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] 20

Section A **20**

Section B

11 **(a)** Nitrogen [1]

(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] 7

12 **(a)** **(i)** Electrons in high energy level [1]
drop back down [1]
emit energy/light [1] [3]

(ii) Energy levels converge [1]

(b) **(i)** $Cs(g) \rightarrow Cs^{+}(g) + e^{-}$ [2]

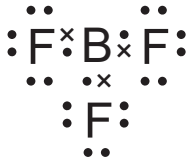
(ii) $E = (6.63 \times 10^{-34})(9.41 \times 10^{14}) = 6.239 \times 10^{-19}$
$IE = (6.239 \times 10^{-19})(6.02 \times 10^{23}) \div 1000 = 375.6\ kJ\,mol^{-1}$ [3]

(iii) The electron being removed is far from the nucleus [1]
and experiences a lot of shielding [1] [2]

(c) $2CsAu + 2H_2O \rightarrow 2CsOH + 2Au + H_2$ [2] 13

13 **(a)** The extent to which an atom attracts the (bonding) electrons [1] in a covalent bond [1] [2]

(b) **(i)**



[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}
$50/1.6 = 31.25\ cm^3$ **or** $0.03125\ dm^3$
$3.816 \times 10^{-3} \div 31.25 \times 1000 = 0.122\ mol\ dm^{-3}$ **or** $0.000122\ mol\ cm^{-3}$
[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] 22

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]

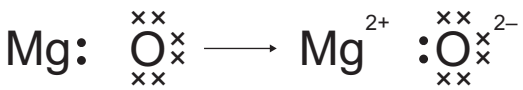
(b) **(i)** HF is weakest acid [1]
because the HF bond is strongest [1] [2]

(ii) $4HF + SiO_2 \rightarrow SiF_4 + 2H_2O$ [2] 13

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 × 0.8) + (25 × 0.1) + (26 × 0.1) = 24.3 [3]

(b) **(i)**  [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 × 2)/1000 = 0.16
nNaOH = (25 × 2)/1000 = 0.05 = moles of unreacted HCl
nHCl reacting with MgO = 0.16 – 0.05 = 0.11
nMgO = 0.11 ÷ 2 = 0.055
mass MgO = (0.055/5) × (24 + 16) = 0.44 g = 440 mg [6] 19

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] 6

Section B **80**

Total **100**