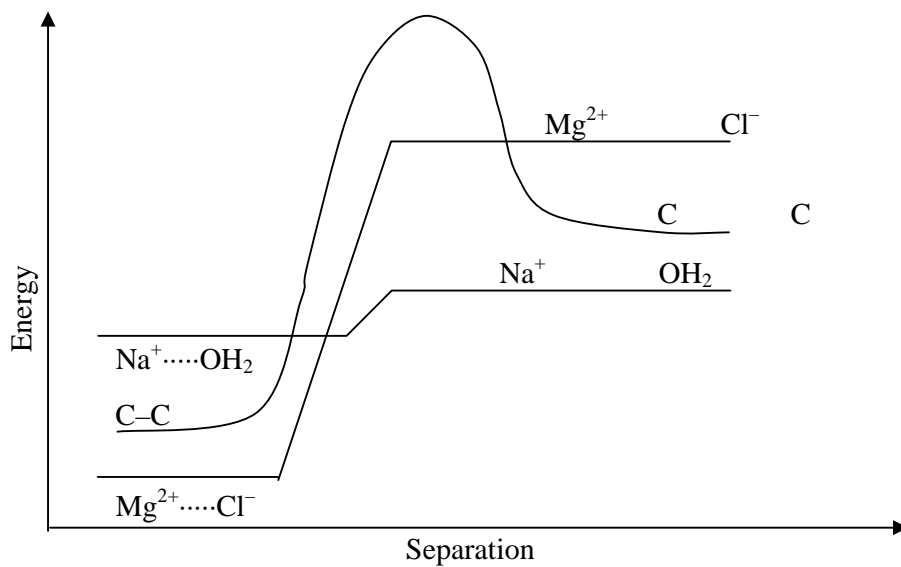


2009-N-2

- $5 \times 10^{-22} \text{ M}$
300
1500 %

2009-N-3



ion - dipole

ion - ion

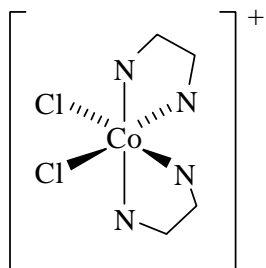
covalent bond

The covalent bond has a large energy barrier (activation energy) that must be overcome to break the bond. Ionic bonds don't have this barrier, but have a larger overall ΔH .

2009-N-4

- $[\text{CoCl}_2(\text{en})_2]\text{Cl}$

cis-dichloridobis(ethane-1,2-diamine)cobalt(III) chloride



d^6

cis and *trans* isomers. The *cis* isomer can form optical isomers.

cis isomer. The *trans* isomer can't form enantiomers.

2009-N-5

- $\text{Rate} = k[\text{NO}]^2[\text{O}_2]$

$$860 \text{ L}^2 \text{ mol}^{-2} \text{ s}^{-1}$$

$$4.7 \times 10^{-4} \text{ M s}^{-1}$$

Possible mechanism is:



$$\text{From Step 1: } K_1 = \frac{[\text{N}_2\text{O}_2]}{[\text{NO}]^2} \Rightarrow [\text{N}_2\text{O}_2] = K_1[\text{NO}]^2$$

$$\begin{aligned} \text{From Step 2: } \text{Rate} &= k[\text{N}_2\text{O}_2][\text{O}_2] \\ &= kK_1[\text{NO}]^2[\text{O}_2] \text{ which agrees with the experimental rate law} \end{aligned}$$

2009-N-6

- Cu_3Au

12 carat

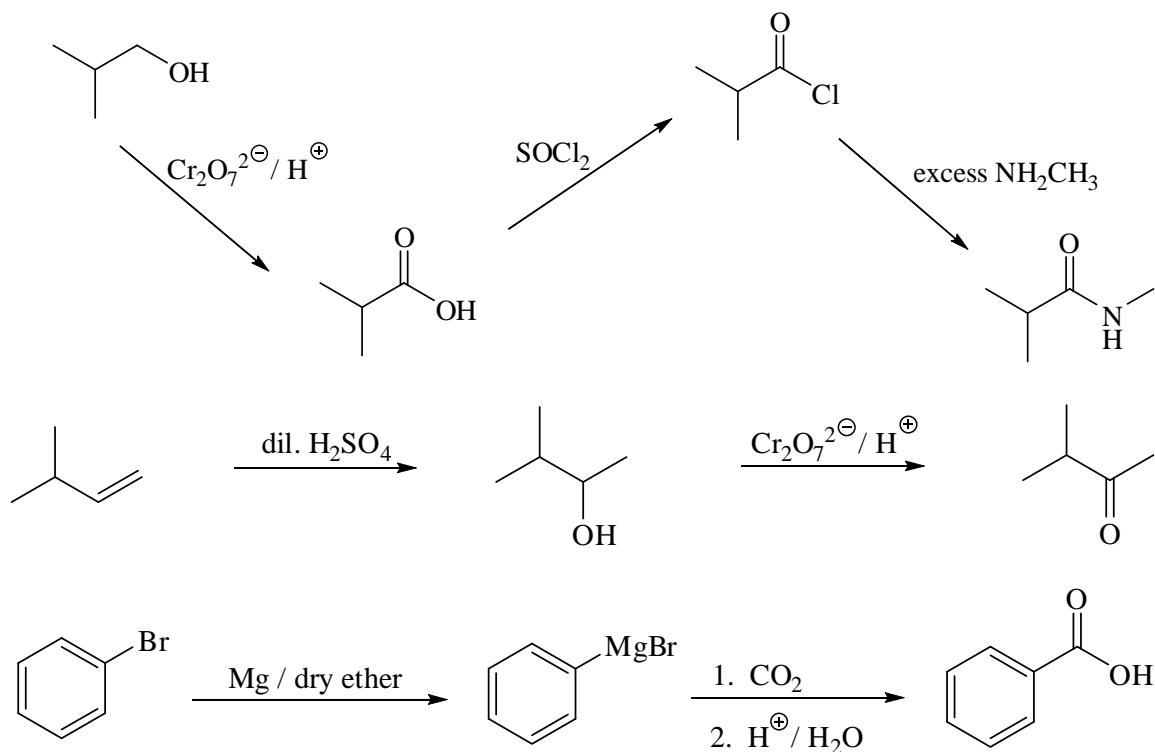
$$4.7 \times 10^{-29} \text{ m}^3$$

$$14 \text{ g cm}^{-3}$$

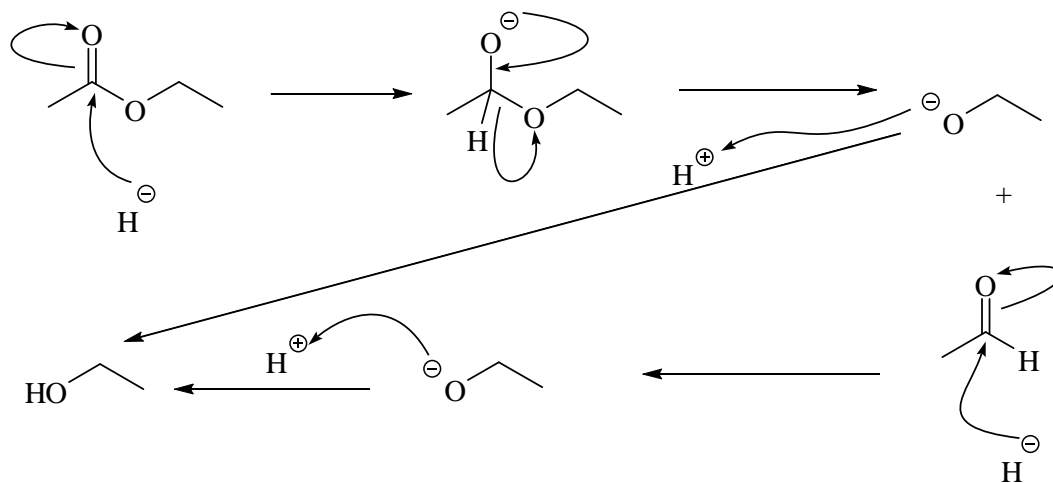
2009-N-7

- The solid would warm to 950°C where melting would begin. From $950 - 960^\circ\text{C}$ solid and liquid phases would co-exist. (Compare with a pure substance where there is no increase in temperature whilst the solid melts.) Above 960°C , only liquid is present.

2009-N-8



2009-N-9

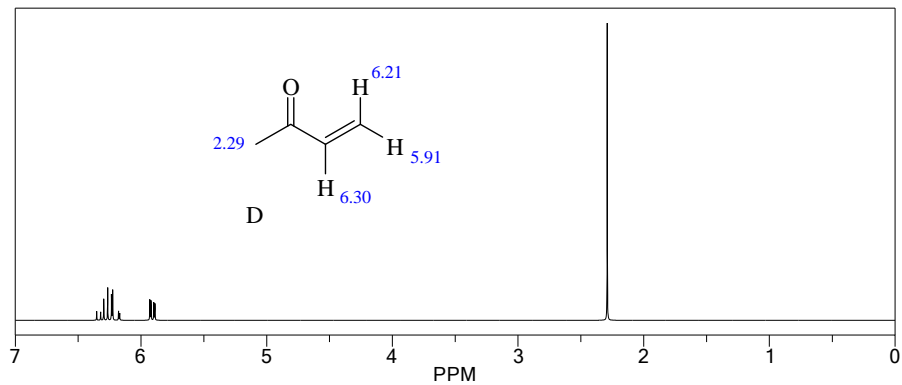
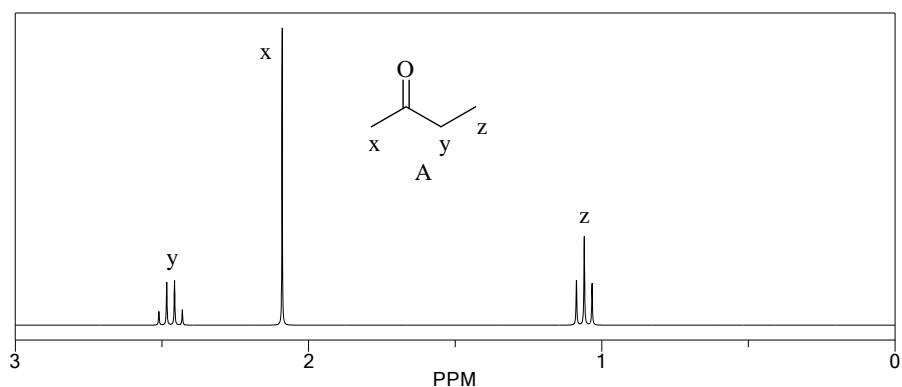
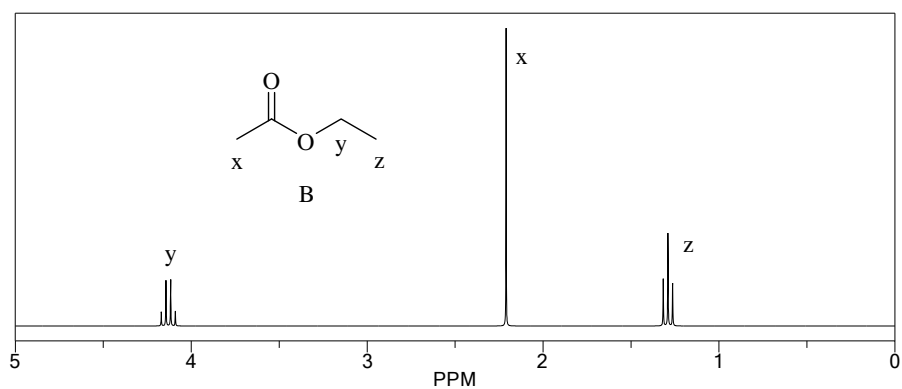


2009-N-10

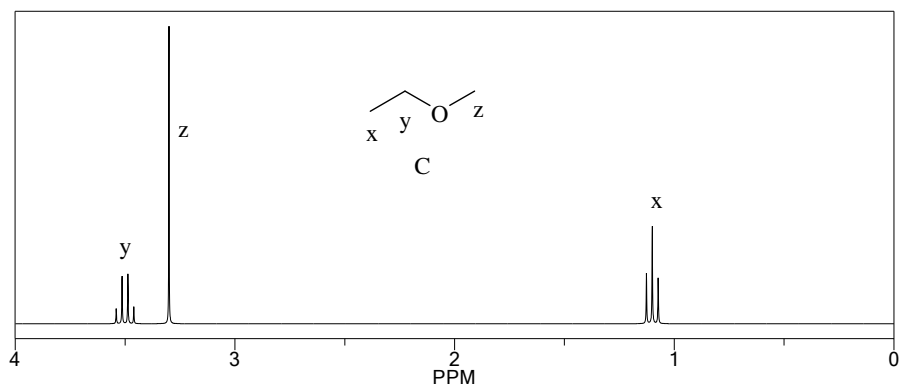
- (Q) There is greater resonance stabilisation of the conjugate base (more canonical forms).
- (R) There is greater resonance stabilisation of the conjugate base because it is aromatic.
- (T) There is greater resonance stabilisation of the conjugate base due to the inductive electron withdrawal of the very electronegative F atoms. (Or electron withdrawal by electronegative fluorines weakens the O–H bond, making T the stronger acid.)

2009-N-11

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The correct assignments are as shown above, but level of knowledge in First Year only allows you to assign the singlet at 2.29 and the other 3 signals to the protons around the double bond.

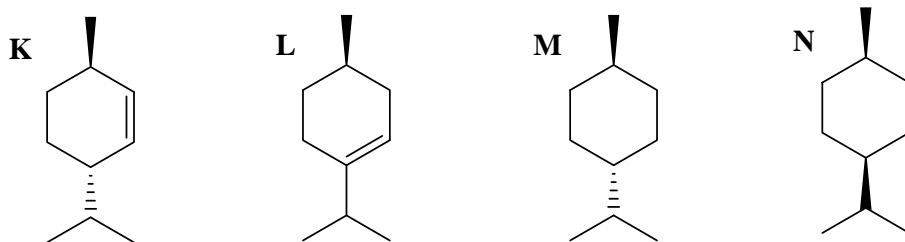


2009-N-12

- 2-isopropyl-5-methylcyclohexanol
2-(1-methylethyl)-5-methylcyclohexanol is also acceptable.

C1 is (*R*) Priorities: OH > C2 C(C,C,H) > C6 C(C,H,H) > H
With H at back, the order of -OH → -C2 → -C6 goes clockwise

C2 is (*S*) Priorities: C1 C(O,C,H) > isopropyl C(C,C,H) > C3 C(C,H,H) > H
Remember the H is pointing in front of the paper.
With H at back, the order of -C1 → -CH(CH₃)₂ → -C3 goes anticlockwise

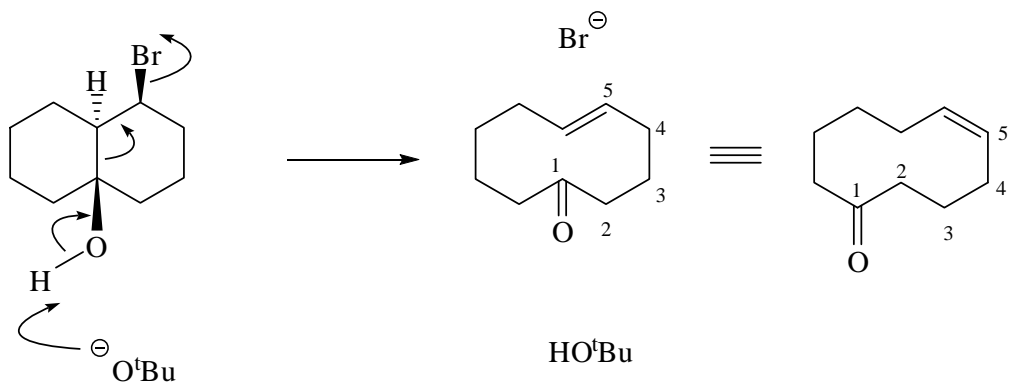


constitutional isomers

diastereoisomers

J, K and L

2009-N-13



The groups must have an antiperiplanar alignment in order that the orbitals overlap correctly to form the new bonds.