M1. (a) s

1

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

\[ 159.5 \]
\[ 221.5 \]
\[ allow \ ecf \ from \ step \ 1 \]

\[ 72.0 \ (\%) \]

\[ allow \ 72.0 \ with \ no \ working \ shown \ for \ 3 \ marks \]

(e) any one from:

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

[13]
M2. (a) cotton wool

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

   *allow 1 mark if 5 or 6 of the points are correct*

   best fit line
   *must not deviate towards anomalous point*

(c) (mass)
   2.1 (g)

   *allow ecf from drawn best fit line*

(d) a gas is produced

which escapes from the flask

(e) \( \frac{9.85}{150} = 0.0656 \)
0.07 (g / s)

allow ecf answer correctly calculated to 2 decimal places

(f) collect the gas in a gas syringe

measured the volume of gas

allow carbon dioxide for gas

allow for 1 mark
collected gas
or
counted bubbles

(g) The particles have more energy

The particles move faster

[14]
M3.(a)  (i) central block

(ii) conducts electricity

(b) any **two** from:
- visual pollution
- noise pollution
- dust pollution
- habitat destruction.

(c) (i) to concentrate the ore / copper carbonate
     or
     to remove / separate the rock

(ii) 12 (tonnes)

     *If answer is incorrect allow one mark for (127 + 132) − 247 or 259 - 247*

(iii) any **one** from:
- so no reactant is wasted / left unreacted
- so they know how much product they will make
- need to record / compensate for the carbon dioxide produced

     *allow so they can work out their carbon footprint.*
M4.(a) 1

must be in this order

very small

accept negligible, 1 / 2000
allow zero

(b) The mass number

(c) C

(d) (i) 2

(ii) 3

(e) (i) 28

(ii) 42.9

accept ecf from (e)(i)
accept 42 - 43

(f) (i) 0.9

(ii) any one from:
  • accurate
  • sensitive
  • rapid
  • small sample.
M5. (a) (i) an alloy

(ii) harder

(b) (i) 162.5

Correct answer with or without working gains 2 marks
If no answer or incorrect answer then evidence of correct working
\[56 + (3\times35.5)\] gains 1 mark

(ii) 34.46

Accept rounding from 34 - 34.5
Correct answer with or without working gains 2 marks
Accept ecf from (b)(i) correctly calculated for 2 marks
If no answer or incorrect answer then evidence of 56 / 162.5 or 56 / answer to (b)(i) gains 1 mark

[6]