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New Specification

Rewarding Learning

General Certificate of Secondary Education
2012–2013

Double Award Science: Chemistry

Unit C1

Higher Tier

[GSD22]

TUESDAY 13 NOVEMBER 2012
9.15 am–10.15 am

MARK SCHEME

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				AVAILABLE MARKS
1	(a)	(i)	The law of Octaves [1]	
		(ii)	Newlands did not use all of the elements that were known at that time/he placed two elements into one space in his list Accept idea that he grouped elements which were not alike, or other correct, e.g. idea that pattern did not work for all the elements [1]	
	(b)		Mendeleev used all of the elements/he left gaps for undiscovered elements/he predicted the properties of undiscovered elements/he swapped elements from atomic mass order if the chemistry did not fit, e.g. I and Te or other correct, e.g. placing elements with similar properties in vertical columns (groups) any two × [1] [2]	
	(c)		Idea must be clear which version of The Periodic Table the candidate is referring to. The modern Periodic table is set out in atomic number order [1]/the transition metals occupy a separate area [1]/the noble gases [1]/lanthanides **OR** actinides [1] or other correct **NOT** just "there are transition metals" [2]	
	(d)	(i)	Cl [1]	
		(ii)	Na and K both needed [1]	
		(iii)	Silicon identification of element [1] correct name [1] (Si = [1]) [2]	10
2	(a)		Candidates draw the electronic configuration Na 2,8,1 and O 2,6 on the diagrams provided [2]	
	(b)		oxygen gains electrons [1] 2 electrons [1] [2]	
	(c)		$+1/1+/Na^{+1}/Na^{+}$ **NOT** positive [1]	
	(d)		2 [1]	
	(e)		Na_2O [1]	
	(f)		Any two of: hard/brittle/non-conductor of electricity/soluble (in water)/ crystalline/high melting point/conducts electricity when liquid or in solution or other correct (2 × [1]) [2]	9

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AVAILABLE MARKS

3 **(a)** copper ethanoate [1]

(b) neutralisation [1]

(c) $CuO + H_2SO_4 \rightarrow CuSO_4 + H_2O$ [2]
LHS [1] RHS [1]

(d) (black) solid disappears dissolves [1] blue solution (forms) [1]
any [2] [2]

(e) nitric acid [1]

(f) valid comparison sulfuric acid is a stronger acid than ethanoic acid
idea that **one** acid is stronger than the other [1] or idea that sulfuric acid is strong/ethanoic acid is weak [1] [2] 9

4

Response	Mark
Candidates access 9 or more of the marks in the indicative content to describe fully the manufacture of aluminium in a logical sequence. They use good spelling, punctuation and grammar and the form and style are of a high standard.	[7]–[9]
Candidates access 5–8 of the marks in the indicative content to describe the manufacture of aluminium in a logical sequence. They use satisfactory spelling, punctuation and grammar and the form and style are of a satisfactory standard.	[4]–[6]
Candidates access 1–4 of the marks in the indicative content using limited spelling, punctuation and grammar. The form and style is of limited standard and they have made no use of specialist terms.	[1]–[3]

Indicative content

- Cryolite is added to lower the melting point/reduce operating temp/ reduce costs
- Cryolite increases the conductivity
- Al produced at the cathode
- $Al^{3+} + 3e^- \rightarrow Al$ [2] ([1] for RHS/[1] for LHS)
- Oxygen produced at the anode
- $2O^{2-} - 4e^- \rightarrow 2O_2$ [2] ([1] for RHS/[1] for LHS)
- Anodes are made of carbon
- Oxygen reacts with the (carbon) anodes
- To produce carbon dioxide
- Al formed is molten/tapped off at bottom [9] 9

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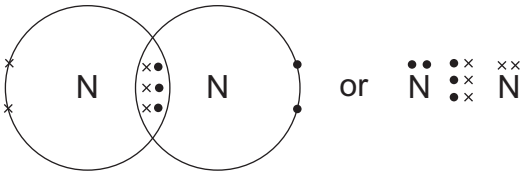
AVAILABLE MARKS

5 **(a)** 20.974 + 78.084 = 99.031 [1]
100 – 99.031 = 0.969% [1] [2]

(b) **(i)** Idea of two atoms joined together/two atoms in a molecule [1]

(ii) Argon has 8 electrons in its outer shell/has a full outer shell [1] this means it is stable/it does not need to lose or gain or share electrons/react with other atoms **not** unqualified stability [2]

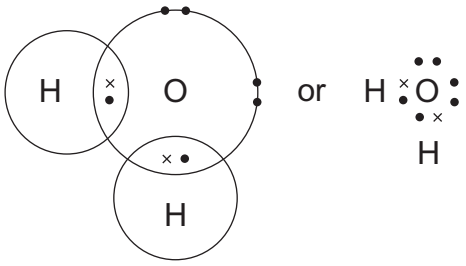
(iii)



correct sharing [2] correct number of electrons dependent on first mark [1]
if 6 electrons shared but poor diagram then award [1] of the [2] marks [3]

(iv) either lone pair correctly labelled [1]

(c)



correct sharing [1] correct number of electrons dependent on first mark [1] dot and cross diagram [1] [3] 12

6 **(a)** Allotropes are different forms of the same element [1] in the same physical state [1] [2]

(b) **(i)** (carbon) atoms [1]

(ii) covalent bonds not **giant** covalent [1]

(c) **(i)** Each carbon atom is (covalently) bonded to 4 others/idea of **giant covalent** structure [1] the (covalent) bonds are extremely strong/ difficult to break [1] any [2] points [2]

(ii) The layers (of atoms) can slide over one another [1] very easily/ leaving a (clear) mark on paper [1] [2] 8

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	AVAILABLE MARKS

7 **(a)** Candidates draw and label clearly regular arrangement [1] of positive ions only [1] in a sea of delocalised electrons [1] Metallic bonding is the attraction [1] between the positive ions and the delocalised electrons. The marks for positive ions and delocalised electrons may be picked up in the written part of the answer or in the diagram [4]

(b) $Zn + 2HCl \rightarrow ZnCl_2 + H_2$ [3]

(c) Idea of effervescence stopping [1] some zinc remaining (in the reaction vessel) [1] [2]

(d) Apply a lighted splint, it will pop [1]

(e) $2H_2 + O_2 \rightarrow 2H_2O$
LHS [1] RHS [1] balancing [1] [3] 13

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