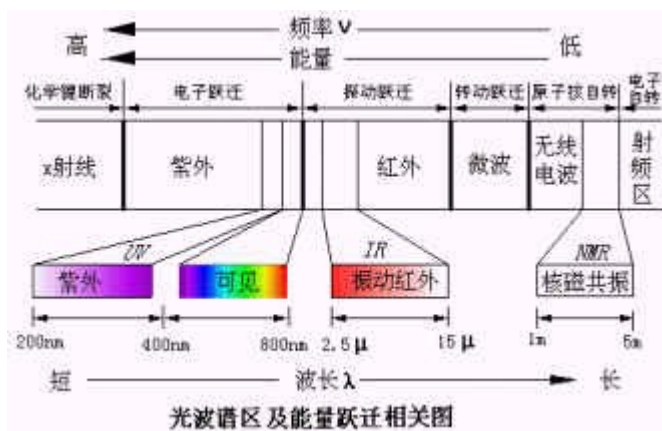


## § 8.1.1 Introduction

Molecules can selectively absorb infrared light at certain wavelengths, and then get



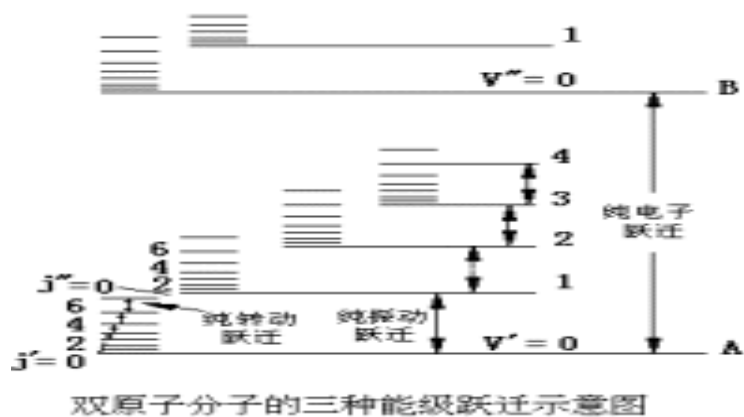
excited and relaxed between vibration and rotation energy levels. So, Infrared Absorption Spectroscopy is also called molecular vibration spectroscopy or rotational spectroscopy. By analyzing the absorption of IR light by the substances, the infrared absorption spectroscopy can be obtained.

Most vibration spectroscopy of organic functional groups appears at  $2.5 \sim 25 \mu\text{m}$  ( $4000\text{--}400 \text{ cm}^{-1}$ ). The light wavelength falling into this region is normally called mid-IR. The IR mentioned is commonly the mid-IR.

IR has the following advantages, such as simplicity in identify and use and the width of its application fields. Therefore, it is one of the common methods in structure analysis of organic compounds.

From the IR spectrum of organic compounds, the functional groups can be determined:

Radiation → excitation between the vibration energy level → IR → Functional groups → molecular structure

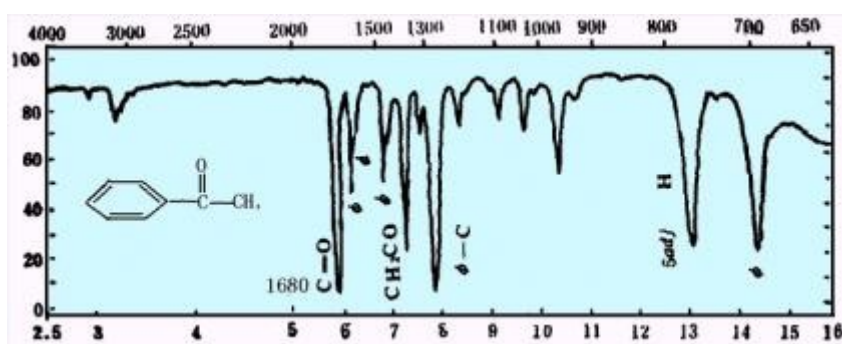


IR provides the microscopic information on the molecular structure of organic compounds. With these information, functional groups exist in the compound can be identified. Molecular structure of unknown substances can be determined by comparing the IR spectroscopes. In these cases, IR and other spectroscopy such as NMR are used together to determine the structure.

IR shows the adsorption peak position of each functional groups exist in the compound.

The X-axis shows the intensity of absorption,

the Y-axis shows the absorption wavelength in the unit of  $\mu\text{m}$  or wavenumber ( $\text{cm}^{-1}$ ).



The absorption peaks of each functional groups can be described by the numbers, positions, shapes of peaks and also their intensities.

Application: Determination of structure of organic compounds

Quality: The absorption frequency of each functional group

Quantity: Intensity of absorption peaks.

Key points: Application and theory of IR, the vibration equation and calculation, the vibration mode of each functional groups, factors that affect the peak positions.

Questions: There are 4 vibration modes for CO<sub>2</sub> molecule, but why there are only 2 peaks on its IR spectroscopy?