

# REDOX REACTIONS AND ELECTROLYSIS 2

## MARK SCHEME

### Question 1.

Question	Answer	Extra information	Marks
(a)	(propanone) has a low(er) boiling point or (propanone) evaporates fast(er) owtte	or water has a high(er) boiling point or water evaporates slow(er) allow propane / solution / it allow evaporates at lower temperature or boils quicker ignore density / reactivity / melting point	1
(b)(i)	0.29	ignore + or - ignore units	1
(b)(ii)	any two sensible suggestions eg: <ul style="list-style-type: none"> <li>• weighing error</li> <li>• (copper) lost during washing owtte</li> <li>• (copper) lost during electrolysis / reaction owtte</li> <li>• electrodes not completely dry</li> <li>• impurities in the electrode</li> <li>• copper falling off when removing electrode / copper from cell</li> </ul>	accept human error or inaccurate measurements allow different washing of electrodes  ignore timing errors ignore 'fair test' ignore sludge ignore gases produced	2
(c)	any four from: <ul style="list-style-type: none"> <li>• impure copper is anode / positive (electrode)</li> <li>• pure copper is cathode / negative (electrode)</li> <li>• copper sulfate solution or any soluble copper salt in solution</li> </ul>	as alternative to these two points	4

	<ul style="list-style-type: none"> <li>• copper loses electrons or copper is oxidised</li> <li>• copper forms positive ions / particles</li> <li>• copper gains electrons or copper reduced at negative electrode</li> <li>• copper attracts to / collects at negative electrode</li> <li>• sludge / impurities collect at the bottom of the</li> <li>• impurities not attracted to electrode</li> </ul>	<p><math>\text{Cu} \rightarrow \text{Cu}^{2+} + 2\text{e}^- = 2 \text{ marks}</math></p> <p>or <math>\text{Cu}^{2+} + 2\text{e}^- \rightarrow \text{Cu}</math> at negative electrode</p> <p>allow sludge left behind or sludge left in solution or impurities separated from copper</p> <p>ignore get rid of impurities</p>	
Total marks			8

### Question 2

Question	Answer	Extra information	Marks
(i)	any one from: <ul style="list-style-type: none"> <li>• they are positive / cations</li> <li>• they are <math>\text{H}^+</math></li> <li>• opposite charges attract</li> </ul>	ignore atom	1
(ii)	potassium is more reactive (or reverse)	assume 'it' refers to hydrogen allow potassium reacts with water allow potassium is very reactive or most reactive metal / element allow hydrogen gains electrons more easily / is reduced more easily accept potassium is higher up the reactivity series	1
Total marks			2

### Question 3

Question	Answer	Extra information	Marks
	loss of an electron or loses electrons	do not accept any ref. to oxygen	1
Total marks			1

#### Question 4

Question	Answer	Extra information	Marks
	magnesium <u>loses 2 electrons</u>	metallic / sharing / covalent or molecule = max 3 all three underlined ideas must be present two underlined ideas = 1 mark eg magnesium loses electrons or magnesium gains 2 electrons or magnesium loses 2 ions nb magnesium ion loses 2 electrons = 1 mark 2 errors = 0 marks e.g. magnesium gains electrons	2
	<u>iodine gains 1 / an electron</u>	all four underlined ideas must be present three underlined ideas = 1 mark eg iodine gains electron(s) or iodine loses 1 / an electron or iodine gains 1 / an ion or iodide (ion) gains 1 / an electron 2 errors = 0 marks	2
Total marks			4

#### Question 5

Question	Answer	Extra information	Marks
(a)(i)	cryolite		1
(ii)	lower the melting point of the aluminium oxide		1
(b)(i)	opposite charges <b>or</b> oxide ions are negative attract		1
(ii)	carbon		1
(iii)	reacts with oxygen or forms carbon dioxide	accept burns	1
Total marks			6

### Question 6

Question	Answer	Extra information	Marks
(a)(i)	ionic		1
(ii)	elements		1
(b)(i)	chlorine (gas)	allow Cl <sub>2</sub> / Cl / Cl <sup>2</sup> allow chloride	1
(ii)	hydrogen (gas)	allow H / H <sub>2</sub> / H <sup>2</sup>	1
(iii)	sodium hydroxide (solution)	allow NaOH allow sodium solution	1
Total marks			5

### Question 7

Question	Answer	Extra information	Marks
(a)	any one from: • because they are negative / anion • opposite charges / attract	allow Cl <sup>-</sup> ignore chlorine	1
(b)(i)	reasonable attempt at straight line which misses the anomalous point	must touch all five crosses do not allow multiple lines	1
(ii)	40	ignore 2.2	1
(iii)	any two sensible errors from: • gas escapes  • weighing error • error in measuring (volume / amount) of hydrogen • error in measuring (volume / amount) of water  • incorrect concentration • timing error • change in voltage / current • change in temperature • recording / plotting error	ignore systematic / human / apparatus / zero / experimental / random / measurement / reading errors unless qualified allow NaCl not measured correctly allow error in measuring volume / scale for 1 mark if neither hydrogen or water mentioned allow NaCl not fully dissolved or spilled or impure  allow faulty power supply	2
(iv)	increases	allow directly proportional or positive correlation allow rate / it is faster / quicker	1
Total marks			6

**Question 8**

Question	Answer	Extra information	Marks
(i)	liquid		1
(ii)	fluorine	accept F / F <sub>2</sub> do not accept fluoride	1
Total marks			2

**Question 9**

Question	Answer	Extra information	Marks
(i)	so ions can move (and carry charge)	accept so current can flow allow so it can conduct (electricity) allow so charged particles can move do not accept so electrons can move	1
(ii)	because zinc ions gain electrons  2 (electrons) zinc is formed	accept because zinc ions are reduced  accept correct half equation for 3 marks if no mark gained allow positive ions go to negative electrode or opposites attract or reduction (of zinc) or (zinc) gains electrons for 1 mark	1  1 1
(iii)	$2 \text{Cl}^- \rightarrow \text{Cl}_2 + 2 \text{e}^-$	must be completely correct	1
Total marks			5