

Mark schemes

Q1.

- (a) displacement 1
- (b) (percentage =)

$$\frac{63.5}{159.5} \times 100$$
 1

$$= 39.81191 \text{ (\%)}$$
 1

$$= 39.8 \text{ \%}$$
allow an answer correctly rounded to 3 significant figures from an incorrect calculation which uses both the values in the question 1
- (c) volume of copper sulfate solution 1
- (d) 0.8(0) g 1
- (e) (maximum temperature change) = 47 – 22 (°C) 1

$$= 25 \text{ (°C)}$$
allow correct use of incorrectly determined value(s) from the graph 1
- (f) (conversion 25 cm³ =) 0.025 dm³ 1
 (concentration =) $\frac{6.75}{0.025} \text{ (g/dm}^3\text{)}$ 1
allow correct use of an incorrectly determined or unconverted volume 1

$$= 270 \text{ (g/dm}^3\text{)}$$
 1
- (g) line of best fit using the first five points
max 1 mark if the lines do not intersect 1
 line of best fit using the last four points 1
- (h) energy is **taken in from** the surroundings so the reaction is **endothermic** 1

Q2.

- (a) ions can move through the molten substance to the electrodes

1

- (b)

Molten compound	Product at negative electrode	Product at positive electrode
Lead chloride	Lead	Chlorine
Potassium iodide	Potassium	Iodine
Zinc bromide	Zinc	Bromine

1
1
1

- (c)
- $2 \text{Al}_2\text{O}_3 \rightarrow 4 \text{Al} + 3 \text{O}_2$

*allow 1 mark for 4 Al**allow 1 mark for 3 O₂*

2

- (d) (
- $M_r =$
-)
-
- (
- 27×2
-) + (
- 16×3
-)

1

= 102

1

- (e) (by electrolysis) any
- one**
- from:

- potassium / K
- lithium / Li

*allow aluminium / Al**allow sodium / Na**allow calcium / Ca**allow magnesium / Mg*

1

(by carbon reduction) any **one** from:

- zinc / Zn
- tin / Sn

*allow iron / Fe**allow copper / Cu*

1

[10]

Q3.

- (a) copper sulfate

allow CuSO₄

1

water

allow H₂O

1

- (b) solid remains (in the mixture)

or

no more effervescence / bubbles / fizzing

*ignore references to colours**allow copper carbonate remains (in the mixture)*

1

- (c) to remove copper carbonate

allow to remove excess (copper carbonate)

1

- (d) electric heater

or

water bath

ignore Bunsen burner

1

- (e)

$$92.8 = \frac{\text{mass produced}}{12.5} \times 100$$

allow mass produced =

$$\% \text{ yield} \times \frac{\text{max theoretical mass}}{100}$$

1

$$(\text{mass produced}) = \frac{92.8}{100} \times 12.5$$

1

$$= 11.6 \text{ (g)}$$

1

- (f) (copper)
does not react with (sulfuric)
acid
- allow is unreactive*
allow will not displace hydrogen
allow is below hydrogen in the reactivity series
ignore is not reactive enough

1

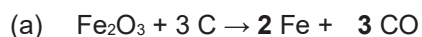
- (sodium)
could explode
or
could get too hot
- allow (the reaction is) dangerous*

1

[10]

Q4.

- (a) (similarity)
both have one outer (shell)
electron
allow energy level for shell
allow same number of outer (shell) electrons
1
- (difference)
sodium has 3 shells but
potassium has 4 shells
allow potassium has more shells
allow (different) number of shells
1
- (b) any **two** from:
 - effervescence / bubbles / fizzing
ignore gas produced
 - (potassium) floats
 - (potassium) moves around
 - (potassium) becomes smaller
 - (potassium) melts
allow (potassium) forms a ball
ignore colour of flame
 - flame
 - explosion
2
- (c) blue / violet / purple
1
- (the solution is) alkaline
allow (the solution) contains
OH⁻ (ions)
allow (the solution) contains hydroxide ions
allow the solution is basic
1
- (d) all five points correctly plotted
allow a tolerance of $\pm \frac{1}{2}$ a small square
allow 1 mark for three or four points correctly plotted
2
- (e) 3.4 (mg/cm³)
allow a value in the range 3.0 to 3.8 (mg/cm³)
1
- (f) chlorine and potassium bromide
1
- (g) relative molecular mass increases and boiling point increases
1

Q5.*allow multiples**allow 1 mark for 2 Fe***or***allow 1 mark for 3 CO*

2

(b) (iron oxide) loses oxygen

ignore references to gain of electrons

1

(c) ($M_r =$)

$$(2 \times 56) + (3 \times 16)$$

allow 112 + 48

1

$$= 160$$

1

(d) (percentage atom economy =)

$$\frac{63.5}{2 + 79.5} \times 100$$

1

$$= 77.9 (\%)$$

allow 77.914110 (%) correctly rounded to at least 2 significant figures

1

(e) any **one** from:

- colour change (in solution)
- colour change (in metal)
- change of temperature

allow bubbles

1

(f) (most reactive) **D****B****A**(least reactive) **C**

1

(reason) more reactive (metals) displace less reactive (metals)

*allow D has most (displacement) reactions***and C does not react***allow the more reactive metals have more (displacement) reactions*

1

[10]

Q6.(a) **B**

1

(b) **C**

1

(c) zinc (oxide)

allow ZnO

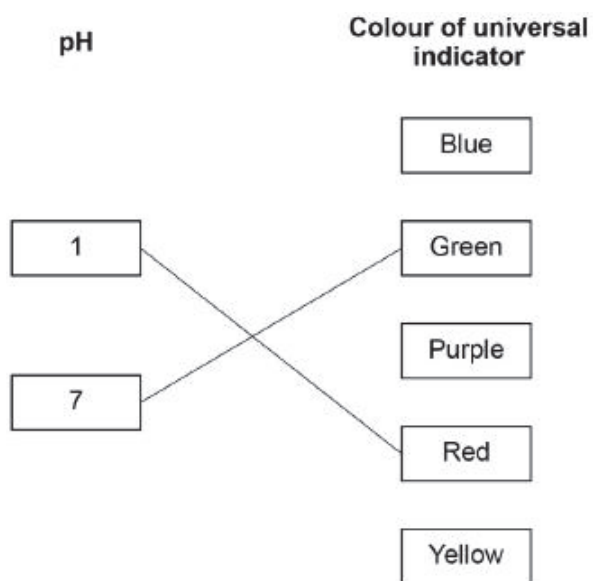
1

sulfuric (acid)

allow H₂SO₄

1

(d)

*do **not** accept more than one line from a box on the left*

2

(e) neutralisation

1

(f) burette

1

[8]