



Rewarding Learning

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

Chemistry

Assessment Unit AS 2

assessing

**Module 2: Organic, Physical
and Inorganic Chemistry**

[AC121] [AC122]

FRIDAY 24 JUNE, MORNING

**MARK
SCHEME**

Section A

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

[2] for each correct answer

[20]

Section A

**AVAILABLE
MARKS**

20

20

Section B

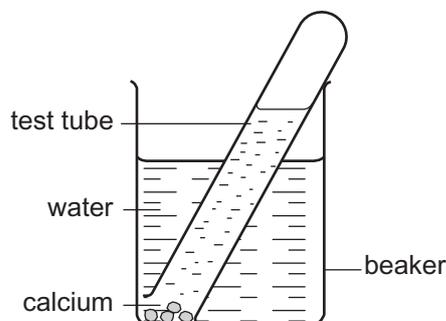
		AVAILABLE MARKS
11	thiocyanate (ion)	[1]
	$K_2Cr_2O_7$	[1]
	iodoform/triiodomethane	[1]
	$SOCl_2$	[1]
		4
12	(a) H_2O , C, CO or names	[2]
	(b) <u>spillage</u> aesthetic aspects [1]	
	oil on birds/animals (explained) [1] oil on plants (explained) [1]	
	non-biodegradable [1]	
	<u>combustion</u> CO_2 – greenhouse effect/global warming [1]	
	problems with particulates (smoke, carbon) explained – respiratory problems [1]	
	carbon monoxide is poisonous [1]	
	sulfur dioxide – acid rain [1]	
	or oxides of nitrogen	
	hydrocarbons – non renewable [1]	[5]
Quality of written communication	[2]	
		9
13	(a) metals are (very) reactive/react with O or S/form compounds	[1]
	(b) $1s^22s^22p^63s^23p^64s^2$	[1]
	(c) (i) increased number of shells	[1]
	(ii) larger atomic radius in Group 1 due to smaller nuclear charge	[2]
	(iii)	
		[1]
	(iv) size of strontium similar/close to barium [1]	
	mass of barium larger than strontium [1]	[2]
	(d) (i) M^{2+}	[1]
	(ii) energy needed to convert 1 mole of gaseous atoms into gaseous ions with a charge of 1+	[1]
(iii) $Mg(g) \rightarrow Mg^+(g) + e^-$	[2]	

(e) (i) calcium heavier/denser than water [1]
sinks [1] [2]

(ii) bubbles [1]
white solid appears [1]
heat evolved [1]
Ca gets smaller [1] any 2 [2]

(iii) $\text{Ca} + 2\text{H}_2\text{O} \rightarrow \text{Ca}(\text{OH})_2 + \text{H}_2$ [2]

(iv)



[3]

(f) $\text{BaCO}_3 \rightarrow \text{BaO} + \text{CO}_2$

$$\text{BaCO}_3 = 137 + 12 + 48 = 197$$

$$\text{BaO} = 137 + 16 = 153$$

$$\text{atom economy} = 153/197 \times 100 = 77.7\% \\ = 78\%$$

[3]

24

14 (a) (i) $100 \times 1.2 \times 4.2 = -504 \text{ J } (-10.08 \text{ kJ mol}^{-1})$ [1]

(ii) $100 \times 1.4 \times 4.2 = +588 \text{ J } (+11.76 \text{ kJ mol}^{-1})$ [1]

(b) enthalpy change is independent of route
(in a series of reactions) [2]

(c) $\text{CuSO}_4 = 64 + 32 + 64 = 160$
 $5\text{H}_2\text{O} = 5 \times 18 = 90$
 $\text{CuSO}_4 \cdot 5\text{H}_2\text{O} = 160 + 90 = 250$

$$12.5 \text{ g} = 12.5/250 = 0.05 \text{ mol}$$

$$8.0 \text{ g} = 8.0/160 = 0.05 \text{ mol}$$

$$\Delta H + \Delta H_2 = \Delta H_1$$

$$\Delta H + 588 = -504$$

$$\Delta H = -588 - 504 = -1092 \text{ J}$$

$$\text{For one mol } -1092/0.05 = -21840 \text{ J mol}^{-1} \\ -21.84 \text{ kJ mol}^{-1}$$

[3]

(d) blue precipitate [1]
in xs ammonia dissolves to give dark/deep blue solution [1] [2]

9

		AVAILABLE MARKS
15 (a) (i)	ammonia present which is alkaline	[1]
	(ii) hydrogen chloride present which is acidic	[1]
(b)	to separate NH_3 from HCl	[1]
(c)	endothermic [1] equilibrium absorbs heat/to reduce temperature [1]/heat is needed	[2]
(d) (i)	add sodium hydroxide (essential) [1]/heat [1] stopper/glass rod with conc HCl giving white fumes/ smoke [1]	[3]
	(ii) add silver nitrate solution (essential) [1] white [1] precipitate [1]	[3]
(e)	$\text{NH}_4\text{Cl} = 14 + 4 + 35.5 = 53.5$ $37.2/53.5 = 0.695 \text{ mol}$ $0.695 \times 24 \text{ dm}^3 = 16.69 \text{ dm}^3 = 16.7 \text{ dm}^3$	[3]
16 (a)	2-chloro(-2-)methylpropane	[2]
(b) (i)	$\text{C}_n\text{H}_{2n+1}\text{Cl}$	[1]
	(ii) $\text{C}_4\text{H}_9\text{Cl}$	[1]
	(iii) less van der Waals forces [1] spherical molecule/branching [1] or linear molecules greater attractive forces [1]	[2]
	(iv) same molecular formula [1] different structure [1]	[2]
	(v) secondary	[1]
(c) (i)	release the pressure/gases	[1]
	(ii) remove acids/hydrogen chloride/hydrochloric acid	[1]
	(iii) remove inorganic material/ $\text{NaCl}/\text{NaHCO}_3$ /alcohol/soluble impurities	[1]
	(iv) dry the butyl chloride	[1]
		14

(v) smooth boiling	[1]	AVAILABLE MARKS
(vi) $(\text{CH}_3)_3\text{COH} = \text{C}_4\text{H}_9\text{OH} = \text{C}_4\text{H}_{10}\text{O}$ $= 48 + 10 + 16 = 74$ $25/74 = 0.34 \text{ mol}$ $(\text{CH}_3)_3\text{CCl} = \text{C}_4\text{H}_9\text{Cl}$ $= 48 + 9 + 35.5 = 92.5$ $28/92.5 = 0.30 \text{ mol}$ percentage yield = $0.30/0.34 \times 100 = 88\%$	[3]	
(d) faster [1] reference to tertiary versus primary structure [1] weaker (C — Cl) bond or correct reference to $\text{S}_{\text{N}}1/\text{S}_{\text{N}}2$ [1]	[3]	20
Section B		80
Total		100