Intermolecular Forces and Solubility

New Regents original practice • Name: _____ Date: _____
Show your work for written answers.

Dissolving involves attractions among solute and solvent particles. Similar types of attraction can favor mixing, and actual solubility also depends on the specific substances and conditions.

1 Which type of molecular solvent often mixes well with a polar molecular solute?

(1) A polar solvent

(2) A metal lattice

(3) A solid with no solvent particles

(4) A solvent chosen only by color

2 Explain how water molecules can interact with a positive ion in solution. [1]

Answer and work

_____

_____

3 A nonpolar liquid forms a separate layer when mixed with water. Which particle description is consistent with this behavior?

(1) The nonpolar molecules become water molecules.

(2) Water molecules interact favorably with one another, and the two liquids have limited mutual solubility.

(3) Every molecule becomes a free ion.

(4) Mixing changes the number of protons in both liquids.

4 Explain why the general mixing rule is insufficient to calculate an exact solubility in grams. [1]

Answer and work

_____

_____

Comparing Model Solute–Solvent Pairs

Use the information below to answer the questions.

At the same temperature, a model compares the equilibrium solubility of two solutes in equal masses of two solvents. Water is polar and the second solvent is nonpolar.

Solute	Polarity	In water (g per 100 g)	In nonpolar solvent (g per 100 g)
P	Polar	30	4
Q	Nonpolar	2	24

5 Which solute–solvent pair gives the greatest solubility?

(1) P in water

(2) P in nonpolar solvent

(3) Q in water

(4) Q in nonpolar solvent

6 How many more grams of Q dissolve per 100 g in the nonpolar solvent than in water? [1]

Answer and work

7 Which observation supports the idea that a nonpolar solute can mix better with a nonpolar solvent?

(1) P has higher solubility in water.

(2) Q is more soluble in the nonpolar solvent than in water.

(3) Water dissolves equal masses of P and Q.

(4) P and Q have equal solubility in both solvents.

8 A student says polar solute P cannot dissolve at all in a nonpolar solvent. Use the table to evaluate the claim. [1]

Answer and work