

Mark schemes



- 1.** (a) gas 1
- (b) the gas escapes
allow carbon dioxide escapes
*do **not** accept references to evaporation* 1
- (c) 5.12 (g) 1
- (d) 4.00 (g) trial 1
allow 2.89 written in either space, or ringed in the table,
unless contradicted by mass of copper carbonate or trial
number 1
- (e) reheat 1
- (and reweigh) until constant mass 1
- an answer of heat to constant mass scores 2 marks*
if no other mark scored allow for 1 mark
heat for longer
or
(heat at a) higher temperature
alternative approach:
(1) continue heating and pass gas through limewater
(1) until the (lime)water stops bubbling
or
until the limewater no longer turns cloudy
- (f) straight line of best fit
must touch at least 5 of the 6 plots 1
- (g) correct value read from line of best fit in the graph
allow tolerance of $\pm\frac{1}{2}$ small square 1



(h) (mass =)

$$168 \times \frac{\text{answer from question (g)}}{8.4}$$

allow (mass =) answer from part (g) × 20

1

correctly calculated value (g)

1

a correctly calculated value from their answer to part (g) scores 2 marks

[10]

2.

(a) mass number

allow the number of protons + neutrons

1

(b) 6.02×10^{23}

1

(c) **Level 2 (3-4 marks):**

Scientifically relevant features are identified; the ways in which they are similar / different is made clear.

Level 1 (1-2 marks):

Relevant features are identified and differences noted.

Level 0

No relevant content.

Indicative content

similarities

- both have positive charges
- both have (negative) electrons
- neither has neutrons

differences

plum pudding model	nuclear model
ball of positive charge (spread throughout)	positive charge concentrated at the centre
electrons spread throughout (embedded in the ball of positive charge)	electrons outside the nucleus
no empty space in the atom	most of the atom is empty space
mass spread throughout	mass concentrated at the centre

4



(d)
$$\frac{(24 \times 78.6) + (25 \times 0.1) + (26 \times 11.3)}{100}$$

or

$$(24 \times 0.786) + (25 \times 0.101) + (26 \times 0.113)$$

$$= 24.3$$

1

1

an answer of 24.3 scores 2 marks

[8]

3.

(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.

(d) Total mass of reactants = 221.5

159.5

221.5

allow ecf from step 1

72.0 (%)

6

1

1

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]

4.

(a) (delivery) tube sticks into the acid

1

the acid would go into the water **or** the acid would leave the flask or go up the delivery tube

ignore no gas collected

1

(b) any **one** from:

- bung not put in firmly / properly
- gas lost before bung put in
- leak from tube

1

(c) all of the acid has reacted

1

(d) take more readings in range 0.34 g to 0.54 g

1

take more readings is insufficient
ignore repeat

(e) $\frac{95}{24000}$

1

0.00396

or

3.96×10^{-3}

1

accept 0.00396 or 3.96×10^{-3} with no working shown for 2 marks

(f) use a pipette / burette to measure the acid

1



because it is more accurate volume than a measuring cylinder

or

greater precision than a measuring cylinder

or

use a gas syringe to collect the gas

so it will not dissolve in water

or

use a flask with a divider

accept description of tube suspended inside flask

so no gas escapes when bung removed

1

(g) they should be collected because carbon dioxide is left in flask at end

1

and it has the same volume as the air collected / displaced

1

[11]

5.

(a) 1

must be in this order

1

very small

accept negligible, 1 / 2000

allow zero

1

(b) The mass number

1

(c) C

1

(d) (i) 2

1

(ii) 3

1

(e) (i) 28

1

(ii) 42.9

accept ecf from (e)(i)

accept 42 - 43

1

(f) (i) 0.9

1



- (ii) any **one** from:
- accurate
 - sensitive
 - rapid
 - small sample.

1

[10]