Rewarding Learning

General Certificate of Secondary Education
2011

Science: Double Award (Modular)

Paper 2
Higher Tier

[G8205]

FRIDAY 27 MAY, MORNING

MARK SCHEME

AVAILABLE MARKS

1 (a) (i) C [1]

(ii) E [1]

(iii) F [1]

(iv) B [1]

(b) Any three of:
idea iron is easy to make
it has a wide range of uses OR specific named bulk use
idea that it is not expensive
availability of raw materials **NOT** availability of iron
strength
Accept idea that it can last a long time
Only one mark may be linked to use
(3 × [1]) [3]

(c)

Symbol	Number of protons	Number of neutrons	Number of electrons	Mass number	Electron arrangement
Na	**11 [1]**	12	11	23	2,8,1
O	8	8	**8 [1]**	16	**2,6 [1]**
Ca	20	20	20	**40 [1]**	2,8,8,2
Al	13	**14 [1]**	13	27	**2,8,3 [1]**

[6]

13

2 (a) (i) diamond [1]

(ii) idea that quartz does not have delocalised electrons [1]

(iii) clear idea of having strong (covalent) **bonds** [1]
which are difficult to break [1] [2]

(b) (i) $^{238}_{92}U \rightarrow {}^{234}_{90}Th + {}^{4}_{2}He$
There are six marking points: 6 correct = [4]; 5 correct = 3;
3 or 4 correct = [2]; 2 correct = [1]; 0 or 1 correct = [0];
Accept the alpha symbol for He [4]

(ii) 1.35×10^{10} years [2]
incorrect answer with 3 half-lives gains 1 method mark
accept 13.5×10^{9} [2]

				AVAILABLE MARKS
	(c)	**(i)**	160 [1]	
		(ii)	0.625 moles i.e. 100 ÷ **(c)(i)** answer – apply CM [1]	
		(iii)	1.25 moles i.e. 2 × **(c)(ii)** answer – apply CM [1]	
		(iv)	70 g i.e. 56 × **(c)(iii)** answer – apply CM [1]	
		(v)	1.875 moles i.e. **(c)(ii)** answer × 3 – apply CM [1]	
		(vi)	52.5 g [3] up to 1 method mark – i.e. **(c)(v)** answer × 28 – apply CM [2]	17
3	**(a)**	**(i)**	Any two of: colourless/odourless/low density/insoluble in water/or other correct no marks relating to mp or bp (2 × [1]) [2]	
		(ii)	meteorological balloons/rocket engines (clean) fuel or other correct e.g. Haber process/hydrogenation of fats [1]	
		(iii)	$CuO + H_2 \rightarrow Cu + H_2O$ LHS [1] RHS [1] [2]	
	(b)	**(i)**	sulphur dioxide [1]	
		(ii)	3 [1]	
		(iii)	kills fish/corrodes or damages stonework or buildings (NOT erodes)/destroys or damages or kills vegetation/leaches nutrients from the soil or other correct e.g. corrodes metal [1]	
		(iv)	idea of scrubbers/filters/use of low sulphur fuels/desulphonation **NOT** use of alternative energy sources [1]	
	(c)		advantages (allow up to four of): use of lignite as a fuel/providing jobs/ helping local economy/allow improved transport links/or other correct e.g. cheap (fuel) disadvantages (allow up to four of): loss of habitat/eyesore/noise pollution/dust pollution/using up natural resource or other correct (max 6 × 1) QWC mark for clear articulation – **NOT** just list [1] [7]	
	(d)	**(i)**	fertilisers/slurry [1]	
		(ii)	fertilisers/detergents [1]	
		(iii)	soluble or dissolved – allow bacteria [1]	
		(iv)	idea of killing bacteria/germs **NOT** cleaning accept sterilises [1]	20

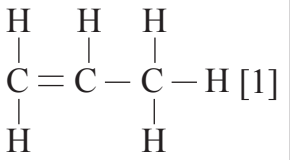
				AVAILABLE MARKS
4	**(a)**	**(i)**	carbon/graphite [1]	
		(ii)	anode – oxygen, cathode – aluminium both needed [1]	
		(iii)	anode [1] idea that it reacts with oxygen [1] forming carbon dioxide [1] **NOT** wears away/erodes [3]	
	(b)	**(i)**	alkali metals **NOT** alkaline [1]	
		(ii)	Any four of: bubbles/effervescence/fizzing **NOT** just "gas"/hissing or similar sound metal floating/on surface forming a ball/melting or similar metal getting smaller/disappearing/dissolving moving around idea of catching fire/sparks/yellow-orange flame exothermic reaction idea of alkaline solution remaining/turns purple indicator idea of very vigorous reaction (4 × [1]) [4]	
		(iii)	idea of reactivity of sodium [1]	
		(iv)	sodium + water → sodium hydoroxide [1] + hydrogen [1] [2]	
		(v)	slower or similar [1] lithium is less reactive [1] correct reference to position in Group 1 [1] any 2 of 3 [2]	
	(c)	**(i)**	calcium hydroxide or slaked lime [1]	
		(ii)	$CaCO_3 + 2HCl \rightarrow CaCl_2 + H_2O + CO_2$ [1] [1] [2]	
		(iii)	Any two of: hard/brittle/crystalline/doesn't conduct electricity when solid/or other correct Allow idea of soluble in water Allow conducts when molten (2 × [1]) [2]	20

				AVAILABLE MARKS
5	**(a)**	**(i)**	solubility of potassium chlorate (g/100 g H_2O) [1] 6 correct points [2] (for 4 or 5 correct award [1]) correct curve [1] [4]	
		(ii)	33.5 °C ± 0.5 °C [1]	
		(iii)	6 ± 0.3 [1] 22.5 ± 0.5 [1] [2]	
		(iv)	(answer **(iii)** 2 – answer **(iii)** 1)/2 [2] award up to 1 method mark i.e. 8.25 g ± 0.4 – apply CM [2]	
	(b)	**(i)**	temperature – 250 °C–500 °C range [1] pressure – 150 atm–400 atm range [1] catalyst – iron [1] [3]	
		(ii)	$N_2 + 3H_2 \rightarrow 2NH_3$ LHS [1] RHS [1] balancing mark (if other 2 marks gained) [1] [3]	
		(iii)	idea that pressure needed cannot be easily obtained/lack of appropriate apparatus [1] Accept qualified danger or qualified cost [1]	
	(c)	**(i)**	hydrated [1] iron(III) oxide [1] [2]	
		(ii)	clear idea that zinc is more reactive than iron [1] idea that zinc reacts first (**NOT** faster) [1] [2]	20

6 **(a)** **(i)** C_nH_{2n} [1]

(ii) a compound/substance of carbon and hydrogen [1]
only (implied) [1]
which has a (at least one) double (C=C) bond [1] [3]

(iii)

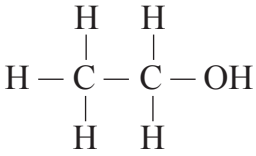
hydrocarbon	molecular formula	structural formula	physical state at room temperature
propene	C_3H_6 [1]	 [1]	gas [1]

[3]

(b) addition [1] polymerisation [1] **NOT** additional [2]

(c) **(i)** $C_2H_4 + H_2O \rightarrow C_2H_5OH$
LHS [1] RHS [1] [2]

(ii) Fermentation/anaerobic respiration by yeast [1]

(iii)  [1]

(iv) solvent, fuel, idea of (alcoholic) beverages or other correct
Accept alcohol or antiseptic [1]

(d) **(i)** CH_3COOH [1]

(ii) Any two of:
bubbling or fizzing or gas given off/magnesium metal disappears or dissolves/colourless solution formed
exothermic reaction
idea of steady or slow (not very vigorous) reaction
(2 × [1]) [2]

(e) **(i)** ethyl ethanoate [1]

(ii) colourless/sweet smelling/oily [1] liquid [1] [2]

Total

AVAILABLE MARKS

20

110