

# Reactivity of Metals

## Mark Scheme 1

Level	GCSE (9-1)
Subject	Combined Science: Trilogy - Chemistry
Exam Board	AQA
Topic	5.4 Chemical Changes
Sub-Topic	Reactivity of Metals
Difficulty Level	Bronze Level
Booklet	Mark Scheme 1

Time Allowed: 59 minutes

Score: /57

Percentage: /100

Grade Boundaries:

M1.(a) Z

1

- (b) magnesium sulfate does not react with any of the metals  
*allow there is no change / increase in temperature with any of the metals*

1

- (c) temperature increase

1

- (d) **Level 2 (3–4 marks):**

A detailed and coherent plan covering all the steps. The steps include the improvements and are set out in a logical manner.

**Level 1 (1–2 marks):**

Simple statements of improvements to the apparatus or steps are made but they may not be set out in a logical manner.

**0 marks:**

No relevant content

**Indicative content**

Simple statements

- stir the solution
- use the same amount of each solution
- use the same concentration of solution
- put insulation or a lid on the beaker
- measure how high temperature goes

Coherent statements in a logical order

- pour a fixed, measured volume of the metal salt solution into a plastic / polystyrene cup
- measure and record the temperature of the solution
- stir and add 1 g of metal to the solution
- (put a lid on the cup)
- measure and record the temperature after a set time or measure and record the greatest / highest temperature
- calculate and record the temperature increase
- (repeat each individual experiment at least two more times and calculate

the mean temperature increase)

4

(e) Activation energy

1

(f)  $386 \text{ (kJ)} / 1370 \times 100$

1

28 %

1

[10]

**M2.(a)** it goes up / increases

1

because the reaction is exothermic **or** transfers energy to the surroundings  
*allow gives out thermal / heat energy*

1

(b)  $\text{H}^+ (\text{aq}) + \text{OH}^- (\text{aq}) \rightarrow \text{H}_2\text{O} (\text{l})$

1

(c) copper sulfate

1

(d) **X** bubbles of gas

1

**Y** no bubbles of gas

1

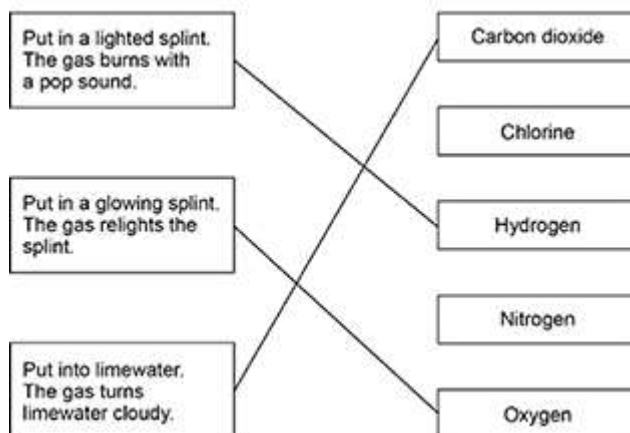
(e) calcium>magnesium>zinc>copper

*if not all correct allow 1 mark for at least two metals in the correct position*

2

(f) Chemical test

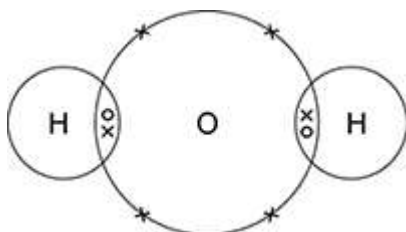
Gas



*extra lines from a test negate the mark*

3

(g)



*two pairs of shared electrons*

*oxygen has four other electrons not bonded*

1

1

[13]

M3.(a) gold

1

(b) atom (s)

1

(c) (i) protons

*any order*

*allow proton*

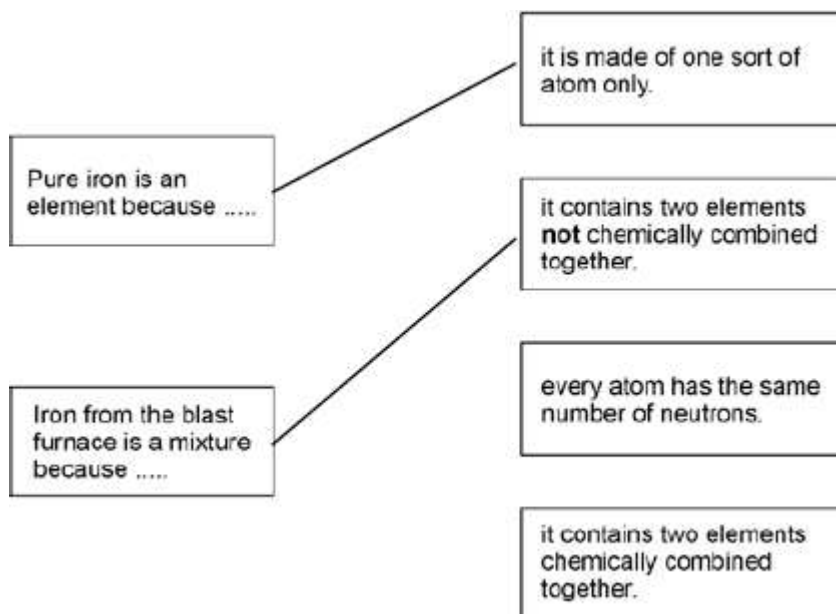
1

neutrons

	<i>allow neutron</i>	1
(ii)	3 / three	1
(d) (i)	Al <i>ignore any numbers / charges</i>	1
(ii)	any <b>two</b> from: <ul style="list-style-type: none"><li>• limited resource</li><li>• expensive in terms of energy / mining</li><li>• effects on the environment, such as, landfill, atmospheric pollution, quarrying</li></ul> <i>allow uses a lot of energy to extract.</i>	2
(e)	resistant to corrosion	1
	does not react (with water or food) <i>allow <b>one</b> mark for low density with a suitable reason given</i>	1
		[10]
M4.(a) (i)	iron <i>either order</i>	1
	carbon dioxide	1
(ii)	reduced	1

(b) (i) **Statementant**

**Explanation**



*each correct line gains 1 mark*

*extra lines from statement negate the mark*

max. 2

(ii) the layers / rows are distorted / disrupted **or** it doesn't occur in layers **or** the atoms are different

1

so cannot **slide** over one another **or slide** less easily

1

[7]

**M5.(a)** (i) economical

1

(ii) phytomining

1

(iii) carbon dioxide

1

(b) (i) copper / Cu 1

iron sulfate /  $\text{FeSO}_4$  1

(ii) copper / ions have a positive charge  
*it = copper ions*  
*allow copper ions have a different charge*  
*accept copper / ions are free to move*  
*accept to gain electrons*  
*accept copper / ions are attracted to the negative electrode*  
*or opposite charges attract* 1

(c) any **two** from:  
*ignore not biodegradable or does not decay*

- copper ores are limited / running out  
*allow copper is running out*
- copper can be recycled
- copper can be reused
- copper is expensive
- landfill sites are filling up
- copper compounds are toxic  
*allow copper is toxic*

2 [8]

M6.(a) (i) copper / Cu 1

(ii) 50 (p) 1

(iii) 25

1

(iv) tin

1

(b) any **one** form:

- high cost of copper  
*allow metal is expensive*
- less copper available **or** (copper ores exhausted / **only** low-grade ores available)  
*allow copper is non-renewable*
- high demand for copper
- high percentage (%) of copper in the coin
- inflation (of cost)

1

[5]

**M7.** (a) (i) conducts electricity

1

(ii) mixture (of metals)  
*(it = alloy)*

1

(b) any **two** from:

*ignore pollution without qualification*

- noise
- dust

*allow dirt*



- traffic
- eyesore

2

[4]