

Sim Pack 4:

Ultraviolet-Visible Absorption Spectroscopy & the Beer Lambert Law

Version 1.1

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Learning Outcomes:

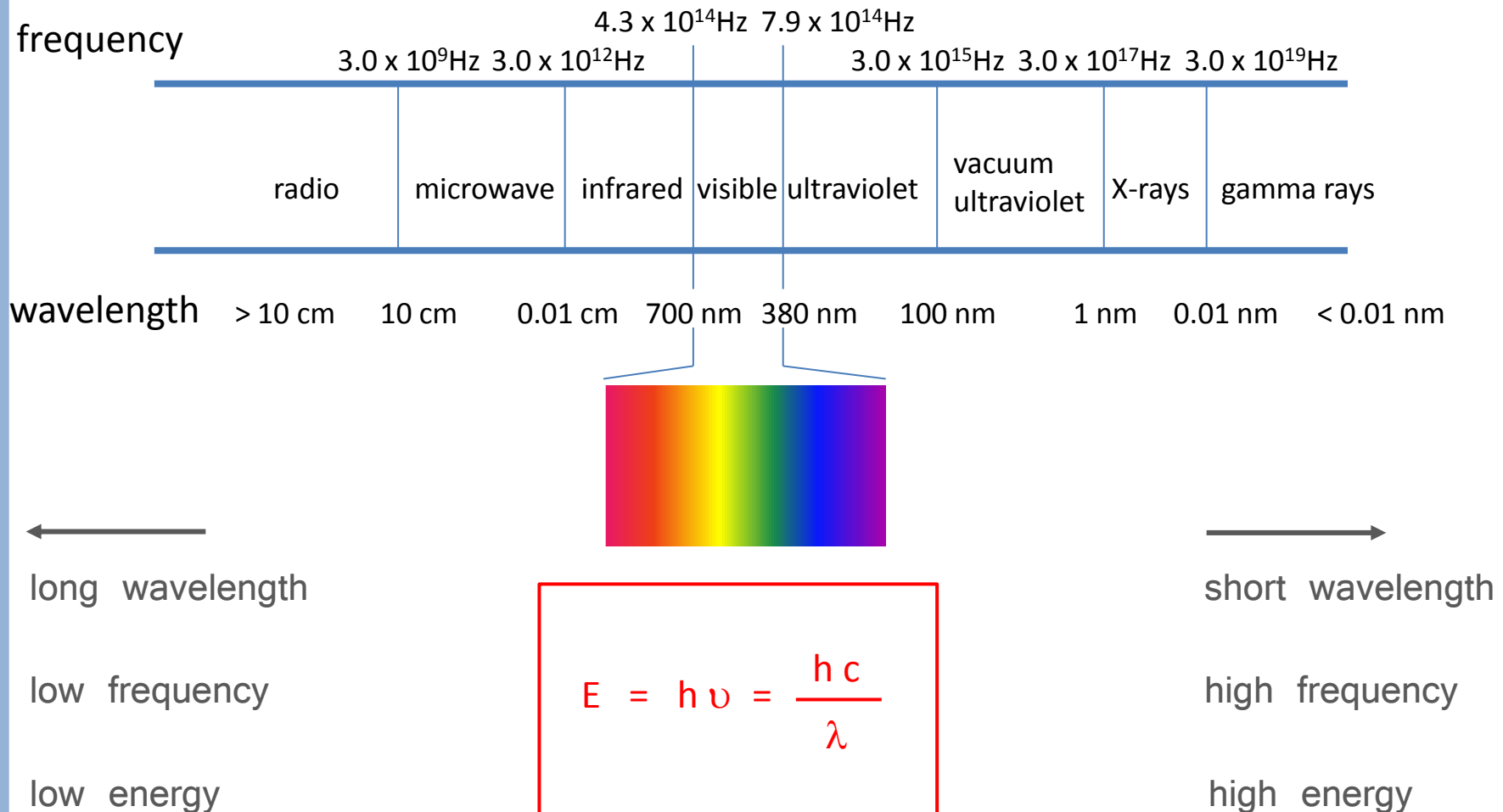
After reading these notes you will learn about the following terms

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

The complete electromagnetic spectrum is shown below:

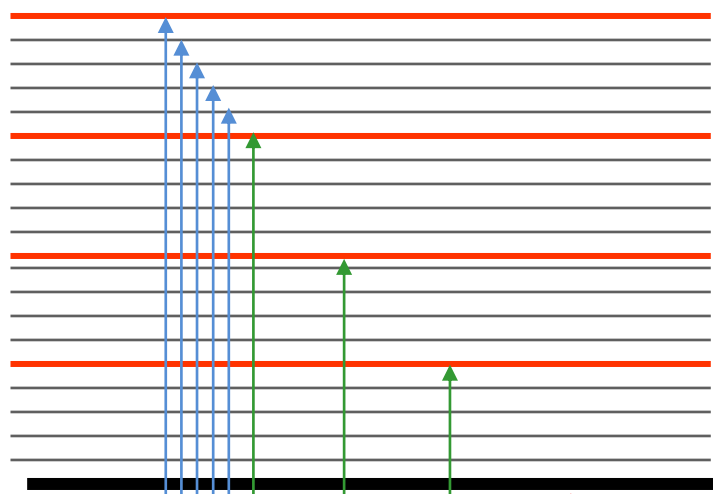
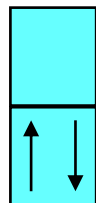
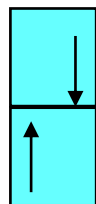
10.

Figure 2: Electromagnetic Spectrum



(Note: only selective rotational transitions are shown)

Rotational levels {



S_1 (excited state)

S_0 (ground state)

Vibrational levels

Absorbance

Wavelength (nm)

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

$$\lambda = \frac{hc}{\Delta E}$$

UV-Visible Absorption Spectrometer

27.

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

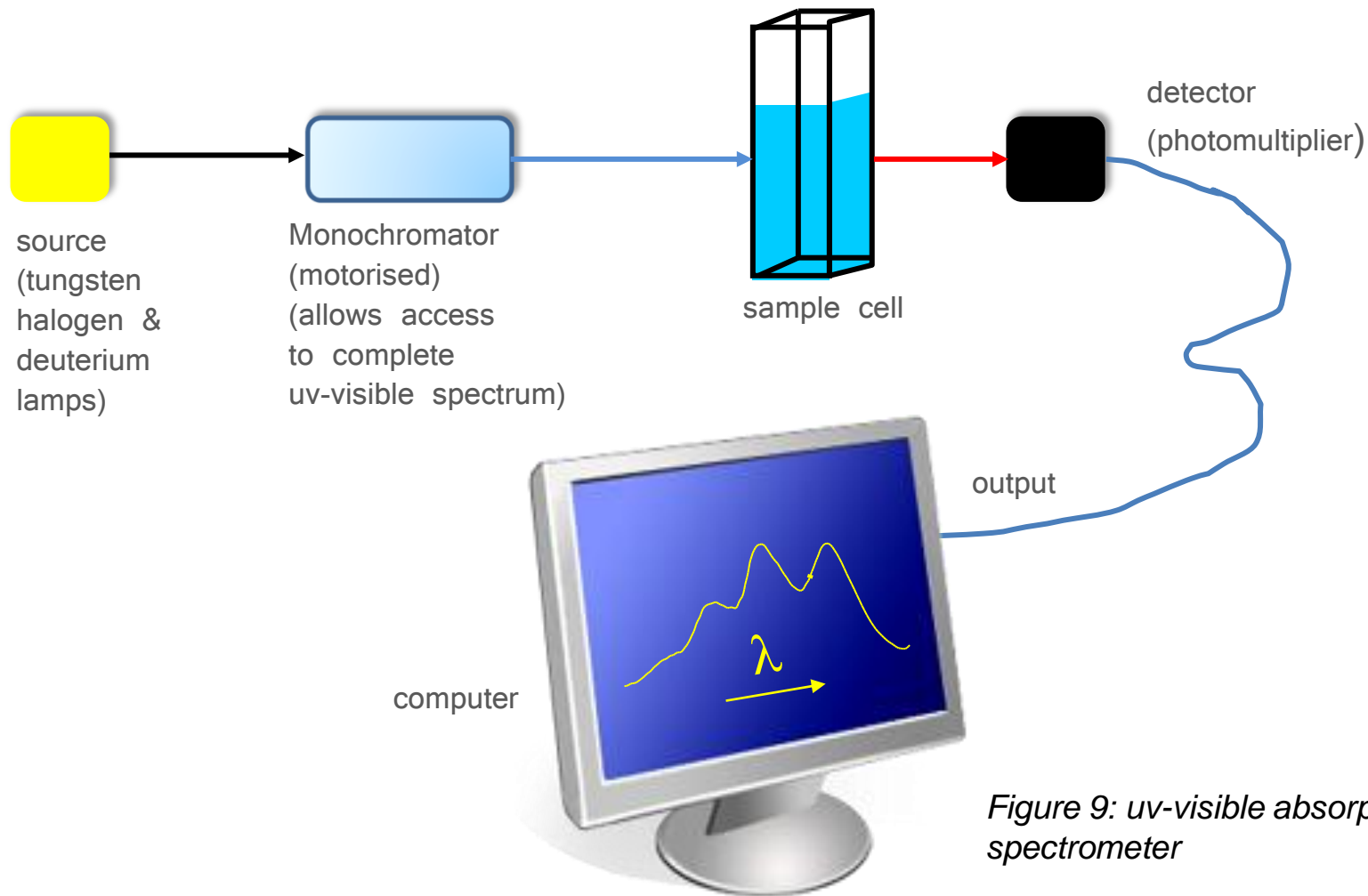


Figure 9: uv-visible absorption spectrometer

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.

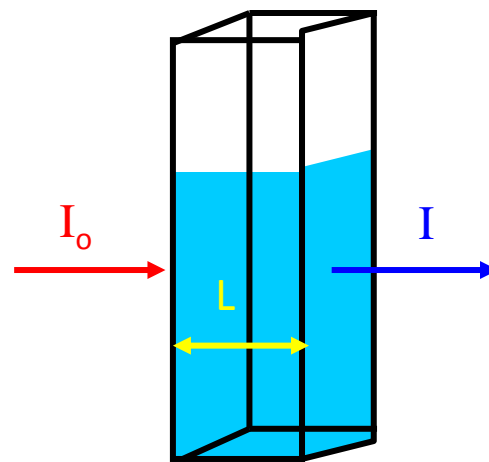


Figure 10: Principle of absorbance measurement & the Beer-Lambert Law



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