



Rewarding Learning

**General Certificate of Secondary Education
2012**

Science: Double Award (Modular)

Paper 2
Higher Tier

[G8205]

TUESDAY 12 JUNE, MORNING

**MARK
SCHEME**

1	<p>(a) (i) zinc, lead, copper, silver [2] Allow [1] if order correct but reversed</p> <p>(ii) displacement allow redox [1]</p> <p>(iii) zinc sulphate [1] hydrogen [1] [2]</p> <p>(b) (i) Any three from: calcium sinks or sinks and rises bubbles/gas evolved/fizzing/gas given off idea of reaction getting faster not reaction is fast not reaction idea of solution going cloudy allow alkaline solution calcium gets smaller/dissolves/disappears idea of heat given out/exothermic Ignore reference to hissing or noise Mark idea of moving across the surface of the water as wrong, mark any idea of flame as wrong Accept moves in the water and not just moves (3 × [1]) [3]</p> <p>(ii) calcium hydroxide/limewater [1]</p> <p>(iii) fume cupboard/safety screen/eye protection/small amounts (of calcium) [1]</p> <p>(c) (i) white or grey not dark grey – dependent on idea of a solid product [1] ash/powder/solid [1] [2]</p> <p>(ii) idea that oxygen has been added/gained or loss of electrons not simply idea of burning in oxygen not loss of hydrogen [1]</p> <p>(iii) magnesium oxide [1] hydrogen [1] [2]</p> <p>(d) (i) reaction complete/constant mass [1]</p> <p>(ii) carbon dioxide [1]</p> <p>(e) (i) calcium chloride [1], water [1] [2]</p> <p>(ii) limewater/calcium hydroxide (solution) [1]</p>
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AVAILABLE MARKS
20

2	(a)	(i)	hydrogen	[1]	
		(ii)	$2\text{Cl}^- [1] \rightarrow \text{Cl}_2 + 2\text{e}^- [1]$ balanced [1] third mark depends on first two	[3]	
		(iii)	sodium hydroxide	[1]	
	(b)	(i)	9/10 points correct [2]/7/8 points correct [1] curve correct (not ruler) [1]	[3]	
		(ii)	$56 \pm 1\text{cm}^3$ penalise lack of units	[1]	
		(iii)	140 s allow 132s – 140s penalise lack of units apply CM	[1]	
		(iv)	$90/140 [= 0.64(\text{cm}^3/\text{s}) (\pm 0.04)]$ (i.e. $90/(\mathbf{(b)(iii)}$ answer) allow 90/140 or equivalent	[1]	
	(c)	(i)	84	[1]	
		(ii)	106	[1]	
		(iii)	$8.4/84 = 0.1$ mole apply CM	[1]	
		(iv)	0.05 (moles) apply CM	[1]	
		(v)	5.3 (g) apply CM i.e. $106 \times$ answer (iv) or answer (ii) \times answer (iv)	[1]	
3	(a)	chlorine:	reactive and green or yellow-green	[1]	
		nitrogen:	colourless and no (poisonous)	[1]	
		helium:	lighter and unreactive	[1]	[3]
	(b)	<i>Appearance:</i>	Grey/yellow [1] solid (mixture) [1] or grey solid (iron) [1] yellow powder/solid (sulphur) [1]		
		<i>Safety precaution:</i>	Wear safety goggles/carry out in fume cupboard [1]		
		<i>Description:</i>	Mixture glows when heated [1] Pungent smell [1] e.g. bad, idea of choking, rotten eggs [1] not strong smell Continues to glow when removed from heat [1] allow blue flames [1] allow idea of sulphur melting [1] Grey/black solid forms [1]		
		<i>Product:</i>	Iron sulphide/iron(II) sulphide [1] FeS [1]		
			(7 \times [1]) Allow up to [6] for the appearance, safety, and description marks. At least one product mark needed for [7]	[7]	
			Quality of written communication	[1]	
	(c)	(i)	toxic/poisonous gas/stops oxygen getting to body odourless/colourless	[1] [1]	[2]
		(ii)	idea of needing good supply air/oxygen for complete combustion or other correct e.g. to prevent leaks of carbon monoxide/poisonous gas or to prevent incomplete combustion (not idea of formation of carbon monoxide)	[1]	[1]

- 4 (a) (i) Any **three** of:
 the left spaces
 elements arranged in order of relative atomic mass **not** mass **not** mass number
 idea that it had a relatively small number of elements
 elements were arranged in Groups
 elements were arranged in Periods
 metals were separated from non-metals
or other correct e.g. hydrogen in Group 1
 Maximum (3 × [1]) [3]

- (ii) Any **three** of:
 elements arranged in order of increasing atomic number
 more elements/more periods
 no spaces
 idea of some elements having their position changed
 (as long as incorrect answer is not given)
 noble gases included
Accept idea of actinides **Accept** lanthanides
 transition metals between Group II and Group III or in a block
or other correct e.g. Hydrogen not in group I
 Maximum (3 × [1]) [3]

(b)

Element	Group	Period	Electronic structure
potassium	I [1]	4	2,8,8,1 [1]
magnesium	II	3 [1]	2,8,2 [1]
sulphur [1]	VI or 6 [1]	3	2,8,6

[6]

- (c) (i) all have same number of electrons in their outer shells/all have one electron in their outer shell [1]
- (ii) reactivity increases [1]
- (iii) iodine [1]
- (iv) decreases [1] then increases [1] then decreases for argon [1] [3]
 Allow [1] for decreases but **not** for increase alone
- (d) (i) magnesium hydroxide **or** magnesium oxide **or** magnesium carbonate [1]
- (ii) sulphuric acid [1]

- 5 (a) (i) idea of shared electrons [1]
- (ii) idea of two or more **atoms** [1] (covalently) bonded/joined together [1] [2]
- (iii)
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- correct sharing [1]
all electrons included correctly, second mark dependent on first [1] [2]
- (iv) two [1]
- (v) bonds/forces **between the molecules** are weak [1]
little energy needed to break bonds/forces [1] [2]
- (b) (i) diagram to show:
regular arrangement [1]
metal **cations** given positive charge – no negative ions [1]
idea of delocalised electrons [1]
labels [1] at least 2 labels correct [4]
- (ii) can be drawn into wires [1]
- (iii) layers of metal **ions/atoms** [1] can slide over one another [1] [2]
- (iv) malleable/high melting point/good conductor of heat/lustrous/sonorous/
hard/dense/strong
not low density, **not** conductor of electricity [1]
- (c) (i) idea it can be heated and remoulded [1]
- (ii) diagram showing at least 3 long chain molecules [1] with cross links
in between [1] [2]
- (iii) Bakelite [1]

AVAILABLE
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- 6 (a) (i) hydrogen and carbon (both needed) [1]
- (ii) alkane [1]
- (iii) Any **two** of:
 same general formula
 same/similar chemical properties
 gradation in physical properties **not** similar physical properties
 accept same functional group/which differ by a CH₂ group
 (2 × [1]) [2]
- (b) (i) steam/H₂O (**not** water) [1]
- (ii) fermentation **or** anaerobic respiration of yeast [1]
- (iii)
- | Molecular Formula | Structural Formula |
|---|--|
| C ₂ H ₅ OH [1]
or
CH ₃ CH ₂ OH | <pre> H H H-C-C-O-H H H [1] </pre> |
- If both correct but wrong way round award [1] [2]
- (iv) idea that ethanol does not contain **only** hydrogen and carbon atoms/
 also contains oxygen atom [1]
- (v) C₂H₅OH + 3O₂ [1] → 2CO₂ + 3H₂O [1] balanced [1] [3]
 third mark depends on first two
- (c) (i) pH 3–6 [1]
- (ii) **black** solid [1] reacts to form blue solution [1]
or colourless solution [1] turns blue [1]
or black solid [1] disappears/dissolves [1]
 (2 × [1]) [2]
 copper ethanoate [1] or copper II ethanoate [1]
- (d) (i) ethanoic acid + ethanol → ethyl ethanoate + **water** [1]
- (ii) **colourless** [1] odourless **liquid** [1]
 solid green white
 orange gas **sweet-smelling** [1] [3]

Total

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110