Sim Pack 4:

Ultraviolet-Visible Absorption Spectroscopy & the Beer Lambert Law

Version 1.0

Learning Outcomes:

After reading these notes you will learn about the following terms

- **Wave particle duality**
- **Absorption spectrum**
- **Ultraviolet - visible absorption spectrometer**
- **Beer Lambert Law**

The complete electromagnetic spectrum is shown below:

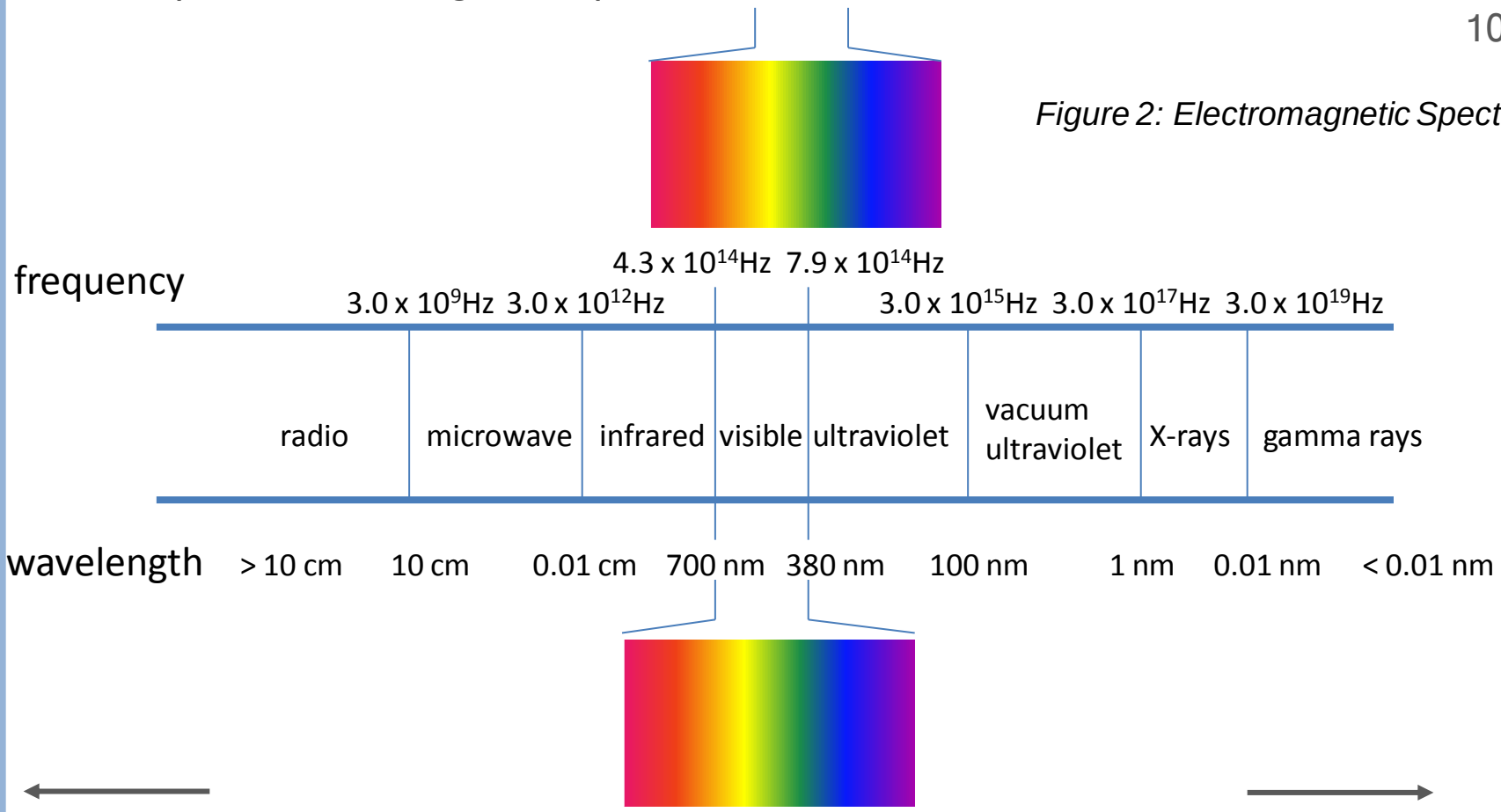

Figure 2: Electromagnetic Spectrum

long wavelength

low frequency

low energy

$$E = h\upsilon = \frac{hc}{\lambda}$$

short wavelength

high frequency

high energy

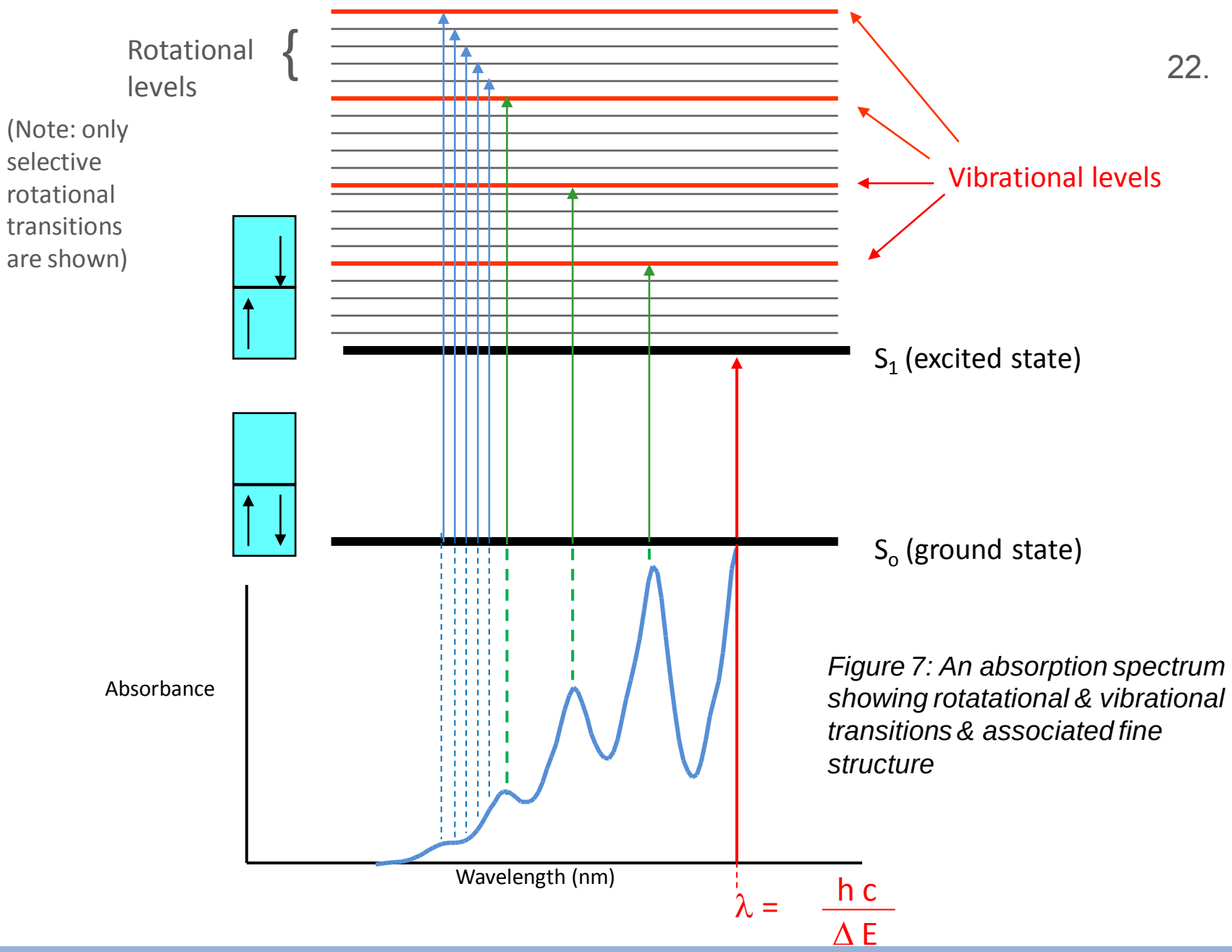

Figure 7: An absorption spectrum showing rotatational & vibrational transitions & associated fine structure

UV-Visible Absorption Spectrometer

We will now look at a typical uv-visible absorption spectrometer (see Figure 9) which is used to measure a moleucle's absorption spectrum or absorption at a single λ.

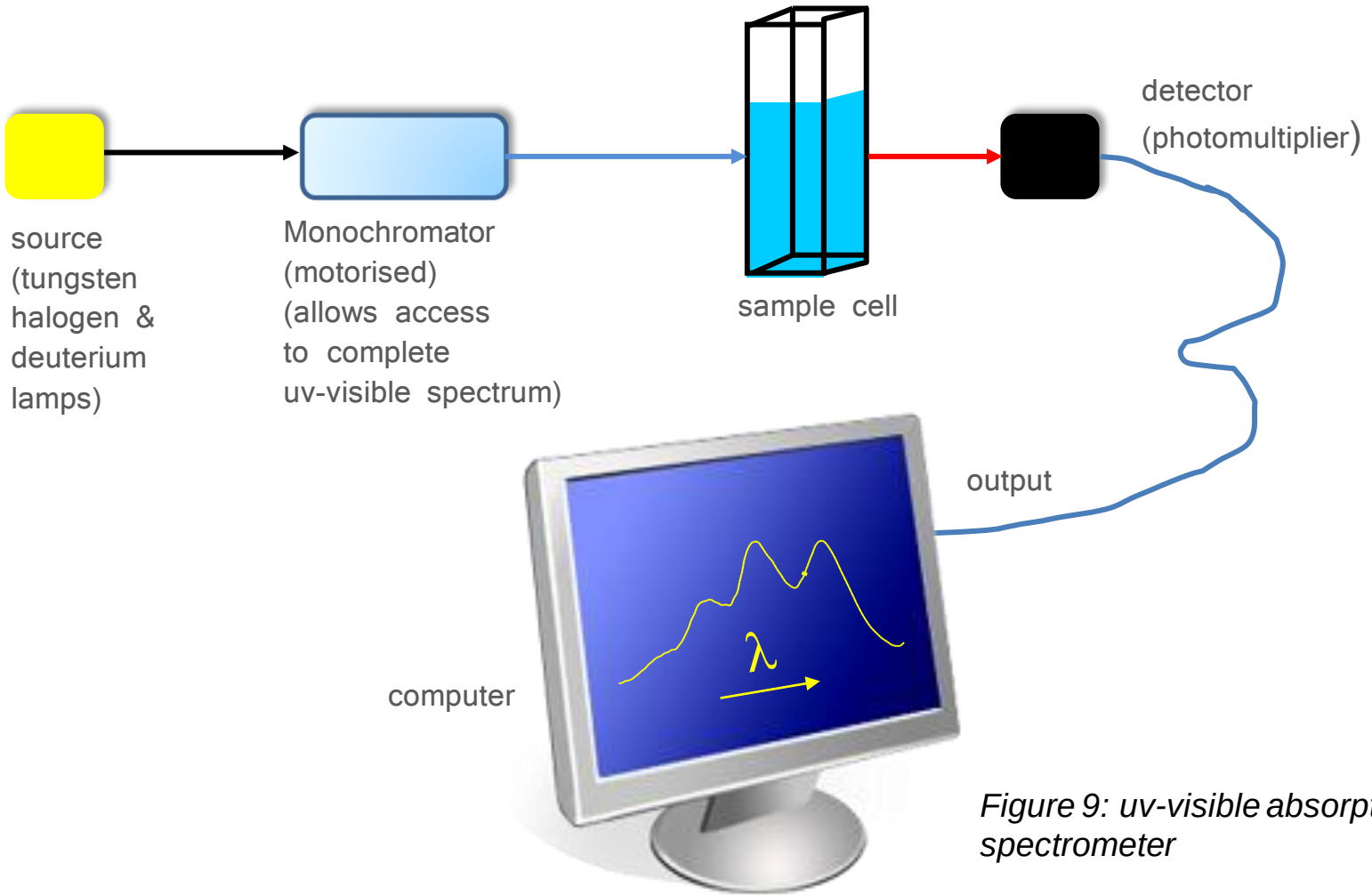

Figure 9: uv-visible absorption spectrometer

UV-Visible Spectroscopy- Uses in Science

Since this form of spectroscopy is concerned with outer electron shell transitions it can provide information about the electronic structure of molecules.

Absorption spectroscopy is also important in chemical analyses: we can identify how much of a species is present in a sample by running its absorption spectrum.

This is as a result of the Beer-Lambert Law.

Beer – Lambert Law

The absorption of a beam of light by homogeneous absorbing systems can be formally described by the Beer-Lambert Law. The principle of the measurement is shown in Figure 10.

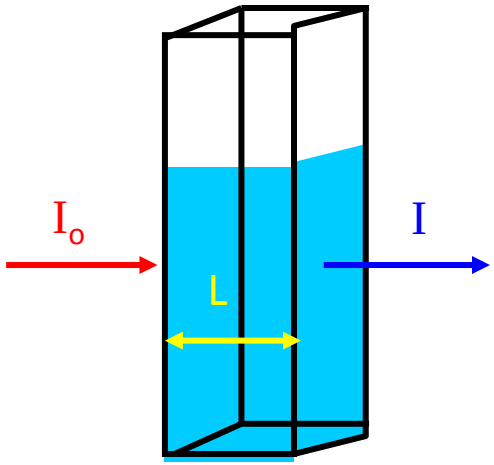

Figure 10: Principle of absorbance measurement & the Beer-Lambert Law