

THE AMAZING WORLD OF SOLUTES, SOLVENTS, AND SOLUTIONS
Class 08 - Science (Curiosity)

Time Allowed: 1 hour and 30 minutes

Maximum Marks: 140

1. What type of mixture is formed when gases dissolve in water? [1]
 - a) Uniform mixture
 - b) None of these
 - c) Non-uniform mixture
 - d) Heterogeneous mixture
2. Which one of the following is the most appropriate statement, and why are the other statements not appropriate? [1]
 - a) No more solute can be dissolved into the saturated solution at that temperature.
 - b) A saturated solution forms only at high temperatures.
 - c) A saturated solution can still dissolve more solute at a given temperature.
 - d) An unsaturated solution has dissolved the maximum amount of solute possible at a given temperature.
3. What is the main difference between a solution and a suspension? [1]
 - a) Solutions have larger particles than suspensions.
 - b) Solutions cannot be separated by filtration, while suspensions can.
 - c) Solutions scatter light, while suspensions do not.
 - d) Solutions are homogeneous, while suspensions are heterogeneous.
4. Why does stirring and heating allow more solute to dissolve in a solvent? [1]
 - a) It decreases the solvent particles
 - b) It decreases the solubility limits
 - c) It increases the energy available to solute particles, helping them integrate into the solution
 - d) It increases the solute particles
5. What happens to the solubility of gases when the temperature of the liquid increases? [1]
 - a) It decreases
 - b) It increases initially then decreases
 - c) It increases
 - d) It remains unchanged
6. What is the role of a solvent in a solution? [1]
 - a) To create a heterogeneous mixture
 - b) To dissolve another substance
 - c) To separate substances
 - d) To be dissolved
7. What distinguishes a solution from a suspension? [1]
 - a) Suspension has large particles that
 - b) Solution settles quickly

settle

c) Both form clear liquids

d) Solutions and suspensions behave similarly

8. How does temperature affect the density of a substance? [1]
- a) Density decreases as temperature decreases. b) Density increases as temperature decreases.
- c) Density remains constant regardless of temperature. d) Density increases as temperature increases.
9. Which of the following is NOT a type of solution based on the physical state of the solvent? [1]
- a) Solid solution b) Liquid solution
- c) Gaseous solution d) Heterogeneous solution
10. Which of the following is a characteristic of a solute? [1]
- a) It is the substance that does the dissolving. b) It is present in the largest quantity.
- c) It forms a heterogeneous mixture. d) It is dissolved in the solvent.
11. Which of the following is an example of a solution? [1]
- a) Sand in water b) Sugar in water
- c) Oil and water d) Muddy water
12. Which of the following is NOT a colligative property? [1]
- a) Boiling point elevation b) Vapour pressure lowering
- c) Freezing point depression d) Solubility
13. What happens to the solubility of most substances when temperature increases? [1]
- a) Solubility remains unchanged b) Solubility decreases
- c) Solubility increases d) Solubility initially increases and then decreases
14. Which of the following best describes why more oxygen can dissolve in cold water? [1]
- a) Cold water evaporates more slowly b) Cold water has fewer impurities
- c) Low temperature allows more gas molecules to remain dissolved d) Cold water has less salinity
15. What could happen if you add too much solute to a solvent? [1]
- a) Excess water will appear b) Excess solute will not dissolve
- c) Solvent will become cloudy d) It will always dissolve
16. **Assertion (A):** If you add an iron rod to water, it will sink. [1]
Reason (R): Iron has a higher density than water.
- a) Both A and R are true and R is the correct explanation of A. b) Both A and R are true but R is not the correct explanation of A.

- c) A is true but R is false. d) A is false but R is true.
17. **Assertion (A):** Rice grains settle at the bottom of the water container. [1]
Reason (R): Rice is denser than water.
- a) Both A and R are true and R is the correct explanation of A. b) Both A and R are true but R is not the correct explanation of A.
c) A is true but R is false. d) A is false but R is true.
18. **Assertion (A):** Dissolved oxygen in water is crucial for aquatic life. [1]
Reason (R): Oxygen is present in water in very high concentrations.
- a) Both A and R are true and R is the correct explanation of A. b) Both A and R are true but R is not the correct explanation of A.
c) A is true but R is false. d) A is false but R is true.
19. **Assertion (A):** Chalk powder does not dissolve in water. [1]
Reason (R): Chalk powder and water form a uniform mixture.
- a) Both A and R are true and R is the correct explanation of A. b) Both A and R are true but R is not the correct explanation of A.
c) A is true but R is false. d) A is false but R is true.
20. **Assertion (A):** Mixing sugar in water creates a solution. [1]
Reason (R): In solutions, the liquid is always the solute.
- a) Both A and R are true and R is the correct explanation of A. b) Both A and R are true but R is not the correct explanation of A.
c) A is true but R is false. d) A is false but R is true.
21. Define density in simple terms. [1]
22. An object has a mass of 400 g and a volume of 40 cm³. What is its density? [1]
23. What happens to the solubility of gases in liquids when temperature increases? [1]
24. What makes a solution dilute as compared to another? [1]
25. What is the concept of density, and how does it relate to the floating or sinking of objects? [1]
26. Why do hot air balloons rise when heated? [1]
27. Describe what happens when salt is added to water. [1]
28. What is the SI unit of density, and how is it derived? [1]
29. Explain why more oxygen dissolves in cold water than in warm water. [1]
30. 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? [1]
31. Illustrate the difference between uniform and non-uniform mixtures with an example. [2]
32. Determine the factors that might affect the solubility of a gas in a liquid. [2]
33. Analyse Fig.(a) and (b). Why does the unpeeled orange float, while the peeled one sinks? Explain. [2]

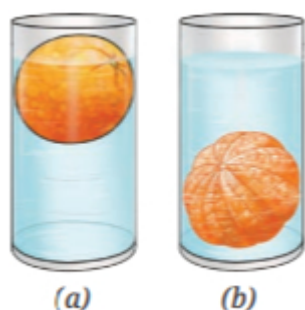
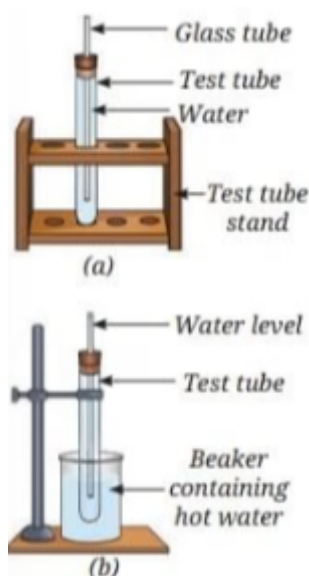


Fig.

34. Explain the difference between a dilute solution and a concentrated solution with examples. [2]
35. How traditional systems of medicine in India utilize different solvents. [2]
36. Analyze why chalk powder does not form a uniform mixture with water. [2]
37. Define the term 'solute' and 'solvent' in the context of solutions. [2]
38. Why do sugar and salt dissolve in water but not in oil? Why is water considered a good solvent? [2]
39. What is the SI unit of density, and how is it determined? [2]
40. You are provided with an experimental setup as shown in Fig. (a) and (b). On keeping the test tube (Fig b) in a beaker containing hot water ($\sim 70^\circ\text{C}$), the water level in the glass tube rises. How does it affect the density? [2]



41. What happens to the solubility of solids and gases in water when the temperature increases? [3]
42. What are the SI units for mass and volume, and how is density expressed using these units? [3]
43. Describe the relationship between volume, mass, and density and how each is measured. [3]
44. Why do hot air balloons rise? Use the idea of density in the answer. [3]
45. Identify and explain the effects of temperature on the solubility of gases in water. [3]
46. How is the relative density of a substance calculated, and why is it a useful measure? [3]
47. Explain why understanding density is important in the design of ships and submarines. [3]
48. Describe how temperature influences the separation of substances in non-uniform mixtures like sand and water. [3]
49. Under what conditions is the density of a substance affected by temperature and pressure? [3]
50. Define a saturated solution and Give an example. [3]
51. **Read the following text carefully and answer the questions that follow:** [4]

Many gases, such as oxygen, dissolve in water to a small extent. This dissolved oxygen is essential for aquatic life. The solubility of gases decreases as temperature rises; hence, more oxygen dissolves in cold water than in warm water. Mixtures can be uniform (solutions) where

components are not separately visible, or non-uniform, where components are visible, like sand in water that sinks, or sawdust in water that floats.

Questions:

- a. What type of mixture is formed when gases dissolve evenly in water? **(1)**
- b. Why is dissolved oxygen in water important for aquatic life? **(1)**
- c. How does temperature affect the solubility of oxygen in water? **(2)**

OR

Differentiate between uniform and non-uniform mixtures with examples. **(2)**

52. **Read the following text carefully and answer the questions that follow:** **[4]**

A fixed amount of solvent can dissolve only a certain quantity of solute, beyond which the solution becomes saturated. The maximum solute that dissolves in a solvent at a given temperature is called its solubility. Solutions can be dilute or concentrated depending on the solute amount. Temperature affects solubility—generally, solubility increases with rising temperature. Thus, heating a saturated solution may allow more solute to dissolve, making it unsaturated again at the higher temperature.

Questions:

- a. What is solubility? **(1)**
- b. Differentiate between a saturated and an unsaturated solution. **(1)**
- c. How do dilute and concentrated solutions differ? Explain with reference to solute quantity. **(2)**

OR

How does temperature affect the solubility of most substances? **(2)**

53. **Read the following text carefully and answer the questions that follow:** **[4]**

Some objects float while others sink in water. For example, husk floats while rice sinks. Similarly, oil floats on water. People often think lighter objects float and heavier ones sink. However, this depends on a property called density, which is the heaviness of a substance. A wooden stick and an iron rod of the same size differ because iron is denser. But density is not the only factor that determines floating or sinking.

Questions:

- a. Which property mainly explains why some objects float while others sink? **(1)**
- b. Why does a wooden stick float while an iron rod of the same size sinks? **(1)**
- c. Explain with examples how density affects whether an object floats or sinks. **(2)**

OR

Why is it incorrect to say that only heavier objects sink in water? **(2)**

54. **Read the following text carefully and answer the questions that follow:** **[4]**

When salt or sugar is dissolved in water, the components mix evenly to form a uniform mixture called a solution. In a solution, the solid that dissolves is the solute, while the liquid is the solvent. Even in liquid-liquid solutions, the substance present in smaller amount is the solute, and the larger one is the solvent. Air is a gaseous solution where nitrogen acts as the solvent and other gases as solutes.

Questions:

- a. In air, which gas is considered the solvent? **(1)**
- b. Define solute and solvent with an example. **(1)**

c. Explain why every sip of homemade ORS tastes the same. (2)

OR

Why is water considered the solvent in Chashni, even though sugar is in large amount? (2)

55. **Read the following text carefully and answer the questions that follow:** [4]

Density is the mass per unit volume of a substance and does not depend on its shape or size, but varies with temperature and pressure. Heating generally decreases density as particles spread apart, while cooling increases it. Pressure mainly affects gases by compressing particles and increasing density, but it has negligible effects on solids and liquids. Water shows unusual behavior: ice floats because it expands on freezing, lowering its density compared to liquid water.

Questions:

- a. Which factor has the greatest effect on the density of gases? (1)
- b. Why does ice float on water even though both are the same substance? (1)
- c. How does temperature affect the density of substances? (2)

OR

Why does pressure have a significant effect on gases but negligible effect on solids and liquids? (2)

56. **State whether the given statement is True or False:** [5]

- (a) A mixture of sand and water is a solution. [1]
- (b) The mixture of different gases in the atmosphere is also a solution. [1]
- (c) Air is a uniform mixture where nitrogen is the solvent. [1]
- (d) The solubility of most solids increases with an increase in temperature. [1]
- (e) Solute particles in a solution are visible to the naked eye. [1]

57. What is meant by 'concentration' in relation to solutions, and how are the terms 'dilute' and 'concentrated' used to describe solutions? [5]

58. What role does the relative density of an object play in its ability to float or sink in a liquid? [5]

59. Define unsaturated and saturated solutions in the context of the solubility limit of a solute. How does the state of the solution change as more solute is added to the solvent? [5]

60. Explain the concept of relative density and how it can be used to compare substances. [5]

61. Discuss how temperature affects the solubility of gases in liquids, specifically regarding dissolved oxygen in water. [5]

62. **Fill in the blanks:** [10]

- (a) In comparing densities, oil is _____ dense than water. [1]
- (b) Non-uniform mixtures allow components to be seen either with a magnifying device or the _____ eye. [1]
- (c) 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. [1]
- (d) Oxygen dissolves in water to a small extent, which is essential for _____ life. [1]
- (e) In a sugar-water solution, water acts as the _____. [1]
- (f) The particles in a solution do not _____ a beam of light passing through it. [1]
- (g) The SI unit of density is kilogram per _____. [1]
- (h) Density is defined as the mass present in a unit _____ of a substance. [1]
- (i) The solubility of gases in liquids generally _____ as temperature increases. [1]

- (j) A substance that dissolves another substance (usually in greater quantity) is called the **[1]**
_____.

USP

Solution
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1. **(a)** Uniform mixture
Explanation:
Gases dissolve evenly in water to form a uniform mixture.
2. **(a)** No more solute can be dissolved into the saturated solution at that temperature.
Explanation:
 - is incorrect because a saturated solution cannot dissolve more.
 - describes a saturated, not unsaturated, solution.
 - is wrong as saturation can occur at any temperature.
3. **(d)** Solutions are homogeneous, while suspensions are heterogeneous.
Explanation:
A solution is a homogeneous mixture, meaning its composition is uniform throughout. A suspension is a heterogeneous mixture, where particles are not uniformly mixed and can often be seen or settle down over time.
4. **(c)** It increases the energy available to solute particles, helping them integrate into the solution
Explanation:
Stirring and heating increase kinetic energy, facilitating more solute to dissolve.
5. **(a)** It decreases
Explanation:
The solubility of gases in liquids generally decreases as temperature increases.
6. **(b)** To dissolve another substance
Explanation:
A solvent is the substance that dissolves the solute to form a solution. It is usually present in a larger amount.
7. **(a)** Suspension has large particles that settle
Explanation:
Solutions have molecules fully dissolved, while suspensions have larger particles.
8. **(b)** Density increases as temperature decreases.
Explanation:
As temperature decreases, volume contracts and density increases.
9. **(d)** Heterogeneous solution
Explanation:
A heterogeneous solution is NOT a type of solution based on physical state; it refers to a mixture that is not uniform in composition.
10. **(d)** It is dissolved in the solvent.
Explanation:

A solute is the substance that gets dissolved in a solvent to form a solution. It is usually present in a smaller amount.

11. **(b)** Sugar in water
Explanation:
Sugar in water is a solution because sugar completely dissolves in water to form a homogeneous mixture. In this case, sugar is the solute and water is the solvent.
- Sand in water → does not dissolve
 - Muddy water → is a suspension (not uniform)
 - Oil and water → do not mix (immiscible liquids)
12. **(d)** Solubility
Explanation:
Solubility is not a colligative property because it depends on the nature of the solute and solvent, not just the number of particles present. Colligative properties depend only on particle count in the solution.
13. **(c)** Solubility increases
Explanation:
As mentioned, for most substances, solubility increases with an increase in temperature.
14. **(c)** Low temperature allows more gas molecules to remain dissolved
Explanation:
Dissolved gas molecules remain in solution more easily at lower temperatures.
15. **(b)** Excess solute will not dissolve
Explanation:
Once the solvent's capacity is full, additional solute will not dissolve.
16. **(a)** Both A and R are true and R is the correct explanation of A.
Explanation:
Iron's higher density compared to water causes it to sink.
17. **(a)** Both A and R are true and R is the correct explanation of A.
Explanation:
Higher density causes rice to sink.
18. **(c)** A is true but R is false.
Explanation:
Oxygen is present only in minute quantities but is essential.
19. **(c)** A is true but R is false.
Explanation:
Chalk powder does not dissolve in water, resulting in a non-uniform mixture.

20. (c) A is true but R is false.
Explanation:
A solution is formed when sugar is mixed in water, but the liquid is not always the solute.
21. Density is the measure of how much mass is contained in a given volume. It indicates how tightly packed the particles are in a substance.
22. $\text{Density} = 400 \text{ g} / 40 \text{ cm}^3 = 10 \text{ g/cm}^3$.
23. The solubility of gases in liquids generally decreases as temperature increases.
24. A solution is termed dilute if it contains less solute relative to another solution with more solute.
25. Density refers to mass per unit volume, influencing whether objects float or sink in a liquid.
26. Hot air in the balloon becomes less dense than the cooler air outside. This reduced density allows the balloon to rise, as less dense substances float above denser ones.
27. Salt dissolves in water, evenly distributing to form a uniform mixture called a solution.
28. The SI unit of density is kilograms per cubic meter (kg/m^3). It is derived from the mass (kilograms) divided by the volume (cubic meter).
29. Cold water can dissolve more oxygen because gases are more soluble at lower temperatures.
30. Density of A: $200 \text{ g} / 40 \text{ cm}^3 = 5 \text{ g/cm}^3$. Density of B: $240 \text{ g} / 60 \text{ cm}^3 = 4 \text{ g/cm}^3$. Object A is denser.
31. Uniform mixtures, like gases dissolved in water, have **indistinct components** that are evenly distributed, while non-uniform mixtures, like sand and water, have **visible components** that are not evenly distributed and may settle over time. This distinction helps in **identifying whether a mixture is a solution or a suspension**.
32. The solubility of a gas in a liquid mainly depends on temperature and pressure. As temperature increases, gases usually become less soluble because they escape more easily. On the other hand, increasing pressure pushes more gas particles into the liquid, increasing solubility. Therefore, cooler temperatures and higher pressures help dissolve more gas in liquids.
33. The unpeeled orange floats due to air pockets in the peel, reducing its overall density below that of water. The peeled orange sinks because, without the peel, its density is higher than water's.
34. A dilute solution has a smaller amount of solute compared to the solvent, like a teaspoon of salt in a glass of water. A concentrated solution contains a higher amount of solute, such as four teaspoons of salt in the same volume of water.
35. Traditional systems of medicine in India, such as **Ayurveda and Siddha**, use a variety of solvents like **water, hydro-alcoholic extracts, oils, ghee, and milk** to prepare medicinal formulations. These solvents help **extract active compounds** from herbs and other ingredients, allowing the medicine to **deliver therapeutic benefits effectively**. Using different solvents also **enhances absorption and bioavailability**, ensuring that the medicinal properties reach the body efficiently.
36. Chalk powder does not dissolve in water, resulting in an uneven distribution of particles. This creates a non-uniform mixture where the solid remains distinct from the liquid, unlike solutes like sugar or salt.
37. A solute is a substance that is dissolved in a solvent to form a solution, while a solvent is the medium in which the solute is dissolved. Together, they form a solution.
38.
 - Sugar and salt dissolve in water because water is a polar solvent that can break apart ionic bonds in salt or form hydrogen bonds with sugar molecules.
 - Oil is non-polar, so it does not interact with these polar or ionic solutes.
 - Water is considered a good solvent due to its polarity, allowing it to dissolve a wide range of substances, earning it the title "**universal solvent**".
39. The SI unit of density is kilogram per cubic metre (kg/m^3). It is determined by dividing the mass (in kilograms) by the volume (in cubic metres) of the substance.
40. Heating causes the air in the tube to expand, increasing volume and decreasing density, which makes the water level rise as less dense air pushes up.
41. Temperature affects the solubility of solids and gases differently. When water is heated, most solids dissolve more easily because heat helps break them into smaller particles. On the other hand, gases become less soluble in hot water because they escape quickly into the air. So, heating increases the solubility of solids but decreases the solubility of gases in water.

42. The SI unit for mass is the kilogram (kg), and the SI unit for volume is the cubic meter (m^3). Using these SI units, the density is expressed in kilograms per cubic meter (kg/m^3). This means that density is calculated as the mass of the substance in kilograms divided by its volume in cubic meters.
43. Density is the ratio of mass to volume. Mass measures the amount of matter and is often measured using balances. Volume measures the space occupied, using tools like measuring cylinders or calculated for regular shapes with mathematical formulas. The relationship between these quantities is: $\text{Density} = \text{Mass}/\text{Volume}$. A consistent unit system is used to ensure accurate density calculations. While mass in grams and volume in cubic centimeters or milliliters, for instance, result in a density measured in grams per cubic centimeter (g/cm^3).
44. Hot air balloons rise because heated air inside the balloon becomes less dense than the cooler external air. As air is heated, its particles move and spread out, increasing the volume and reducing density without changing mass. This decreased density allows the balloon to ascend, floating above denser, cooler air. The heated air's buoyancy, caused by a strong density contrast with surrounding air, enables the balloon to rise, illustrating practical density application in aerostatics.
45. Temperature affects the solubility of gases in water by generally decreasing the solubility as temperature increases. This phenomenon is because increased temperature provides energy that overcomes intermolecular forces binding gases to water, allowing them to escape more easily into the air. Consequently, cold water can dissolve more oxygen, supporting aquatic life through sufficient oxygen levels. In contrast, warm water holds less oxygen.
46. Relative density, also known as specific gravity, is calculated by dividing the density of a substance by the density of water at the same temperature. It is a useful measure because it provides a dimensionless number that expresses how much more or less dense a substance is compared to water. This makes comparisons between different substances easier without involving various units.
47. Density knowledge is crucial in ship and submarine design to ensure buoyancy and stability. Ships must displace water weighing more than the ship itself to float, requiring a lower density than water. Submarines adjust buoyancy by altering internal volume with water and air, changing overall density. These adjustments ensure they can surface or submerge. Designers use density changes to achieve controlled stability, maneuverability, and prevent capsizing in various ocean conditions.
48. Temperature influences substance separation in non-uniform mixtures by altering viscosity and density. Warmer temperatures decrease water viscosity, potentially causing suspended particles to settle more slowly. However, temperature might not profoundly affect heavier substances, like sand, that settle due to gravity. In contrast, temperature plays a more significant role in dissolving lighter particles or gases in solutions.
49. The density of a substance is affected by both temperature and pressure. Temperature affects density because as the temperature increases, particles move apart, increasing volume and decreasing density. Pressure primarily affects gases, causing particles to come closer together, decreasing volume and increasing density. The effect of pressure on solids and liquids is negligible due to their incompressibility.
50. A saturated solution is a solution in which no more solute can dissolve at a given temperature, resulting in the excess solute settling at the bottom. An example is when adding salt to water until it no longer dissolves, forming undissolved salt at the bottom under constant temperature conditions.
51.
 - a. A uniform mixture is formed when gases dissolve evenly in water.
 - b. Dissolved oxygen, even in small amounts, sustains aquatic life like plants, fish, and other organisms. Without it, aquatic animals cannot survive, as oxygen is essential for their respiration.
 - c. The solubility of oxygen in water decreases as temperature increases. In cold water, more oxygen dissolves, which supports aquatic organisms. However, in warm water, less oxygen is available, creating difficulties for aquatic life to survive due to reduced oxygen content.

OR

- Uniform mixtures, or solutions, have components evenly distributed, such as oxygen dissolved in water. Non-uniform mixtures have visible components, like sand in water, where sand settles down, or sawdust in water, where particles float. Thus, visibility distinguishes them.
52.
 - a. Solubility is the maximum amount of solute that can dissolve in a solvent at a fixed temperature.

- b. A saturated solution contains the maximum amount of solute that can dissolve at a given temperature, leaving extra solute undissolved. An unsaturated solution, on the other hand, can still dissolve more solute under the same conditions.
- c. A dilute solution has a small amount of solute relative to the solvent, while a concentrated solution has a comparatively larger amount of solute. These terms are relative. For example, one spoon of salt in 100 mL water makes a dilute solution, while four spoons in the same amount of water form a concentrated solution.

OR

For most substances, solubility increases with an increase in temperature. At higher temperatures, solvent particles gain more energy, enabling them to dissolve more solute. A saturated solution at a lower temperature may become unsaturated if the temperature is raised, allowing additional solute to dissolve.

53. a. Density mainly explains why some objects float while others sink.
- b. A wooden stick floats while an iron rod sinks because wood has lower density than water, while iron has higher density. Density determines an object's ability to float or sink.
 - c. Density describes the heaviness of a substance. Objects with density lower than water, like wood and husk, float, while those with higher density, like rice and iron, sink. However, floating or sinking is not decided by density alone; other factors like liquid type also matter.

OR

It is incorrect because weight alone doesn't decide floating. For instance, oil, though liquid and lighter than water, floats because of lower density. Similarly, husk floats while rice sinks despite both being small. Hence, density and other properties, not just heaviness, decide floating or sinking.

54. a. Nitrogen is considered the solvent in air.
- b. A solute is the substance that dissolves, and a solvent is the medium in which it dissolves. For example, in a sugar solution, sugar is the solute, while water acts as the solvent.
 - c. Every sip of ORS tastes the same because sugar and salt dissolve completely and distribute evenly in water, forming a uniform mixture or solution. Since the solute particles are spread equally throughout, no part of the solution is sweeter or saltier than another, making it uniform in taste.

OR

In Chashni, though sugar is present in larger quantity, water is considered the solvent because it dissolves the sugar and forms the medium of the solution. The substance that enables dissolution, regardless of its proportion, is defined as the solvent, while the substance being dissolved is the solute.

55. a. Pressure has the greatest effect on the density of gases.
- b. Ice floats because when water freezes, its particles arrange in a structure that occupies more space, reducing density. As a result, ice becomes less dense than liquid water and remains on the surface.
 - c. When temperature increases, particles move apart, increasing volume but keeping mass constant, so density decreases. On cooling, particles come closer, decreasing volume and increasing density. This explains why hot air rises and why hot air balloons float, as warm air inside is less dense than the surrounding cooler air.

OR

Gases have particles far apart, so pressure easily compresses them, reducing volume and increasing density. Liquids are almost incompressible, and solids are even more rigid because their particles are tightly packed. Thus, pressure significantly alters gas density but has negligible influence on liquids and solids.

56. State whether the given statement is True or False:

(a) **(b)** False

Explanation:

A mixture of sand and water is a non-uniform mixture, not a solution.

(b) **(a)** True

Explanation:

The mixture of different gases in the atmosphere is a solution, with nitrogen as the solvent.

- (c) (a) True

Explanation:

Nitrogen is present in the largest amount in the air.

- (d) (a) True

Explanation:

In most cases, the solubility of solids increases when temperature increases because higher temperature gives more energy to dissolve more solute in the solvent.

- (e) (b) False

Explanation:

The correct answer is False. Solute particles in a solution are extremely small and get completely dissolved in the solvent, so they cannot be seen with the naked eye. The mixture looks uniform throughout.

57. The **concentration** of a solution shows how much solute is present in a certain amount of solvent or solution. When only a little solute is mixed in a large amount of solvent, the solution is called **dilute**. If a lot of solute is present in less solvent, the solution is called **concentrated**. These terms are **relative**, meaning one solution is called dilute or concentrated only when compared with another. For example, lemon juice with less sugar is dilute, while lemon juice with more sugar is concentrated. **Concentration also affects the properties of a solution**, such as taste, reactivity, and density.
58. Relative density is crucial in determining whether an object will float or sink in a liquid. It is the ratio of the density of the object to the density of the liquid. If the relative density is less than one, the object is less dense than the liquid and will float. Conversely, if the relative density is greater than one, the object is denser and will sink. For example, a wooden stick floats on water as it has a lower relative density compared to water, whereas an iron rod sinks due to its higher relative density.
59. An **unsaturated solution** is one in which **more solute can still be dissolved** at a given temperature. As solute continues to dissolve completely, the solution **remains unsaturated**. A **saturated solution** occurs when **no more solute can dissolve** in the solvent at that temperature; any additional solute **remains undissolved and settles at the bottom**. As more solute is gradually added to an unsaturated solution, it **eventually becomes saturated once its solubility limit is reached**, and the solution cannot dissolve any more solute under the same conditions. This process is **temperature-dependent**, as increasing the temperature can allow more solute to dissolve, temporarily converting a saturated solution back to unsaturated.
60. Relative density, also known as specific gravity, is a dimensionless quantity indicating the density of a substance relative to a reference substance, typically water. It is calculated by dividing the density of the substance by the density of water at a given temperature. This value helps compare the densities of different substances without needing units. For instance, aluminum has a relative density of 2.7, meaning it is 2.7 times denser than water. Scientists and engineers use relative density to make informed decisions about material properties, buoyancy, and compatibility in various applications.
61. Solubility of gases in liquids is significantly influenced by temperature. As temperature increases, the solubility of gases typically decreases. When water is cold, it can dissolve more oxygen, ensuring aquatic environments remain oxygen-rich to support life. This is crucial for colder climates or seasons where organisms rely on high oxygen solubility for their survival. Conversely, as water warms, less oxygen can be dissolved, which can stress aquatic life forms, especially in shallow waters or during summer. This decrease in oxygen levels can lead to hypoxia, impacting organism health and ecosystem balance. Hence, monitoring water temperature is essential for maintaining aquatic life and preventing oxygen depletion.
62. Fill in the blanks:
- (a) less
 - (b) naked
 - (c) saturated
 - (d) aquatic
 - (e) solvent
 - (f) Scatter
 - (g) cubic metre

- (h) volume
- (i) decreases
- (j) solvent

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