Answer on the question #59723, Chemistry / General Chemistry

Question:

if you had a dye with a molecular weight of 574.76 amu which has a molar absorptivity of 82,000 at 550 nm, what would be the expected value of absorbance at that wavelength if the dye was present at a concentration of 1.0 mg/L?

Solution:

According to Beer-Lambert law the absorbance A is the product of molar absorptivity ε, concentration of the dye c and length of the spectroscopic cell l:

$$A = \varepsilon \cdot l \cdot c$$

If we assume 1cm length of spectroscopic cell:

$$A = \varepsilon \cdot c$$

Molar concentration of the dye is (the value of molar mass in $g \cdot mol^{-1}$ is equal to the value of molecular mass in amu):

$$c = \frac{m}{M} = \frac{1.0(mg \cdot L^{-1})}{574.76(g \cdot mol^{-1})} = 1.74 \cdot 10^{-6} mol \cdot L^{-1}$$

$$A = 82000(L \cdot mol^{-1}) \cdot 1.74 \cdot 10^{-6}(mol \cdot L^{-1}) = 0.143$$

Answer: Expected absorbance is 0.143.