

# MARK SCHEME

# GCSE

## CHEMISTRY

## AQA - COMBINED SCIENCE

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C4 - TEST 3

CHEMICAL CHANGES

Intermediate

## Mark schemes

<b>1.</b>	sodium nitrate	1
	$\text{NaNO}_3$	
	<i>do not credit lower case N or O, upper case A</i>	1
	potassium sulphate	1
	$\text{K}_2\text{SO}_4$	
	<i>accept potassium hydrogen sulphate or <math>\text{KHSO}_4</math> do not credit lower case K, S or O ignore charges on ions</i>	1
		<b>[4]</b>
<b>2.</b>	(a) substance breakdown / separates / splits into elements by electric current / electricity ions free to move e.g. when molten / in solution <i>allow 1 mark for "a substance that conducts electricity"</i>	<b>max 2</b>
	(b) (i) copper / Cu	1
	(ii) oxygen / $\text{O}_2$ <i>allow <math>\text{CO}_2</math></i>	1
	(c) tube over electrode full of $\text{CuSO}_4(\text{aq})$ / water <i>allow sulphuric acid / sensible electrolyte not any other liquid / using a syringe</i>	2
	(d) $\text{Cu}^{2+}$ ions removed / less $\text{Cu}^{2+}$ <i>not copper sulphate removed allow 1 mark for "copper removed / less copper"</i>	2
		<b>[8]</b>

- 3.** (i) sulphuric acid /  $\text{H}_2\text{SO}_4$   
*accept sulfuric 1 for one mark* 1
- (ii) exothermic  
*for one mark* 1
- (iii)  $\text{Na}_2\text{SO}_4$  /  $(\text{Na})_2\text{SO}_4$  /  $\text{Na}_2(\text{SO}_4)$  /  $(\text{Na}^+)_2\text{SO}_4^{2-}$   
*for one mark*  
*lower case O( $\text{Na}_2\text{SO}_4$ ) not accepted / tops of subscripted letters*  
*should be in line or lower than lower case letters of symbols* 1
- [3]**

- 4.** (i)  $\text{Mg} + (\text{H}_2\text{SO}_4) \rightarrow$  1
- $\text{MgSO}_4 +$  1
- $\text{H}_2$
- deduct 1 mark if not balanced only if all three correct*  
*accept alternative metal of similar reactivity for example Zn **or** Fe*  
*candidate would not then be awarded first mark for Mg*  
*then error carried forward*  
*deduct 1 mark if not balanced only if all three correct* 1
- (ii) to remove the (excess) magnesium  
*accept separate*  
*accept insoluble substances **or** solids **or** residue*  
*do **not** accept unreactive substances **or** impurities **or** remove*  
*magnesium from sulphuric acid* 1
- (iii) to evaporate (some of the water **or** solution) 1
- to form crystals **or** crystallise  
*accept to form a saturated solution*  
***or** concentrated solution*  
*do **not** accept to leave  $\text{MgSO}_4$*  1
- [6]**

**5.** hydrogen ions (from acid) or protons /  $H^+$  1

react with hydroxide ions (from alkali) /  $OH^-$  1

to produce water

$H^+ + OH^- \longrightarrow H_2O$  gains all **3** marks  
 ignore state symbols  
 molecules of hydrogen ions and molecules of hydroxide ions produce water = **2** marks  
 if they fail to get any of the above marks they can get **1** mark for neutralisation / product neutral

1

**[3]**

**6.** (a) acidic }  
 neutral } *in this order*  
 alkaline }

*all correct 2 marks*  
*one correct 1 mark*

2

(b) *ideas that*

- nothing happens at first (to pH) / pH stays the same
- then (rapidly) changes / increases
- then stays at same (higher) level

5

**[7]**

**7.** copper collects at the negative electrode  
 copper positive ions  
*each for 1 mark*

2

**[2]**

**8.** (a) hydrogen  
*for 1 mark*

1

(b) chloride ions are negative;  
 negative ions move to positive electrode  
*each for 1 mark*

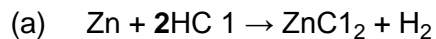
2

- (c) any **one** use of chlorine e.g.  
sterilisation;  
bleaching;  
making plastics  
*any one for 1 mark*

1

[4]

9.



1

- (b) (i) 12.5

1

- (ii) steeper curve same volume of gas evolved  
*do not credit two intersects of straight lines*  
*accept a sharp bend*

2

- (iii) any **two** from:

stir it

*accept mix it better*

heat it

*accept warm it*

use a more finely divided catalyst

*accept use a better catalyst or more finely divided zinc*

*do not credit use acid of a higher*

2

- (c) (i) any **one** from

zinc is more reactive than copper

*accept zinc is above copper in the reactivity series*

zinc displaces copper

*accept it is higher than copper in the reactivity series*

1

- (ii) zinc + copper sulphate  $\rightarrow$  copper + zinc sulphate

*ignore the presence of acid or water*

*accept a balanced equation*

1

[8]

10.

- (a) (i) bulb lights up

1

bubbles / fizz / gas or chlorine given off

1

(ii) in solid, ions 1

are not free to move / (charged) particles cannot move or converse  
*atoms / electrons cannot move worth 0 marks*

1

(b) (i) breakdown / decomposition / splitting up  
**not separation**

1

by using electricity

1

(ii) gas **A** = chlorine / oxygen

1

deposit **B** = copper

1

(c) any one from:

- manufacturer of chlorine / sodium hydroxide / hydrogen / sodium
- electroplating of steel / reference to plating  
**not galvanising**
- extraction of aluminium / metal reactivity series specified
- purification of copper  
**not making copper**

1

[9]

11.

(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

- (c)  $2\text{Fe}_2\text{O}_3 + 3\text{C} \rightarrow 4\text{Fe} + 3\text{CO}_2$   
*correct formulae for 1 mark*  
*correct balancing of correct formulae for 1 mark*  
*allow multiples*  
*accept for 2 marks:*  
 $\text{Fe}_2\text{O}_3 + 3\text{CO} \rightarrow 2\text{Fe} + 3\text{CO}_2$

2

[5]

12.

- (a) positive  
*accept + or +ve or plus*

1

- (b) chlorine

1

- (c) (i) hydroxide  
*Any indication of hydro...*

1

- (ii) destroys / damages / dissolves (owtte) the hair / follicle / root  
*allow burns / reacts with the hair*  
*ignore incorrect name of compound*

1

[4]

13.

**Level 3:** Relevant points (reasons / causes) are identified, given in detail and logically linked to form a clear account.

5-6

**Level 2:** Relevant points (reasons / causes) are identified, and there are attempts at logical linking. The resulting account is not fully clear.

3-4

**Level 1:** Points are identified and stated simply, but their relevance is not clear and there is no attempt at logical linking.

1-2

**No relevant content**

0

### Indicative content

- uses sulfuric acid not hydrochloric acid  
**or** sulfuric acid needed
- uses copper carbonate / oxide not calcium carbonate  
**or** copper carbonate / oxide needed
- add solid until solid remains **or** is in excess **or** no more reacts / dissolves  
so that most / all of the acid reacts
- filter  
to remove excess **or** unreacted carbonate / oxide / solid
- heat gently **or** partially evaporate **or** leave  
until crystals appear **or** to crystallise

for **level 3** the correct chemicals must have been selected

[6]