Chemistry 1B Adv/SSP (CHEM1902/1904) November 2004

2004-N-2

- Ionisation energies increase across a period in the periodic table because the increasing nuclear charge holds the electrons more tightly. Hence, in any period, the Group I element is the one that most easily loses its electron (from the *s* subshell). This electron is then available to reduce another species.
- 1.16×10^{-5} s^{-1}

  4.1%

2004-N-3

- 1×10^{-18} M

  pH = 8.9
II	4	8	$K^+(aq)$, $[Ni(CN)_4]^{2-}(aq)$
III	6	3	$[Cr(NH_3)_5Cl]^{2+}(aq)$, $Cl^-(aq)$
III	6	6	$[Co(en)_3]^{3+}(aq)$, $Br^-(aq)$

2004-N-4

- Hydroxyapatite dissolves according to the equation:

  $$Ca_5(PO_4)_3OH(s) \rightleftharpoons 5Ca^{2+}(aq) + 3PO_4^{3-}(aq) + OH^-(aq)$$

  This equilibrium lies far to the left, but the added of H^+ (acidic medium) will react with the $OH^-(aq)$ and push the reaction to the right (Le Chatelier's principle). Fluoridation of water promotes the replacement of OH with F to form $Ca_5(PO_4)_3F(s)$. This compound is much less water soluble than $Ca_5(PO_4)_3OH$ and as F^- is a weaker base than OH^-, the corresponding reaction

  $$Ca_5(PO_4)_3F(s) \rightleftharpoons 5Ca^{2+}(aq) + 3PO_4^{3-}(aq) + F^-(aq)$$

  is less affected by the addition of H^+. Less soluble enamel means less tooth decay.

2004-N-5

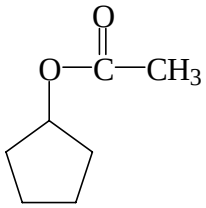
- 1.99

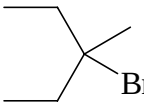
  8.23

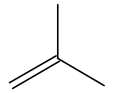
  3.27

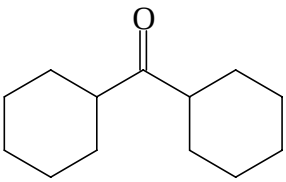
  HNO_2

2004-N-6

- 



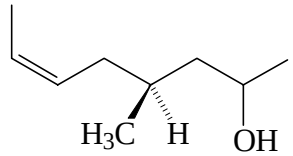




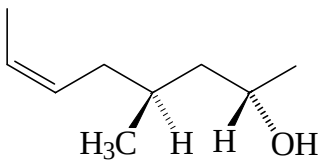
2004-N-7

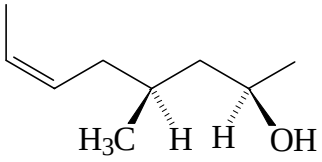
- $-CH_2CHO$ $-CH_2CH{=}CHCH_3$ $-CH_3$ $-H$

(4*S* ,6*Z*)-4-methyloct-6-en-2-one

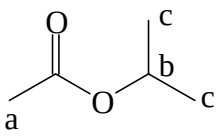


The reduction indtroduces a second stereogenic centre into the molecule. The two products are diastereoisomers (not eneantiomers) and hence have different chemical and physical properties and can be separated

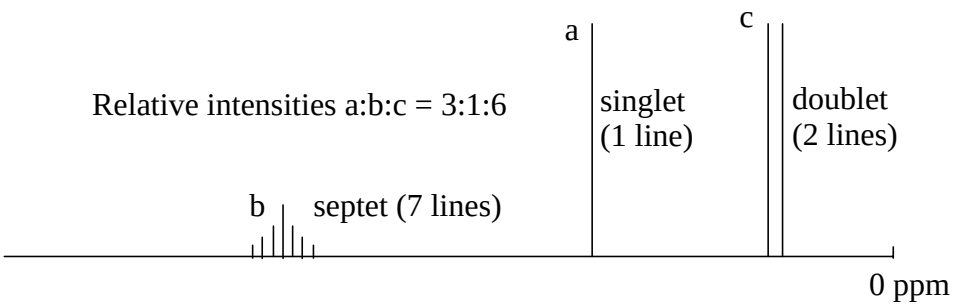


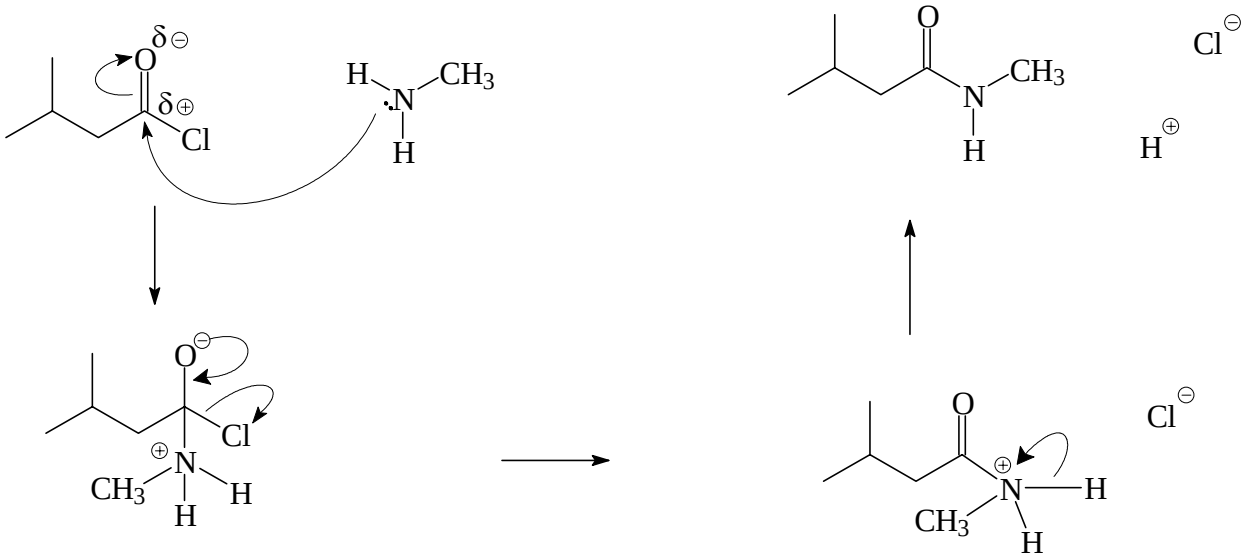


2004-N-8

- 
O
c
b
O
c
a

3


a
c
Relative intensities a:b:c = 3:1:6
singlet
(1 line)
doublet
(2 lines)
b
septet (7 lines)
0 ppm

- 
δ⊖
O
δ⊕
Cl
H
N
CH3
H
O
N
CH3
H
Cl⊖
H⊕
O⊖
Cl
N⊕
CH3
H
H
O
N⊕
H
CH3
H
Cl⊖

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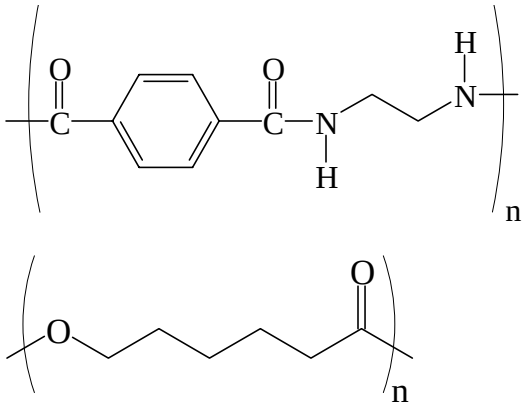
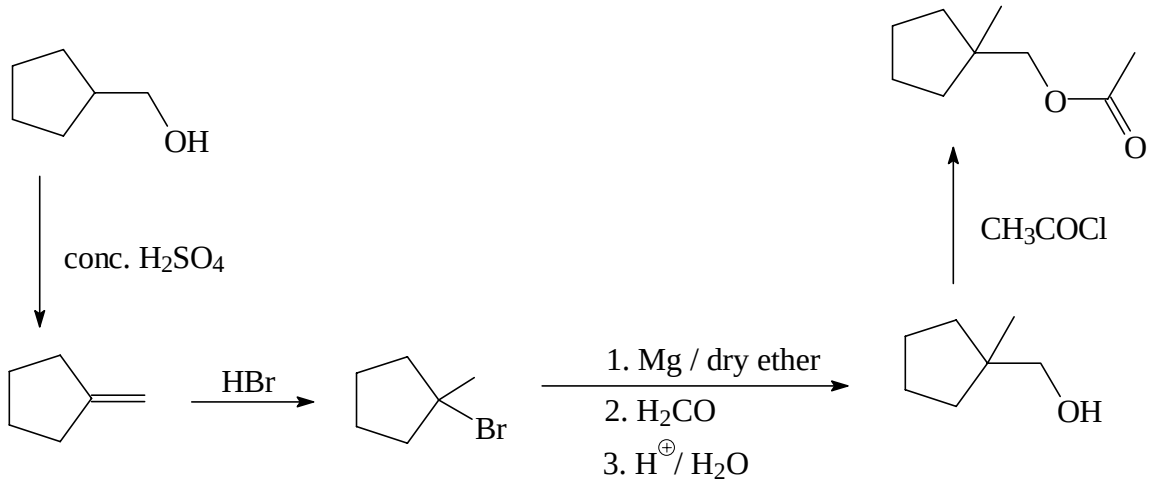
- 

- 
OH
conc. H_2SO_4
HBr
Br
1. Mg / dry ether
2. H_2CO
3. $H^{\oplus}$/ H_2O
OH
CH_3COCl
O
O