1. The molar absorption coefficient of human hemoglobin (molecular weight 64,000) is 532 $dm^3/(cm*mol)$ at 440 nm. A solution of hemoglobin in a cuvette having a light path of 1 cm was found at that wavelength to have a transmittance of 76.7%. Calculate the concentration in g/dm^3.

$T = \frac{I}{I_0} = 0.767 \qquad A = \log_{10} \frac{I_0}{I} = \log_{10} 1.304 = 0.1152$

$A = \varepsilon \cdot c \cdot l \Rightarrow c = \frac{A}{\varepsilon \cdot l}$

$= \frac{0.1152}{532 \cdot 1 \cdot dm^3/mol}$

$= 2.166 \times 10^{-4} \, mol/dm^3$

$= 13.86 \, g/dm^3$

2. A 10 μM solution of a substance gave an absorbance of 0.0128 with a light path of 1 cm. Calculate the molar absorption coefficient.

$A = \varepsilon \cdot c \cdot l \Rightarrow \varepsilon = \frac{A}{c \cdot l} \qquad c = 10 \times 10^{-6} \, M$

$l = 1 \, cm$

$= \frac{0.1028}{10^{-5}} = 1.028 \times 10^4 \, \frac{dm^3}{mol \cdot cm}$

3. In the Blamer series of the hydrogen atom, the first line is observed at 656.3 nm. What is the energy of light emitted at this line by one mol of H-atoms?

$\varepsilon = \frac{hc}{\lambda} = \frac{6.626 \times 10^{-34} \, J \cdot s \cdot 2.998 \times 10^8 \, \frac{m}{s}}{656.3 \times 10^{-9} \, m}$

$= 3.027 \times 10^{-19} \, J$ for one photon

For 1 mol : $182.3 \, kJ/mol$