NCERT QUESTIONS WITH SOLUTIONS

1. State whether the statements given below are True [T] or False [F]. Correct the false statement(s).

(i) Oxygen gas is more soluble in hot water rather than in cold water.

(ii) A mixture of sand and water is a solution.

(iii) The amount of space occupied by any object is called its mass.

(iv) An unsaturated solution has more solute dissolved than a saturated solution.

(v) The mixture of different gases in the atmosphere is also a solution.

Sol. (i) False

Oxygen gas is more soluble in cold water rather than in hot water. The solubility of most of the gases decreases as the temperature increases.

(ii) False

A mixture of sand and water is a non-uniform mixture (a suspension), not a solution. In a solution, the components must be evenly distributed.

(iii) False

The amount of space occupied by any object is called its volume. Mass is the amount of matter in an object.

(iv) False

A saturated solution has more (or equal) solute than an unsaturated solution. An unsaturated solution can still dissolve more solute.

(v) True

Air is an example of a gaseous solution, with nitrogen as the solvent and other gases like oxygen as the solute.

2. Fill in the blanks.

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

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

(iii) Generally, the density _____ with increase in temperature.

(iv) 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.

Sol. (i) The volume of a solid can be measured by the method of displacement, where the solid is immersed in water and the rise in water level is measured.

(ii) The maximum amount of solute dissolved in a fixed quantity of a solvent (or solution) at a particular temperature is called solubility at that temperature.

(iii) Generally, the density decreases with increase in temperature.

(iv) The solution in which glucose has completely dissolved in water, and no more glucose can dissolve at a given temperature, is called a saturated solution of glucose.

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

(i) Oil is denser than water

(ii) Water is denser than oil

(iii) Oil and water have the same density

(iv) Oil dissolves in water

Sol. (ii) Water is denser than oil. Therefore, oil floats on water.

4. A stone sculpture weighs 225 g and has a volume of 90 cm^3. Calculate its density and predict whether it will float or sink in water.

Sol. Mass of stone sculpture is 225 g, Volume of stone sculpture is 90 cm^3.

Density = Mass / Volume

Density = 225 g / 90 cm^3 = 2.5 g/cm^3

The density of water is approximately 1 g/cm^3.

Since the sculpture's density (2.5 g/cm^3) is greater than the density of water, it will sink.

5. 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.

Sol. The most appropriate statement is (iii) No more solute can be dissolved into the saturated solution at that temperature.

(i) This statement describes an unsaturated solution, not a saturated one.

(ii) This statement describes a saturated solution, not an unsaturated one.

(iv) Saturated solutions can be formed at any temperature; the amount of solute needed to reach its saturation. The temperature primarily affects the amount of solute that can be dissolved no the ability to reach saturation itself.

6. 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?

Sol. First, convert litres to millilitres: 2 litres = 2 × 1000 mL = 2000 mL.

The bottle can hold 2000 mL in total. We have already poured 500 mL.

Amount of water the bottle can still hold

= Total Volume – Poured Volume

= 2000 mL – 500 mL

= 1500 mL.

The bottle can hold 1500 mL more water (or 1.5 litres).

7. An object has a mass of 400 g and a volume of 40 cm^3. What is its density?

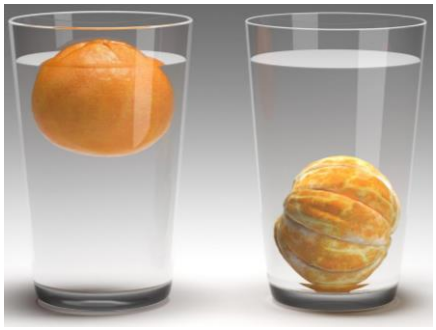
Sol. Mass of object is 400 g and volume is 40 cm^3

Density = Mass / Volume

Density = 400 g / 40 cm^3 = 10 g/cm^3

The density of the object is 10 g/cm^3.

8. Analyse Fig. (a) and (b). Why does the unpeeled orange float while the peeled one sinks? Explain.



(a) (b)

Sol. The unpeeled orange floats because its peel is full of tiny air pockets. This trapped air increases the orange's total volume significantly without adding much mass. This makes the overall density of the unpeeled orange less than the density of water, causing it to float. When we peel the orange, we remove the peel and all the trapped air. The remaining orange flesh is denser than water, so it sinks.

9. Object A has a mass of 200 g and a volume of 40 cm^3. Object B has a mass of 240 g and a volume of 60 cm^3. Which object is denser?

Sol. Density of Object A = Mass / Volume

= 200 g / 40 cm^3 = 5 g/cm^3

Density of Object B = Mass / Volume

= 240 g / 60 cm^3 = 4 g/cm^3

Comparing the two, Object A (5 g/cm^3) is denser than Object B (4 g/cm^3).

10. Reema has a piece of modelling clay that weighs 120 g. She first moulds it into a compact cube that has a volume of 60 cm^3. Later, she flattens it into a thin sheet. Predict what will happen to its density.

Sol. The density of the modelling clay will not change because density is an intrinsic property of substance, (does not depend on the amount of material of its shape) it remains constant for a given substance. When Reema flattens the clay, she changes its shape, but she doesn't change the amount of matter (its mass, 120 g) or the space it takes up (its volume, 60 cm^3). Since both the mass and the volume remain the same, its density (120 g / 60 cm^3 = 2 g/cm^3) also remains the same.

11. A block of iron has a mass of 600 g and a density of 7.9 g/cm^3. What is its volume?

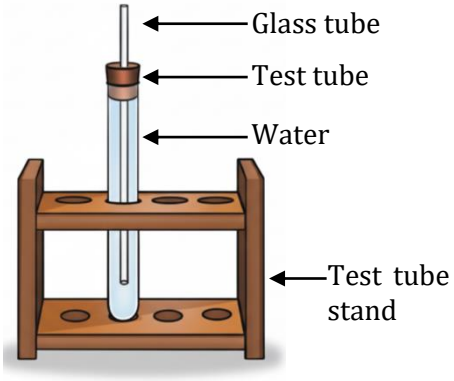
Sol. Density of iron block is 7.9 g/cm^3, mass of iron block is 600 g

Volume = Mass / Density

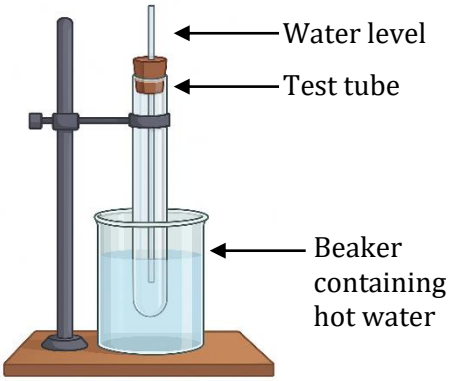
Volume = 600 g / 7.9 g/cm^3 ≈ 75.95 cm^3

The volume of the iron block is approximately 75.95 cm^3.

12. 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 (~70°C), the water level in the glass tube rises. How does it affect density?



(a)



(b)

Sol. The above experiment shows the effect of temperature on density of water. When the water in the test tube is heated, its particles gain energy, move faster therefore interparticle space of water increases causes the water to expand, so its total volume increases (which is why the level rises in the narrow glass tube). As Density = Mass / Volume and the mass of the water hasn't changed but its volume has increased, the density of the water has decreased. So, heating the water causes its density to decrease.