

## FUNDAMENTALS OF CHEMISTRY 1B (CHEM1002) - November 2013

2013-N-2

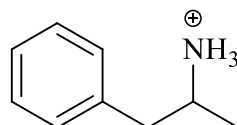
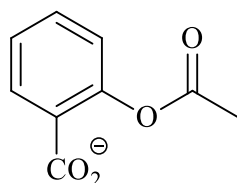
- $\text{Cu}_3\text{Au}$
- $\text{Co}^{2+}, 3d^7$   

↑↓	↑↓	↑	↑	↑
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 $\text{Co}^{2+}$  is a  $d^7$  system, so must have at least 1 unpaired electron. Consequently it must be paramagnetic.
- A catalyst provides a different reaction pathway which has a lower activation energy.

2013-N-3

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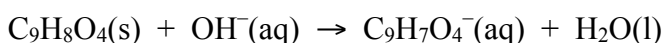


Aspirin is absorbed in stomach. Acidic environment so is mainly in its protonated uncharged form.

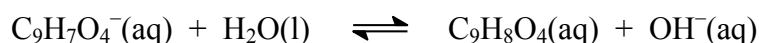
Amphetamine is absorbed in intestine where it exists as uncharged unprotonated molecule.

2013-N-4

2.8



Basic. The  $\text{C}_9\text{H}_7\text{O}_4^-(\text{aq})$  ion reacts with water (*i.e.* undergoes hydrolysis) to generate a small amount of  $\text{OH}^-$  ions. The  $\text{C}_9\text{H}_7\text{O}_4^-(\text{aq})$  ion is a weak base, so the following equilibrium reaction lies very much in favour of the reactants.



2013-N-5

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

$$1.1 \times 10^{-10} \text{ M}$$

8.2

$$6.8 \times 10^{-22} \text{ M}$$

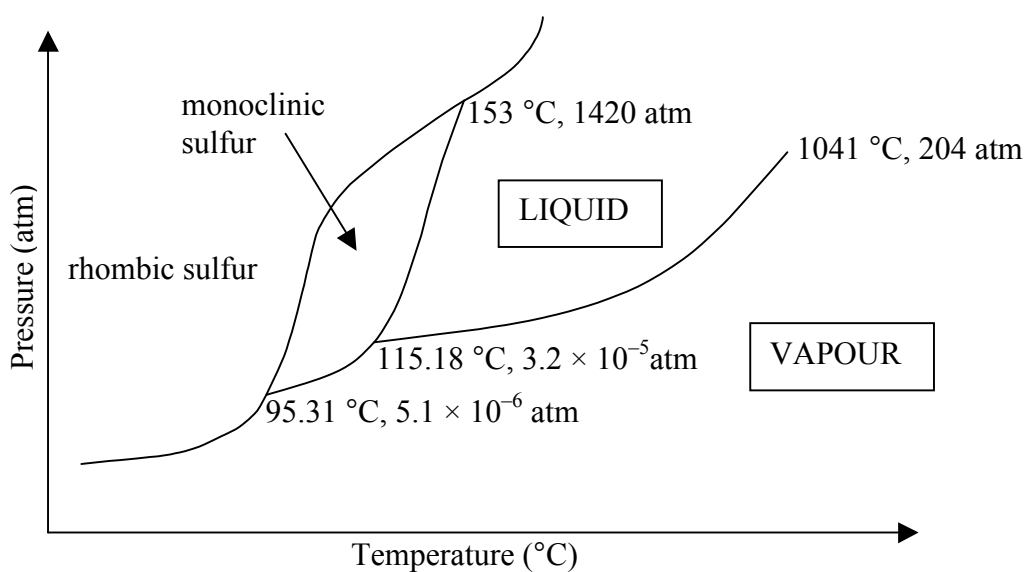
Dissolved  $\text{CO}_2$  reacts with water to form  $\text{H}_2\text{CO}_3$  which is slightly acidic.



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

2013-N-6

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rhombic

It changes into the monoclinic form and then it melts.

3

rhombic, monoclinic and vapour (at 95.31 °C and  $5.1 \times 10^{-6}$  atm);

monoclinic, liquid and vapour (at 115.18 °C and  $3.2 \times 10^{-5}$  atm);

rhombic, monoclinic and liquid (at 153 °C and 1420 atm);

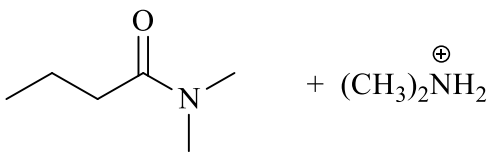
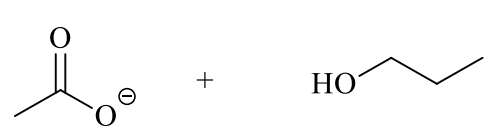
Rhombic is denser. If you start in the monoclinic region and increase the pressure at constant temperature (*i.e.* draw a vertical line upwards) you move into the rhombic region. Rhombic is thus the more stable form at higher pressures, so must be denser.

2013-N-7

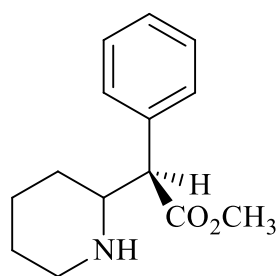
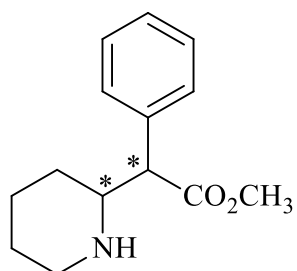
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1-methylcyclohexene		

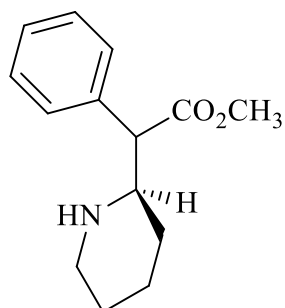
2013-N-7 (cont.)

pentanal	$\text{Cr}_2\text{O}_7^{2-} / \text{H}^+$	
		
		
	hot conc. KOH in ethanol solvent	

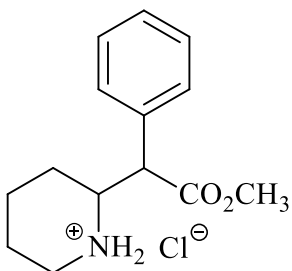
2013-N-8



or



4 Each isomer has 1 enantiomer and 2 diastereoisomers.

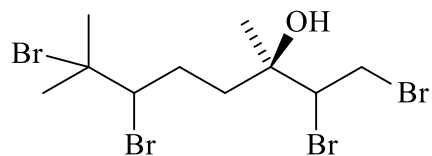


The hydrochloride salt is soluble in water, which generally means better bioavailability.

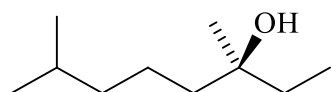
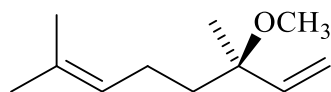
Salt will have better stability - amines prone to aerial oxidation.

2013-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.

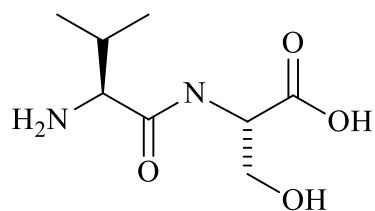
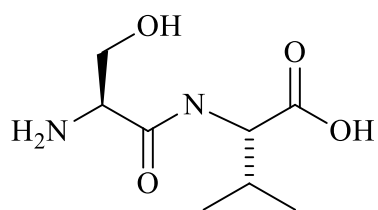


no reaction



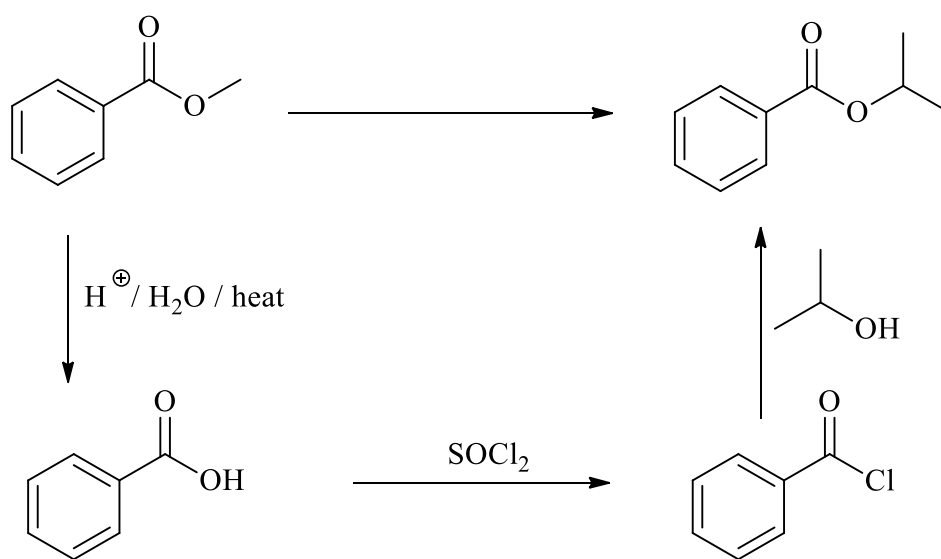
2013-N-10

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2013-N-11

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