

M1.(a) 36 cm³ 1

(b) all points correct
 $\pm \frac{1}{2}$ small square 2

allow 1 mark if 6 or 7 of the points are correct

2 best fit lines drawn
must not deviate towards anomalous point 2

allow 1 mark if 1 line correct

(c) The bung was not pushed in firmly enough. 1

The measuring cylinder was not completely over the delivery tube. 1

(d) as mass of lithium carbonate increases volume of gas produced increases 1

linear / (directly) proportional 1

(e) A gas / carbon dioxide is produced.
allow because the air in the tube expands 1

(f) any **one** from:
• Potassium carbonate does not decompose to produce carbon dioxide / a gas.

- Potassium carbonate does not decompose at the temperature of the Bunsen burner **or** the Bunsen burner is not hot enough to decompose potassium carbonate.
- When potassium carbonate decomposes a gas is not formed.

1

[11]

M2.(a) any **one** from:

- there was a flame
- energy was given out
- a new substance was formed
- the magnesium turned into a (white) powder

answers must be from the figure

1

(b) Magnesium oxide

1

(c) The reaction has a high activation energy

1

(d) 9

1

(e) They have a high surface area to volume ratio

1

(f) any **one** from:

- Better coverage
- More protection from the Sun's ultraviolet rays

1

(g) any **one** from:

- Potential cell damage to the body
- Harmful effects on the environment

1

- (h) indication of $\frac{1}{1.6} = 0.625$
and
use of indices $10^{-9} - 10^{-6} = 10^3$

Both steps must be seen to score first mark

1

$$0.625 \times 1000 = 625 \text{ (times bigger)}$$

1

[9]

M3.(a) s

1

l

Answers **must** be in the correct order.

1

(b) A gas was lost from the flask

1

(c) **Level 3 (5–6 marks):**

A coherent method is described with relevant detail, and in correct sequence which demonstrates a broad understanding of the relevant scientific techniques and procedures. The steps in the method are logically ordered. The method would lead to the production of valid results.

Level 2 (3–4 marks):

The bulk of the method is described with mostly relevant detail, which demonstrates a reasonable understanding of the relevant scientific techniques and procedures. The method may not be in a completely logical sequence and may be missing some detail.

Level 1 (1–2 marks):

Simple statements are made which demonstrate some understanding of some of the relevant scientific techniques and procedures. The response may lack a logical structure and would not lead to the production of valid results.

0 marks:

No relevant content.

Indicative content

- sulfuric acid in beaker (or similar)
- add copper carbonate one spatula at a time
- until copper carbonate is in excess or until no more effervescence occurs *
- filter using filter paper and funnel
- filter excess copper carbonate
- pour solution into evaporating basin / dish
- heat using Bunsen burner
- leave to crystallise / leave for water to evaporate / boil off water
- decant solution
- pat dry (using filter paper)
- wear safety spectacles / goggles

*Students. may choose to use a named indicator until it turns a neutral colour, record the

number of spatulas of copper carbonate added then repeat without the indicator.

6

(d) Total mass of reactants = 221.5

1

159.5

221.5

allow ecf from step 1

1

72.0 (%)

1

allow 72.0 with no working shown for 3 marks

(e) any **one** from:

- Important for sustainable development
- Economic reasons
- Waste products may be pollutants / greenhouse gases

1

[13]

M4.(a) sodium loses (electron)

sharing / covalent / metallic = max 2

1

chlorine gains (electron)

1

1 **or** an (electron)

1

(b) (i) Have no overall electric charge

1

(ii) Should iodine be added to salt?

1

reason

any **one** from:

- cannot be done by experiment
accept difficult to get / not enough evidence
- based on opinion / view
allow must be done by survey
- ethical **or** economic issue.

1

(c) (i) nitric (acid)

1

(ii) an alkali

1

(iii) indicator

accept any named acid base indicator

1

(d) (i) Crystallisation

1

(ii) fertiliser

allow to help crops grow

1

- (iii) any **one** from:
- pressure
allow concentration
 - temperature
ignore heat
 - catalyst.

1
[12]

M5.(a) (i) $(19.5 + 18.5 + 19.0) / 3$

allow $(23.0 + 19.5 + 18.5 + 19.0) / 4$ for 1 mark

2

(ii) R P Q

allow Q P R for 1 mark

2

(b) any **two** from:

- repeat more times
- calculate a mean
- measure to one decimal place.

2

(c) both students get similar results / similar pattern

1

[7]