



Rewarding Learning

**ADVANCED SUBSIDIARY (AS)
General Certificate of Education
January 2013**

Chemistry

Assessment Unit AS 1

assessing

**Basic Concepts in Physical
and Inorganic Chemistry**

[AC112]

THURSDAY 10 JANUARY, MORNING

**MARK
SCHEME**

Section A

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

[2] for each correct answer

[20]
Section A

AVAILABLE MARKS	
	20
Section A	20

Section B

			AVAILABLE MARKS	
11	(a)	Nitrogen	[1]	7
	(b)	(i) X: proton to electron ratio increasing or effective nuclear charge increasing [1]; as each electron is removed the remaining electrons are held more tightly [1]	[2]	
		(ii) Y: electron being removed from a full shell [1] closer to nucleus or less/no shielding represents the change in ionisation energy [1]	[2]	
		Quality of written communication	[2]	
12	(a)	(i) Electrons in high energy level [1] drop back down [1] emit energy/light [1]	[3]	13
		(ii) Energy levels converge	[1]	
	(b)	(i) $\text{Cs(g)} \rightarrow \text{Cs}^{\text{+}}(\text{g}) + \text{e}^{-}$	[2]	
		(ii) $E = (6.63 \times 10^{-34})(9.41 \times 10^{14}) = 6.239 \times 10^{-19}$ $IE = (6.239 \times 10^{-19})(6.02 \times 10^{23}) \div 1000 = 375.6 \text{ kJ mol}^{-1}$	[3]	
		(iii) The electron being removed is far from the nucleus [1] and experiences a lot of shielding [1]	[2]	
	(c)	$2\text{CsAu} + 2\text{H}_2\text{O} \rightarrow 2\text{CsOH} + 2\text{Au} + \text{H}_2$	[2]	

- 13 (a) The extent to which an atom attracts the (bonding) electrons [1] in a covalent bond [1] [2]
- (b) (i) $\begin{array}{c} \cdot\cdot & & \cdot\cdot \\ \cdot\cdot & \times & \cdot\cdot \\ \cdot\cdot & & \cdot\cdot \\ \cdot\cdot & \times & \cdot\cdot \\ \cdot\cdot & & \cdot\cdot \\ & \cdot\cdot & \\ & \cdot\cdot & \\ & \cdot\cdot & \end{array}$ [2]
- (ii) Trigonal planar [1]
Bonding electrons [1]
repel to get as far apart as possible [1] [3]
- (iii) Atoms bond in order to get eight electrons [1] in the outer shell [1] [2]
- (iv) Boron does not obey the octet rule in BF_3 as it has only six electrons [1] in its outer shell;
fluorine does obey [1] [2]
- (c) (i) $1450/10^6 \times 50 = 0.0725$
 $0.0725/19 = 3.816 \times 10^{-3}$
 3.816×10^{-3}
 $50/1.6 = 31.25 \text{ cm}^3$ or 0.03125 dm^3
 $3.816 \times 10^{-3} \div 31.25 \times 1000 = 0.122 \text{ mol dm}^{-3}$ or $0.000122 \text{ mol cm}^{-3}$ [6]
- (ii) Freedom of choice [1]
- (iii) Nichrome wire [1]
concentrated hydrochloric acid [1]
place sample in blue Bunsen flame [1]
orange/yellow [1] [4]
- 14 (a) (i) Colourless [1] to orange/yellow/brown [1] [2]
- (ii) Cl 0 to -1 [1]
Br -1 to 0 [1]
Br oxidised and Cl reduced [1] [3]
- (iii) Silver nitrate solution [1]
(white) precipitate [1]
add dilute ammonia [1]
no precipitate remaining [1] [4]
- (b) (i) HF is weakest acid [1]
because the HF bond is strongest [1] [2]
- (ii) $4\text{HF} + \text{SiO}_2 \rightarrow \text{SiF}_4 + 2\text{H}_2\text{O}$ [2]

AVAILABLE
MARKS

22

13

		AVAILABLE MARKS
15	(a) (i) Outermost electrons in an s orbital	[1]
	(ii) Atoms having the same atomic number [1] different mass numbers [1]	[2]
	(iii) $RAM = (24 \times 0.8) + (25 \times 0.1) + (26 \times 0.1) = 24.3$	[3]
(b)	(i) $Mg: \begin{array}{c} \times \times \\ \text{O} \times \\ \times \times \end{array} \longrightarrow Mg^{2+} \begin{array}{c} \times \times \\ \text{:O} \times \\ \times \times \end{array}^{2-}$	[3]
	(ii) Ionic	[1]
	(iii) Conducts electricity when molten/aqueous [1] high melting point [1]	[2]
(c)	(i) Back [1] titration	[1]
	(ii) $nHCl = (80 \times 2)/1000 = 0.16$ $nNaOH = (25 \times 2)/1000 = 0.05 = \text{moles of unreacted HCl}$ $nHCl \text{ reacting with MgO} = 0.16 - 0.05 = 0.11$ $nMgO = 0.11 \div 2 = 0.055$ $\text{mass MgO} = (0.055/5) \times (24 + 16) = 0.44 \text{ g} = 440 \text{ mg}$	[6]
16	(a) Hydrogen bonds in ice are fixed [1] holding water molecules further apart/leading to open structure [1]	[2]
	(b) (Three/high number of) delocalised electrons (per atom) [1] move and carry charge [1]	[2]
	(c) A lot of heat/energy required [1] to break strong covalent bonds/to break strong bonds in giant covalent structure [1]	[2]
Section B		80
Total		100