. : false
60. Stirring a solution can make the solute dissolve faster.
Ans. : true
61. Solute particles can be separated from the solvent by filtration.
Ans. : false
62. The particles in a solution will settle down over time if left undisturbed.
Ans. : false

* **Answer the following questions in short.** [9]

63. Comment on dilute solution and concentrated solution. Which of them gives the solubility of the solute? Explain.

Ans. : Dilute and concentrated solutions are relative terms. The solution obtained by dissolving one teaspoonful of salt in 100 mL of water is dilute compared to a solution obtained by dissolving two spoonfuls of salt in 100 mL of water. None of these gives the solubility of the salt. The idea of solubility can be obtained by



dissolving the maximum amount of salt in a fixed quantity of a solvent at a given temperature. Solubility changes with temperature. In the case of a solid solution, solubility increases, but in the case of a gaseous solution, the solubility decreases.

64. Riya is preparing lemonade for her friends on a hot summer day. She takes a jug of water, adds some sugar, and stirs it well. Then, she squeezes some lemons into the jug and mixes everything. She notices that the sugar completely disappears, but the lemon pulp settles down a bit after some time.

Q.1. In Riya's lemonade, identify the solute(s) and the solvent.

Q.2. Why did the sugar dissolve completely in the water, but the lemon pulp settled down?

Q.3. If Riya wants the sugar to dissolve faster, what could she do?

Ans. : 1. The solutes are sugar and lemon juice. The solvent is water.

2. Sugar is soluble in water, forming a homogeneous mixture (a solution). The sugar particles are very small and become evenly distributed throughout the water. Lemon pulp, however, is mostly insoluble in water, meaning it doesn't dissolve completely and will eventually settle down, forming a heterogeneous mixture.

3. She would raise the temperature of the sample by keeping it in a hot water bath.

65. A group of students is experimenting. They have two beakers, A and B, each containing 100 mL of water. In beaker A, they add 5 grams of salt and stir. In beaker B, they add 20 grams of salt and stir. They observe that all the salt in beaker A dissolves, but in beaker B, some salt remains at the bottom, even after stirring vigorously.

Q.1. Why did all the salt dissolve in beaker A, but not in beaker B?

Q.2. What kind of solution is formed in beaker A?

Q.3. What about beaker B (considering the undissolved salt)?

Ans. : 1. In beaker A salt added was lower in amount than its solubility, but the salt in beaker B had reached its solubility limit unsaturated solution.

2. In beaker A unsaturated solution is formed.

3. In beaker B saturated solution is formed.

* Answer the following questions in one sentence

[37]

66. We know air is a mixture. Would a mixture of gases also be considered a solution?

Ans. : Yes, if it is a uniform mixture.

67. What will happen if we keep adding more salt to a given amount of water?

Ans. : It will dissolve to its maximum solubility and then settle down.

68. Do gases also dissolve in water?

Ans. : Oxygen dissolves in water to a low extent only.

69. Why are measuring cylinders always designed narrow and tall instead of wider and shorter like a beaker?

Ans. : Narrow and tall cylinders give a better measurement of volume.

70. I wonder how the level of a coloured liquid is measured?

Ans. : In case of coloured liquid, the mark on the measuring cylinder should coincide with the top of the meniscus.

71. A stone sculpture weighs 225 g and has a volume of 90 cm³. Calculate its density and predict whether it will float or sink in water.

Ans. : Density of stone = $\frac{225}{90} = 2.5g/cm^3$

It will sink in water.

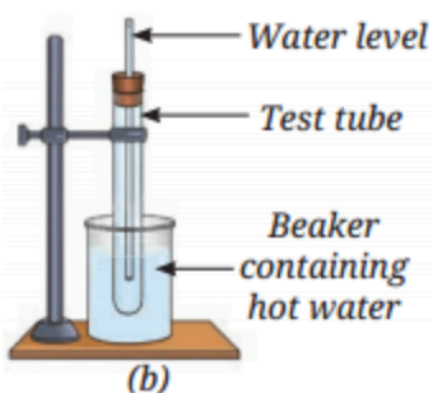
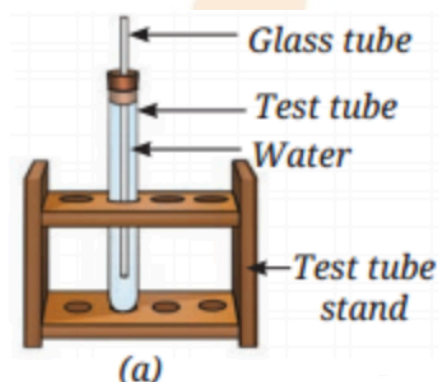
72. You have a bottle with a volume of 2 litres. You pour 500 mL of water into it. How much more water can the bottle hold?

Ans. : The bottle of 2 litres capacity can hold 1500 mL more of water besides 500 mL.

73. Reema has a piece of modeling clay that weighs 120 g. She first moulds it into a compact cube that has a volume of 60 cm³. Later, she flattens it into a thin sheet. Predict what will happen to its density.

Ans. : The density of flattened clay will decrease as it displaces more liquid.

74. You are provided with an experimental setup as shown in Figures (a) and (b). On keeping the test tube (Figure b) in a beaker containing hot water (~ 70°C), the water level in the glass tube rises. How does it affect the density?



Ans. : The density of water in setup (b) will decrease.

75. What is the maximum volume it can measure?

Ans. : The maximum volume that can be measured in a cylinder depends on its size.



76. How much is the volume difference indicated between the two bigger marks (for example, between 10 mL and 20 mL)?

Ans. : The volume difference between two bigger marks (say 10 mL and 20 mL) is 10 mL.

77. How many smaller divisions are there between the two bigger marks?

Ans. : There are 10 smaller divisions between the two bigger marks.

78. How much volume does one small division indicate?

Ans. : One small division indicates 0.1 mL.

The smallest volume that the measuring cylinder can read is 1 mL.

79. What do you use to treat oral dehydration at home?

Ans. : ORS (Oral Rehydration Solution)

80. Predict whether a mixture of sugar and water is uniform or non-uniform.

Ans. : Uniform

81. Name some non-uniform mixtures.

Ans. : Mixture of chalk and water.

82. What is one solute in a solution of two liquids?

Ans. : The one present in a smaller amount.

83. What other name is given to a uniform mixture?

Ans. : Solution

84. Name three possible solutes present in the air.

Ans. : Oxygen, carbon dioxide, argon, etc.

85. What do you call a solution in which more salt can be dissolved?

Ans. : Unsaturated Solution

86. What is termed as concentration?

Ans. : The amount of solute in a fixed quantity of solution is termed its concentration.

87. How does the solubility of solids change with the temperature rise?

Ans. : The solubility will increase with the rise in temperature.

88. What maintains aquatic life in water?

Ans. : A small amount of oxygen is dissolved in water.

89. Out of husk particles or iron sticks, which will float on water?

Ans. : Husk Particles.

90. How is the density of a substance measured?

Ans. : The ratio of mass to volume of a substance gives its density.

91. What appliance do you use to measure the mass of a substance?

Ans. : Digital Weighing Balance

92. Digital Weighing Balance

Ans. : Volume is the space occupied by an object.

93. How does the density of a substance change with temperature?

Ans. : Generally, the density of a substance decreases with the rise of temperature.

94. What is the mass of 1 mL of water?

Ans. : 1 gm

95. Why do sugar and salt dissolve in water but not in oil?

Ans. : Water can disperse particles of salt or sugar. But oil cannot do so.

96. Why are water bottles usually tall and cylindrical in shape instead of spherical?

Ans. : Tall and cylindrical bottles can indicate very small changes in volume.

97. How will you change an unsaturated solution to a saturated solution?

Ans. : We will add more and more salt to the unsaturated solution till it dissolves. When the solute stops dissolving and starts settling at the bottom, it becomes a saturated solution.

98. In a mixture of sawdust or sand in water, which mixture is called a solution? In which case, the so-added substance will float or sink?

Ans. : Both mixtures are non-uniform and are not called solutions. The sawdust will float on water as it is lighter than water. Sand will sink as it is heavier than water.

99. Which is heavier: a wooden stick or an iron rod? Explain.

Ans. : An iron rod is heavier than a wooden stick. A wooden stick can displace more liquid and thus its density is lower than that of an iron rod.

100. Give the SI unit of density.

Ans. : kg/m³ or 1000 g/1000 L or g/L or g/1000 mL

101. Differentiate between mass and weight.

Ans. : Mass is the quantity of matter present in an object or a substance. Its units are gram (g) or kilogram (kg). On the other hand, weight is the force by which the Earth attracts an object towards itself. Its unit is newton (N)

102. Give the formula to calculate the volume of a regular object.

Ans. : Volume = length × width × height = cm^3

* Match the Following.

[8]

103.

Column A	Column B
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Q.1. Solute	(a) The substance that dissolves in a solution.
Q.2. Solvent	(b) A solution in which water acts as the dissolving medium.
Q.3. Solution	(c) The substance in which a solute dissolves.
Q.4. Aqueous Solution	(d) A homogeneous mixture of two or more substances.

Ans. :

Column A	Column B
1. Solute	(a) The substance that dissolves in a solution.
2. Solvent	(c) The substance in which a solute dissolves.
3. Solution	(d) A homogeneous mixture of two or more substances.
4. Aqueous Solution	(b) A solution in which water acts as the dissolving medium.

104.

Column A	Column B
Q.1. Aqueous Solution	(a) A solution containing the maximum amount of solute that can be dissolved at a given temperature.
Q.2. Saturated Solution	(b) A solution that can still dissolve more solute at a given temperature.
Q.3. Unsaturated Solution	(c) Water, because it dissolves more substances than any other liquid.
Q.4. Universal Solvent	(d) A solution in which water acts as the dissolving medium.

Ans. :

Column A	Column B
1. Aqueous Solution	(d) A solution in which water acts as the dissolving medium.
2. Saturated Solution	(a) A solution containing the maximum amount of solute that can be dissolved at a given temperature.
3. Unsaturated Solution	(b) A solution that can still dissolve more solute at a given temperature.
4. Universal Solvent	(c) Water, because it dissolves more substances than any other liquid.

