CHEMISTRY 1B (CHEM1102) - June 2009

2009-J-2

- Oxidising agents undergo reduction (*i.e.* a gain of electrons). The electronic configuration of the halogens (Group 17) is ns^5. They are small atoms (atomic size decreases across a period as shielding decreases) and will readily gain a single electron to form the X^- ion with a complete octet. As the atoms are small, the electrons are firmly held and have high ionisation energies. Hence halogens are poor reducing agents.

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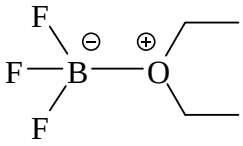
  Co^{2+} (d^7)

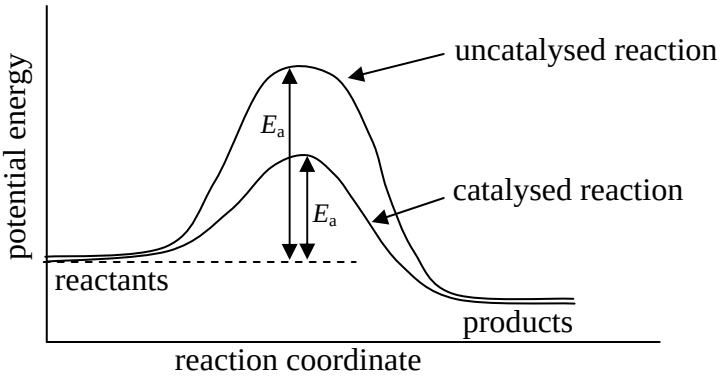
  Paramagnetism arises as a result of the presence of 1 or more unpaired electrons. Co^{2+} has 3 unpaired electrons and so is paramagnetic.

2009-J-3

- A Lewis acid is an electron pair acceptor. BF_3 possess an empty *p*-orbital on B. $CH_3CH_2OCH_2CH_3$ possess a lone pair on O.



- A catalyst is a substance that increases the rate of a reaction without being consumed in the reaction. A catalyst works by providing an alternative reaction pathway of lower activation energy, E_a.



- The critical temperature (T_c) is the temperature above which a substance cannot exist as a liquid. Thus methane cannot be liquefied at 25 °C.
- Allotropes are different structural forms of the same element.

  O_2 and O_3, white phosphorus and red phosphorus, many other examples

2009-J-4

II	III	II
4	6	6
7	5	10
2–	3–	0
tetrahedral	octahedral	octahedral
Cl	Br and C	N and O

2009-J-5

- 3.28
  8.59
  4.87
  $KC_3H_5O_2$

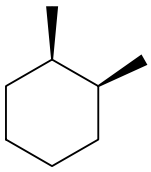
2009-J-6

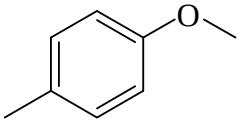
- Rate = $k[S_2O_8^{2-}][I^-]$
  $k = 0.081\ M^{-1}\ s^{-1}$

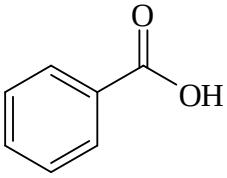
2009-J-7

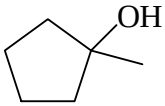
- constitutional isomers
  diastereoisomers
  enantiomers
  conformational isomers
  diastereoisomers
  (*E*)-2-pentene
  (*R*)
  No. It has no plane of symmetry.

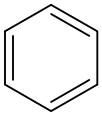
2009-J-8

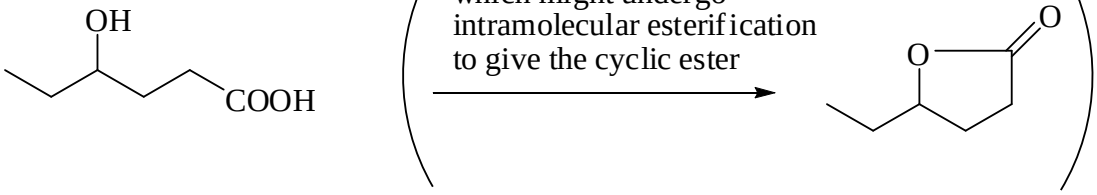
- 


O

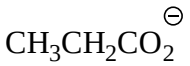

O
OH

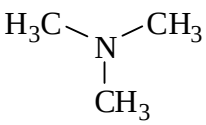

OH

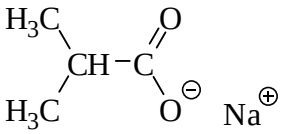


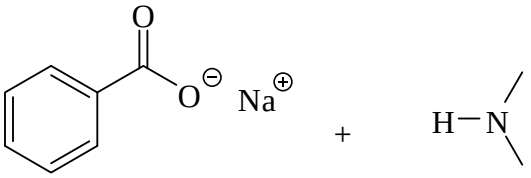

OH
COOH
which might undergo
intramolecular esterification
to give the cyclic ester
O
O

2009-J-9

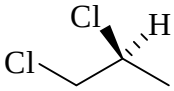
- 



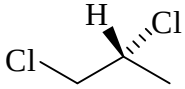




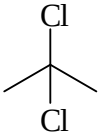
2009-J-10

- 

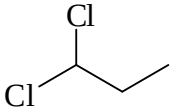
(*S*)-enantiomer



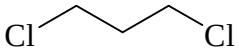
(*R*)-enantiomer



2,2-dichloropropane



1,1-dichloropropane



1,3-dichloropropane

2009-J-11

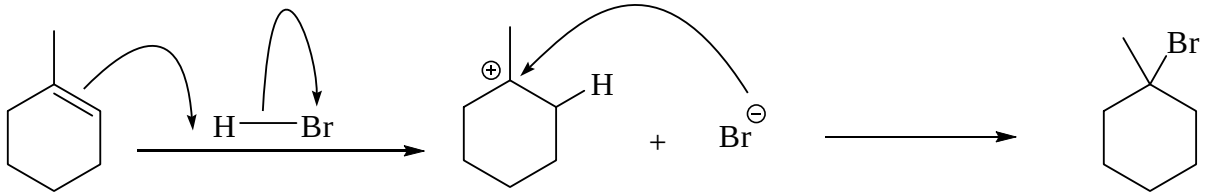
constitutional isomers

constitutional isomers

constitutional isomers

racemate

2009-J-12

- 

2009-J-13

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