Rewarding Learning

General Certificate of Secondary Education
2012

Science: Double Award (Non-Modular)

Paper 2
Higher Tier

[G8405]

TUESDAY 12 JUNE, MORNING

MARK SCHEME

				AVAILABLE MARKS
1	**(a)**	zinc, lead, copper, silver Allow [1] if order correct but reversed	[2]	
	(b)	displacement allow redox	[1]	
	(c)	zinc sulphate [1] hydrogen [1]	[2]	5
2	**(a)**	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 is slow idea of solution going cloudy calcium gets smaller/dissolves/disappears idea of heat given out/exothermic allow alkaline solution **Ignore** reference to hissing or noise Mark idea of moving across the surface of the water as wrong Any idea of catching fire or flame **wrong** Accept moves **in** the water and **not** just moves (3 × [1])	[3]	
	(b)	calcium hydroxide/limewater	[1]	
	(c)	fume cupboard/safety screen/eye protection/small amounts (of calcium)	[1]	5
3	**(a)**	**(i)** white or grey **not** dark grey – dependent on idea of solid product [1] ash/powder/solid [1]	[2]	
		(ii) idea that oxygen has been added/gained **or** allow loss of electrons do not allow idea of burning in oxygen **not** loss of hydrogen	[1]	
	(b)	magnesium oxide [1] hydrogen [1]	[2]	5
4	**(a)**	reaction complete/constant mass	[1]	
	(b)	carbon dioxide	[1]	
	(c)	**(i)** calcium chloride [1], water [1]	[2]	
		(ii) limewater/calcium hydroxide (solution)	[1]	5
5	**(a)**	graphite/platinum **Accept** carbon	[1]	
	(b)	hydrogen	[1]	
	(c)	$2Cl^-$ [1] $\rightarrow Cl_2 + 2e^-$ [1] balanced [1] third mark depends on first two	[3]	
	(d)	sodium hydroxide	[1]	6

			AVAILABLE MARKS
6	**(a)** 9/10 points correct [2]/7/8 points correct [1] curve correct (**not** ruler) [1]	[3]	
	(b) **(i)** $56 \pm 1\,cm^3$ Penalise lack of units	[1]	
	(ii) 140 s allow 132–140 s Penalise lack of units apply CM	[1]	
	(c) 90/140 [= 0.64 (cm^3/s) (± 0.04)] (i.e. 90/**(b)(ii)** answer) allow 90/140 or equivalent	[1]	6
7	$\frac{P_1V_1}{T_1} = \frac{P_2V_2}{T_2}$ or any correct method step [1]		
	$\frac{2000 \times 750}{300} = \frac{4000 \times V_2}{450}$		
	Second mark must involve computation rather than just substitution [1]		
	$\frac{2000 \times 750 \times 450}{300 \times 4000}$ working out constant/mark $\frac{2000 \times 750}{300} = 5000$		
	Answer 562.5 (cm^3) Correct answer gains [3] maximum 2 method marks	[3]	3
8	**(a)** 84	[1]	
	(b) 106	[1]	
	(c) 8.4/84 = 0.1 mole apply CM	[1]	
	(d) 0.05 (moles) apply CM	[1]	
	(e) 5.3 (g) apply CM i.e. 106 × **(d)** **or** answer **(b)** × answer **(d)**	[1]	5

					AVAILABLE MARKS
9	**(a)**	chlorine:	reactive **and** green or yellow-green [1]		
		nitrogen:	colourless **and** no (poisonous) [1]		
		helium:	lighter **and** unreactive [1]	[3]	
	(b)	*Appearance:*	Grey/yellow [1] solid (mixture) [1] **or** grey solid iron [1]/ yellow powder/solid sulphur [1]		
		Safety precaution:	Wear safety goggles/carry out in fume cupboard [1]		
		Description:	Mixture **glows** when heated [1]		
			Pungent smell [1] bad, choking, rotten eggs **not** strong		
			Continues to glow when removed from heat [1] allow burns with blue flame [1] allow idea of sulphur melts [1]		
			Grey/black solid forms [1]		
		Product:	Iron sulphide/iron(II) sulphide [1] FeS [1]		
		(7 × [1]) Allow up to [6] for the appearance, safety and description At least one product mark needed for [7]		[7]	
		Quality of written communication		[1]	
	(c)	**(i)**	toxic/poisonous gas/stops oxygen getting to the body [1] odourless/colourless [1]	[2]	
		(ii)	idea of needing good supply air/oxygen/for complete combustion/ **or** other correct Prevents leaks of carbon monoxide/poisonous gas **or** to prevent incomplete combustion **not** idea of clogging up (**not** idea of formation of carbon monoxide)	[1]	
		(iii)	idea of global warming/greenhouse effect	[1]	
	(d)	**(i)**	chlorine is poisonous	[1]	
		(ii)	colourless [1] to brown [1]/yellow brown orange brown red-brown	[2]	
		(iii)	$Cl_2 + \mathbf{2}KI \rightarrow I_2 + \mathbf{2}KCl$	[1]	
		(iv)	bromine	[1]	20

AVAILABLE MARKS

10 (a) (i) Any **three** of:
he left spaces
elements arranged in order of atomic mass **not** mass or 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 I
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 Groups 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** [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]

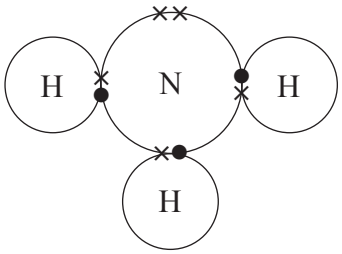
(ii) reactivity increases [1]

(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] 20

					AVAILABLE MARKS
11	**(a)**	**(i)**	idea of shared electrons	[1]	
		(ii)	two or more group of atoms [1] (covalently) bonded/joined together [1]	[2]	
		(iii)			
			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] idea of 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 correct labels	[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)**	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]	20

12 (a) (i) hydrogen and carbon (both needed) [1]

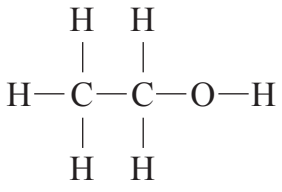
(ii) alkane [1]

(iii) Any **two** of:
same general formula
same/similar chemical properties/chemical reactivity
gradation in physical properties **not** similar physical peoperties
accept same functional group/which differ by a CH_2 group
(2 × [1]) [2]

(b) (i) steam/H_2O (**not** water) [1]

(ii) fermentation **or** anaerobic respiration of yeast [1]

(iii)

Molecular Formula	Structural Formula
C_2H_5OH **or** CH_3CH_2OH [1]	 [1]

If both correct but wrong way round award [1] [2]

(iv) idea that ethanol does not contain **only** hydrogen and carbon atoms [1]/
also contains oxygen atom [1] [1]

(v) $C_2H_5OH + 3O_2$ [1] → $2CO_2 + 3H_2O$ [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

AVAILABLE MARKS
20
120