CHEMISTRY 1B (CHEM1102) - June 2010

NB These answers have not been checked

2010-J-2

- O is very small and very electronegative atom, both of which are required for strong H-bonds to form.
- The Fe^{3+} ion is much smaller and has a much higher charge density than the Fe^{2+} ion. This results in a stronger Fe–O bond and a weakening of the O–H bonds. As the O–H bonds are weaker, it is more acidic, i.e. has a much greater value for K_a.
- Allotropes are different structural forms of an element. The allotropes are O_2 and O_3.

2010-J-3

- The slope of the solid-liquid curve is irrelevant as sublimation is the phase change from solid to gas. As long as there is an equilibrium line between these phases then the compound can sublime.
- 3.1×10^{-8} mol L^{-1}

2010-J-4

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II	III	II
4	6	6
10	6	7
tetrahedral	octahedral	octahedral
C	N	N

2010-J-5

- 0.025 M

  2.38

  3.15 7.60

  Initial pH would increase slightly towards 7. The pH at half-equivalence point would not change (as pH = pKa). The final pH would decrease slightly towards 7.

2010-J-6

- Cu_3Au

  12 carat

  4.7×10^{-23} cm^3

  14 g cm^{-3}

2010-J-7

- Graph B is correct.

  Graphs A and C: As $K_c = 2$, the reaction does not go anywhere near to completion. Graphs A and C can therefore be rejected because at least one reagent in both these graphs has dropped to 0. Also, in Graph C, the rates of change of $[Br_2]$ and $[Cl_2]$ are different, at variance with the stoichiometry of the reaction.

  Graph D: Cl_2 is the limiting reagent, so the maximum [BrCl] that can form is twice the initial $[Cl_2]$. But as only half the Cl_2 has been used, the maximum [BrCl] that can form is $0.2 \times 2 = 0.4$ M.

2010-J-8

- 3

  $1.61 \times 10^{-6}\ kPa^{-2}\ s^{-1}$

2010-J-9

- constitutional isomers

  conformational isomers

  enantiomers

  diastereoisomers

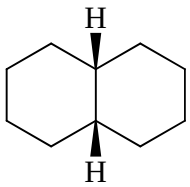
  diastereoisomers

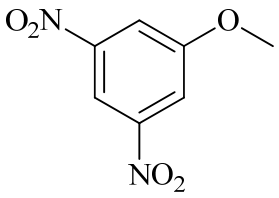
  (*S*)

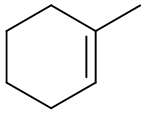
  (*Z*)-3-bromo-4-methylpent-2-ene

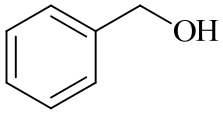
  No. It has no plane of symmetry.

2010-J-10

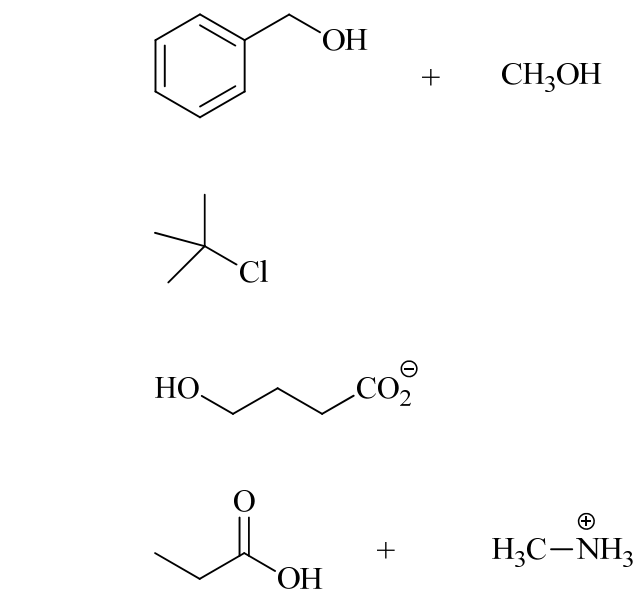
- 



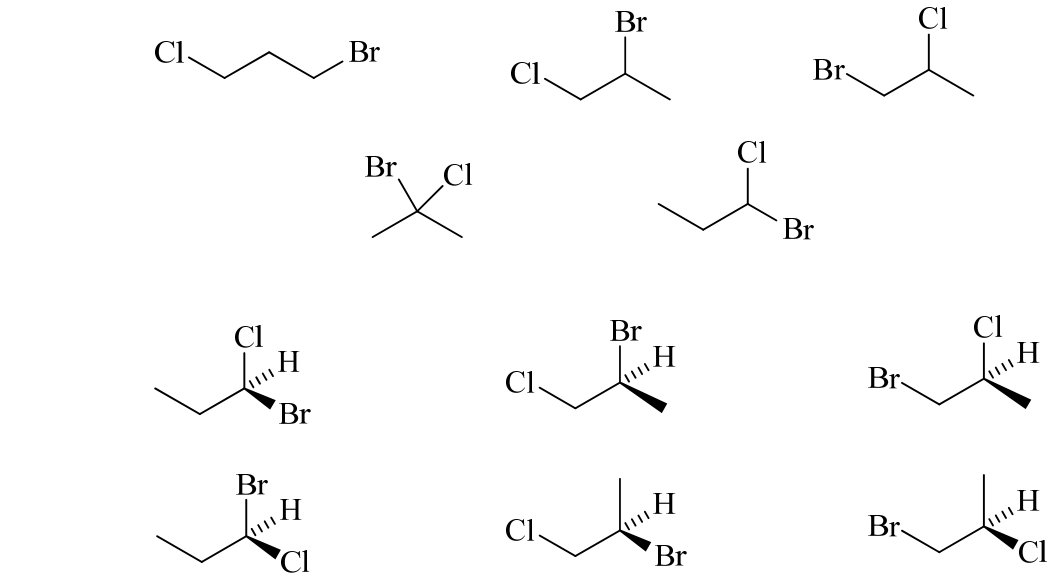




2010-J-11

- 

2010-J-12

- 

2010-J-13

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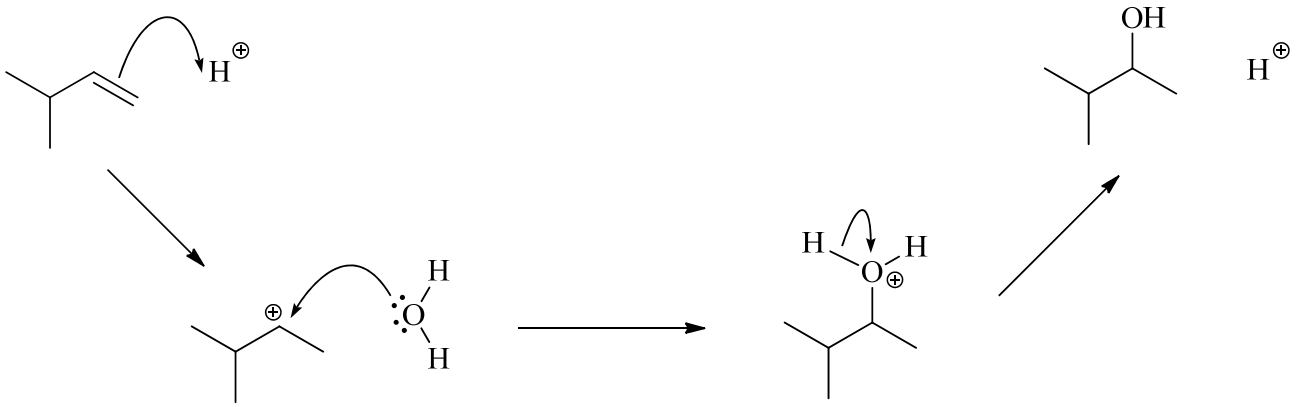

2010-J-14

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