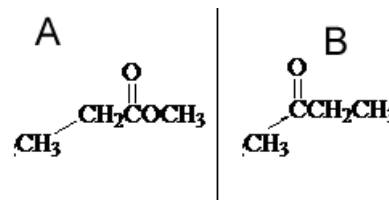


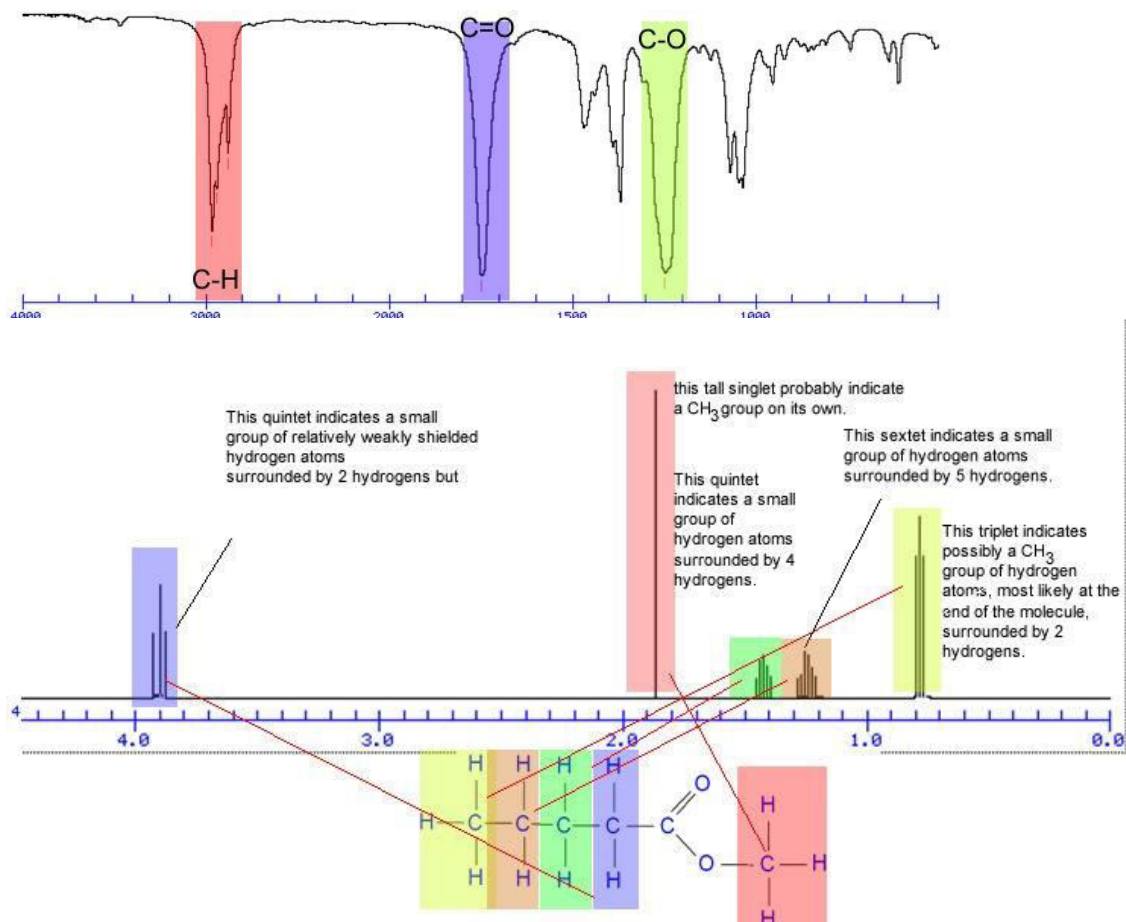
IR and NRM spectroscopy

- 1) Consider the following statements.
- i. Valence electrons in metal atoms absorb energy and are excited to higher energy levels.
 - ii. Valence electrons in metal atoms release energy as they return from high energy levels to low energy levels.
 - iii. Nucleons absorb radio waves and are excited to higher energy spin states.
 - iv. Bonds present in a molecule stretch or bend by absorbing energy of specific wavelength.
 - v. Bonding and non-bonding valence electrons only absorb energy and are promoted to a higher energy state.
 - vi. The energy absorbed depends on the mass of the atoms forming a bond.
- a) Which of the statements above relate to IR spectroscopy?
 - b) Which of the statements above relate to NMR spectroscopy?
 - c) Which of the statements above relate to UV-visible spectroscopy?

- 2) How can IR spectroscopy be used to distinguish between compounds "A" and "B" shown on the right?



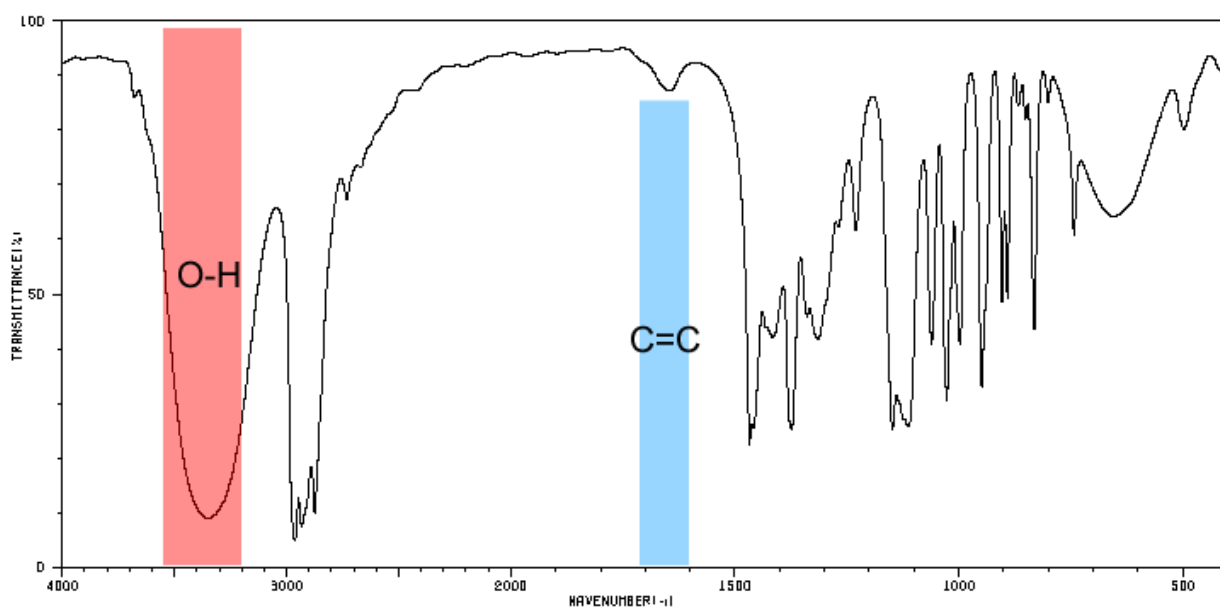
- 3) A compound has the molecular formula $C_6H_{12}O_2$. Its IR and 1H NMR spectra are shown below.



a) Identify the bonds present in the molecule?

b) Give a possible structural formula for the compound

4) Below is the IR spectrum of an organic molecule.



A scientist suspects that it belongs to either of three molecules

- i) $\text{CH}_3\text{CHOHCH}_2\text{CH}_2\text{CH}_3$
- ii) $\text{CH}_3\text{CHCHCH}_2\text{CH}_2\text{OH}$
- iii) $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{COOH}$

Which molecule is likely to form the IR spectrum above? Discuss with reference to the IR spectrum.