

GCSE Chemistry (9 – 1)

Ionic Equations

Name:

Group:

Instructions

- Read each question carefully before you begin to answer it.
- Use black ink or black ball-point pen for your answers.
- Fill in the boxes at the top of this page with your name and group.
- Attempt to answer every question in the booklet.
- Answer the questions in the spaces provided – there may be more space than you need in some answer spaces.
- Calculators may be used for this booklet.
- For any calculations, you **must** show all your working.
- Any and all drawings or graphs should be completed in pencil.



For markers use	
Question	Mark
1	/4
2	/8
3	/10
4	/8
5	/15
Total	/45
%	
Grade	

Information

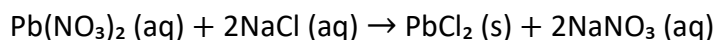
- The maximum mark for this paper is 45 marks.
- The marks for each question are shown in brackets.
- Please be aware that good English and clear presentation are required in your answers.



1. Many reactions in solution involve ions that do not change; an ionic equation is written to show only the particles that are actually involved in the reaction.

Circle the letter of the correct answer for each of the following questions.

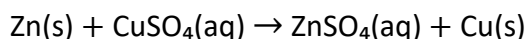
- a) A precipitation reaction occurs when aqueous solutions of lead(II) nitrate and sodium chloride are mixed.



Which ions are the spectator ions in this reaction?

A	B	C	D
Pb^{2+} and Cl^-	Na^+ and NO_3^-	Pb^{2+} and Na^+	Cl^- and NO_3^-
(1 mark)			

- b) A student adds a piece of zinc metal to copper(II) sulfate solution. The equation for the reaction is:



What is the correct ionic equation for this reaction?

- A $\text{Zn}(\text{s}) + \text{Cu}^{2+}(\text{aq}) \rightarrow \text{Zn}^{2+}(\text{aq}) + \text{Cu}(\text{s})$
B $\text{Zn}(\text{s}) + \text{SO}_4^{2-}(\text{aq}) \rightarrow \text{ZnSO}_4(\text{s})$
C $\text{Zn}^{2+}(\text{aq}) + \text{Cu}(\text{s}) \rightarrow \text{Zn}(\text{s}) + \text{Cu}^{2+}(\text{aq})$
D $\text{Zn}(\text{s}) + \text{Cu}(\text{s}) \rightarrow \text{ZnCu}(\text{s})$ (1 mark)

- c) Which equation correctly represents the neutralisation of a dilute strong acid by a strong alkali?

- A $\text{HCl} + \text{NaOH} \rightarrow \text{NaCl} + \text{H}_2\text{O}$
B $\text{H}^+(\text{aq}) + \text{OH}^-(\text{aq}) \rightarrow \text{H}_2\text{O}(\text{l})$
C $\text{H}^+(\text{aq}) + \text{O}^{2-}(\text{aq}) \rightarrow \text{H}_2\text{O}(\text{l})$
D $\text{Na}^+(\text{aq}) + \text{Cl}^-(\text{aq}) \rightarrow \text{NaCl}(\text{s})$ (1 mark)

- d) The reaction between solid calcium carbonate and hydrochloric acid produces calcium chloride solution, water and carbon dioxide gas.



Which is the correct ionic equation for this reaction?

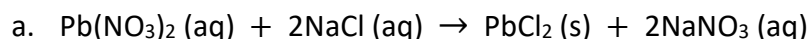
- A $\text{CaCO}_3(\text{s}) + 2\text{H}^+(\text{aq}) \rightarrow \text{Ca}^{2+}(\text{aq}) + \text{H}_2\text{O}(\text{l}) + \text{CO}_2(\text{g})$
B $\text{Ca}^{2+}(\text{s}) + 2\text{Cl}^-(\text{aq}) \rightarrow \text{CaCl}_2(\text{aq})$
C $\text{CO}_3^{2-}(\text{aq}) + 2\text{H}^+(\text{aq}) \rightarrow \text{H}_2\text{O}(\text{l}) + \text{CO}_2(\text{g})$
D $\text{Ca}^{2+}(\text{aq}) + 2\text{Cl}^-(\text{aq}) \rightarrow \text{CaCl}_2(\text{s})$ (1 mark)

(Total for Question 1 is 4 marks)

For each of the equations below, rewrite the equation to show the separate aqueous ions (where appropriate) and then deduce the ionic equation.

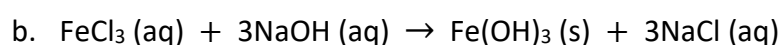
Make sure you include **state symbols** throughout and clearly identify the **spectator ions**.

2. Write ionic equations for the following precipitation reactions:



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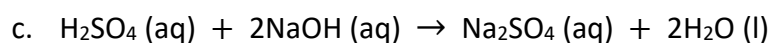
(2 marks)



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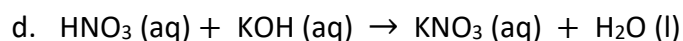
(2 marks)

Write ionic equations for the following neutralisation reactions:



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(2 marks)

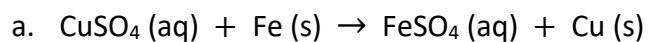


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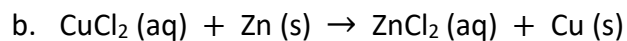
(Total for Question 2 is 8 marks)

3. Write ionic equations for the following displacement reactions:



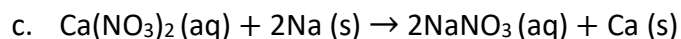
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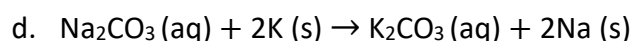
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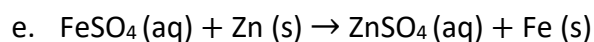
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(2 marks)



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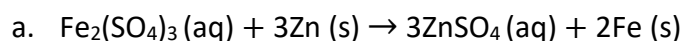


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(2 marks)

(Total for Question 3 is 10 marks)

4. Write ionic equations for the following reactions:



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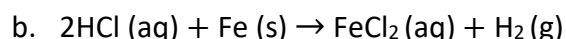
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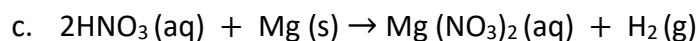
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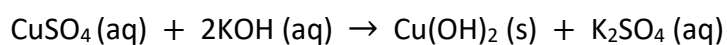
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(2 marks)

d. In the following reaction:



31.9 g of copper sulphate was reacted with 22.4 g of potassium hydroxide. The mass of the precipitate was found to be 19.5 g, deduce the mass of potassium sulphate left dissolved in solution.

[Hint – no need for a moles calculation!] Explain your answer.

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Mass: g

(2 marks)

(Total for Question 4 is 8 marks)

5. Write full **balanced** symbol equations with state symbols for the reactions below.
Then convert these into ionic equations as before.

a. Zinc (s) + copper (II) sulphate (aq) → zinc sulphate (aq) + copper (s)

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(2 marks)

b. Calcium nitrate (aq) + potassium (s) → potassium nitrate (aq) + calcium (s)

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(2 marks)

c. lithium sulphate (aq) + sodium (s) →

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(2 marks)

d. magnesium + hydrochloric acid →

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(2 marks)

e. iron + sulphuric acid →

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(2 marks)

f. potassium carbonate solution + nitric acid →

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(2 marks)

g. For each of the following, classify the reaction as **precipitation**, **neutralisation** or **displacement**:

i. calcium hydroxide solution + ethanoic acid → calcium ethanoate + water

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(1 mark)

ii. magnesium + iron sulphate solution → magnesium sulphate solution + iron

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(1 mark)

iii. barium chloride solution + sodium sulphate solution → barium sulphate solid + sodium chloride solution

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(1 mark)

(Total for Question 5 is 15 marks)