



# **GCE MARKING SCHEME**

**CHEMISTRY  
AS/Advanced**

**SUMMER 2010**

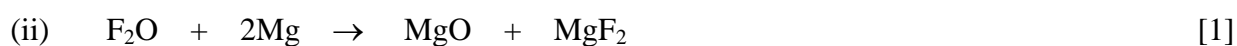
**CH2**

**SECTION A**

1. (i)



all outer electrons must be shown.



2. 23.8 g produced per 100 g of water (1)

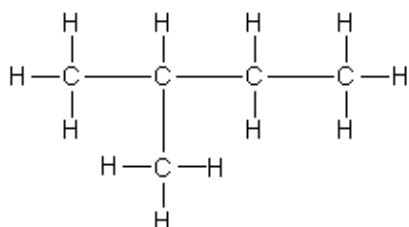
$5 \times 23.8 \text{ g produced per } 500 \text{ g of water} = 119 \text{ (g)}$  (1) [2]

3. (i) Ni / Pt / Pd [1]

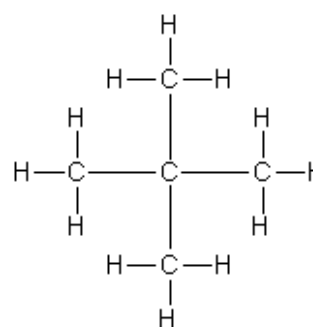
(ii) eg because of restricted/no rotation about the double bond [1]

4. (i)  $C_5H_{12}$  [1]

(ii)



or



5. .... increases..... decreases. [1]

6. elimination / dehydration [1]

**Section A Total [10]**

## SECTION B

7. (a) (i)

Number of bonding pairs	Number of lone pairs	F – S – F	Shape
6	0	90° / 180°	octahedral

one mark for each correct answer

[4]

(ii) There is an unequal electron distribution in the bond (1) because fluorine has a higher electronegativity (in this bond) (1) (accept a diagram) [2]

(iii)

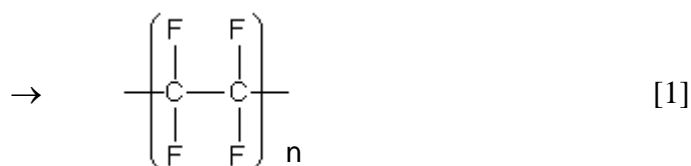
Oxidation state of sulfur in SF <sub>6</sub>	Oxidation state of sulfur in H <sub>2</sub> S	Oxidation state of sulfur in sulfur, S
(+)6	-2	0

(1)

The sulfur atom in sulfur hexafluoride has become less positive / more negative  
 ∴ reduced by reaction with hydrogen sulfide (1) [2]

(b) Na<sup>+</sup> F<sup>-</sup> correct formula of both ions (1)  
 6 : 6 (1) [2]

(c) (i)



[1]

(ii) diagram shows correct δ<sup>+</sup> / δ<sup>-</sup> (1) correct lone pairs (1)  
 intermolecular bonding correct (1) [3]

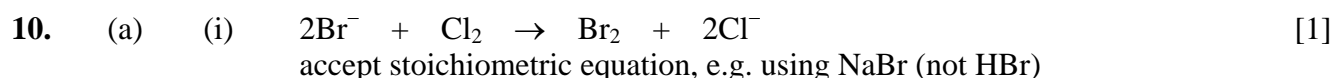
**Total [14]**

8. (a) (i)  $\text{Ca} + 2\text{H}_2\text{O} \rightarrow \text{Ca}(\text{OH})_2 + \text{H}_2$  [1]
- (ii) from the graph the mass of pure calcium = 0.104 g (1)  
 % purity of calcium =  $\frac{0.104 \times 100}{0.115} = 90.4$  (1) [2]
- (iii) The (2) outer electrons to be removed are further from the nucleus in a strontium atom/strontium atom is larger/has an extra shell of electrons (1)  
 There is less electron shielding in the calcium atom / more electron shielding in the strontium atom (1) [2]
- (b) addition of a sulfate (ion) / sulfuric acid – white precipitate (1)  
 addition of an acid-base indicator / pH probe – solution is basic /  $\text{pH} > 7$  (1) [2]
- (c) strontium  
 writing / diagram indicates lattice of cations with ‘sea’ of electrons (1)  
 electrons able to move (under applied potential), carry charge (1)
- graphite  
 diagram shows hexagonal layer structure (1)  
 weak intermolecular/Van der Waals forces between layers (1)  
 (Delocalised) electrons able to move / carry charge (under applied potential) (1) [5]
- QWC ensure that text is legible and that spelling, punctuation and grammar are accurate so that the meaning is clear* [1]
- (d) nanotubes consist of layers / pipelines of graphite hexagons (1)  
 closed at the end by (pentagons of) carbon atoms / OWTTE (1) [2]

**Total [15]**

9. (a) (i) Homolytic fission – a process of **covalent** bond breaking where each atom (of the bond) receives an electron (from the bond) (1)
- $$\text{Cl} - \text{Cl} \rightarrow 2 \text{Cl}\bullet \quad (1) \quad [2]$$
- (ii) Propagation stage – a stage where a (free) radical reacts and another is generated (to carry on the reaction) (1)
- eg  $\text{Cl}\bullet + \text{CH}_4 \rightarrow \bullet\text{CH}_3 + \text{HCl}$  (1) [2]
- (b) (i) The C – F bond is stronger than the C – Cl bond (1)  
and is not broken by **UV** radiation (1) [2]
- (ii) I  $m/e$  60  $\rightarrow$   $M_r$  60 (1)  
 $1725 \text{ cm}^{-1} \rightarrow \text{C} = \text{O}$  (1)  
 $2500\text{-}3500 \text{ cm}^{-1} \rightarrow \text{O} - \text{H}$  (1)  
likely to be ethanoic acid (1) (accept 2-hydroxyethanal) [4]
- II Reagent – silver nitrate /  $\text{AgNO}_3$  / silver ions /  $\text{Ag}^+$  (assume aqueous) (1)  
White precipitate (1) [2]

**Total [12]**



(ii) I An oxidising agent is itself reduced / gains electrons / removes electrons from the other reactant. [1]

II In this reaction the outer electron shell of a chlorine atom is closer to the nucleus than in a bromine atom / chlorine is a smaller atom (1) and therefore the attraction for the electron is greater (1) [2]

(iii) Iodine is a bigger molecule / contains more electrons (or vice versa) (1) therefore intermolecular Van der Waals forces are greater for iodine (1), (more energy is needed to separate iodine molecules, therefore less volatile than bromine) [2]

(unqualified mention of Van der Waals forces (1))

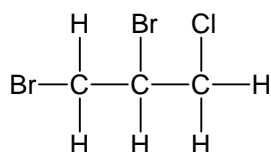
(b) (i)  $M_r$  of calcium bromide  $\rightarrow$  200 / 199.9 (1)  
Concentration =  $\frac{\text{no. of moles}}{\text{volume}} = 1200 / 200 \div 1 = 6 \text{ (mol dm}^{-3}\text{)}$  (1) [2]

(ii)

<i>Compound</i>	<i>Flame colour(if any)</i>
magnesium bromide	none (1)
calcium bromide	brick red (1)

[2]

(c) (i)



[1]

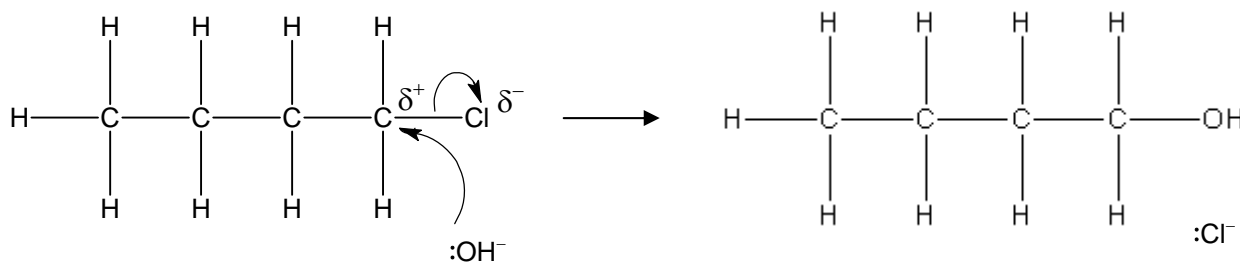
(ii) I (Bromine is added) across the double bond [1]

II Any correct carbocation /  $\text{H}^+$  /  $\text{Cl}^+$  /  $\text{NO}_2^+$  / accept  $\text{H}_2$  / accept  $\text{Cl}_2$  [1]

III A movement of **two** electrons/an electron pair/a lone pair [1]

**Total [14]**

11. (a) 1-Chlorobutane is heated / refluxed (1) with aqueous (1) sodium hydroxide.



Correct formulae and charges (1) curly arrows (1) polarisation (1)

The reaction mechanism is nucleophilic substitution (1) [6]

*QWC select and use a form and style of writing appropriate to purpose and to complex subject matter [1]  
organise information clearly and coherently, using specialist vocabulary when appropriate [1]* [2]

- (b) (i) (2-)methylpropan-1-ol [1]

(ii) number of moles of compound G =  $\frac{0.50 \times 86}{100} = 0.43$  (1)

mass of compound G =  $0.43 \times 74 = 31.8 / 32$  g (1) [2]

- (iii) oxidising agent (potassium) dichromate /  $K_2Cr_2O_7$  /  $Cr_2O_7^{2-}$  (1)

observation orange to green (solution) (1) [2]

accept correct answers based on potassium manganate(VII)

- (c) temperature  $300^\circ C$  (1) pressure 60-70 atmospheres (1) [2]

**Total [15]**

**Total Section B [70]**