

# MARK SCHEME

# GCSE

## CHEMISTRY

## AQA - COMBINED SCIENCE

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C4 - TEST 4

CHEMICAL CHANGES

Intermediate

## Mark schemes

<b>1.</b>	(i) carbon dioxide ( <i>allow</i> CO <sub>2</sub> ) <i>for 1 mark</i>	1	
	(ii) sodium nitrate (accept correct formula) <i>for 1 mark</i>	1	
			<b>[2]</b>
<b>2.</b>	(a) An arrow indicating a position between aluminium and zinc.	1	
	(b) electrolysis	1	
	because calcium is more reactive (than aluminium <b>or</b> carbon) <i>accept it is more reactive</i> <b>or</b> <i>very reactive</i>	1	
	<b>OR</b>		
	in a blast furnace	1	
	because calcium is less reactive (than carbon <b>or</b> lower)	1	
	(c) any equation from <i>1 mark for correct formulae</i> <i>1 mark for balancing</i>		
	$2\text{ZnO} + \text{C} \rightarrow 2\text{Zn} + \text{CO}_2$		
	$\text{ZnO} + \text{CO} \rightarrow \text{Zn} + \text{CO}_2$		
	$\text{ZnO} + \text{C} \rightarrow \text{Zn} + \text{CO}$	1	
			<b>[5]</b>
<b>3.</b>	(a) <i>ideas that it is a</i>		
	<ul style="list-style-type: none"><li>compound of metal/metal oxide/combined (NOT mixed) cpd/ named cpd O<sup>2-</sup>/S<sup>2-</sup>/CO<sub>3</sub><sup>2-</sup> etc</li><li>found naturally/in rocks/in Earth's Crust</li></ul> <i>for 1 mark each</i>	2	
	(b) reduction (accept smelting/refining but <u>not</u> electrolysis) <i>for 1 mark</i>	1	

- (c) One example. Al or above in Reactivity Series  
ie Group I or II metals NOT Pb/Cu or compounds

*for 1 mark*

1

[4]

4.

- (a) sodium

1

- (b) neutralisation

1

- (c) increase/inc. number

1

- (d)  $H^+$

1

- (e)  $OH^-$

1

- (f)  $H^+ + OH^- \rightarrow H_2O$

1

[6]

5.

- (a) 2 2 multiples of  $\frac{1}{2}$  allowed

*for 1 mark*

1

- (b) (i) 2. 8. 1 and 2. 8. 7

*gains 3 marks*

1 mark for 2 electrons in each inner shell  
1 mark for 8 electrons in each second shell  
1 mark for 1 electron in sodium outer shell  
and 7 in chlorine outer shell

3

- (ii) sodium atom loses;  
electron;  
chlorine atom gains;  
electron

*for 1 mark each*

inversion = 2 marks  
lose negative charge = 1 mark

4

- (c) (i) KCl (accept 2KCl)  
*for 1 mark* 1
- (ii) both have one electron in outer shell/same number of electrons/  
lose same number of electrons in compound formation/  
both lose one electron  
*for 1 mark* 1
- (d) 0 amps;  
the ions;  
cannot move in the solid  
solid Na chloride does not conduct  
*for 1 mark each* 3
- (e) (i) water (H<sub>2</sub>O)  
*for 1 mark* 1
- (ii) (1) chlorine;  
(2) hydrogen  
*for 1 mark* 1

[15]

6.

- (a) breakdown / decomposition / splits into elements /  
**not ions**  
  
separates into elements / produce a chemical reaction 1  
  
using electricity 1
- (b) lead bromide melted / free ions  
  
not electrolyte 1
- (c) (+) bromine  
*element must be appropriate to electrode* 1  
  
(-) lead  
*element must be appropriate to electrode* 1
- (d) fume cupboard / protective clothing  
*allow safety glasses*  
**not safety mat** 1

[6]

- 7.** (a) sodium ions and chloride ions (not chlorine)  
*allow sodium chloride/salt/common salt*  
*for 1 mark* 1
- (b)  $H^+ + OH^- \rightarrow H_2O$   
 H<sup>+</sup> from (hydrochloric) acid  
 OH<sup>-</sup> from alkali/sodium hydroxide  
 lose 1 mark if no charge shown disregard other ions  
*each for 1 mark* 3
- [4]**

- 8.** (a) rare  
**or**  
 very small amount in Earth's crust  
*ignore figures without qualification* 1
- (b) (i) electrolysis 1
- (ii) (electrolysis) uses more energy  
**or**  
 there are many stages in the process  
*ignore references to reactivity*  
*accept uses a large amount of energy* 1
- [3]**

- 9.** (a) (i)
- |                      |   |                  |   |                   |
|----------------------|---|------------------|---|-------------------|
| calcium<br>carbonate | → | calcium<br>oxide | + | carbon<br>dioxide |
|----------------------|---|------------------|---|-------------------|
- accept  $CaO_3 \rightarrow CaO + CO_2$*  1
- (ii) (thermal) decomposition  
*accept endothermic*  
*accept reversible* 1
- (b) (i) neutralisation  
*accept exothermic* 1

(ii) sulphuric (acid)  $H_2SO_4$  2

(c) (i) to speed up the reaction  
*accept to increase the rate of reaction **or** to increase the number **or** rate of collisions*  
*do **not** accept "dissolves" copper oxide faster*

1

(ii) all acid reacts  
*accept there will be no acid left **or** acid used up*

1

**acid is neutralised** (for 2 marks)  
*do **not** accept to form a concentrated **or** saturated solution*

1

(excess) copper oxide collects in filter paper  
*accept larger particles (of copper oxide) cannot pass through filter paper*

1

copper sulphate solution passes through the filter paper  
*accept dissolved copper sulphate passes through filter paper **or** smaller particles (of copper sulphate) in solution (liquid) pass through filter paper*  
*accept (black) solid collects in filter paper and filtrate **or** soluble solid **or** (blue) solution (liquid) passes through filter paper for 1 mark only*

1

[10]

10.

(i) idea that:  
carbon is above lead in the reactivity series } NOT  
*for 1 mark*

carbon is below aluminium in the reactivity series } OXIDE  
*for 1 mark*

carbon can remove oxygen from/reduce lead oxide  
or cannot remove oxygen from aluminium oxide  
not aluminium more reactive than lead  
*for 1 mark*

OR similar ideas in comparing bond strengths 3

(ii) (carbon + lead oxide)  $\rightarrow$  \*lead + \*carbon dioxide  
*each for 1 mark*

accept correct formulae  $CO_2$  and CO **NOT** carbon oxide 2

[5]

**11.****NOTE**

In this question and throughout the Paper, if the name of a chemical is asked for, then the formula is acceptable only if it is correct in every detail. If the name is correct and the candidate has tried to be 'helpful' by giving, in addition, an incorrect version of the formula, then this is acceptable provided it does not lead to ambiguity.

(i) nitric (acid)

*accept HNO<sub>3</sub>*

1

(ii) sulphuric (acid)

*accept H<sub>2</sub>SO<sub>4</sub>*

1

(iii) heat given out

*or temperature rise**or energy given out**or steam**do not credit just 'use a thermometer'**do not credit just 'change in temperature'*

1

(iv) neutralisation

*accept neutralise**accept neutral**accept formation of salt or water**do not credit exothermic*

1

**[4]****12.**

(a) (i) sodium ions and chloride ions

*(allow sodium chloride/salt) [not "chlorine"] for 1 mark*

1

(ii) sodium ions and chloride ions

*(allow sodium chloride/salt) for 1 mark*H<sup>+</sup> ions (*allow hydrochloric acid*)*for 1 mark*

2

(b) H<sup>+</sup> + OH<sup>-</sup> → H<sub>2</sub>O [N.B Na<sup>+</sup> and Cl<sup>-</sup> may also be present]H<sup>+</sup> ions from acidOH<sup>-</sup> ions from alkali*each for 1 mark*

[N.B First mark lost if changes on ions not shown]

3

**[6]**