CHEM1405 (Vet. Science) - June 2007

2007-J-2

- (a) An unusually strong dipole-dipole interaction that forms when a hydrogen atom is bonded to one of the very electronegative atoms F, O or N.

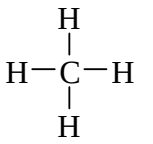
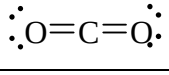
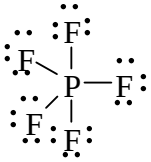
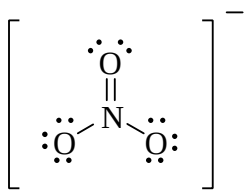
  (b) Properties of a solution that depend only upon the number of moles of solute present, not the nature of the solute.

  (c) A solution with lower osmotic pressure than cell fluid.

  (d) The pH at which there is no nett charge on a molecule containing both acidic and basic groups.

  (e) The time required for the concentration of a reactant to fall to half its initial value.

2007-J-3

CH_4	8		tetrahedral
CO_2	16		linear
PF_5	40		trigonal bipyramidal
NO_3^-	24		trigonal planar

  NO_3^-, three resonance forms

2007-J-4

- 4

  3

  4

  0

- $2MnO_4^-(aq) + 16H^+(aq) + 5Sn^{2+}(aq) \rightarrow 2Mn^{2+}(aq) + 8H_2O(l) + 5Sn^{4+}(aq)$

  $MnO_4^-(aq)$

  $Sn^{2+}(aq)$

  1.38 V

2007-J-5

- -11256 kJ mol^{-1}

  -10464 kJ mol^{-1}

  Yes, ΔS is greater for $H_2O(g)$ than for $H_2O(l)$, so combustion in air will have greater overall ΔS.

  2.78 g

2007-J-6

- 2.43

  3.68

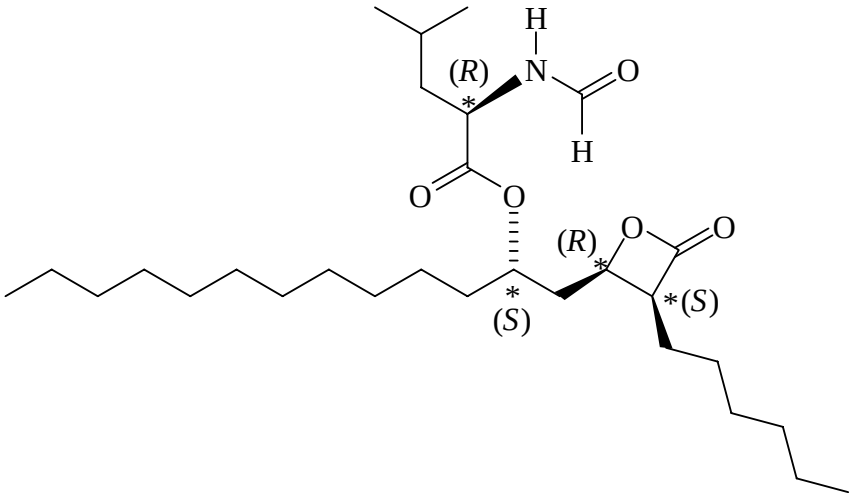
  The solution in (b) will act as a buffer.

  Added H_3O^+ will be consumed: $Lac^- + H_3O^+ \rightarrow HLac + H_2O$

  OH^- will be consumed: $HLac + OH^- \rightarrow Lac^- + H_2O$

2007-J-7

- No. It contains long chain hydrocarbon areas which are hydrophilic.



Note that the structure shown in the exam paper is actually a diastereoisomer of Orlistat. All four stereogenic centres in Orlistat have the (*S*) configuration.

amide, ester

2007-J-8

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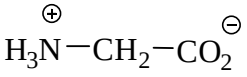
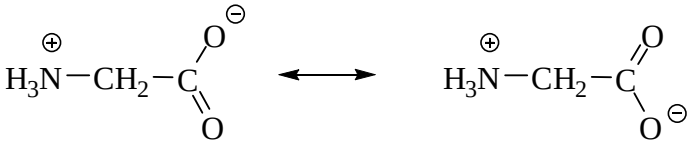




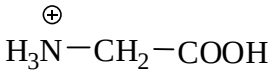
C1 (terminal C)	sp^2	trigonal planar
C2 (middle C)	sp^3	tetrahedral
N	sp^3	tetrahedral

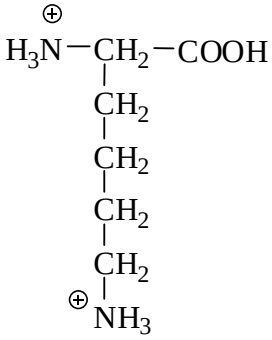
Major intermolecular force in glycine is ionic bonding between the positively and negatively charged ends of the molecule. Major intermolecular force in propionic acid is hydrogen bonding between the carboxylic acid groups. Ionic bonding is much stronger than H-bonding so glycine has a much higher melting point.

2007-J-9

• *ala-lys-lys*, *lys-ala-lys*, *lys-lys-ala*

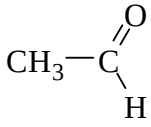
basic as lysine has a basic sidechain.





2007-J-10

• NAD^+



NAD^+ is aromatic. It is cyclic, planar, conjugated, and has $4n+2$ π electrons. NADH is not fully conjugated.

• Benzoic acid has a low solubility in water because of the relatively large hydrophobic aromatic ring. At high pH, it can react with OH^- ions to form the benzoate ion. This species is water soluble because it is charged and hence is easily solvated by the polar water molecules.