

NOVEMBER 2001

ADVANCED SUBSIDIARY LEVEL

MARK SCHEME

MAXIMUM MARK : 60

SYLLABUS/COMPONENT : 8701/2

CHEMISTRY
(Structured Questions)



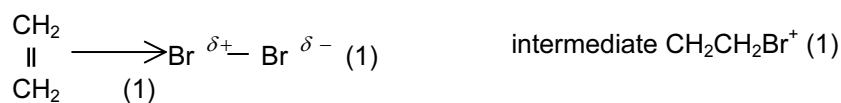
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Question Number	Mark Scheme Details	Part Mark
1 (a)	Mg $1s^2$ $2s^2$ $2p^6$ $3s^2$ } (1) Mg $^{2+}$ $1s^2$ $2s^2$ $2p^6$ } (1) O $1s^2$ $2s^2$ $2p^4$ } (1) O $^{2-}$ $1s^2$ $2s^2$ $2p^6$ } (1)	[2]
(b) (i)	• ○ • ○ • is Mg $^{2+}$ regular (1) ○ • ○ • ○ is O $^{2-}$ • ○ • ○ cations surrounded by anions etc. (1)	[2]
(ii)	Two physical properties insulator ions unable to move high m.p./b.p. forces between doubly charged ions are strong insoluble in water conducts when molten (1) for each	[2]
(iii)	Furnace linings, electrical insulators, spark plugs, ceramics any two	[1]
(c) (i)	CO (1) and water vapour (1) [or from equations]	[1]
(ii)	CaO + H $_2$ O → Ca(OH) $_2$ (1) Ca(OH) $_2$ + CO $_2$ → CaCO $_3$ + H $_2$ O <u>OR</u> CaO + CO $_2$ → CaCO $_3$ (1) max 3	[3]
[Total: 10]		

2 (a) (i)	Rate of forward reaction is equal to rate of backward or equivalent. (1)	
(ii)		activation energy mentioned (1) two E $_a$ peaks (1) (1)
[5]		
(b) (i)	$K_c = \frac{[\text{ester}][\text{water}]}{[\text{acid}][\text{alcohol}]} \quad (1)$	
(ii)	Since same number of terms in expression, top & bottom	or equivalent (1) [2]
(c) (i)	ethanol = ethanoic acid = 0.43 (1) ethyl ethanoate = 0.57 (1) water = 1.57 (1)	
(ii)	$K_c = \frac{0.57 \times 1.57}{0.43 \times 0.43} = 4.84 \quad (1)$	[4]
[marked consequentially from (i)]		
[Total: 11]		

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- 3 (a) red / brown liquid / vapour (1) [1]
 (b) Stronger van der Waals' forces between molecules (1)
 since bromine is a bigger molecule / more electrons than chlorine (1)
 and has more induced dipoles on its surface (1) Max (2) [2]
 (c) (i) $2P + 5Cl_2 \rightarrow 2PCl_5$ (1)
 (ii) $PCl_5 + 4H_2O \rightarrow H_3PO_4 + 5HCl$ (1)
 (iii) $NaCl + AgNO_3 \rightarrow AgCl \downarrow + NaNO_3$
OR $Cl^-_{(aq)} + Ag^+_{(aq)} \rightarrow AgCl_{(s)}$ (1)
 (iv) $AgCl + 2NH_3 \rightarrow Ag(NH_3)_2^+_{(aq)} + Cl^-$ OR to $Ag(NH_3)_2Cl$ (1) [4]
 (d) (i) $CH_2=CH_2 + Br_2 \rightarrow CH_2BrCH_2Br$ (1)
 (ii) Electrophilic addition (1)
 (iii) Electron-rich double bond attracts Br_2 which is then polarised



Final addition of Br^- [5]

[Total: 12]

- 4 (a) $\begin{array}{l} N_2 \quad \text{zero} \\ NH_4^+ \quad -3 \end{array} \left. \vphantom{\begin{array}{l} N_2 \\ NH_4^+ \end{array}} \right\} (1) \quad \begin{array}{l} NO_2^- \\ NO_3^- \end{array} \quad \begin{array}{l} +3 \\ +5 \end{array} \left. \vphantom{\begin{array}{l} NO_2^- \\ NO_3^- \end{array}} \right\} (1) \quad [2]$
 (b) (i) The triple bond (high energy) needs to be broken (1)
 (ii) gives NH_4^+ directly / gives soluble N to soil (1) [2]
 (c) (i) $6.3 \times 10^{-9} \text{ mol dm}^{-3}$ (1)
 (ii) Since H^+ is a product, and this is removed (1)
 (iii) lime / a base / ammonia (1) [3]
 (d) Waterlogged soils will contain very little oxygen / will discourage nitrifying bacteria (1) [1]

- (e) (i) $\begin{array}{c} H \oplus \\ \times \times \\ H \times N \bullet H \\ \bullet \times \bullet \\ H \end{array}$ charge (1) To include dative bond

- (ii) tetrahedral, 109 or $109\frac{1}{2}^\circ$ (1) [2]

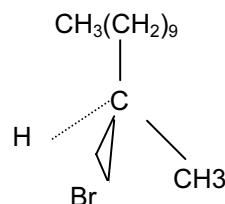
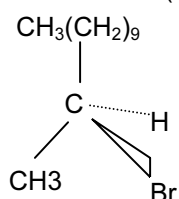
[Total: max 10]

- 5 (a) (i) $CH_3(CH_2)_9CHBrCH_2Br$ (1)
 (ii) $CH_3(CH_2)_9CHBrCH_3$ (1)
 (iii) $CH_3(CH_2)_9CO_2H$ (1)
 (iv) $CH_3(CH_2)_9CH(OH)CH_3$ (1) [4]

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(b) (i) optical isomerism (1)

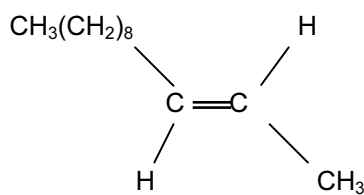
(ii)



(1) each

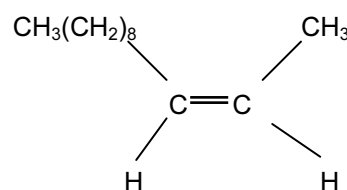
[3]

(c)



trans

(1) each



cis

[2]

[Total: 9]

6

A Only alcohol

sodium (1) – bubbles of gas / H₂ (1)

OR PCl₅ (1) misty fumes (1)

OR carboxylic acid + catalyst (1) smell of ester (1)

[2]

Not H⁺/Cr₂O₇²⁻ or H⁺/MnO₄⁻

B Only ketone

DNP reagent gives red precipitate (1)

does not give Tollens or Fehlings

OR H⁺/Cr₂O₇²⁻ tests (1)

[2]

C alkene and aldehyde

decolourises Br₂ (water) (1)

red/brown ppt with Benedicts or Fehlings

OR Ag mirror – Tollens (1)

DNP test (1) if not used elsewhere

[2]

D aldehyde only

DNP gives red ppt (1)

Benedicts/Tollens/Fehlings positive (1)

(as C)

[2]

[Total: 8]