GCE MARKING SCHEME

CHEMISTRY
AS/Advanced

SUMMER 2013

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]**

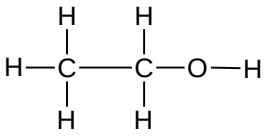
Q.5 e.g. wound dressing/sterilising sprays/deodorant socks/ refrigerator surfaces/anti-perspirants **[1]**

Q.6 Potassium and chlorine (1)

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

Section B

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

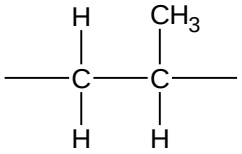


(ii) Nickel / platinum / palladium **[1]**

(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	
22.0	4.6	73.4	(1)
12	1.01	79.9	
1.83	4.55	0.92	
2	5	1	

Formula = C_2H_5Br (1) **[3]**

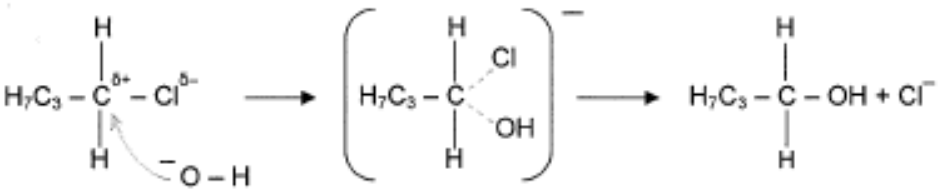
(ii) M_r of compound / number of atoms of any element in compound **[1]**

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]**

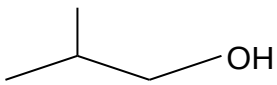
(b) (i) Nucleophilic substitution / hydrolysis (1)



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)
$CH_3CH_2CH_2CH_2OH \longrightarrow CH_3CH_2CHCH_2 + H_2O$ (1) **[2]**

(d) (i) C – F bond stronger than C – Cl bond (1)
C – Cl bond breaks (in stratosphere) forming Cl● 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) $C_4H_{10} + 6½O_2 \longrightarrow 4CO_2 + 5H_2O$ **[1]**

(c) 109½° **[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)
$Cl_2 + 2KBr \longrightarrow Br_2 + 2KCl$ (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]

Q.11 (a) (i) $2Ca + O_2 \longrightarrow 2CaO$ **[1]**

(ii) 

(1)

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

(b) (i) $Ca(OH)_2$ **[1]**

(ii) 8 – 14 **[1]**

(c) $Ca^{2+}(aq) + CO_3^{2-}(aq) \longrightarrow CaCO_3(s)$ **[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 dm^3 (1) **[3]**

(iii) Volume H_2 = 0.0207 × 24 = 0.497 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]