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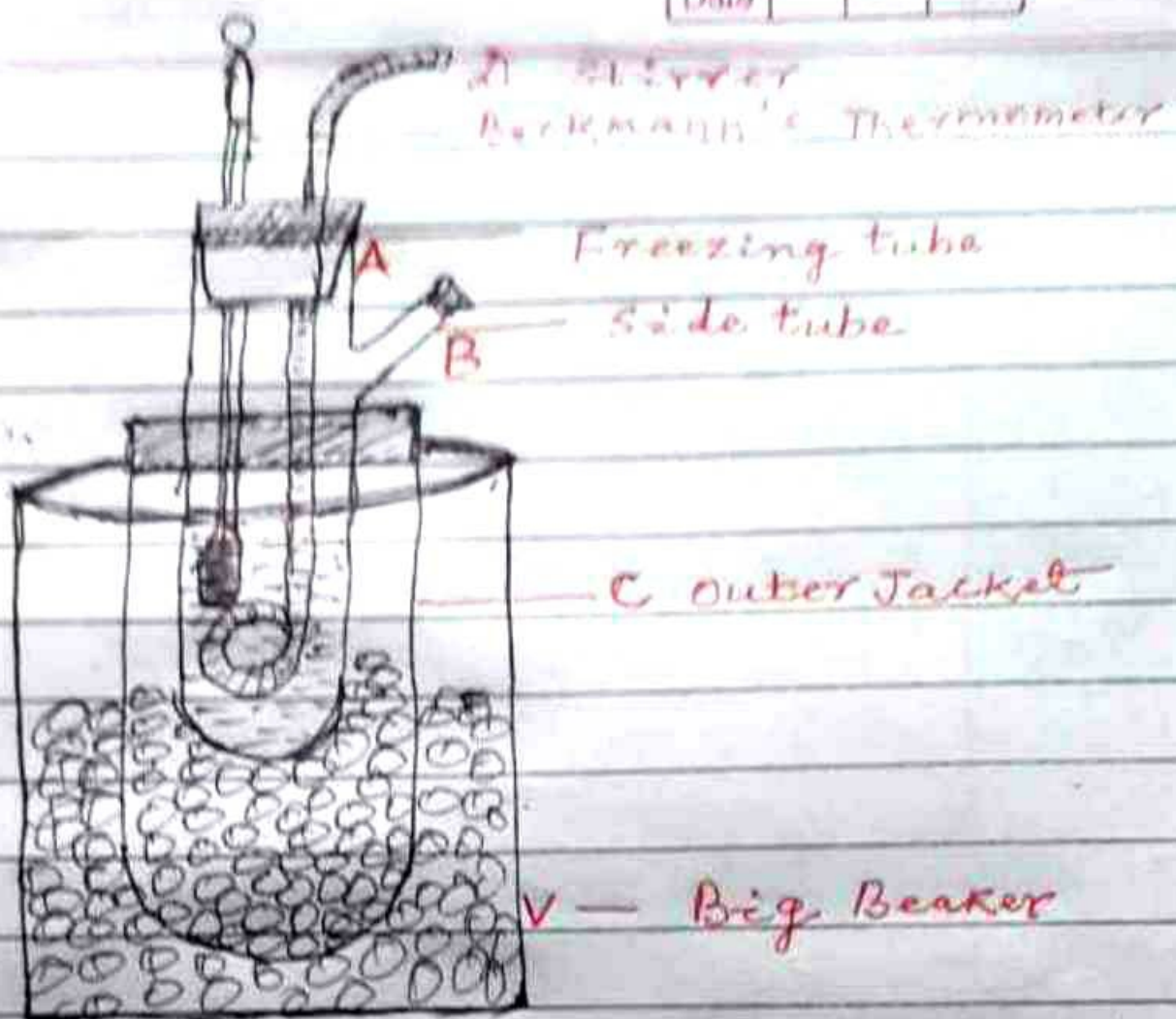
Topic: - Colligative Properties

Experimental measurement of Depression of freezing Point: -

Beckmann's method :- The experimental arrangement is shown in the figure. It consists of a freezing tube A with the side tube B through which a weighed amount of a solute can be introduced.

Freezing tube is fitted with a stopper consisting of a Beckmann's thermometer and a stirrer. To prevent rapid cooling of the contents of the freezing tube A, an outer jacket C surrounds the tube. The entire set up is placed in a big beaker V containing freezing mixture (Ice + salt)

A weight amount of pure solvent is placed in the tube A. It is cooled gently by stirring. The temperature at which the solvent freezes remains constant and is noted down. This is T_0 . ✓



The tube A is taken out, warmed to melt the solid and a known weight of the solute is added through the side tube B. When the solute passes into the solution the tube A is again put back in its original position and the freezing point of solution is determined by the same method as described above. Thus the freezing point of solution (T) is determined.

$$\text{The freezing point depression } (\Delta T_f) = T_0 - T$$

Determination of molecular wt of solute

Suppose the amount of solute = a gram
 " " " " solvent = b gram

The molecular wt of solute = m

$$\therefore \text{No of moles of solute} = \frac{a}{m}$$

\therefore b gram of solvent contains $\frac{a}{m}$ moles of a solute

$$\therefore 1 \text{ " " " } = \frac{a}{m \times b}$$

$$\therefore 1000 \text{ " " } = \frac{a \times 1000 \text{ moles}}{m \times b \text{ of solute}}$$

\therefore Molar Concentration (Cm)

$$= \frac{a \times 1000}{m \times b}$$

We know that $\Delta T_f = K_f \times C_m$

$$\therefore \Delta T_f = \frac{K_f \times a \times 1000}{m \times b}$$

$$\therefore m = \frac{K_f \times a \times 1000}{\Delta T_f \times b}$$

The quantities in the right hand side of the equation are known hence the molecular wt of the solute can be calculated with the help of above equation.