Use of Amount of Sub; Masses Pure Subs

Mark Scheme

Level	GCSE (9-1)
Subject	Combined Science: Trilogy - Chemistry
Exam Board	AQA
Topic	5.3 Quantitative Chemistry
Sub-Topic	Use of Amount of Sub; Masses Pure Subs
Difficulty Level	Gold Level
Booklet	Mark Scheme

Time Allowed: **31 minutes**

Score: **/29**

Percentage: **/100**

Grade Boundaries:

M1.(a) electrodes connected to d.c. power supply by wires

for this diagram ignore the material used for the electrodes as long as they are made from carbon or metals that are inert

1

electrodes labelled anode (+) and cathode (−)

1

(b) copper ions cause the blue colour

answer must be in terms on copper ions

1

copper ions are reduced / converted to copper ions

1

so the concentration of copper ions decreased

1

*if no other mark awarded allow **1** mark for copper ions are used up during electrolysis*

(c) copper ions are positive

1

so are attracted to the inert cathode **or** inert negative electrode

1

copper ions gain electrons at the inert cathode **or** inert negative electrode

1

so they are reduced to form copper atoms

1

(d) 50 cm^3 contains 4 g $CuSO_4$

1

M_r $CuSO_4$ = 159.5

1

4 g $CuSO_4$ reacts with $\frac{4}{159.5}$ × 56 g Fe

= 1.40(43877)

1

= 1.4 (g)

1

*accept 1.4(g) with no working shown for **4** marks*
*allow 1.40(43887) without working shown for **3** marks*

[13]

M2.(a) **Level 3 (5–6 marks):**
A full, detailed and coherent plan covering all the major steps is provided, which outlines
the apparatus required and sets out the steps needed in a logical manner that could be followed by another person to produce a pure, dry sample of copper nitrate.

Level 2 (3–4 marks):
The substantive content of a plan is present but may be missing some steps. The plan
may not be in a completely logical sequence but leads towards the production of a pure,
dry sample of copper nitrate.

Level 1 (1–2 marks):
Simple statements relating to relevant apparatus or steps are made but they may not be
in a logical order. The plan would not allow another person to produce the sample.

0 marks:
No relevant content

Indicative content

- pour a suitable volume of nitric acid into a suitable container
- add a small amount of copper carbonate to the acid and stir until the effervescence stops
- continue to add small amounts of copper carbonate to the acid and each time stir until any effervescence stops
- eventually when there is no reaction / effervescence when the copper carbonate is added filter the mixture to remove the excess copper carbonate
- pour the filtrate (copper nitrate solution) into an evaporating basin and heat to evaporate a small amount of the water
- leave the copper nitrate solution to crystallise
- remove the crystals from the solution remaining and dry the crystals

6

(b) 1 mole carbon dioxide = 14 + (16 × 2) = 46 g

1

14 g is 0.30 mole

1

1 mole is 6.02×10^{23} molecules

1

so 14 g has 1.81×10^{23} molecules

*allow 1.81×10^{23} with no working shown for **4** marks*

1

*answer not given in standard form max. **3** marks*

[10]

M3.(a) copper has delocalised electrons

*accept copper has free electronsignore sea of electrons **or** mobile electrons*

1

(electrons) which can move through the metal / structure

allow (electrons) which can carry a charge through the metal / structure

1

(b) (i) (M_r $FeCl_3$ =) 162.5

*correct answer with or without working gains **3** marks*
*can be credited from correct substitution in step **2***

1

or

2 (moles of) $FeCl_3$ = 325

or

112 → 325

$$\frac{11.20}{56} \times 162.5$$

allow ecf from step 1

accept $\frac{325}{112} \times 11.2$

1

= 32.5

accept 32.48

1

(ii) 74.8

accept 74.77 - 75
accept ecf from (b)(i)
if there is no answer to part(i)
or
if candidate chooses not to use their answer then accept 86.79 - 87

1

[6]