

C5 Chemical Changes Homework task 1 - ANSWERS

Q1. (a)
$$\frac{54 + 50 + 55}{3}$$

= 53 (°C)

1

if no other mark awarded allow 1 mark for
$$\frac{54 + 50 + 37 + 55}{4} = 49 \text{ (°C)}$$

1

- (b) (most reactive) magnesium zinc
(least reactive) cobalt
allow ecf from question (a)

1

- (c) (18 ±) 2 (°C)

1

- (d) control

1

- (e) use the same mass of metal / powder

1

- (f) (A) progress of reaction

1

- (B) activation energy

1

- (C) products

1

[9]

Q2. (a) 48 (cm³)

1

- (b) (change in y =) 70 (cm³)

1

- (change in x =) 0.4 (g)

1

(gradient =) $\frac{70}{0.4}$ *allow correct use of incorrectly derived values for change in y and / or change in x*

1

= 175 (cm³/g)

1

- (c) hydrochloric acid

1

- (d) carbon dioxide 1
- (e) to evaporate water 1
- (f) using a (boiling) water bath
or
using an electric heater 1

[9]

- Q3.** (a) electrolysis uses electricity to produce a chemical reaction
allow voltage for electricity
allow potential difference for electricity
allow (electrical) current for electricity
allow electrolysis uses electricity to decompose a compound / electrolyte

1

(but) cells use a chemical reaction to produce electricity

1

- (b) $2\text{Br}^- \rightarrow \text{Br}_2 + 2\text{e}^-$
allow multiples
allow 1 mark for Br₂ and e⁻

2

(c)

Salt solution	Product at positive electrode	Product at negative electrode
(copper nitrate)	oxygen (1)	(copper)
(potassium iodide)	iodine (1)	hydrogen (1)

1

2

- (d) filter the mixture 1
- wash and dry the copper / residue 1
- weigh the copper collected 1
- add to the increase in mass of the electrode 1
- (e) (for given current) straight line through the origin
allow (for given current) when time doubles, mass doubles 1

- (f) (for given time) when current doubles, mass doubles with supporting data

- (g) copper ions are discharged (from the solution)
allow the solution becomes less concentrated
allow copper ions are removed (from the solution)
allow copper ions are used up (from the solution)
- (h) (number of moles = $\frac{0.24}{63.5} =$)
 3.78×10^{-3} **or** 0.00378
- (number of atoms =)
 $0.00378 \times 6.02 \times 10^{23}$
allow correct use of an incorrectly calculated number of moles
- = 2.28×10^{21}
allow a correct evaluation to 3 significant figures of an incorrect expression which involves only a mass from the graph, the A_r of copper and the Avogadro constant

1

1

1

1

1

[17]

Q4. (a) the chemical reaction is reversible

1

- (b) any **two** from:
- type of electrode
 - electrolyte
 - concentration of electrolyte
 - temperature

2

(c) $\text{H}_2 + 2\text{OH}^- \rightarrow 2\text{H}_2\text{O} + 2\text{e}^-$ *allow multiples*

1

(d) contains OH^- ions

1

(e) (bonds broken)

$$((6 \times 412) + (2 \times 360) + (2 \times 464) + (3 \times 498)) = 5614$$

1

(bonds made)

$$((4 \times 805) + (8 \times 464)) = 6932$$

1

(overall energy change)

$$(6932 - 5614) = -1318 \text{ (kJ / mol)}$$

allow ecf from marking point 1 and / or marking point 2

1

an answer of 1318 (kJ / mol) scores 3 marks

[8]