Checking Solubility When Two Solvents Change

Base your answers on the information provided and your knowledge of chemistry. Use the 2025 Chemistry Reference Tables as needed.

A model dissolves a solid dye in a mixture of water and a second solvent. The maximum dye concentration depends on the solvent composition. At the same temperature, an excess of dye remains solid when the liquid reaches that maximum. All trials begin with 6.0 g of dye. The model treats the two solvent volumes as additive.

Condition	Water (mL)	Second solvent (mL)	Maximum dissolved concentration (g/mL)
P	40	40	0.050
Q	40	10	0.140
R	30	30	0.050

1 Calculate the maximum dye mass that can dissolve in P and the mass of its remaining solid dye. [1]

Answer and work

2 Which trial can dissolve all 6.0 g of the starting dye?

(1) P only

(2) Q only

(3) R only

(4) All three

A model treatment removes 30 mL of the second solvent from P without removing dye or water. The mixture returns to the original temperature.

3 Predict how much solid dye remains after the treated sample settles. Use the trial that matches the treated composition. [1]

Answer and work

4 A student says less liquid always means less dye can dissolve. Compare Q and R to evaluate that claim. [1]

Answer and work