Solubility

The table summarises whether common ionic compounds are soluble or insoluble in water. You will need to refer to this information to answer **questions 1(b)**, **2(d)** and **3(d)**.

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) Complete the table to show the names of the salts produced from the reactants.

Acid	Alkali or base	Name of salt produced
hydrochloric acid	potassium hydroxide	
sulfuric acid	magnesium hydroxide	
nitric acid	copper(II) oxide	
ethanoic acid	calcium carbonate	

(4 marks)

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

A all ammonium salts are insoluble

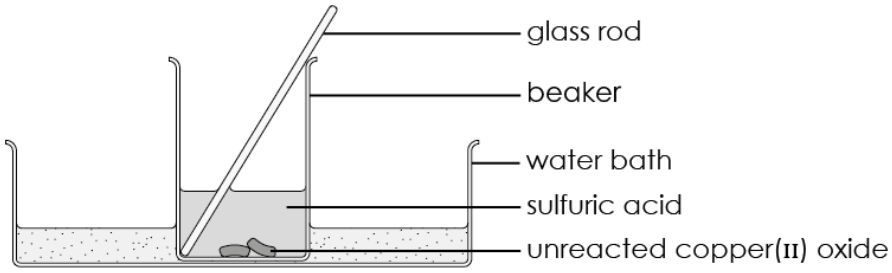
B all group 1 chlorides are insoluble

C all group 1 salts are soluble

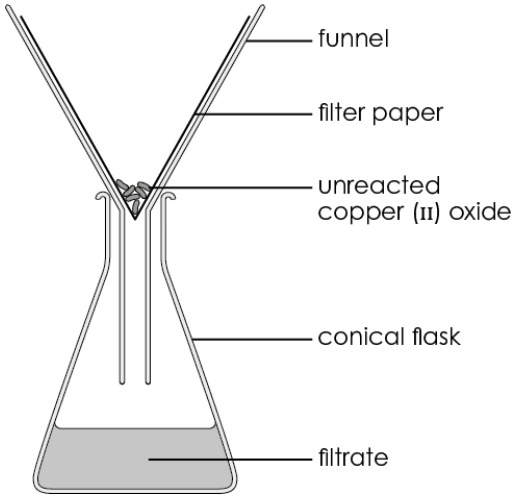
D all nitrates are insoluble

2 This question is about preparing a soluble salt from an acid and an insoluble reactant. The image shows the first two stages in the method used to prepare copper sulfate crystals from dilute sulfuric acid and copper(II) oxide:

A



B



(a) Write a balanced symbol equation, including state symbols, to represent the reaction.

_____ **(2 marks)**

(b) The limiting reactant is the one that determines the amount of copper (II) sulfate produced. Name the limiting reactant in this reaction.

_____ **(1 mark)**

(c) Give **one** reason why the reaction mixture is filtered.

_____ **(1 mark)**

(d) Identify the pair of reactants that can be used to prepare salts using this method. Circle the correct answer. **(1 mark)**

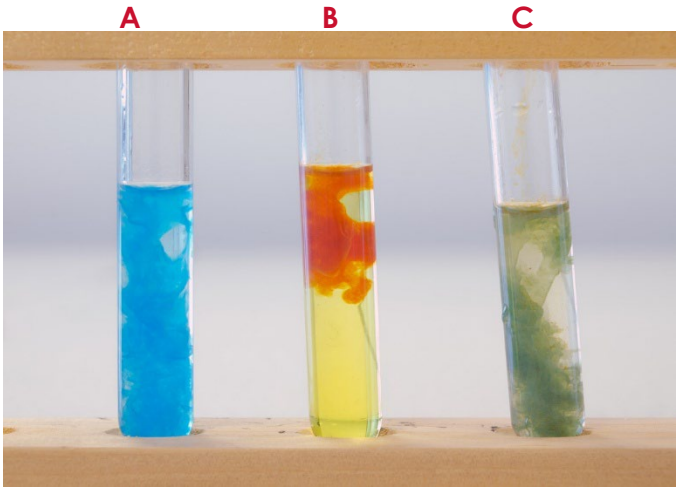
A ammonium hydroxide and dilute sulfuric acid

B copper(II) carbonate and dilute nitric acid

C lead(II) oxide and dilute hydrochloric acid

D potassium hydroxide and dilute nitric acid

3 As shown in the image, some metal ions are identified by the colour of the insoluble hydroxides formed when sodium hydroxide solution is added.



Source: © Science Photo Library

(a) Give the general term for the solid formed in the test tubes.

_____ **(1 mark)**

(b) Complete and balance the ionic equations for the reactions in which these solids are formed.

i. $Cu^{2+}(aq)$ + _____$OH^-(aq)$ ⟶ _____ (s) **(2 marks)**

ii. $Fe^{3+}(aq)$ + _____$OH^-(aq)$ ⟶ _____ (s) **(2 marks)**

iii. $Fe^{2+}(aq)$ + _____$OH^-(aq)$ ⟶ _____ (s) **(2 marks)**

(c) Explain why potassium ions cannot be detected by adding sodium hydroxide solution.

_____

_____

(2 marks)

(d) In the reaction in test tube **A**, sodium hydroxide solution has been added to copper(II) sulfate solution. Why is the solid formed in test tube **A** not sodium sulfate?

_____

_____

(2 marks)

4 The concentration of a solution can be measured in g/dm^3 or mol/dm^3. A solution of sodium hydroxide contains $2.00\ g$ sodium hydroxide in $1\ dm^3$ of solution.

(a) Calculate the concentration of the solution in mol/dm^3.

A_r sodium 23; A_r oxygen 16; A_r hydrogen 1

_____

_____

(3 marks)

(b) Calculate the number of moles of sodium hydroxide contained in $25\ cm^3$ of solution.

_____

_____

(2 marks)

(c) A different solution contains 1.50×10^{-3} mols of NaOH in $25\ cm^3$. Calculate the mass of sodium hydroxide contained in $25\ cm^3$ of this solution.

_____

_____

(2 marks)

[Total: 28 marks]

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

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