

# Calculating solubility - inquiry activity

If we want to make an accurate prediction about whether something will dissolve in water or not, we need to know four key factors:

- ① The type of solute
- ② The volume of solvent
- ③ The mass of solute
- ④ The temperature

We can say, for example, that the solubility of salt in water at 20°C is 35 grams per 100 cm<sup>3</sup> of water.

In general: **Solubility =  $\frac{\text{Mass of solute}}{\text{Volume of solvent}}$**

Temperature (°C)	Solubility of potassium nitrate	Solubility of potassium chloride
10	20	32
20	30	35
30	44	36
40	60	38
50	78	40
60	100	42
70	125	45
80		50
90		55

The table shows the solubilities of potassium nitrate (a type of fertiliser) and potassium chloride (the main ingredient in 'lo-salt' at different temperatures. The solubilities are given in grams of solute per 100cm<sup>3</sup> water

## Questions

- ① Plot a line graph to show these results. Put the temperature on the horizontal (x) axis and the solubility on the vertical (y) axis. Choose a different colour for each solid, and show these in a key.
- ② Copy and complete this sentence: 'As the temperature rises, the solubility ...'
- ③ Which of the two solids best dissolves at 10°C and at 40°C?
- ④ Use your graph to estimate the solubility of potassium chloride at 75°C.
- ⑤ Use your graph to estimate the temperature you would need for 110g of potassium nitrate to dissolve in 100 cm<sup>3</sup> water.
- ⑥ If 100 cm<sup>3</sup> of a saturated solution of potassium nitrate was cooled down from 70°C to room temperature (20°C), how many grams of crystals would be formed? Show your working.
- ⑦ How much potassium chloride dissolves in 100 cm<sup>3</sup> of water at 50°C?
- ⑧ How much potassium chloride would dissolve in 1 litre (1000 cm<sup>3</sup>) of water at 50°C? Show your working.