

## Chemguide – answers

### INFRA-RED SPECTROSCOPY: THE FINGERPRINT REGION

1. The fingerprint region of the spectrum lies at the right-hand side covering wavenumbers of about 1500 to 500  $\text{cm}^{-1}$ .

Comparing the two spectra, they are obviously very different in this region, whereas there are definite similarities on the left-hand side of the spectrum.

The troughs at higher wavenumbers pick out particular bonds in the molecules. As you will discover later, the two major troughs on both spectra are due to O-H bonds and C-H bonds. Since both molecules contain these, you would expect them to be similar.

In the fingerprint region, many of the troughs are due to vibrations of the molecule as a whole and, because the two molecules are different, the fingerprint region will be different as well.

The fingerprint regions of different molecules will always be different, and so you can identify a molecule by comparing its fingerprint region with the fingerprint regions of known substances - provided, of course, that they are measured under identical conditions.

(Note: If you are very wide awake, you might wonder why the C-O bonds don't produce a trough in the spectra of these two alcohols. In fact, they do, but the trough falls into the fingerprint region at around 1100  $\text{cm}^{-1}$ . You have to be very careful about identifying troughs with specific bonds if they fall within this region.)