



General Certificate of Secondary Education
2011

Science: Double Award (Modular)

Paper 2
Higher Tier

[G8205]

FRIDAY 27 MAY, MORNING

**MARK
SCHEME**

- 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) ${}_{92}^{238}\text{U} \rightarrow {}_{90}^{234}\text{Th} + {}_2^4\text{He}$
 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] [2]

		AVAILABLE MARKS
(c) (i)	160	[1]
(ii)	0.625 moles i.e. $100 \div$ (c)(i) answer – apply CM	[1]
(iii)	1.25 moles i.e. $2 \times$ (c)(ii) answer – apply CM	[1]
(iv)	70 g i.e. $56 \times$ (c)(iii) answer – apply CM	[1]
(v)	1.875 moles i.e. (c)(ii) answer $\times 3$ – apply CM	[1]
(vi)	52.5 g [3] up to 1 method mark – i.e. (c)(v) answer $\times 28$ – 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 ($2 \times [1]$)	[2]
(ii)	meteorological balloons/rocket engines (clean) fuel or other correct e.g. Haber process/hydrogenation of fats	[1]
(iii)	$\text{CuO} + \text{H}_2 \rightarrow \text{Cu} + \text{H}_2\text{O}$ 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	[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

- 5 (a) (i) solubility of potassium chlorate (g/100 g H₂O) [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) N₂ + 3H₂ → 2NH₃
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]

AVAILABLE
MARKS

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]	$\begin{array}{c} \text{H} \quad \text{H} \quad \text{H} \\ \quad \quad \\ \text{C} = \text{C} - \text{C} - \text{H} \\ \quad \quad \\ \text{H} \quad \quad \text{H} \end{array}$ [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)

$$\begin{array}{c} \text{H} \quad \text{H} \\ | \quad | \\ \text{H} - \text{C} - \text{C} - \text{OH} \\ | \quad | \\ \text{H} \quad \text{H} \end{array}$$
 [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