

BONDS, POLARITY, AND SOLUBILITY

PURPOSE

To relate bond types and molecular polarity to the solubility of various substances.

TERMINOLOGY

Soluble and insoluble
Miscible and immiscible

PROCEDURE

Part 1 - Miscibility of liquids

You will need samples of each of the following liquids:

~~carbon tetrachloride (CCl₄) or TCE~~

xylene (C₈H₁₀)

ethanol (C₂H₅OH)

toluene (C₇H₈)

water (H₂O)

In test tubes, using 5 mL samples, mix the four liquids (two at a time) in all possible combinations. After mixing each set, add 1 drop of food coloring to the test tube and observe. Note whether or not the two liquids are miscible (mix in each other) or immiscible (do not mix). Record your results in the data table.

Part 2 - Solubility of solids in liquids

- Add a pea-size sample of NaCl to 5 mL of each of the four liquids used in Part 1. Shake the test tube. Note whether or not the solid dissolves in the liquid. If it dissolves, the solid is soluble in that liquid. If it does not dissolve, the solid is said to be insoluble in that substance.
- Add a pea-size sample of I₂ to 5 mL of each of the four liquids used in Part 1. Note whether or not the iodine dissolves in each of the liquids.

OBSERVATIONS AND DATA

PART 1

| | Water | CCl₄ xylene | Toluene |
|--------------------------------------|-------|--------------------------------------|---------|
| CCl₄ xylene | | X | |
| Toluene | | | X |
| Ethanol | | | |

PART 2

| Liquid | I ₂ | NaCl |
|--------------------------------------|----------------|------|
| Water | | |
| CCl₄ xylene | | |
| Toluene | | |
| Ethanol | | |

ANALYSIS AND QUESTIONS

1. List the bond types in each of the substances used in this lab.

Toluene =

~~C₆H₄~~ =
Xylene

Water =

Ethanol =

NaCl =

I₂ =

2. Classify the covalent molecules as either polar or nonpolar. Use the molecular model kits if necessary.

3. Based on your observations and your answers in #1 and #2, describe the relationship between bond type, type of molecule, and solubility/miscibility.

4. Based on your observations and the relationship you described in #3, are the molecules that make up food coloring ionic, polar covalent, or nonpolar covalent? Explain.