CHEMISTRY 1B (CHEM1102) - June 2014

2014-J-2

- Cu_3Au
- Co^{2+}, $3d^7$

↑↓	↑↓	↑	↑	↑

Co^{2+} is a d^7 system, so must have at least 1 unpaired electron. Consequently it must be paramagnetic.

- A catalyst provides an alternative reaction pathway that has a lower activation energy. This allows the reaction to proceed at lower temperatures or under milder conditions. The catalyst is not consumed during the reaction and does not affect the final position of equilibrium.

2014-J-3

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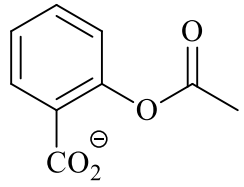
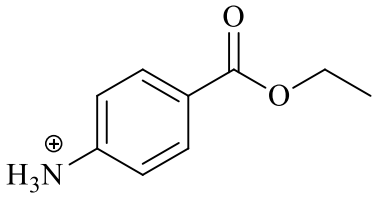




Aspirin is absorbed in the stomach as it remains in the neutral uncharged form in the acidic environment.
Benzocaine is absorbed in the intestine as it remains in the neutral uncharged form in the basic environment.

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-J-4

2.8

$$C_9H_8O_4(s) + NH_3(aq) \rightarrow C_9H_7O_4^-(aq) + NH_4^+(aq)$$

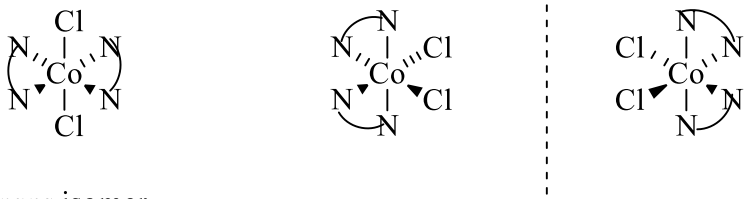
$$K = \frac{[NH_4^+][C_9H_7O_4^-]}{[NH_3][C_9H_8O_4]} \qquad \left(= \frac{[NH_4^+]}{[NH_3]} \frac{[H^+][C_9H_7O_4^-]}{[H^+][C_9H_8CO_4]} \right)$$

$K = 10^{5.7} = 5 \times 10^5$

Yes. K is large, so the reaction lies well to the product side.

2014-J-5

- dichloridobis(ethylenediamine)cobalt(II)



trans isomer

cis isomers

2014-J-6

- 1.8×10^{-9} M

  6.0×10^{-6} M

  3.0×10^{-5} M

  99.97%

2014-J-7

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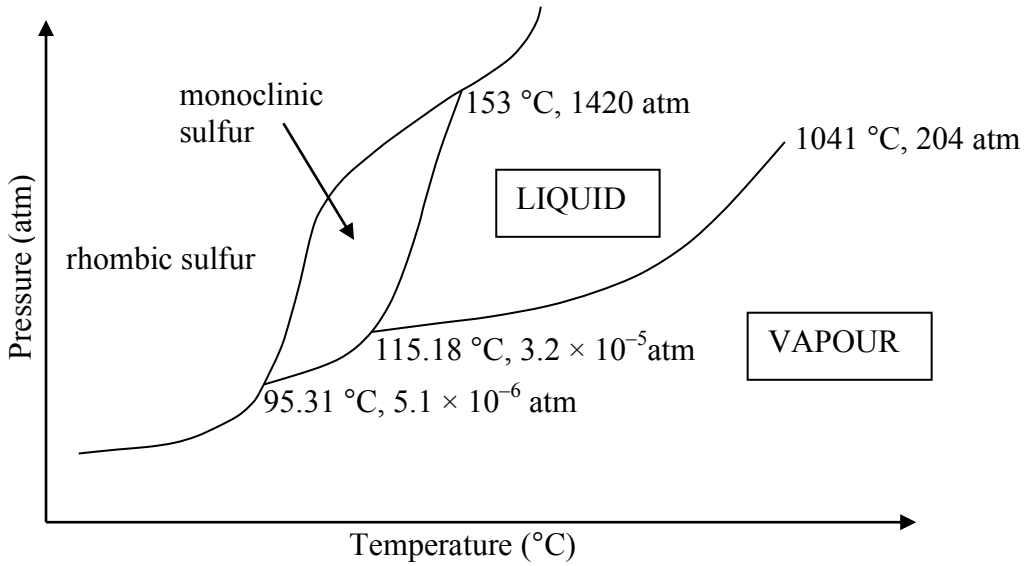

rhombic

It changes into the monoclinic form and then it melts.

3

rhombic, monoclinic and vapour (at 95.31 °C and 5.1×10^{-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-8

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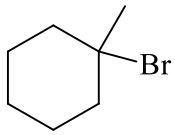
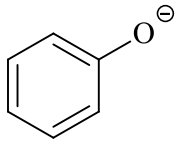
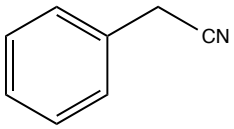
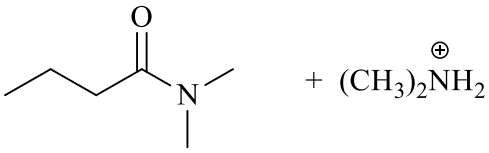
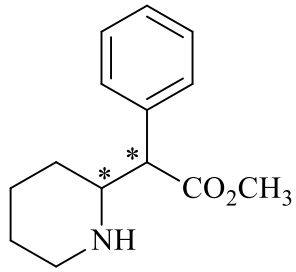
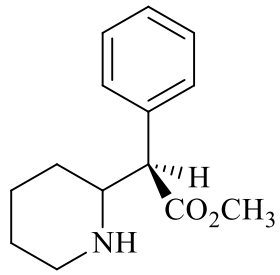
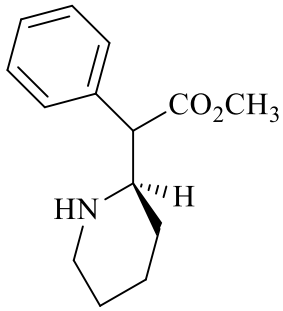
1-methylcyclohexene		
		
		
pentanal	$Cr_2O_7^{2-}$ / H^+	
		
		
	hot conc. KOH in ethanol solvent	

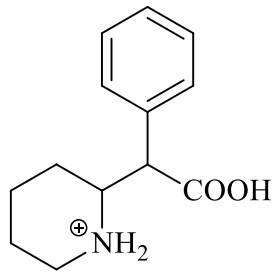




or



4 Each isomer has 1 enantiomer and 2 diastereoisomers.



+ CH_3OH

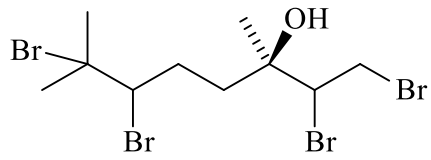
2014-N-10

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

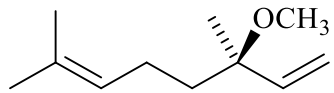
  (*R*)-enantiomer

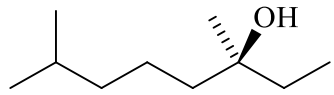
  tertiary alcohol, alkene

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



  no reaction





2014-N-11

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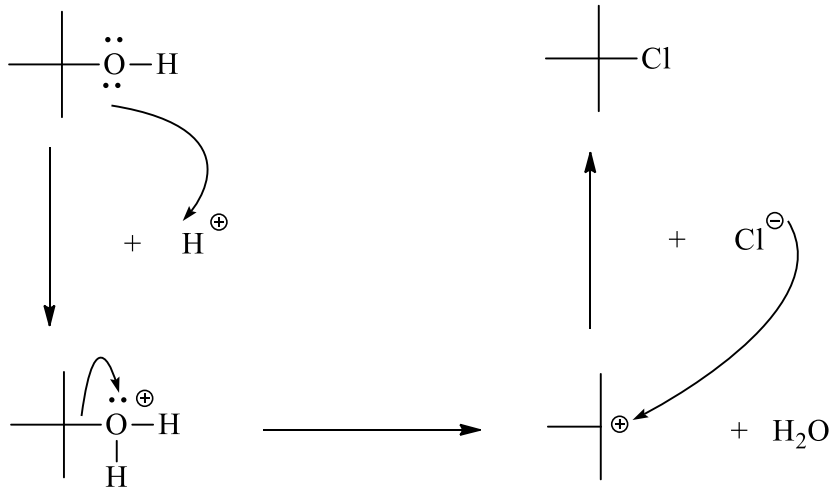

  substitution

  nucleophilic

  unimolecular

2014-N-12

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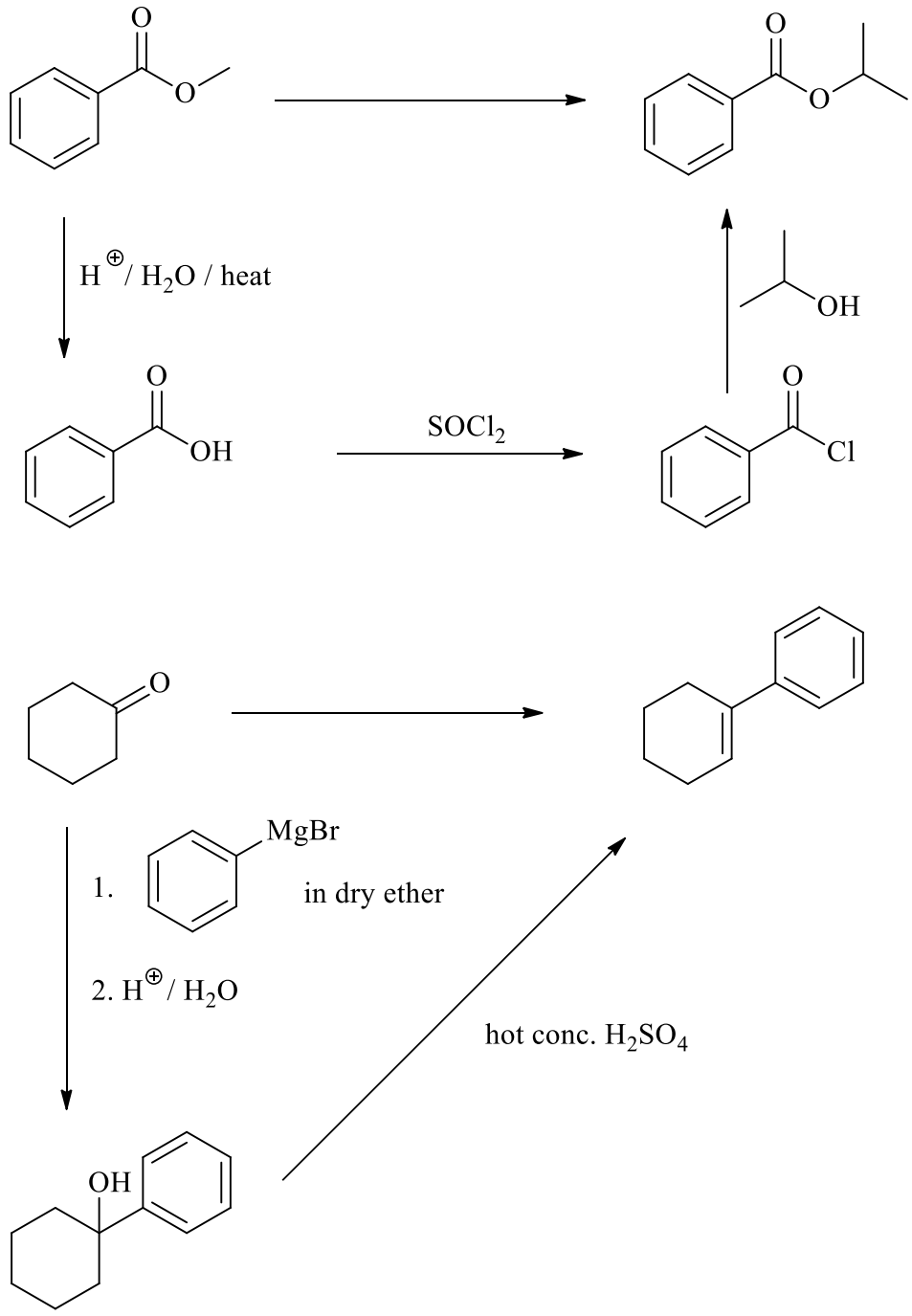
O
O
O
O
H⊕ / H2O / heat
OH
O
OH
SOCl2
O
Cl
OH
O
1.
MgBr
in dry ether
2. H⊕ / H2O
hot conc. H2SO4
OH