Rewarding Learning

ADVANCED SUBSIDIARY (AS)
General Certificate of Education
2011

Chemistry

Assessment Unit AS 1

assessing

Basic Concepts in Physical and Inorganic Chemistry

[AC112]

WEDNESDAY 15 JUNE, AFTERNOON

MARK SCHEME

Section A

1 B

2 B

3 C

4 B

5 C

6 B

7 D

8 C

9 A

10 B

[2] for each correct answer [20] 20

Section A **20**

Section B

11 (a) diamond [1]

(b) hard [1]
strong bonds [1] [2]

(c) no [1]
electrons (in bonds) cannot move [1] [2] 5

12 (a) (i) $BaCl_2 + 2AgNO_3 \rightarrow 2AgCl + Ba(NO_3)_2$ [1]

(ii) $Ag^+ + Cl^- \rightarrow AgCl$ [1]

(iii) White precipitate [1]

(b) (i) $20 \times 10^{-3} \times 10^{-1} = 2 \times 10^{-3}$ mol [1]

(ii) 2×10^{-3} mol [1]

(iii) $\frac{1}{2} \times 2 \times 10^{-3} \times \frac{250}{20} = 1.25 \times 10^{-2}$ [1]

(iv) $0.0125 \equiv 3.05\,g$

$1\text{ mol} \equiv \frac{3.05}{0.0125} = 244$ [1]

(v) $BaCl_2 = 137 + 71 = 208$ [1]

(vi) $244 - 208 = 36 \quad 36 = H_2O$
$\therefore x = 2$ [1]

(c) $BaCl_2.xH_2O \rightarrow BaCl_2 + xH_2O$ [1] 10
or $BaCl_2.2H_2O \rightarrow BaCl_2 + 2H_2O$

13 **(a)** **(i)** same number of protons [1]
different number of neutrons [1] [2]

(ii) 85 protons 85 electrons 125 neutrons
[−1] for each wrong part [3]

(b) $30\,g = \frac{30}{210} = 0.1429$ mol

$6.023 \times 10^{23} \times 0.1429 = 0.86 \times 10^{23} = 8.6 \times 10^{22}$ [2]

(c) At_2 [1]
solid [1]
grey-black/black [1]
purple/violet/dark violet [1]
no [1]
yes [1] [6]

(d) $I_2 + 2NaAt \rightarrow 2NaI + At_2$ [1]

(e) new peak at 210 or round about [1] 15

14 **(a)** $NaCl + H_2SO_4 \rightarrow NaHSO_4 + HCl$
use of Na_2SO_4 = [1] [2]

(b) **(i)** $O_2 = 32$ $N_2 = 28$ $HCl = 36.5$
wrong value is [−1] [2]

(ii) HCl is heavier than N_2 or O_2 [1]
hence HCl sinks [1] [2]

(c) **(i)** NaOH reacts with HCl/acid + base [1]

(ii) conc H_2SO_4/anhydrous $CuSO_4$ etc. [1] [2]

(d) no – HBr reacts with H_2SO_4 [1]

(e) hydrogen iodide [1]

(f) use $AgNO_3$(aq) or conc NH_3(aq) [1]
white ppt/white smoke [1] [2] 12

15 **(a)** outer electrons are s electrons [1]

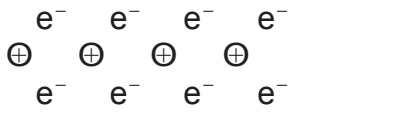
(b) increased number of shells [1]

(c) **(i)** $E = hf = 6.63 \times 10^{-34} \times 1.25 \times 10^{15}$
$= 8.29 \times 10^{-19}$ J
For one mole $= 6.023 \times 10^{23} \times 8.29 \times 10^{-19}$ J
$= 49.9 \times 10^{4}$J
$= 499$ [3]

(ii) $Na(g) \rightarrow Na^{+}(g) + e^{-}$ [2]

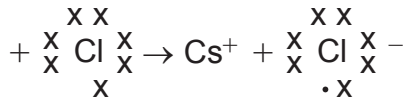
(iii) outer electrons further away from the nucleus [1]
shielded by increased shells of electrons [1] [2]

(iv) removal of second electron is from a full shell [1]

(d) **(i)**

[2]
electrons are delocalised/can move/
(electrostatic) attraction between e^{-} and metal ion [1] [3]

(ii) forces of attraction decreases
charge density decreases [1]

(iii) Ca has two outer electrons [1]

(e)
 [3]

(f) **(i)** nichrome/platinum wire [1]
blue flame (of Bunsen) [1]
conc. hydrochloric acid [1]
place compound on wire/put in blue flame [1] [4]

Quality of written communication [2]

(ii) potassium → lilac
or sodium → yellow/orange [1]

25

16 **(a)** 8 electrons [1]
in outer shell [1] [2]

(b) attraction of electrons by an atom [1]
in a covalent bond [1] [2]

(c) **(i)**  [2]

(ii) O = C = O or O — C — O [1]
linear/straight [1] [2]

(iii) electrons in the bonds [1]
repel as much as possible [1] [2]

(d) the dipoles "cancel" out [1]

(e) attraction between
$\delta+$ on C and $\delta-$ on O in H_2O
or $\delta-$ on O and $\delta+$ on H in H_2O [2] 13

Section B **80**

Total **100**