

Mark schemes

Q1.

- (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

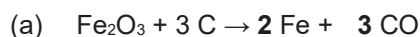
- (f) (copper)
does not react with (sulfuric)
acid
- allow is unreactive*
allow will not displace hydrogen
allow is below hydrogen in the reactivity series
ignore is not reactive enough

1

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

1

[10]

Q2.*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]

Q3.

(a) hydroxide ions

1

(b) 27 (cm³)

1

(c) ions cannot move (freely in a solid)

allow ions are fixed in place (in a solid)

1

(d)

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

2

(e) carbon is less reactive than sodium

1

(f) (l)

1

(g) (percentage atom economy =) $\frac{48}{80} \times 100$

1

= 60 (%)

1

[9]