LAB. 4

METHODS OF SOLUBILITY

Introduction

Solubility is defined as the maximum concentration that the solute can achieve in a given volume of solvent at a certain temperature.

There are several factors that can affect the solubility of a compound such as the physical and chemical properties of the solute (polarity, molecular size...etc.), temperature, pressure, and the pH of the solution.

Method of solubility

1. Solvent combination (co-solvency)

The solubility of the solute is qualitatively related to the polarity of the solvent system. Nonpolar solutes dissolve in nonpolar solvents while polar solutes dissolve in polar solvents. The use of solvent combination can change the polarity of the solvent system and thus can change the solubility of the solute in that solvent.

2. Salt Formation (pH control)

Most weak electrolytes can remain in solution by adjusting the pH to keep the drug in ionized form.

3-Solubilization by complexation

Insoluble drugs can form soluble complexes with some compounds. Inorganic and organic materials that are not ionizable can be solubilized in polar solvents by complexation with electrolytes.

Materials and equipment

1- Salicylic acid, ethanol, sodium carbonate, iodine, potassium iodide, HCl (10%) solution, and water.
2- Conical flask, pipette, burette, dropper, graduated cylinder, and balance.

Procedure

1. Solvent combination (co-solvency)

The objective of this experiment is to increase the solubility of salicylic acid (weak organic acid with poor water solubility) by using co-solvent:

1. Put 0.1 g of salicylic acid in a conical flask.
2. Add 10 mL of distilled water to the flask and shake it to observe the solubility of salicylic acid.
3. Add absolute alcohol from a burette drop by drop with continuous shaking until all crystals of salicylic acid dissolve. Measure the amount of alcohol used and Calculate its percentage in the final mixture.
4. Express the solubility, as 1 part of salicylic acid is soluble in x parts of y % of alcohol.

2. Salt Formation (pH control)

The objective of this experiment is to increase the solubility of salicylic acid by salt formation (increasing the pH by using Na_2CO_3).

1. Put 0.1 g salicylic acid in a conical flask.
2. Add 10 mL of distilled water to the flask and shake it.
3. Add 0.1 g Na_2CO_3 to the flask with shaking and observe the result.
4. Add 5 ml dilute HCl (10%) to the same flask slowly and observe the result.
5. write an equation to explain the observations in step 3 and 4

3. Solubilization by complexation

The objective of this experiment is to dissolve I_2 in water by using KI as the complexing agent:

1. Put 0.1 g of iodine (I_2) in a conical flask.
2. Add 10 mL water to the flask, shake the flask and observe the result.
3. Add 0.2 g of potassium iodide (KI) to the flask and observe the result
4. Write an equation to explain the observation in step 3

Group: Subgroup: Date: ***Lab instructor signature:***

Names:

Results

1. Solvent combination (co-solvency)

2. Salt Formation (pH control)

3. Solubilization by complexation