CEA

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) $2 \times 10^{-3} \, mol$ [1]

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

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

$1 \, mol \equiv \dfrac{3.05}{0.0125} = 244$ [1]

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

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

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

				AVAILABLE MARKS

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) $30\,g = \dfrac{30}{210} = 0.1429$ 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 = $6.63 \times 10^{-34} \times 1.25 \times 10^{15}$
       = 8.29×10^{-19} J
  For one mole = $6.023 \times 10^{23} \times 8.29 \times 10^{-19}$ J
       = 49.9×10^{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) e^- e^- e^- e^-
    $\oplus$ $\oplus$ $\oplus$ $\oplus$
     e^- e^- e^- e^-
  $\oplus$ $\oplus$ $\oplus$ $\oplus$ [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) $\overset{\bullet}{Cs}$ + $\overset{\text{x x}}{\underset{\text{x}}{\overset{}{_{x}^{x}} Cl\, {}_{x}^{x}}}$ $\rightarrow$ Cs^+ + $\overset{\text{x x}}{\underset{\bullet\,\text{x}}{\overset{}{_{x}^{x}} Cl\, {}_{x}^{x}}}$ $^-$ [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 $\rightarrow$ lilac
  or sodium $\rightarrow$ yellow/orange [1]

AVAILABLE MARKS

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) $:\overset{\bullet\bullet}{O}:\overset{x}{\underset{x}{C}}\overset{x}{\overset{\bullet\bullet}{O}}:$ [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 |