



Rewarding Learning

**ADVANCED SUBSIDIARY (AS)
General Certificate of Education
January 2011**

Chemistry

Assessment Unit AS 1

assessing

**Basic Concepts in Physical
and Inorganic Chemistry**

[AC111]

THURSDAY 13 JANUARY, MORNING

**MARK
SCHEME**

Section A

- 1 B
- 2 D
- 3 C
- 4 B
- 5 D
- 6 C
- 7 C
- 8 D
- 9 C
- 10 B

[2] for each correct answer

[20]

Section A

**AVAILABLE
MARKS**

20

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Section B

AVAILABLE
MARKS

- 11 (a) $305 \times 10^3 = 3.05 \times 10^5$ J [1]
- (b) $\frac{3.05 \times 10^5}{6.02 \times 10^{23}} = 5.07 \times 10^{-19}$ J [1]
- (c) $0.507 \times 10^{-18} = 6.63 \times 10^{-34} \times f$
 $f = 0.076 \times 10^{16}$
 $= 7.6 \times 10^{14} \text{ s}^{-1}/\text{Hz}$ [1]
- 12 (a) $\text{Be}_3\text{Al}_2\text{Si}_6\text{O}_{18} = 3 \times 9 + 2 \times 27 + 6 \times 28 + 18 \times 16$
 $= 27 + 54 + 168 + 288$
 $= 537$
 $\% \text{ Be} = \frac{27}{537} \times 100 = 5.03\%$ [3]
- (b) (i) $\text{Be}^{2+} + 2\text{e}^- \rightarrow \text{Be}$ [1]
- (ii) $\text{BeF}_2 + \text{Mg} \rightarrow \text{Be} + \text{MgF}_2$ [1]
- (c) (i) ability of an atom in a covalent bond to attract (bonding) electrons [2]
- (ii) Be and Cl have similar EN values [1]
 Ba and Cl have (very) different EN values [1] [2]
- (iii) melting point, boiling point, "reaction" with water, (electrical) conductivity etc.
 2 from list [2]
- (d) (i) $\text{Be} + 2\text{HCl} \rightarrow \text{BeCl}_2 + \text{H}_2$ [1]
- (ii)
- $$\begin{array}{c} \cdot\cdot \\ \text{Be} \\ \cdot\cdot \end{array} \begin{array}{c} \text{xx} \\ \text{xClx} \\ \text{xx} \\ \text{xx} \\ \text{xClx} \\ \text{xx} \end{array} \rightarrow \begin{array}{c} \text{xx} \\ \text{xClx} \\ \text{xx} \end{array} \text{Be} \begin{array}{c} \cdot \\ \text{x} \\ \text{xx} \end{array} \begin{array}{c} \text{xx} \\ \text{Clx} \\ \text{xx} \end{array}$$
- [3]
- (iii) 8 electrons around an atom in outer shell [2]
- (iv) 8 electrons around Cl [1]
 4 electrons around Be [1] [2]
- (v) $\text{Cl} - \text{Be} - \text{Cl}$ [1]
- (vi) linear/straight [1]
- (vii) bond electrons repel [1] to minimise forces [1] [2]

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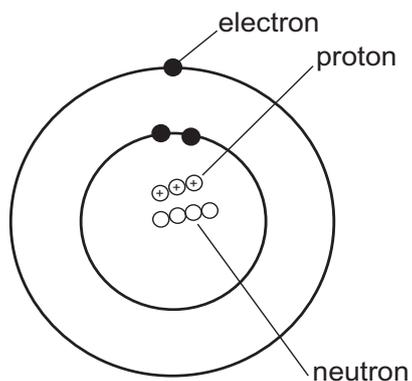
		AVAILABLE MARKS
13 (a)	chlorine(VII) oxide	[1]
(b) (i)	atom raises and lowers its oxidation number during a chemical reaction	[1]
(ii)	$\text{ClO}_2 + 4$ $\text{HClO}_3 + 5 \quad \text{HCl} - 1$	[2]
	$\therefore +4 \rightarrow +5$ oxidation $+4 \rightarrow -1$ reduction	[1]
(c) (i)	$\text{Cl}_2 = 2 \times 35.5 = 71$ $0.8 \text{ g} = \frac{0.8}{71} = 0.01127 \text{ mol}$ $\therefore 0.113 \text{ M}$	[2]
(ii)	e.g. hexane	[1]
14 (a)	✓ ✓ ✗ (Note that the marking of the colour changes in this question will be subject to the application of the "colour changes" scheme.)	[2]
(b) (i)	compare colours with original solutions it should go darker colour of iodine is darker than bromine	[2]
(ii)	$\text{Br}_2 + 2\text{I}^- \rightarrow 2\text{Br}^- + \text{I}_2$ no state symbols required	[1]
(c) (i)	colourless solution [1] orange/yellow/brown colour produced [1]	[2]
(ii)	$\text{Cl}_2 + 2\text{NaBr} \rightarrow 2\text{NaCl} + \text{Br}_2$ no state symbols required	[1]
(d)	iodide: yellow ppt insoluble in (both dilute and conc.) ammonia solution [2] bromide: cream ppt soluble in conc NH_3 [2] chloride: white ppt soluble in dil NH_3 [2]	[6]
	Quality of written communication	[2]
		8
		16

- 15 (a) van der Waals [1]
dipole – dipole [1] [2]
- (b) (i) attraction between lone pair on O and a H atom on another water molecule [2]
- (ii) distance between water molecules in ice greater than in water [1]
open structure [1] longer/expanded H-bonds [1] fixed H-bonds [1]
any 2 [2]
- (c) F more electronegative than oxygen/H—F bond more polarised [1]
F·····H bond stronger [1]
movement of water molecules breaks H bonds [1] [2]
- (d) (i)
-
- [2]
- (ii) lone pair removed/forms a dative bond [1]
- (e) N: forms hydrogen bonds with $\text{H}-\text{O}-\text{H}$ [1]
and N—H forms hydrogen bonds with $\text{O}-\text{H}$ [1] [2]

AVAILABLE
MARKS

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16 (a)



- [3]
- (b) s block [1]
outer electron in s shell [1]
- (c) 7.42 3 6 5 44.52
92.58 3 7 5 648.06
Total 5 692.58
4 100 5 6.9258
5 6.93 [3]
- (d) (i) water chemically bonded in salt [1]
(ii) Li_2SO_4 [1]
(iii) Li_2SO_4
5 2 3 7 1 32 1 64 5 110
moles 5 $\frac{3.23}{110}$ 5 0.029
 H_2O
5 2 1 16 5 18
moles 5 $\frac{0.53}{18}$ 5 0.029
{ $\text{Li}_2\text{SO}_4 \cdot \text{H}_2\text{O}$ [3]
- (e) conc hydrochloric acid
blue Bunsen flame
nichrome (platinum) wire
crimson flame [4]

Section B

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80**Total****100**