

Chemguide – questions

UV-VISIBLE SPECTROSCOPY – THE BEER-LAMBERT LAW

1. The Beer-Lambert Law can be expressed as:

$$A = \log_{10} \frac{I_0}{I} = \epsilon l c$$

- a) What is A ?
- b) What are I_0 and I ? Explain very briefly how they are measured.
- c) If 50% of the light of a particular wavelength is absorbed, what is the value of A ?
- d) What are the l and c in the equation? A is obviously proportional to both of those. Explain in physical terms why that is.
- e) ϵ (epsilon) is known as the molar absorptivity or the molar absorption coefficient. If the units for l are cm, and the units for c are mol dm⁻³, what are the units for ϵ ?
- f) The Chemguide page has this table for absorptions of a solution of ethanal in hexane:

electron jump	wavelength of maximum absorption (nm)	molar absorptivity
lone pair to pi anti-bonding orbital	290	15
pi bonding to pi anti-bonding orbital	180	10000

Explain briefly what this shows.

- g) If molar absorptivity is used as the vertical axis in a UV-visible spectrum, it is often plotted as $\log_{10}(\text{molar absorptivity})$. Explain why.