



GCE MARKING SCHEME

**CHEMISTRY
AS/Advanced**

SUMMER 2013

GCE CHEMISTRY - CH2
SUMMER 2013 MARK SCHEME

Section A

Q.1 C [1]

Q.2 B [1]

Q.3 (a) Calcium chloride [1]

(b) Magnesium carbonate [1]

(c) Sodium sulfate [1]

Q.4

Species	Cl•	NH ₃
Classification	Radical	Nucleophile

(1 for each box) [2]

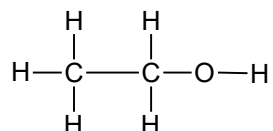
Q.5 e.g. wound dressing/sterilising sprays/deodorant socks/
refrigerator surfaces/anti-perspirants [1]

Q.6 Potassium and chlorine (1)

They have the largest electronegativity difference (1) [2]

Section B

Q.7 (a) (i) [1]

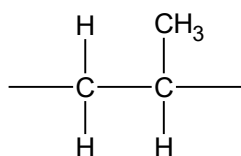


(ii) Nickel / platinum / palladium [1]

(iii) Potassium / sodium hydroxide (1)
in ethanol and heat (1) [2]

(iv) Elimination [1]

(b) (i) [1]



(ii) M_r poly(propene) unit = 42 (1)
Number of units = $\frac{1.05 \times 10^6}{42} = 25000$ (1) [2]

(c) (i) Percentage hydrogen = 4.6% (1)

C	H	Br	(1)
$\frac{22.0}{12}$	$\frac{4.6}{1.01}$	$\frac{73.4}{79.9}$	

1.83 4.55 0.92

2 5 1

Formula = $\text{C}_2\text{H}_5\text{Br}$ (1) [3]

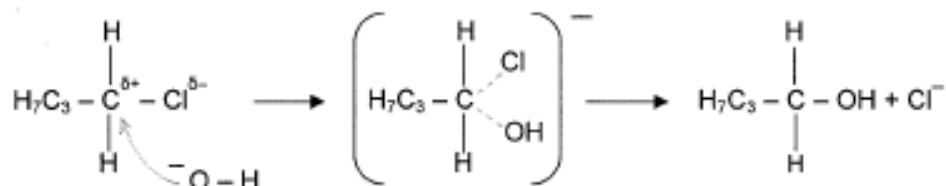
(ii) M_r of compound / number of atoms of any element in compound [1]

Total [12]

- Q.8** (a) e.g. damages liver/ damages pancreas/causes cancer/causes skin disorders/
short-term effects (1)

e.g. more traffic accidents/violent behaviour/criminal behaviour (1) [2]

- (b) (i) Nucleophilic substitution / hydrolysis (1)



- Reactants: Intermediate (1)
Polarisation (1) (accept curly arrow to show
curly arrow (1) C – Cl breaking instead of intermediate) [4]
(Incorrect starting material or product maximum 2 marks from 3 for mechanism)

- (ii) Peak at 650–800 cm^{-1} due to C – Cl bond will be gone (1)
Peak at 2500–3500 cm^{-1} due to O – H bond /
1000–1300 cm^{-1} due to C – O bond will be present (1) [2]

- (c) (i)  [1]

- (ii) Structural / positional / chain [1]

- (iii) Colour change from orange to green [1]

- (iv) Concentrated sulfuric acid / aluminium oxide (1)
 $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{OH} \longrightarrow \text{CH}_3\text{CH}_2\text{CHCH}_2 + \text{H}_2\text{O}$ (1) [2]

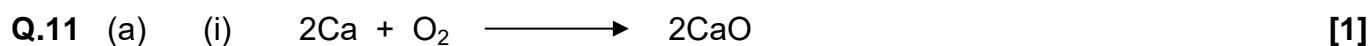
- (d) (i) C – F bond stronger than C – Cl bond (1)
C – Cl bond breaks (in stratosphere) forming $\text{Cl}\bullet$ which
reacts with ozone (1) [2]

- (ii) Some CFCs still being used / CFCs take a very long time to reach the
ozone layer / other substances deplete the ozone layer [1]

Total [16]

- Q.9** (a) A mixture of (many) hydrocarbons / alkanes [1]
- (b) $C_4H_{10} + 6\frac{1}{2}O_2 \longrightarrow 4CO_2 + 5H_2O$ [1]
- (c) $109\frac{1}{2}^\circ$ [1]
- (d) H_2O has 2 bonding and 2 lone pair of electrons (1)
- CH_4 has 4 bonding pairs only (1)
- Repulsion between lone pairs and bond pairs is greater than between bond pairs and bond pairs (1) [3]
- QWC* The information is organised clearly and coherently, using specialist vocabulary where appropriate *QWC* [1]
- (e) (i) Butane is higher because it has more van der Waals' forces between molecules [1]
- (ii) Regular array of metal ions surrounded by a 'sea' of delocalised valence electrons (1)
- Strong attraction between the positive ions and the delocalised electrons (1)
(Can be obtained from labelled diagrams)
- Malleable because when a force is applied the layer of metal ions slide over each other forming a new shape (1)
- Conduct electricity since under a potential difference the delocalised electrons flow / the delocalised electrons flow towards the positive potential (1)
[4]
- QWC* Legibility of text; accuracy of spelling, punctuation and grammar, clarity of meaning *QWC* [1]
- Total [13]**

- Q.10** (a) (i) Chlorine – gas
Iodine – solid [1]
- (ii) Chlorine – brown/orange solution (1)
Iodine – no change / no reaction (1)
 $\text{Cl}_2 + 2\text{KBr} \longrightarrow \text{Br}_2 + 2\text{KCl}$ (1) [3]
(Accept ionic equation)
- (b) Oxygen loses electrons therefore oxidised / oxidation state changes from -2 to 0
therefore is oxidised (1)
- Chlorine gains electrons therefore reduced / oxidation state changes from 0 to -1
therefore is reduced (1) [2]
- (c) (i) Boiling temperatures increase as relative molecular mass increases /
number of electrons increases / down group (1)
- HF has a higher boiling point than expected (1) [2]
- (ii) Group 7 hydrides contain more dipole–dipole forces as group descended (1)
but HF contains hydrogen bonding between molecules (1)
- Hydrogen bonds are stronger therefore HF's boiling temperature is greater
/ need more energy to break (1) [3]
- QWC Selection of a form and style of writing appropriate to purpose and to
complexity of subject matter QWC [1]
- (iii) HCl more polar than SiH_4 therefore intermolecular forces are stronger /
dipole greater in HCl / Cl more electronegative than Si [1]
- Total [13]**



forming Ca^{2+} and O^{2-} ions (1) [2]



(ii) 8 – 14 [1]



(d) (i) Magnesium disappears / gets smaller (1)
Effervescence / bubbles (of hydrogen) (1)
Heat given off (1) [2]
(Accept any 2 points)

(ii) Moles Mg = $\frac{0.503}{24.3} = 0.0207$ (1)
Moles HCl = 0.0414 (1)
Volume HCl = $\frac{0.0414}{1.6} = 0.0259 \text{ dm}^3$ (1) [3]

(iii) Volume $\text{H}_2 = 0.0207 \times 24 = 0.497 \text{ dm}^3$ [1]

(iv) Add aqueous silver nitrate (1)
White precipitate forms (1) [2]

(e) Less reactive (1)

Electrons in beryllium more difficult to lose / ionisation energy is higher (1) [2]

(Need reason to get first mark but accept less reactive as reactivity increases down group / outer electron has less shielding etc. for 1 mark)

Total [16]