Solubility

The table summarises whether common ionic compounds are soluble or insoluble in water. You will need to refer to this information to answer **question 1(b)**.

Soluble	Insoluble
all common sodium, potassium and ammonium salts	
all nitrates	
most common chlorides	silver chloride, lead chloride
most common sulfates	lead sulfate, barium sulfate, calcium sulfate
sodium carbonate, potassium carbonate, ammonium carbonate	most common carbonates
sodium hydroxide, potassium hydroxide, ammonium hydroxide	most common hydroxides

1 (a) Which term correctly describes a solid substance that is dissolved to make a solution? Circle the correct answer. **(1 mark)**

A saturated

B solute

C solvent

D unsaturated

(b) Which statement is true? Circle the correct answer. **(1 mark)**

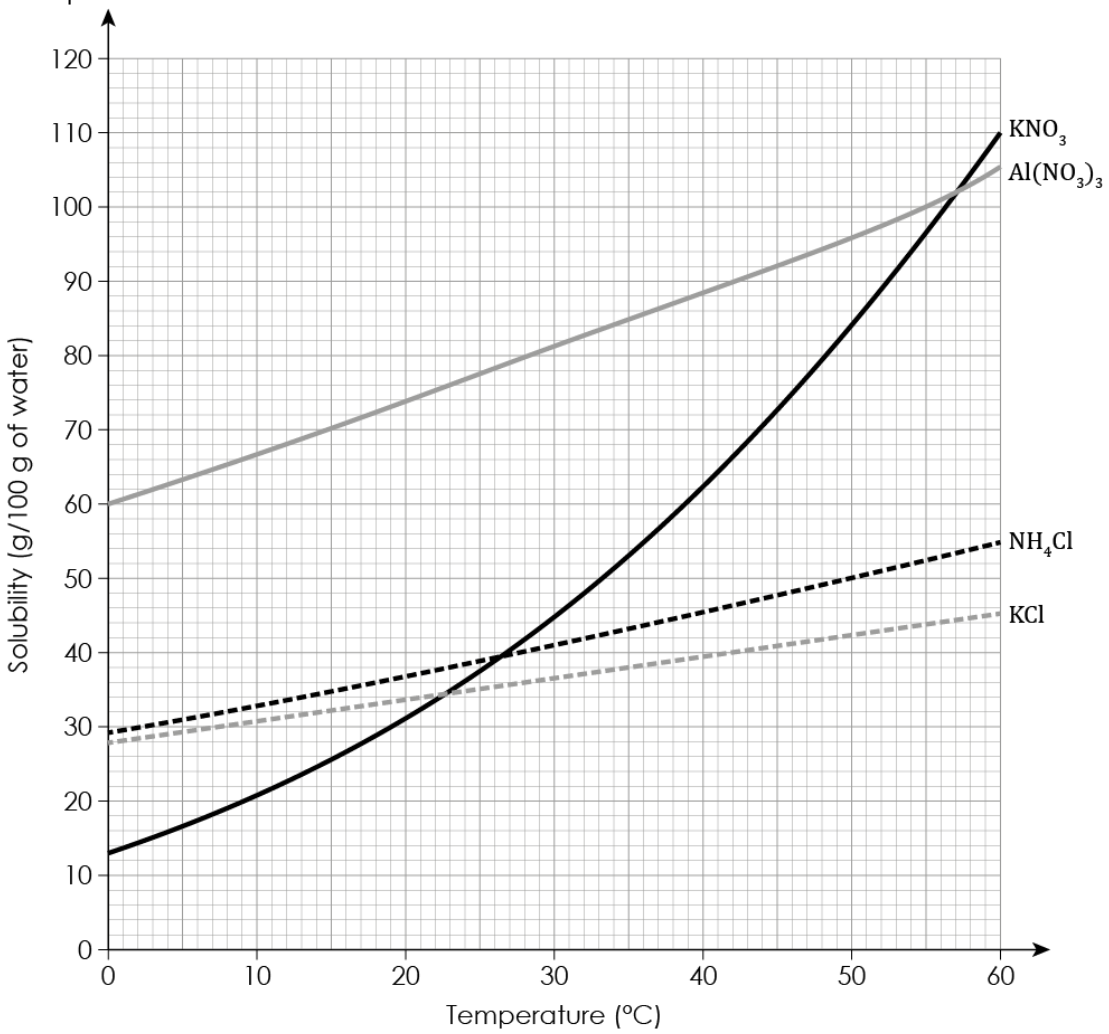
A all ammonium salts are insoluble

B all group 1 chlorides are insoluble

C all group 1 salts are soluble

D all nitrates are insoluble

(c) The graph shows how the solubility of four different salts changes with temperature.



i. What is the general trend in solubility as the temperature increases?

_____ **(1 mark)**

ii. At which temperature do KNO_3 and NH_4Cl have the same solubility?

_____ **(1 mark)**

iii. Calculate the mass of $Al(NO_3)_3$ that crystallises out when a saturated solution cools from 58°C to 0°C.

Hint: You should:

- determine the solubility of $Al(NO_3)_3$ at 0°C
- determine the solubility of $Al(NO_3)_3$ at 58°C
- calculate the difference between the two solubilities.

_____

_____

(2 marks)

2 Complete the table to name the salts produced from the reactants. The first salt has been named for you.

Acid	Alkali or base	Name of salt produced
hydrochloric acid	zinc oxide	zinc chloride
nitric acid	lithium hydroxide	
sulfuric acid	magnesium oxide	
ethanoic acid	calcium carbonate	

(3 marks)

3 This question is about the method used to prepare a soluble salt from an acid and an insoluble substance.

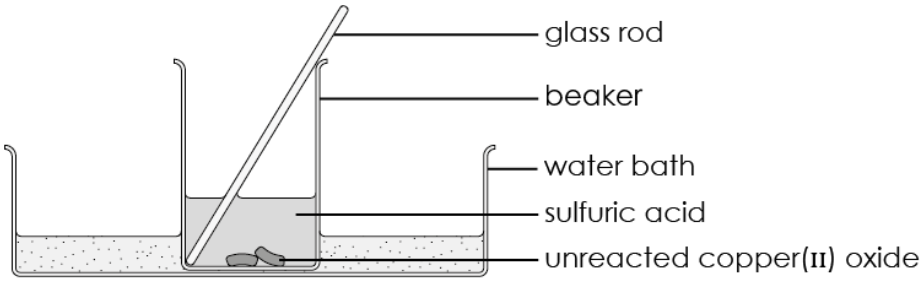
(a) Complete the symbol equation, including state symbols, representing the reaction used to prepare copper(II) sulfate ($CuSO_4$).

$$CuO(s) + \_\_\_\_\_ (aq) \longrightarrow CuSO_4 \_\_\_\_ + \_\_\_\_\_ (l)$$

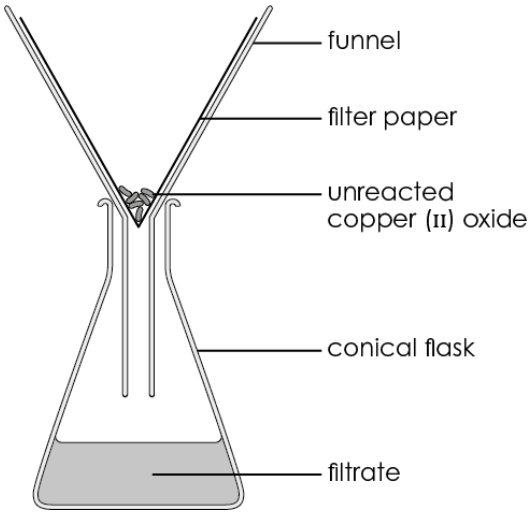
(2 marks)

The diagrams below show the first two stages in a method used to prepare copper(II) sulfate crystals:

A



B



(b) Give **one** reason why:

i. an excess of copper oxide must be added to the sulfuric acid.

_____

_____

(1 mark)

ii. the reaction mixture is filtered.

_____

_____

(1 mark)

(c) Describe a method to produce copper sulfate crystals from the filtrate in **diagram B**.

_____

_____

_____

_____

(2 marks)

4 This question is about preparing an insoluble salt from two soluble salts.
Silver nitrate and sodium chloride are both soluble. A few drops of silver nitrate solution are added to sodium chloride solution. The image shows the product formed in the test tube.

Source: © Science Photo Library

(a) What is the general term used to describe a solid produced from solutions of two soluble salts?

_____ **(1 mark)**

(b) The reaction between silver nitrate and sodium chloride can be represented using the equation:

$$AgNO_3(aq) + NaCl(aq) \longrightarrow AgCl(s) + NaNO_3(aq)$$

i. Name the solid product.

_____ **(1 mark)**

ii. Describe how a pure, dry sample of the solid product can be obtained from the mixture in the test tube.

_____

_____

_____

(3 marks)

[Total: 20 marks]

Which question(s) did you get wrong? Why?

What will you do next time you're asked a similar question?