Experiment 10

AIM

To prepare a solution of common salt of 10% composition by mass.

THEORY

The concentration of a solution is the amount of solute present in a given amount (mass or volume) of the solution. Mass percent concentration is defined as a mass (g) of the solute per 100 g mass of the solution. A 10% solution by mass means, 10 g of solute dissolved in 90 g of solvent to result into 100 g of solution.

MATERIALS REQUIRED

Common salt, distilled water, watch glass, stirring rod, physical balance, measuring cylinder (100 mL), and a beaker (250 mL).

PROCEDURE

1. Calculate the volume of solvent (distilled water) and mass of solute (sodium chloride or common salt) required to prepare 100 g of 10% by mass solution. This may be done as follows–

   10 g solute is required for 100 g solution (distilled water + salt). Thus the amount of water required would be 100 g – 10 g = 90 g. Since the density of distilled water is 1 g/mL, therefore the volume of distilled water (required to prepare 100 g of 10% by mass solution with 10 g of common salt) is 90 mL.

2. Weigh an empty watch glass on a physical balance. Also weigh 10 g of sodium chloride (common salt) on the watch glass now.

3. Take 90 mL (90 g) of distilled water in a 250 mL beaker with the help of a measuring cylinder.

4. Transfer 10 g of salt from the watch glass to the beaker containing 90 mL distilled water.

5. Stir the solution untill all the salt dissolve in it.

OBSERVATIONS AND CALCULATIONS

(i)   Mass of empty watch glass (m_1)   = _____ g

(ii) Mass of watch glass + sodium chloride (m_1 + 10 g)   = _____ g

(iii) Mass of sodium chloride (common salt)   = 10 g.

RESULTS AND DISCUSSION

The concentration of prepared solution is 10% by mass of common salt in water. This way of expressing concentration is one amongst many.

PRECAUTIONS AND SOURCES OF ERROR

• Use of physical balance must be done with all precautions. Ask your teacher acquaint you with the working of a physical balance.

• The readings of the physical balance should be taken only when its pointer comes to rest.

• The measuring cylinder should be placed on a horizontal surface while measuring the volume of the distilled water and solution.

NOTE FOR THE TEACHER

• In place of common salt, some students may be suggested to perform this experiment with sugar.

• This experiments requires to use a physical balance to weigh 10 g of common salt or sugar using a watch glass. A physical balance is a sophisticated equipment. It is suggested to acquaint students with the working of a physical balance. They may be asked to practice with this balance before performing this experiment.

• In case, if distilled water is not available, the experiment may be performed with filtered water or drinking water. Its density may be assumed as 1 g/mL at the experimental temperature.

QUESTIONS

- Why should the density of a 10% common salt be more than the density of pure water at a specified temperature? Offer qualitative explanation.
- A student is asked to prepare 250 mL sugar solution 15% by mass concentration. How much amount of sugar and water should be taken for preparation of the solution?
- If 50 mL of water is added to the above solution. What will be the change in the mass percentage of the solute?
- 830 g of salt solution contains 50 g of common salt in it. Calculate its concentration in terms of mass percentage?