Answer on Question #51537 – Chemistry – Physical Chemistry

Question

The molar extinction coefficient of a compound, X, at 370 nm wavelength is 250 m^2 mol^{-1}. It's solutions of concentration $7.5 \cdot 10^{-2}$ mol m^{-3} is taken in a cell of thickness 0.010 m. Find the ratio of the intensity of transmitted radiation to the intensity of the incident radiation.

Solution:

According to the Beer-Lambert law:

$$\log_{10} \frac{I_0}{I} = \varepsilon \cdot l \cdot c$$

I_0 - the intensity of the incident radiation

I - the intensity of transmitted radiation

ε - molar extinction coefficient

l - cell thickness

c – concentration

The ratio of the intensity of transmitted radiation to the intensity of the incident radiation is:

$$\frac{I_0}{I} = 10^{\varepsilon \cdot l \cdot c}$$

$$\frac{I}{I_0} = 10^{-\varepsilon \cdot l \cdot c}$$

$$\frac{I}{I_0} = 10^{-(250\ m^2 mol^{-1} \cdot\ 7.5 \cdot 10^{-2}\ mol \cdot m^{-3}\ \cdot 0.010\ m)} = 10^{-0.1875} = 0.65$$

Answer: 0.65