

QUESTIONSHEET 1

- (i) electricity is conducted by the movement of ions 1
- (ii) cryolite 1
- (iii) aluminium is a very reactive metal 1
- (iv) carbon 1
- (v) oxygen 1
- (vi) I $2\text{O}^{2-} - 4\text{e} \longrightarrow \text{O}_2$ (1-equation, 1-balance)
 I $\text{Al}^{3+} + 3\text{e} \longrightarrow \text{Al}$ (1-equation, 1-balance) 4
- (vii) carbon reacts with the oxygen formed, to give carbon dioxide 2

TOTAL 11**QUESTIONSHEET 2**

- (i) I substance which conducts electricity into a liquid
 II a compound that conducts an electric current when molten or in aqueous solution 2
- (ii) to melt the lead bromide 1
- (iii) $\text{Pb}^{2+} \quad \text{Br}^-$ 2
- (iv) brown/ red-brown
- (v) $\text{Pb}^{2+} + 2\text{e} \quad \text{II} \quad \text{Pb}$ (1-equation, 1-balancing) 2
- (vi) chlorine sodium
 sulphur lithium 2

TOTAL 10

QUESTIONSHEET 3

(a)	zinc and copper or other suitable metals	2
(b)	in batteries/cells	1
(c)	voltage reading (size) gives distance between metals in series	1
	or sign of voltage reading shows order of reactivity	1 1
(d)	one of the metals gets used up	1
(e)	increase concentration of salt solution	1
	raise temperature	1
	use metals further apart in reactivity series	1
	TOTAL	9

QUESTIONSHEET 4

(a)	NaCl	1
(b)	(i) chlorine	1
	(ii) hydrogen	1
(c)	(i) $2\text{Cl}^- \rightarrow \text{Cl}_2 + 2\text{e}^-$	2
	(ii) $2\text{H}^+ + 2\text{e}^- \rightarrow \text{H}_2$	2
(d)	(i) 2.3 g Na from 1/10 mole electrons	1
	35.5 / 10	1
	3.55 g	1
	(ii) 1 mole chlorine occupies 24 dm^3	
	$3.55 \text{ g} = 3.55 / 71 = 0.05 \text{ mol Cl}_2$	1
	volume = $24 \times 0.05 = 1.2 \text{ dm}^3$	1
	TOTAL	12

QUESTIONSHEET 5

- (a) Gas A = Chlorine 1
Gas B = Hydrogen 1
- (b) Na^+ , Cl^- , H^+ , OH^- (½ each, max 2)
- (c) Anode $2\text{Cl}^- \rightarrow \text{Cl}_2 + 2\text{e}^-$ 2
Cathode $2\text{H}^+ + 2\text{e}^- \rightarrow \text{H}_2$ 2

TOTAL 8**QUESTIONSHEET 6**

- (a) Na^+ 1
 Cl^- 1
- (b) (i) anode $2\text{Cl}^- \rightarrow \text{Cl}_2 + 2\text{e}^-$ 2
(ii) cathode $\text{Na}^+ + \text{e}^- \rightarrow \text{Na}$ 2
- (c) high temperature/ hot liquid 1

TOTAL 7**QUESTIONSHEET 7**

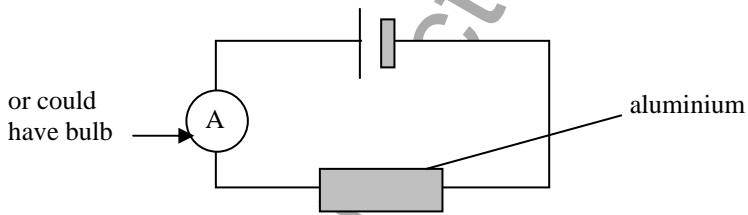
- (a) Ni^{2+} , NO_3^- , H^+ , OH^- (½ each, max2)
- (b) $\text{Ni}^{2+} + 2\text{e}^- \rightarrow \text{Ni}$ 1
- (c) (i) coulombs = amps \times time = $0.1 \times 60 \times 60 = 360$ C 1
(ii) coulombs = $\frac{59 \times 360}{0.1}$ 1
= 212400 C 1

TOTAL 6

QUESTIONSHEET 8

- (a) Al_2O_3 1
- (b) melting point of aluminium oxide is too high 1
- (c) $\text{Al}^{3+} + 3\text{e}^- \rightarrow \text{Al}$ 1
- (d) as it is liquid (molten) 1
- (e) (i) oxygen (gas) 1
- (ii) carbon anodes burn in oxygen
produces carbon dioxide instead 1
- (f) Two from:
cooking foil, milk bottle tops, window frames, aeroplanes, power cables, saucepans 2

TOTAL 9**QUESTIONSHEET 9**

- (a) (i)  2
- (ii) copper & graphite – conductors, polythene & sulphur – non-conductors 2
- (b) strong electrolyte – bulb bright, weak electrolyte – bulb dim 2
- (c) (i) silver 1
- (ii) negative 1
- (iii) $\text{Ag}^+ + \text{e}^- \rightarrow \text{Ag}$ 1

TOTAL 9**QUESTIONSHEET 10**

- (a) (i) copper or silver 1
- (ii) sulphur/molten wax 1
- (iii) molten aluminium oxide 1
- (iv) copper 1
- (v) carbon 1
- (b) (i) cell 1
- (ii) bulb lights up 1
- (iii) bubbles of gas 1

TOTAL 8

QUESTIONSHEET 11

(a)	(i)	sodium (or other alkali/ alkaline earth metal)	1
	(ii)	chlorine (or other halogen)	1
	(iii)	sodium chloride (or suitable equivalent)	1
(b)		ionic solids do not conduct melting P allows electricity to flow	1 1
(c)		$2\text{Na} + \text{Cl}_2 \rightarrow 2\text{NaCl}$ (or equivalent)	2
TOTAL			7

QUESTIONSHEET 12

(a)	(i)	cathode – negative anode – positive	1 1
	(ii)	cathode	1
	(iii)	because they go to the anode	1
(b)	(i)	electrolytes	1
	(ii)	conducts electricity/contains ions	1
(c)	(i)	bromine	1
	(ii)	potassium	1
TOTAL			8

QUESTIONSHEET 13

(i)		impurity	1
(ii)		any copper solution e.g. copper sulphate	1
(iii)		Two from: negative electrode gets bigger, copper deposited positive electrode gets thinner, copper dissolved impurities under positive electrode, impurities not transferred	2
(iv)		no change	1
(v)		jewellery/ornaments	1
TOTAL			6

QUESTIONSHEET 14

- (a) (i) fuel is a gas 1
electricity produced directly 1
- (ii) water 1
- (b) solar cells/panels 1
- (c) (i) run out too quickly/low power 1
- (ii) too heavy 1
- (iii) low current/power 1

TOTAL 7**QUESTIONSHEET 15**

- (a)
- | cell | electrolyte | anode product | cathode product |
|------|-----------------------------|----------------|-----------------|
| A | sodium chloride solution | chlorine | hydrogen |
| B | dilute sulphuric acid | <i>oxygen</i> | <i>hydrogen</i> |
| C | <i>Copper(II) chloride</i> | chlorine | copper |
| D | molten lead(II) bromide | <i>bromine</i> | <i>lead</i> |
| E | magnesium sulphate solution | oxygen | <i>hydrogen</i> |
- 6
- (b) hydrogen below sodium in reactivity series 1
hydrogen discharged in preference to sodium 1
- (c) (i) electrolysis 1
- (ii) splitting up substances with electricity 1

TOTAL 10**QUESTIONSHEET 16**

- (a) appearance 1
protection 1
- (b) (i) nickel 1
other metals would contaminate solution 1
- (ii) metals ions are positive 1
go to cathode 1
- (c) jewellery / cutlery silver 1
steel plate zinc 1
car fittings chromium 1

TOTAL 9

QUESTIONSHEET 17

(a)	ions need to be able to move need liquid to allow them to flow	1 1
(b)	(i) carbon/ graphite (ii) zinc	1 1
(c)	arrow drawn to show flow from negative to positive terminal	1
(d)	one component used up	1
(e)	Two from torches, tape recorders, calculators, games, clocks etc	2
		TOTAL 8

QUESTIONSHEET 18

(a)	needs two different metals in this case both are lead	1
(b)	anode	1
(c)	(i) 12 volts (ii) Two from lights, radio, wipers, starter, heater etc	1 2
	(iii) more power used for lights, heater etc	1 1
(d)	acid spillage	1
		TOTAL 8

QUESTIONSHEET 19

(a)	The following paired together for one mark each dry cell – personal stereo mercury cell – hearing aid lead-acid cell - invalid car rechargeable cell – mobile phone lithium cell - heart pacemaker solar cell - space station	6
(b)	(i) reliable for a long time	1
	(ii) uses the sun's energy	1
		TOTAL 8

QUESTIONSHEET 20

One mark for each of

metals
graphite / carbon
cathode
anode
metals
hydrogen
non-metals
electrolyte
ions
dissolve
water
melt

TOTAL 12

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