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Solubility

Is the mass of a solute that saturate 100g of a solvent at a given temperature.

A saturated solution is one that contains the maximum amount of solute in it at a given temperature

Super saturated solution contains more solute dissolved in it than could exist if the solution were in equilibrium with the solid.

Experiment to determine solubility of a salt in water (say NaCl)

- (i) 100g of water is weighed out accurately into a flask and the flask is kept at constant temperature by placing it in a water bath with a thermostat.
- (ii) The salt is added to the solution until it dissolves no more.
- (iii) A measured volume of the solution is withdrawn from the flask, e.g. using a pipette, but making sure that no solid is sucked.
- (iv) The mass of the solid in the volume is determined by evaporation to dryness or by titration.
- (v) Finally, the result from (iv) are scaled up to give the mass of a solute in the original 100g of water

Application of solubility

- compare solubility of different salts
- Fractional crystallizations

This is based on the difference in solubilities of salts in water.

Example 5.71 (1993/2/7)

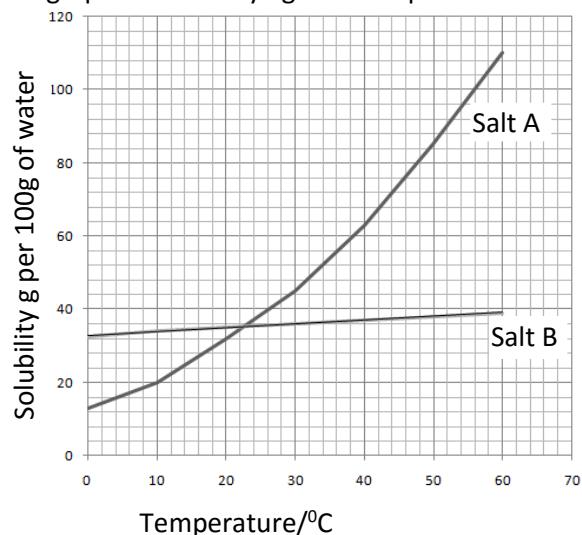
(a) The table below shows the solubility of salt A and salt B at different temperatures

Temp/ ^o C		0	10	20	30	40	50	60
Solubility g per 100g of water	Salt A	13	20	32	45	63	85	110
	Salt B	32.5	34	35	36	37	38	39

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(i) Plot a graph of solubility against temperature for salt A and B using the same axes (4marks)

A graph of solubility against temperature



(ii) A saturated solution of salt A was cooled from 45°C to 25°C. determine the mass of salt deposited (2marks)

Mass deposited per 100g of solution = solubility at 45°C – solubility at 25°C

$$72 - 37 = 35\text{g}$$

(b) Explain how a pure sample of salt A can be obtained from a mixture containing salt A and B. Name one method that can be used to test for purity of the separated sample

Ans: When a saturated solution with A and B at 45°C is cooled to 25°C, the crystals deposited are richer in A than B. If the crystals are re-dissolved to give a saturated solution of A at 45°C and again cooled to 25°C, the crystals given off will be richer in A than B. If the process is repeated a number of times pure crystals of A will be deposited; hence complete separation.