FUNDAMENTALS OF CHEMISTRY 1B (CHEM1002) - November 2014

2014-N-2

- 10^{-7} M

  6.17

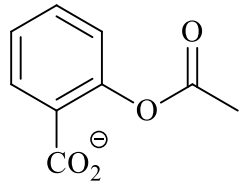
- 2.78

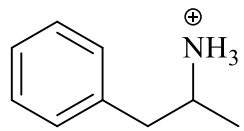
  $HC_3H_5O_3(aq) + OH^-(aq) \rightarrow C_3H_5O_3^-(aq) + H_2O(l)$

  The solution contains the conjugate base of lactic acid: the solution is basic.

2014-N-3

-





Aspirin is absorbed in stomach. Acidic environment so is mainly in its protonated uncharged form.

Amphetamine is absorbed in intestine where it exists as uncharged unprotonated molecule.

2014-N-4

2.8

$C_9H_8O_4(s) + OH^-(aq) \rightarrow C_9H_7O_4^-(aq) + H_2O(l)$

Basic. The $C_9H_7O_4^-(aq)$ ion reacts with water (*i.e.* undergoes hydrolysis) to generate a small amount of OH^- ions. The $C_9H_7O_4^-(aq)$ ion is a weak base, so the following equilibrium reaction lies very much in favour of the reactants.

$$C_9H_7O_4^-(aq) + H_2O(l) \rightleftharpoons C_9H_8O_4(aq) + OH^-(aq)$$

2014-N-5

- $Fe(OH)_3(s) \rightarrow Fe^{3+}(aq) + 3OH^-(aq)$

  1.1×10^{-10} M

  8.2

  6.8×10^{-22} M

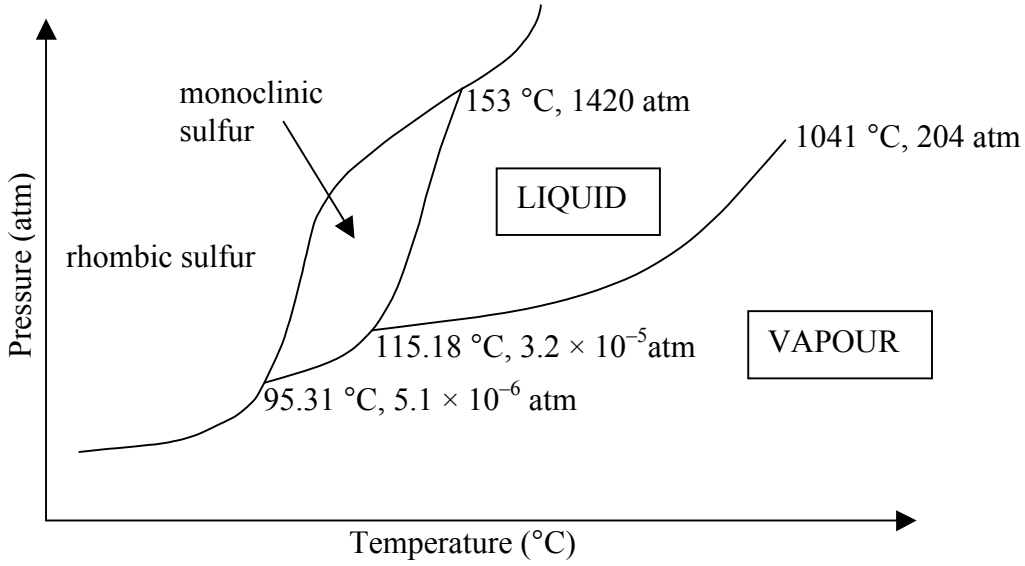
  Dissolved CO_2 reacts with water to form H_2CO_3 which is slightly acidic.

  $H_2CO_3(aq) \rightleftharpoons H^+(aq) + HCO_3^-(aq)$

The increase in $[H^+(aq)]$ results in a decrease in $[OH^-(aq)]$ and hence (from Le Chatelier's principle) more $Fe(OH)_3(s)$ will dissolve.

2014-N-6

•



rhombic

It changes into the monoclinic form and then it melts.

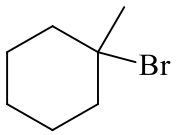
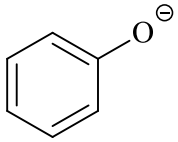
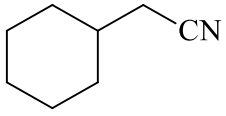
3

rhombic, monoclinic and vapour (at 95.31 °C and 5.1×10^{-6} atm);
monoclinic, liquid and vapour (at 115.18 °C and 3.2×10^{-5} atm);
rhombic, monoclinic and liquid (at 153 °C and 1420 atm);

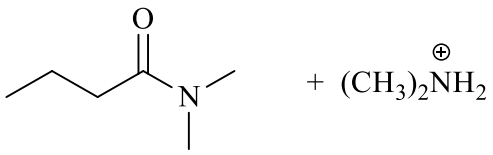
Rhombic is denser. If you start in the monoclinic region and increase the pressure at constant temperature *(i.e.* draw a vertical line upwards) you move into the rhombic region. Rhombic is thus the more stable form at higher pressures, so must be denser.

2014-N-7

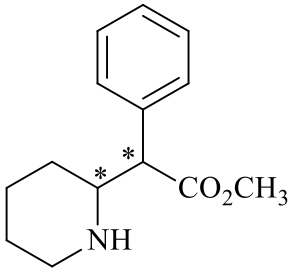
•

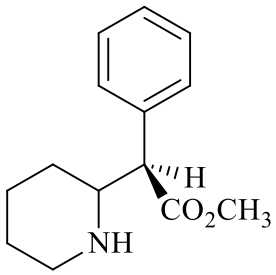
1-methylcyclohexene		
		
		

2014-N-7 (cont.)

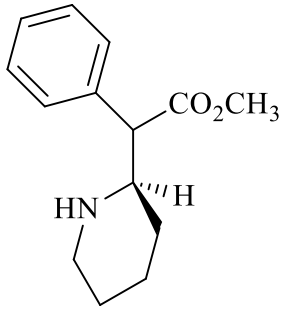
pentanal	$Cr_2O_7^{2-}$ / H^+	
		
		
	hot conc. KOH in ethanol solvent	

2014-N-8

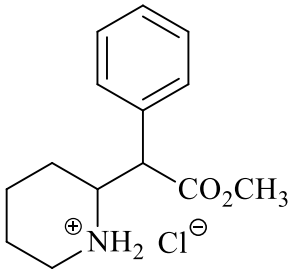




or



4 Each isomer has 1 enantiomer and 2 diastereoisomers.



The hydrochloride salt is soluble in water, which generally means better bioavailability.

Salt will have better stability - amines prone to aerial oxidation.

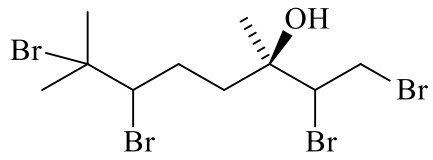
2014-N-9

- $C_{10}H_{18}O$

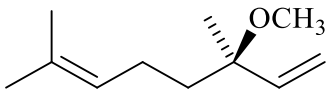
  (*R*)-enantiomer

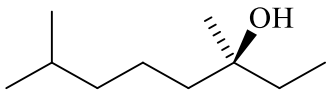
  tertiary alcohol, alkene

  No. One end of each double bond has two identical groups (methyl or hydrogen) attached to it.



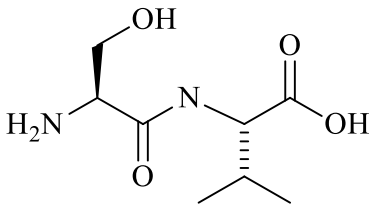
no reaction

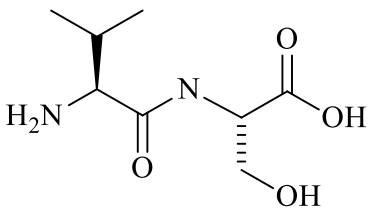




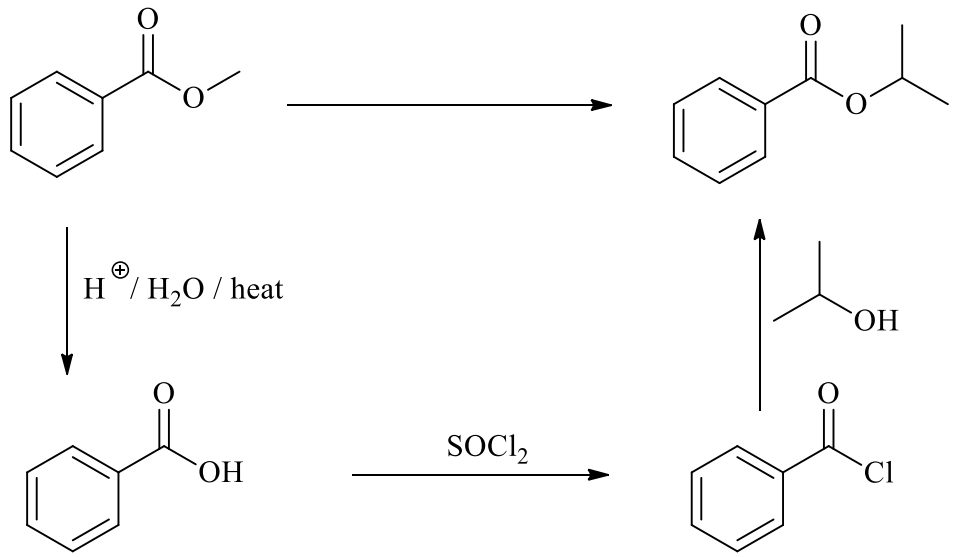
2014-N-10

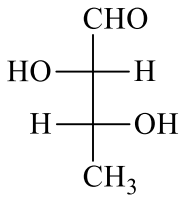
-



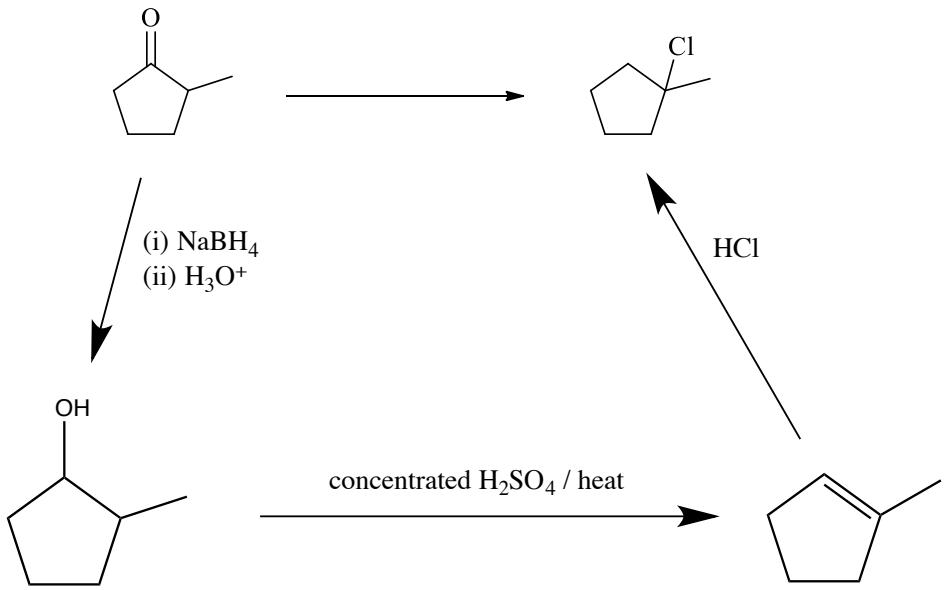


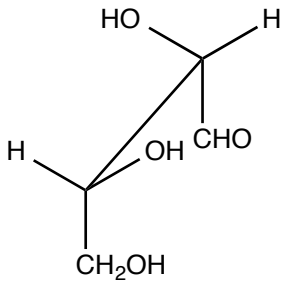
2014-N-11

- 

- 

2014-N-12

- 



The OH on the last stereogenic carbon on the Fischer projection (i.e. the third carbon from the top) is on the right hand side.