FUNDAMENTALS OF CHEMISTRY 1B (CHEM1002) - November 2005

2005-N-2

- Both have hexagonal layers of metal atoms.
  Both have coordination numbers of 12.
  Both fill 74% of the space in a unit cell.

  The layer stacking sequence is different:
  hcp: ABABAB
  ccp: ABCABC

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

  Both $PO_4^{3-}(aq)$ and $OH^-(aq)$ ions react with $H^+(aq)$ and are therefore removed from the above equilibrium. The reaction therefore moves to the right and more hydroxyapatite dissolves to re-establish equilibrium and tooth decay increases.

  Fluoride ion in the water promotes the formation of fluoroapatite, $Ca_5(PO_4)_3F$. This compound is less soluble in water than apatite. Also $F^-(aq)$ is a weaker base than $OH^-(aq)$, so it is less soluble in acid than the hydroxy analogue.

2005-N-3

- $[Ni(en)_2(H_2O)_2]^{2+}$

  N and O

  $3d^8$

- A strong acid dissociates 100% in water: $HA(aq) \rightarrow H^+(aq) + A^-(aq)$
  A weak acid does not dissociate 100% in water: $HA(aq) \rightleftharpoons H^+(aq) + A^-(aq)$

  The % ionisation increases.

  Le Chatelier's principle.
  $K_a = [H^+][A^-]/[HA]$ Dilution affects all terms in this equation, causing decrease in Q. The reaction will therefore move to the right, *i.e.* % ionisation will increase.

2005-N-4

- The two molecules have to be aligned or oriented correctly.
  They need to collide with sufficient energy to overcome activation barrier.

  From Arrhenius equation, $k = Ae^{-E_a/RT}$, the larger the activation energy, E_a, the smaller the rate constant, k. *i.e.* higher E_a results in slower reaction rate.

  152 kJ mol^{-1}

2005-N-5

- 12.30

  2.5

  4.46

2005-N-6

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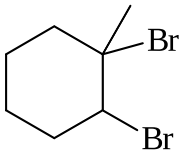
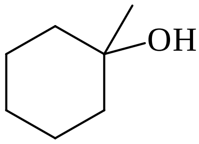
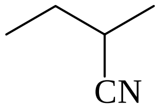
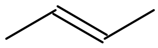
1-methylcyclohexene



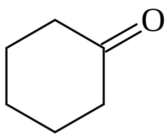


2-bromobutane





cyclohexanol



2005-N-7

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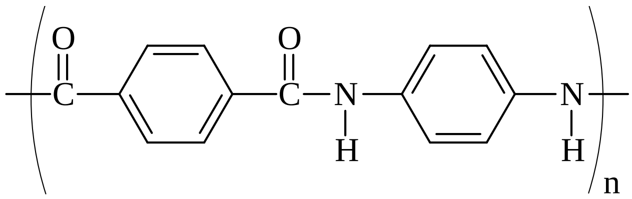

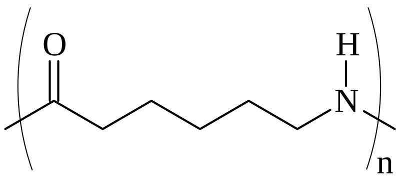

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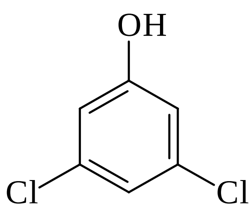

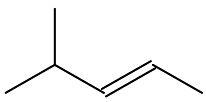

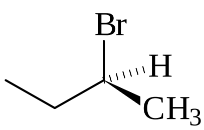

2005-N-8

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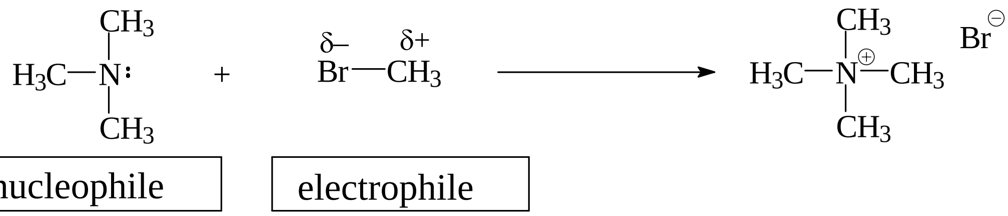

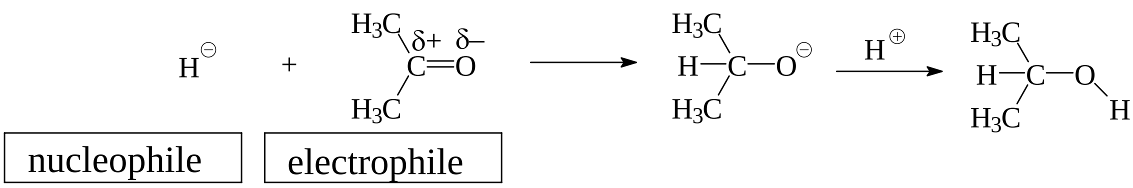

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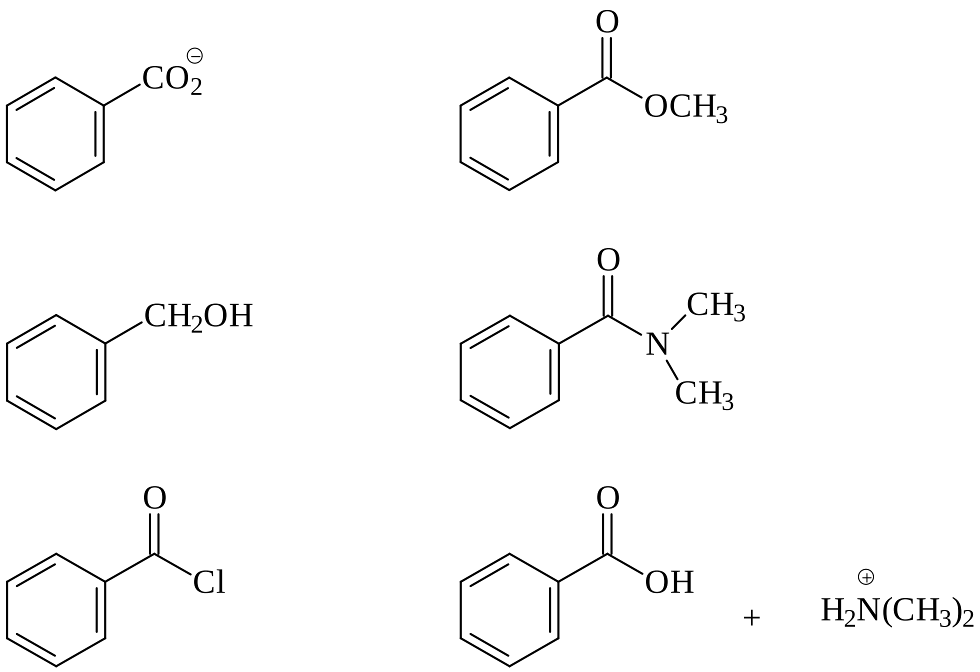
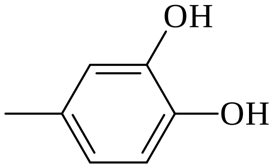


2005-N-9

• $C_9H_{13}O_3N$

—OH —CH_2NHCH_3  —H

C(N,H,H) C(C,C,C,)

(*R*)

a = aromatic ring **b** = secondary amine