

NOVEMBER 2001

ADVANCED SUBSIDIARY LEVEL

MARK SCHEME

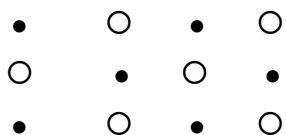
MAXIMUM MARK : 60

SYLLABUS/COMPONENT : 8701/2

**CHEMISTRY
(Structured Questions)**

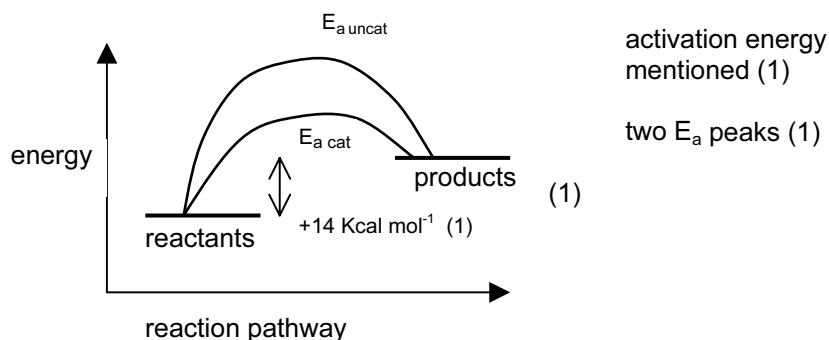


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|-------------|-----------------------------------|----------|-------|
| Page 1 of 3 | Mark Scheme | Syllabus | Paper |
| | AS Level Examinations – June 2001 | 8701 | 2 |

| Question Number | Mark Scheme Details | Part Mark |
|-----------------|---|-----------|
| 1 (a) | $\text{Mg} \quad 1s^2 \quad 2s^2 \quad 2p^6 \quad 3s^2 \quad \left. \vphantom{\begin{matrix} 1s^2 \\ 2s^2 \\ 2p^6 \\ 3s^2 \end{matrix}} \right\} (1)$ $\text{Mg}^{2+} \quad 1s^2 \quad 2s^2 \quad 2p^6 \quad \left. \vphantom{\begin{matrix} 1s^2 \\ 2s^2 \\ 2p^6 \end{matrix}} \right\} (1)$ $\text{O} \quad 1s^2 \quad 2s^2 \quad 2p^4 \quad \left. \vphantom{\begin{matrix} 1s^2 \\ 2s^2 \\ 2p^4 \end{matrix}} \right\} (1)$ $\text{O}^{2-} \quad 1s^2 \quad 2s^2 \quad 2p^6$ | [2] |
| (b) (i) |  \bullet is Mg^{2+} regular (1) \bigcirc 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] | |
| (ii) | $\text{CaO} + \text{H}_2\text{O} \rightarrow \text{Ca(OH)}_2$ (1) $\text{Ca(OH)}_2 + \text{CO}_2 \rightarrow \text{CaCO}_3 + \text{H}_2\text{O}$ <u>OR</u> $\text{CaO} + \text{CO}_2 \rightarrow \text{CaCO}_3$ (1) max 3 | [3] |

[Total: 10]

- 2 (a) (i) Rate of forward reaction is equal to rate of backward or equivalent. (1)
(ii)



[5]

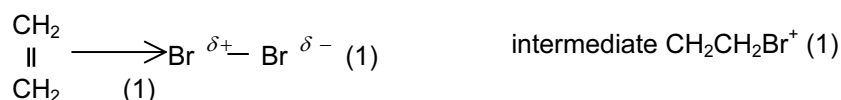
- (b) (i) $K_c = \frac{[\text{ester}][\text{water}]}{[\text{acid}][\text{alcohol}]}$ (1)
(ii) Since same number of terms in expression, top & bottom or equivalent (1) [2]
(c) (i) ethanol = ethanoic acid = 0.43 (1)
ethyl ethanoate = 0.57 (1)
water = 1.57 (1)
(ii) $K_c = \frac{0.57 \times 1.57}{0.43 \times 0.43} = 4.84$ (1) [4]

[marked consequentially from (i)]

[Total: 11]

| Page 2 of 3 | Mark Scheme | Syllabus | Paper |
|-------------|------------------------------------|----------|-------|
| | IGCSE Examinations – November 2001 | 8701 | 2 |

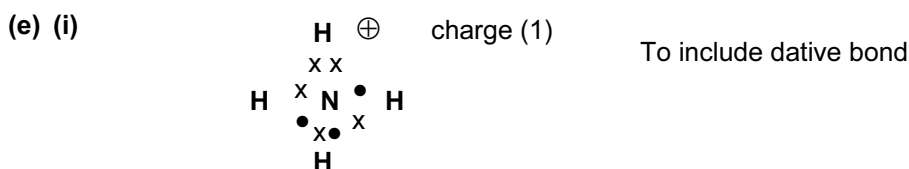
- 3 (a) red / brown liquid / vapour (1) [1]
 (b) Stronger van der Waals' forces between molecules (1)
 since bromine is a bigger molecule / more electrons than chlorine (1)
 and has more induced dipoles on its surface (1) Max (2) [2]
 (c) (i) $2P + 5Cl_2 \rightarrow 2PCl_5$ (1)
 (ii) $PCl_5 + 4H_2O \rightarrow H_3PO_4 + 5HCl$ (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) $\begin{array}{cc} N_2 & \text{zero} \\ NH_4^+ & -3 \end{array} \left. \vphantom{\begin{array}{cc} N_2 & \text{zero} \\ NH_4^+ & -3 \end{array}} \right\} (1) \quad \begin{array}{cc} NO_2^- & +3 \\ NO_3^- & +5 \end{array} \left. \vphantom{\begin{array}{cc} NO_2^- & +3 \\ NO_3^- & +5 \end{array}} \right\} (1) [2]$
 (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]



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

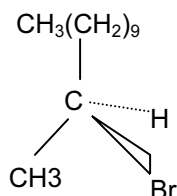
[Total: max 10]

- 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]

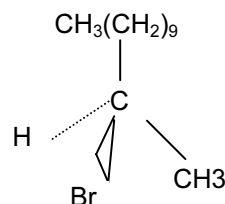
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|-------------|-----------------------------------|----------|-------|
| Page 3 of 3 | Mark Scheme | Syllabus | Paper |
| | AS Level Examinations – June 2001 | 8701 | 2 |

(b) (i) optical isomerism (1)

(ii)

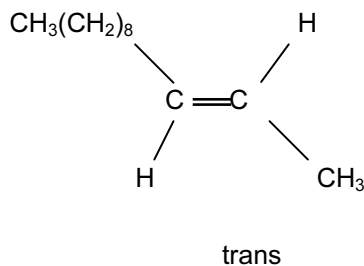


(1) each

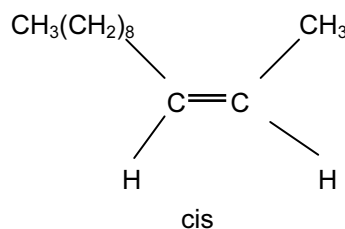


[3]

(c)



(1) each



[2]

[Total: 9]

6

A Only alcohol

sodium (1) – bubbles of gas / H_2 (1)

OR PCl_5 (1) misty fumes (1)

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

[2]

Not $\text{H}^+/\text{Cr}_2\text{O}_7^{2-}$ or $\text{H}^+/\text{MnO}_4^-$

B Only ketone

DNP reagent gives red precipitate (1)

does not give Tollens or Fehlings

OR $\text{H}^+/\text{Cr}_2\text{O}_7^{2-}$ tests (1)

[2]

C alkene and aldehyde

decolourises Br_2 (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]