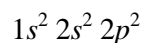


CHEM1405 (Vet. Science) - June 2010

2010-J-2

- The mathematical mixing of atomic orbitals to produce equivalent orbitals. There is no energy gain in this process, but the overlap of the hybridised orbitals to form bonds results in a lower energy situation because of reduced repulsion of the electron pairs.



CH₂ *i.e.* $x = 2$. The p orbitals would overlap with the $1s$ orbitals of the H atoms.

The molecule would be bent with approx 90° bond angle as the p orbitals are at right angles to each other.

CH₄ - methane. The s orbital and the 3 p orbitals of carbon undergo hybridisation to form 4 equivalent sp^3 orbitals that point to the corners of a tetrahedron. Overlap of these orbitals with the 1 s orbital of H atoms results in the formation of the tetrahedral molecule, methane.

2010-J-3

- 11300 kJ mol⁻¹
-10500 kJ mol⁻¹

ΔS will be greater for the air-oxidation as the product H₂O(g) has a much greater entropy than the product H₂O(l) - gases are much more disordered than liquids.

2.78 g

2010-J-4

- It is more difficult to remove a proton from a negatively charged species, so $K_{a1} > K_{a2} > K_{a3}$ for all acids.

The number of resonance structures for the various conjugate bases are:

2 for H₂PO₄⁻; 3 for HPO₄²⁻; and 4 for PO₄³⁻
2 for C₆H₇O₇⁻; 4 for C₆H₆O₇²⁻; and 8 for C₆H₅O₇³⁻

The conjugate bases for citric acid are more stable (because they have greater resonance stabilisation) so the corresponding acids are all stronger.

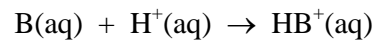
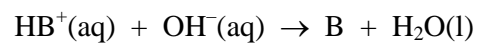
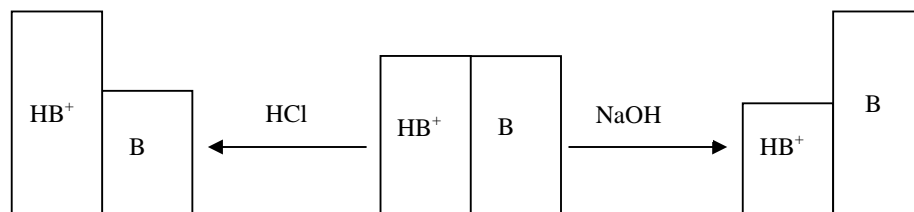
Alternatively, the increasing negative charges in the conjugate bases are being formed in different parts of the molecule in the case of citric acid, whereas they are all very close to each other in phosphoric acid. Again, the formation of the conjugate base series of citric acid is therefore easier and the acids are therefore stronger.

2010-J-5

- 3×10^{-3} mol 0.02 mol
0.4 L

2010-J-6

•



2.97

2.78 1.30

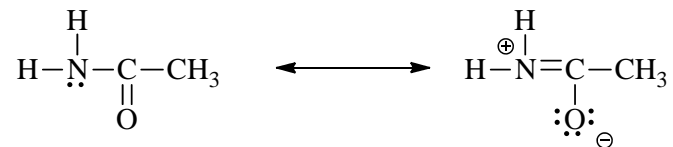
2010-J-7

• 9.1 hours

• +0.62 V

 9.4×10^{20} **2010-J-8**

•



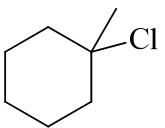
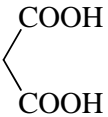
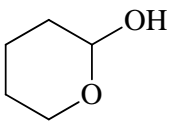
The canonical form on the right is a significant contributor to the resonance stabilised molecule. The N atom in this structure is sp^2 hybridised with trigonal planar geometry.

$$K_c = \frac{[\text{C}][\text{D}]^3}{[\text{A}]^2[\text{B}]}$$

It does not change. K_c changes only with temperature.

2010-J-9

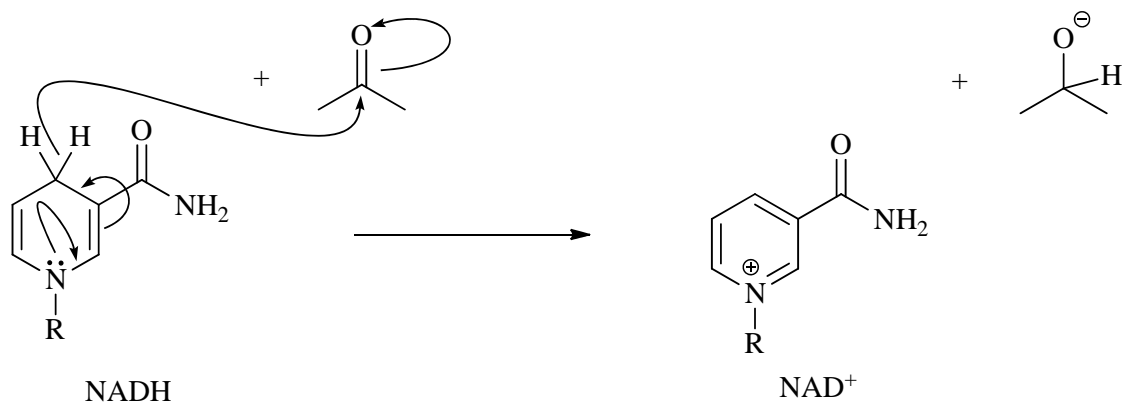
•

		
	CH_3COCl	
	$\text{N}(\text{CH}_3)_3$	
		
		$\text{HO}-\text{CH}_2-\text{CH}_2-\text{CH}_2-\text{CO}_2^-$
		

2010-J-10

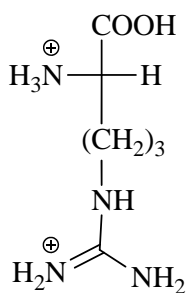
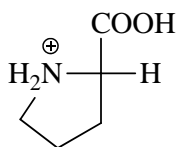
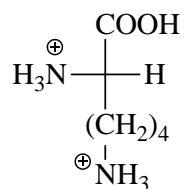
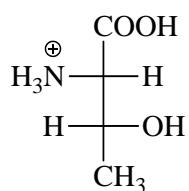
- NaOH
- $\text{CH}_3\text{CH}_2\text{CH}_2\text{-Br}$
- H_2O_2
- Zn / H^+

•

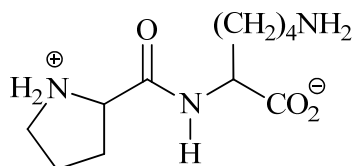
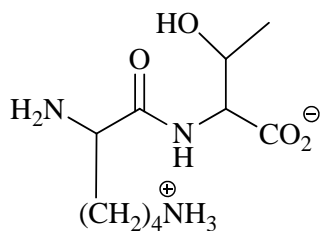
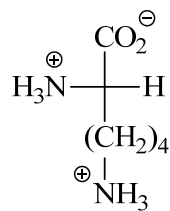
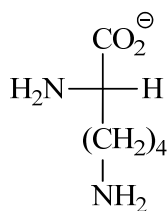


2010-J-11

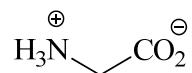
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2010-J-12



- Glycine is an amino acid and has the following zwitterionic structure.



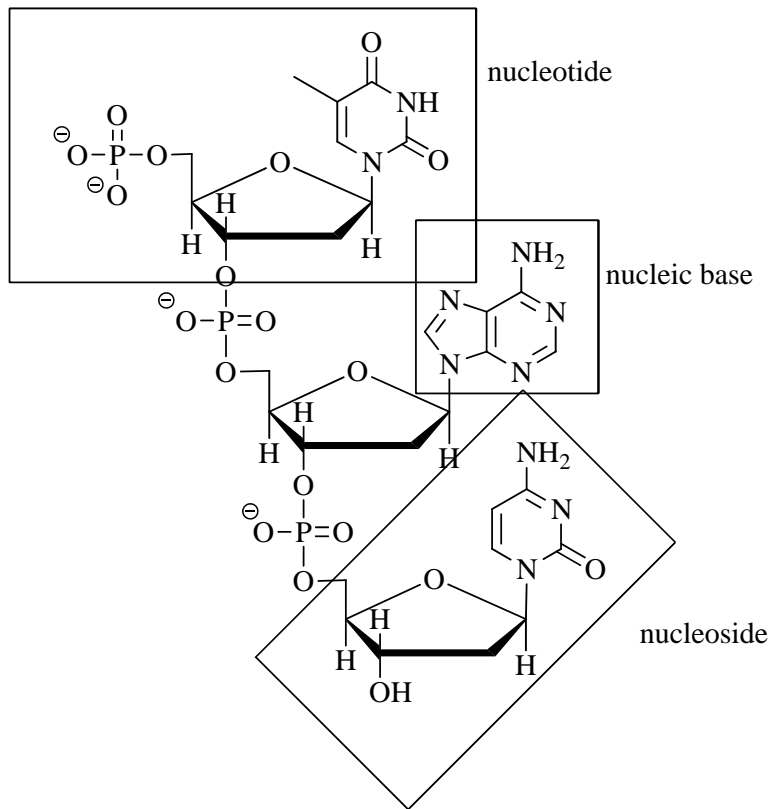
Propionic acid has strong hydrogen bonds, giving it a relatively high m.p. However, glycine has very strong ionic bonds between the NH_3^+ and CO_2^- groups giving it very high m.p.

2010-J-13

- It is a DNA fragment:

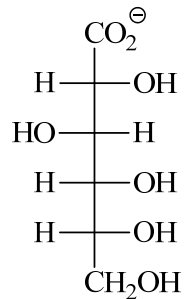
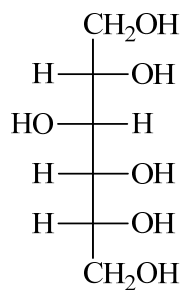
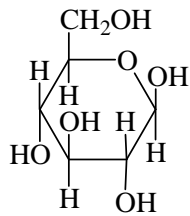
The sugar is deoxyribose (RNA has ribose as the sugar).

The topmost nucleic base is thymine (RNA utilises uracil instead of thymine).



2010-J-14

-



Yes. It has a number of alcohol groups which can H-bond with the very polar water molecules.