Exothermic and Endothermic Reactions

Mark Scheme 1

Level	GCSE (9-1)
Subject	Combined Science: Trilogy - Chemistry
Exam Board	AQA
Topic	5.5 Energy Changes
Sub-Topic	Exothermic and Endothermic Reactions
Difficulty Level	Bronze Level
Booklet	Mark Scheme 1

Time Allowed: **56 minutes**

Score: **/54**

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 (kJ) / 1370 × 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) H^+ (aq) + OH^-(aq) → H_2O(l)

1

(c) copper sulfate

1

(d) **X** bubbles of gas

1

Y no bubbles of gas

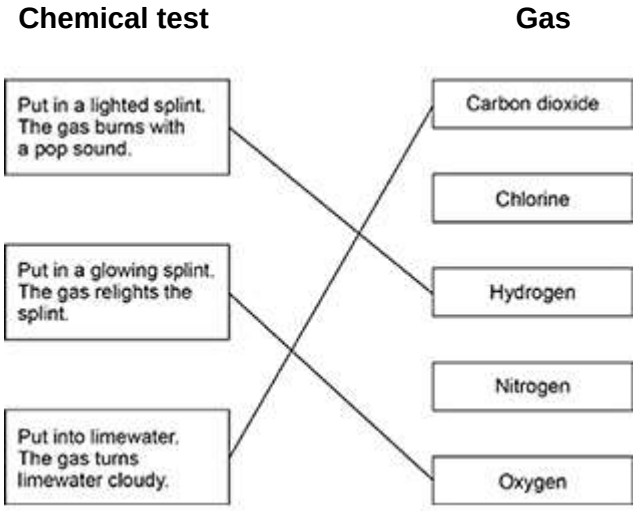
1

(e) calcium>magnesium>zinc>copper

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

2

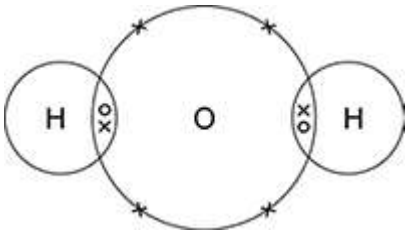
(f)



extra lines from a test negate the mark

3

(g)



two pairs of shared electrons

1

oxygen has four other electrons not bonded

1

[13]

M3.(a) (i) 11

1

(ii) 4620 (J)

*correct answer gains **2** marks with or without working*

*allow 4.62kJ for **2** marks*

if answer is incorrect:

*100 × 4.2 × 11 gains **1** mark*

or

*100 × 4.2 × (their temp. rise) gains **1** mark*

or

*100 × 4.2 × (their temp. rise) correctly calculated gains **2** marks*

2

(b) the temperature increases

allow gets hotter

allow heat / energy is given off

1

(c) (i) (energy of) products lower than (energy of) reactants

allow converse

allow arrow C points downwards

1

(ii) A

1

[6]

M4.(a) (i) ions cannot move

allow only conducts as a liquid

1

(ii) chlorine

1

(iii) they are positively / oppositely charged

or

they are attracted

1

(iv) 2

1

(b) (i) any **one** from:

- not all the magnesium was collected

  allow some magnesium was lost
- *used less time **or** lower current **or** different battery / power pack **or** different balance **or** lower voltage*
- error in reading balance
- error in recording result

1

(ii) 1.11

*correct answer with or without working gains **2** marks.*

*if answer incorrect, allow **1** mark for 0.99*

***or** for 1.13 + 1.11 + 1.09*

2

(c) (i) *25 – 25.3*

*correct answer with or without working gains **2** marks.*
*If answer incorrect, allow **1** mark for 24 / 95*

2

(ii) 71

1

(d) (i) reversible reaction

1

(ii) decreases

1

[12]

M5.(a) electrical

1

(b) (i) 900

accept any answer between 840 and 960

1

(ii) any **one** from:

- little demand
- few hydrogen cars
- *changeover from petrol to hydrogen will take time*

allow answers in terms of petrol

1

(c) X on rising section of *line*

1

[4]

M6.(a) exothermic

1

(b) 'Should people use kelp instead of oil as an energy source?'

1

'Will kelp be more popular than coal in the next 10 years?'

1

(c) (i) any **four** from:

*If atom or ion omitted = max **3***
*sharing / covalent / metallic = max **3***
ignore reference to full outer shells

- potassium (atom) loses (an electron) and iodine (atom) gains (an electron)
- 1 electron
- iodide (ion) has negative charge
  allow iodine ion
- potassium (ion) has positive charge
- electrostatic attraction **or** ionic bonding
  *accept stable (structure) **or** noble gas (structure)*

4

(ii) because a solid is formed (from two aqueous solutions)

1

(iii) filtering **or** centrifuging **or** decanting

1

[9]