# CH1012 Tutorial 7

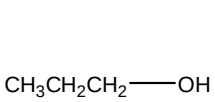
**Name:**

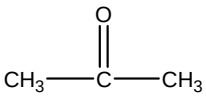
1. A colourless organic liquid which reacted with sodium metal to give an explosive gas gave the following analytical results: C: 64.80% H: 13.50%
   Mass spectrum: m/z 74 Infrared spectrum: 3300 $cm^{-1}$ s,br; 2900 $cm^{-1}$ s
   - Provide a reasonable **molecular formula**, **structure** and **IUPAC name** for the compound. [1]
   - Explain how you came up with this answer.

2. Explain how you would **purify** a well characterised organic liquid that had been contaminated with an organic solid which had completely dissolved in it.
   - How would you verify the purity of the purified material?

[1] Atomic masses: C 12.0 H 1.0 O 16.0
IR table see over page

3. Explain how compounds in the following pairs could be **distinguished** on the basis of their IR and NMR spectra ($^{1}H$ & $^{13}C$).
   (i)





4. Given the following information (formula, IR, NMR) deduce a **structure** for the following organic compound. Detail how you came up with the structure you have chosen.

   Molecular formula: $C_5H_8O_2$

   UV($CH_2Cl_2$): $\lambda$ l90 nm, $\varepsilon$ 1800 $M^{-1}$ $cm^{-1}$

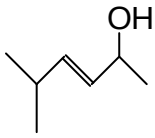
   IR(KBr): 2950 (m), 1742 (s), 1625 (s), $cm^{-1}$

   $^{1}H$ NMR ($CDCl_3$): 5.50 (dd, 1H), 5.05 (dd, 1H), 4.02 (m, 1H), 2.51 (d, 2H), 3.52 (s, 3H) ppm

   $^{13}C$ NMR($CDCl_3$): 167.0 , 135.0 , 124.5 , 62.0 , 18.2 ppm

5. Provide **IUPAC names** for the following molecules:

(a)



(b)

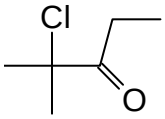
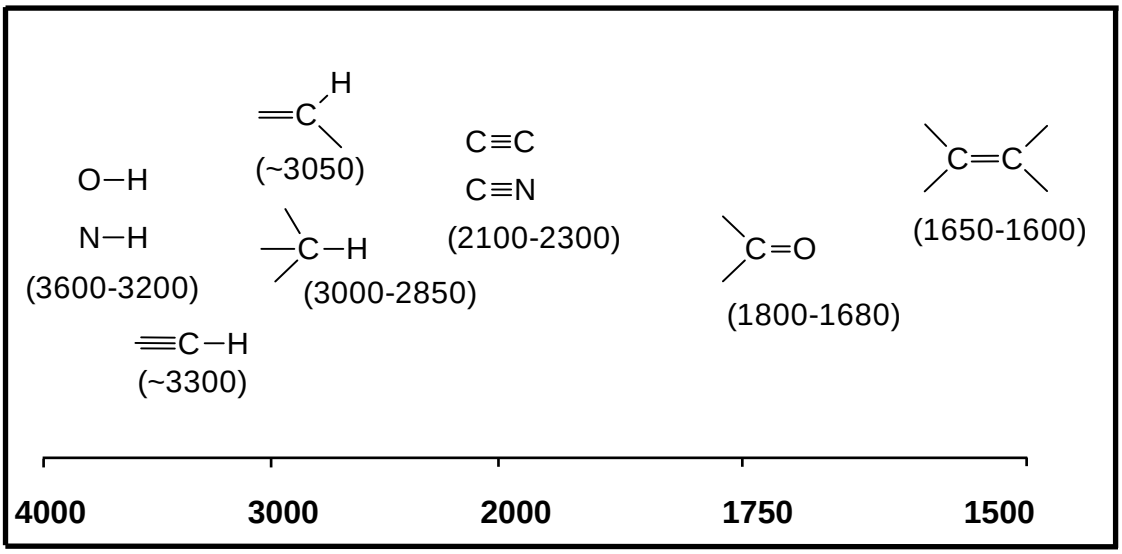
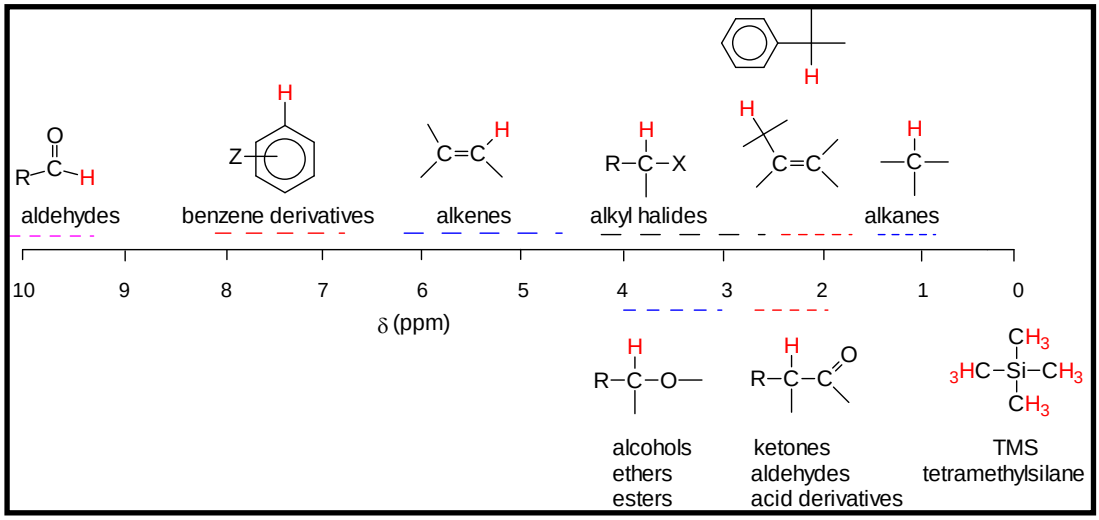


**Chart 1. Typical Infrared (IR) frequencies of common functional groups**




**Carbonyl Absorptions** ν ($cm^{-1}$) **Acid chlorides** ~ 1790**; Esters** ~ 1740**;**
**Aldehydes** ~ 1720**; Ketones** ~ 1710**; Acids** ~ 1700

**Approximate $^{1}$H NMR shifts of protons bound to C in organic compounds**




**Approximate $^{13}$C NMR shifts for groups in organic compounds**