# Solubility: teacher guidance

These **Knowledge check** worksheets provide a series of questions to assess learners' knowledge and understanding of this topic at the end of a period of teaching or as revision. Available at Foundation and Higher level and as fully editable versions so you can adapt them to suit learners' needs. Use for individual student work in class or at home. Find the full set of answers below.

Also available to assess this topic:

- **Review my learning worksheets**: available with three levels of scaffolded support to help build confidence in every learner. Use before, during or after teaching the relevant topic, to understand progress and identify misconceptions, rsc.li/44igB7V.
- **In context** worksheets ask learners to apply their knowledge to interesting contexts from everyday life, helping them develop their skills and prepare for examination, including calculation questions to practise mathematical skills within a genuine chemical context, rsc.li/411kQnF.

Some specifications require learners to know the solubility rules, others do not. The rules are given at the start of each worksheet so that all learners can access all questions. If you want to test this knowledge remove the table. If you want to remove all material linked to solubility rules remove the table and the following questions: Foundation 1b; Higher 1b, 2d, 3d.

# Answers

## Foundation tier

**1** (a) **B** solute [1 mark]

(b) **C** all group 1 salts are soluble [1 mark]

(c) i. solubility increase as the temperature increases [1 mark]

ii. 26°C [1 mark]

iii. mass crystallising out = $103 - 60$ [1 mark]

$= 43$ g [1 mark]

**2** [3 marks –1 per correct salt name]

| Acid | Alkali or base | Name of salt produced |
|---|---|---|
| nitric acid | lithium hydroxide | **lithium nitrate** |
| sulfuric acid | magnesium oxide | **magnesium sulfate** |
| ethanoic acid | calcium carbonate | **calcium ethanoate** |

**3** (a) $CuO\ (s) + \mathbf{H_2SO_4}\ (aq) \longrightarrow CuSO_4\ \mathbf{(aq)} + \mathbf{H_2O}\ (l)$
correct chemical formulas [1]; correct state symbol [1] [2 marks]

(b) i. An excess of copper oxide is added to ensure that all the sulfuric acid has reacted. [1 mark]

ii. The reaction mixture is filtered to remove the unreacted/excess copper oxide. [1 mark]

Pour filtrate into a crystallising dish/watch glass/petri dish [1], leave the filtrate to crystallise. [1] **OR**
Pour filtrate into an evaporating dish [1], evaporate to half volume to remove some of the water until crystals start to form, leave to crystallise. [1]
[2 marks]

**4** (a) precipitate [1 mark]

(b) i. silver chloride [1 mark]

ii. The mixture of products is filtered [1], washed [1] and dried. [1] [3 marks]

[Total: 20 marks]

## Higher tier

**1** (a) [4 marks – 1 mark per correct salt name]

| Acid | Alkali or base | Name of salt produced |
|---|---|---|
| hydrochloric acid | potassium hydroxide | **potassium chloride** |
| sulfuric acid | magnesium hydroxide | **magnesium sulfate** |
| nitric acid | copper(II) oxide | **copper(II) nitrate** |
| ethanoic acid | calcium carbonate | **calcium ethanoate** |

(b) **C** all group 1 salts are soluble [1 mark]

**2** (a) $CuO(s) + H_2SO_4(aq) \longrightarrow CuSO_4(aq) + H_2O(l)$
correct chemical formulas [1]; correct state symbols [1] [2 marks]

(b) dilute sulfuric acid [1 mark]

(c) The mixture is filtered to remove excess/unreacted copper(II) oxide. [1 mark]

(d) **B** copper(II) carbonate and dilute nitric acid [1 mark]

**3** (a) precipitate [1 mark]

(b) i. $Cu^{2+}(aq) + \mathbf{2}OH^{-}(aq)$ [1] $\longrightarrow \mathbf{Cu(OH)_2}$ [1] (s) [2 marks]

ii. $Fe^{3+}(aq) + \mathbf{3}OH^{-}(aq)$ [1] $\longrightarrow \mathbf{Fe(OH)_3}$ [1] (s) [2 marks]

iii. $Fe^{2+}(aq) + \mathbf{2}OH^{-}(aq)$ [1] $\longrightarrow \mathbf{Fe(OH)_2}$ [1] (s) [2 marks]

(c) potassium hydroxide is soluble, [1] so will not form a precipitate[1] [2 marks]

(d) sodium sulfate is soluble, [1] so the ions remain in solution[1] [2 marks]

**4** (a) $M_r\ NaOH = 23 + 16 + 1$

$= 40$ [1]

there are $40g$ NaOH in a $1\ mol/dm^3$ solution, [1] so:

number of moles $= \frac{\text{mass}}{\text{formula mass}} = \frac{2.00}{40}$

$= 0.05\ mol/dm^3$ [1] [3 marks]

(b) number of moles in $25cm^3$ solution $= 0.05 \times \frac{25}{1000}$ [1 mark]

$= 1.25 \times 10^{-3}\ mol$ [1 mark]

(c) mass in g $= 1.5 \times 10^{-3} \times 40$ [1 mark]

$= 0.06\ g$ [1 mark]

[Total: 28 marks]