

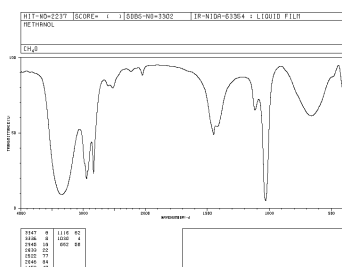
## Intro to Chemistry III

- Low resolution mass spectrometry identified the molecular ion peak of an organic molecule as 86. Suggest three possible molecular formulae for the molecule.
  - High resolution mass spectrometry identified the molecular ion peak of the organic molecule as 85.998. Deduce the molecular formula of the molecule, given the following relative isotopic masses:

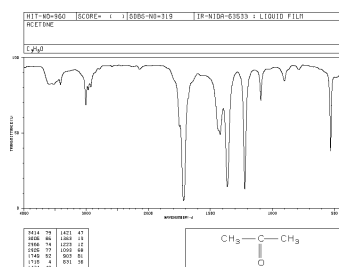
isotope	Relative isotopic mass
$^{16}\text{O}$	15.994
$^{12}\text{C}$	12.000
$^1\text{H}$	1.008

- Identify the bonds responsible for all the peaks in the non-fingerprint region of the following infra-red spectra, and hence state the functional group present:

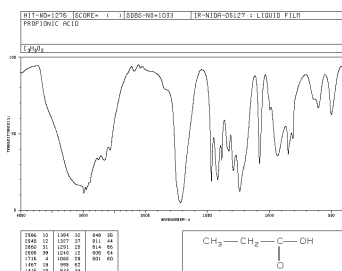
a)



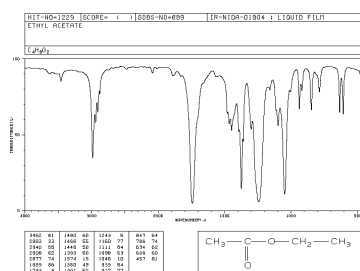
b)



c)



d)



- Three compounds A, B and C, all with molecular formula  $\text{C}_4\text{H}_8\text{O}_2$ , are found to have very different infra-red spectra. All three spectra contain a sharp peak at  $1700\text{ cm}^{-1}$ , but the infra-red spectrum of A contains a broad peak at  $2500 - 3000\text{ cm}^{-1}$ , the infra-red spectrum of B contains no broad peaks, and the infra-red spectrum of C contains a broad peak at  $3000 - 3300\text{ cm}^{-1}$ . Suggest possible structures for A, B and C.

4. Suggest how infra-red spectroscopy could be used to determine the exact structure of a molecule containing only C-H absorptions and a C=O absorption in the region  $1500 - 3500 \text{ cm}^{-1}$ .