Al-Mustaqbal University College

Department of Pharmacy

Second Stage – Second Semester

Physical Pharmacy Laboratory

First Experiment: SOLUBILITY

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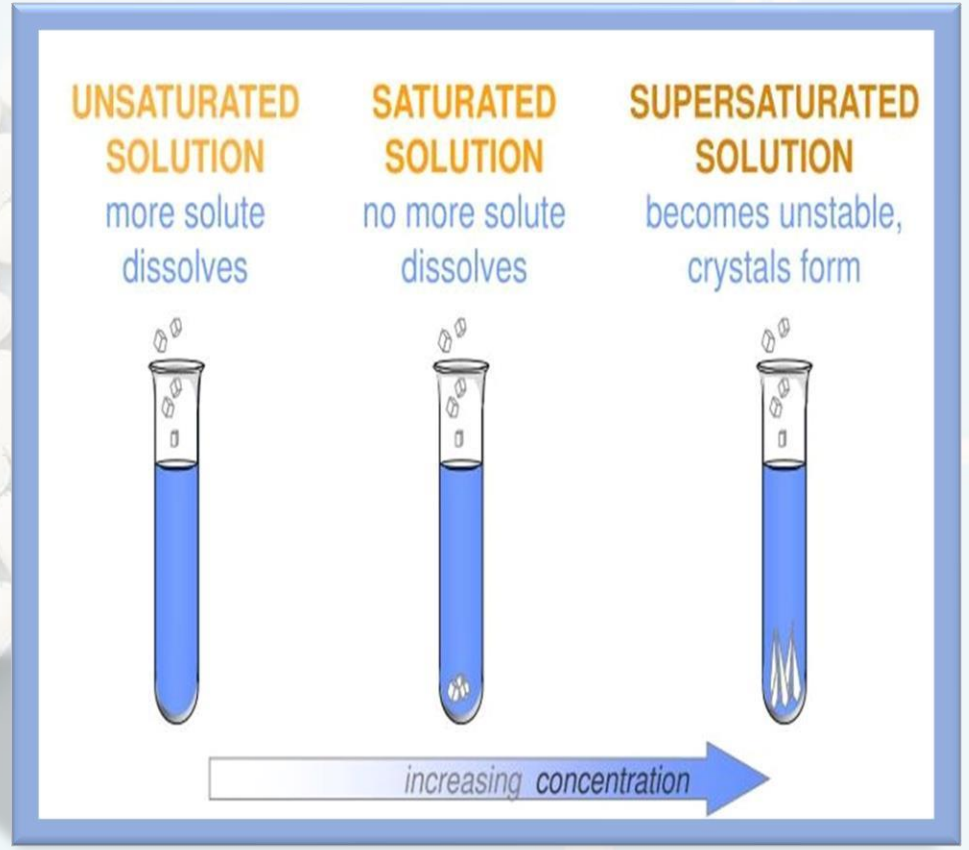
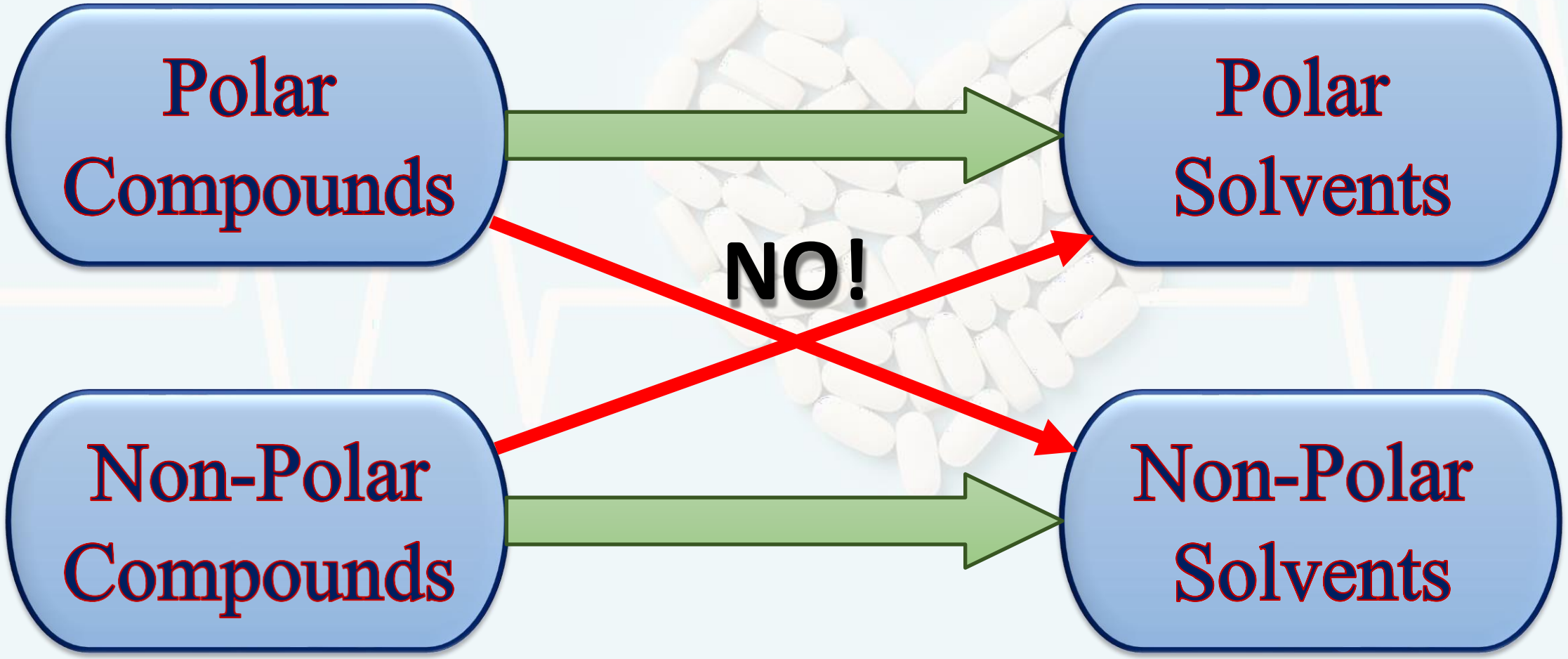
What is solubility?

- **Solubility:** is a chemical property referring to the ability for a given substance, the solute, to dissolve in a solvent.
- It is measured in terms of the maximum amount of solute dissolved in a solvent at equilibrium..



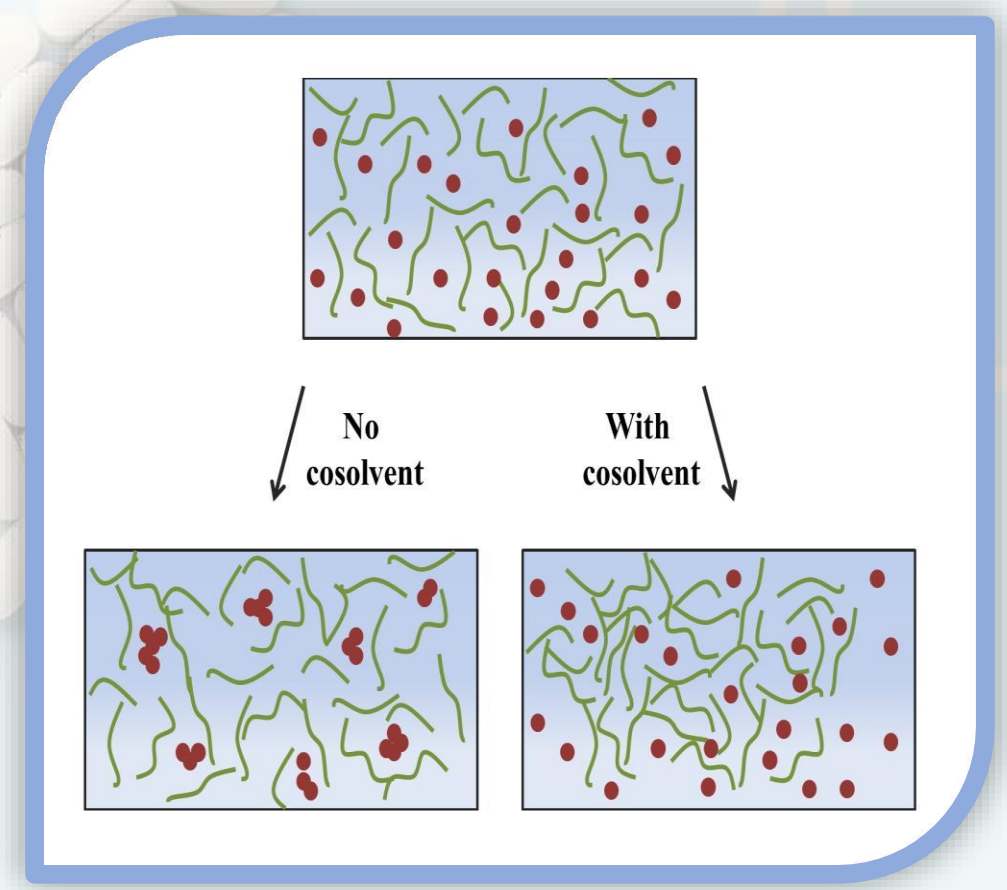
Selection of the most suitable solvent is based on the principle

"like dissolves like"



Determination of Solubility of Aspirin in Single and Mixed Solvents

- **Influence of Cosolvents:** Frequently a solute is more soluble in a **mixture** of solvents rather than in a **single** solvent.
- **The solvents, which are used to increase the solubility of a drug in water, are called as cosolvents.**

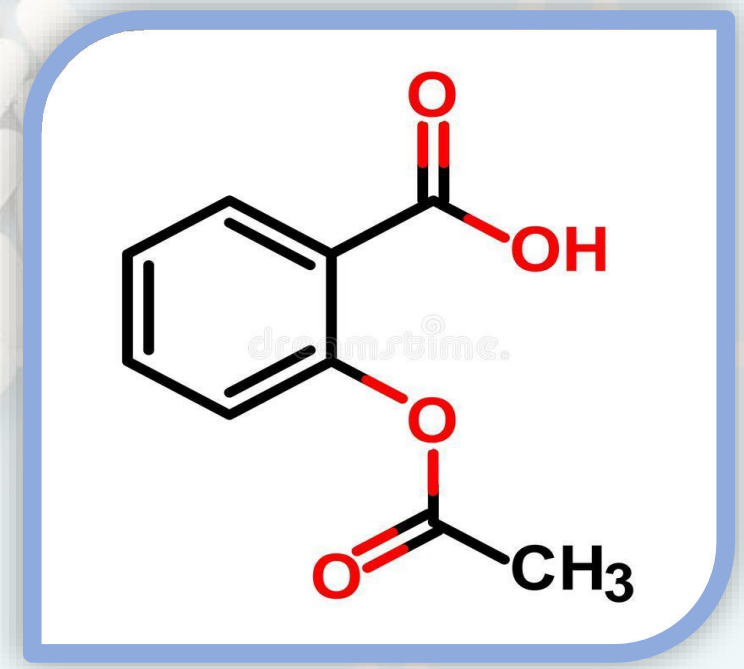


Determination of Solubility of Aspirin in Single and Mixed Solvents

- **The phenomenon is known as cosolvency. Mechanism responsible for solubility enhancement through cosolvency is by reducing the interfacial tension (polarity differences) between the aqueous solution and hydrophobic solute.**

Aspirin (Acetyl Salicylic Acid)

- The aspirin molecule is made up of a **benzene ring**, a **carboxyl group**, and an **ester**.
- It has both **polar** and **non-polar** components.
- Thus, the affinity of water (very polar) for this compound is not as great as the affinity of water for itself.



Aspirin (Acetyl Salicylic Acid)

- The affinity of ethanol molecules (only slightly polar) for aspirin molecules is relatively similar to the affinity of ethanol molecules for each other.
- Thus, aspirin is more soluble in ethanol than in water.

Glassware and Equipment

- **Pestle and mortar**
- **Beaker**
- **Pipette**
- **Burette**
- **Conical flask**
- **Stirrer**
- **Stand and clamp**
- **Filter paper**

Chemicals

- Aspirin tablets
- NaOH,
- Distilled water,
- Ethanol
- Phenolphthalein indicator

Procedure

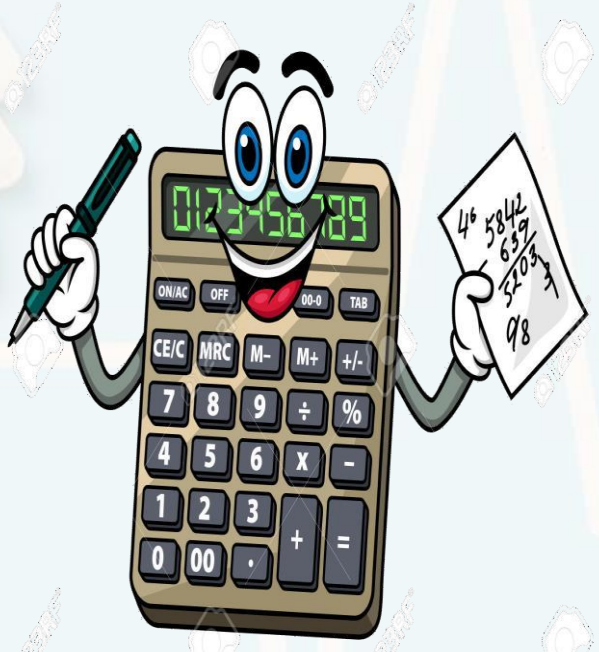
1. Grind up aspirin tablets to a fine powder using the pestle and mortar.
2. Prepare saturated solution form aspirin in (100 ml) distilled water at room temperature (25℃).
3. Filtrate the aspirin solution and transfer (10 ml) from filtrated solution to conical flask.
4. Add 2-3 drops of phenolphthalein indicator solution (Swirl for at least 3 minutes).
5. Titrate carefully with (0.05 M) sodium hydroxide (Swirl the flask continuously, The NaOH solution should be added very slowly, The end point is reached at the first instance of the pink color persisting).
6. Record the volume of the sodium hydroxide used.
7. Repeat this procedure at 100 ml of (5, 10, 15, 20%) hydro alcoholic solvent (ethanol-water solvent).

Calculations

1. Calculate the aspirin concentration from this relation:

$$M_1 \times V_{1\ (Aspirin)} = M_2 V_{2\ (NaOH)}$$

$$M_1 \times 10_{\ (Aspirin)} = 0.05 \times V_{\ \text{from burette (NaOH)}}$$



Calculations

2. Arrange results as in the following table:

V / V % (Ethanol)	Aspirin Concentration
5	
10	
15	
20	

Calculations

3. Calculate the aspirin solubility by the following equation:

$$S = \frac{M.wt\ of\ aspirin \times M\ aspirin}{100}$$


THANK
YOU