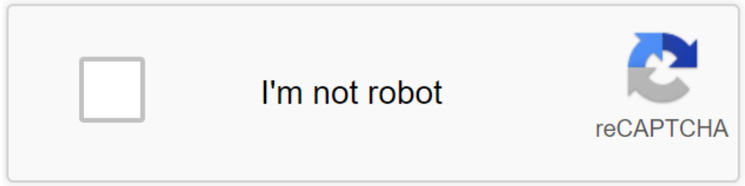

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Molar Extinction Coefficient Values Table. Part of the problem when looking for molar absorption coefficients is the confusion around correct terminology. Many students and researchers still use obsolete terms like "extinction coefficient." Here are some definitions for clarity. Molar absorption coefficient (ε) Synonyms: Molar extinction coefficient, Molar absorptivity "The recommended term for the absorbance for a molar concentration of a substance with a path length of l cm determined at a specific wavelength. Its value is obtained from the equation ε = A / cl Strictly speaking, in compliance with SI units the path length should be specified in meters but it is current general practice for centimeters to be used for this purpose. Under defined conditions of solvent, pH and temperature the molar absorption coefficient for a particular compound is a constant at the specified wavelength." -- Denney, R.C. Dictionary of Spectroscopy, 2nd ed.; Wiley: New York, 1982; pp 119-20. Molar absorptivity "Synonym: Molar (decadic) absorption coefficient. Decadic absorbance divided by the path-length l and mole concentration c, of the absorbing material. ε = A10 / cl. The molar absorptivity is a Beer-Lambert absorption coefficient. SI unit: m2 mol-1." -- Handbook of Vibrational Spectroscopy; Chalmers, J.M., Griffiths, P.R. Eds.; Wiley: New York, 2002; Vol.5, p 3772. "The term molar absorptivity for molar absorption coefficient should be avoided." -- IUPAC Gold Book Extinction coefficient "A term that has been widely used for the molar absorptivity, unfortunately often with values given in ill-defined units. Use of this term has been discouraged since the 1960s, when international agreement with non-chemical societies reserved the word "extinction" for diffusion of radiation, i.e. the sum of the effects of absorption, scattering, and luminescence." -- Handbook of Vibrational Spectroscopy; Vol.5, p 3760. "Seldom, if ever, is it safe to assume adherence to Beer's law and use only a single standard to determine the molar absorptivity. It is never a good idea to base the results of an analysis on a literature value for the molar absorptivity." --Skoog, D.A., Holler, F.J., Crouch, S.R. Principles of Instrumental Analysis, 6th ed.; Brooks/Cole, 2007; p 375. The molar attenuation coefficient is a measurement of how strongly a chemical species attenuates light at a given wavelength. It is an intrinsic property of the species. The SI unit of molar attenuation coefficient is the square metre per mole (m2/mol), but in practice, it is usually taken as the M−1·cm−1 or the L·mol−1·cm−1. In older literature, the cm2/mol is sometimes used with corresponding values 1,000 times larger. In practice these units are the same, with the difference being expression of volume in either cm3 or in L. The molar attenuation coefficient is also known as the molar extinction coefficient and molar absorptivity, but the use of these alternative terms has been discouraged by the IUPAC.[1][2] Beer–Lambert law The absorbance of a material that has only one attenuating species also depends on the pathlength and the concentration of the species, according to the Beer–Lambert law A = ε c ℓ , {\displaystyle A=\varepsilon c\ell ,} where ε is the molar attenuation coefficient of that material; c is the molar concentration of those species; ℓ is the pathlength. Different disciplines have different conventions as to whether absorbance is decadic (10-based) or Napierian (e-based), i.e., defined with respect to the transmission via common logarithm (log10) or a natural logarithm (ln). The molar attenuation coefficient is usually decadic.[3] When ambiguity exists, it is best to indicate which one applies. When there are N attenuation species in a solution, the overall absorbance is the sum of the absorbances for each individual species i: A = ∑ i = 1 N A i = ℓ ∑ i = 1 N ε i c i . {\displaystyle A=\sum _{i=1}^{N}A_{i}=\ell \sum _{i=1}^{N}\varepsilon _{i}c_{i}.} The composition of a mixture of N attenuating species can be found by measuring the absorbance at N wavelengths (the values of the molar coefficient of attenuation for each species at these wavelengths must also be known). The wavelengths chosen are usually the wavelengths of maximum absorption (absorbance maxima) for the individual species. None of the wavelengths must be an isosbestic point for a pair of species. The set of the following simultaneous equations can be solved to find the concentrations of each attenuating species: { A (λ 1) = ℓ ∑ i = 1 N ε i (λ 1) c i , … A (λ N) = ℓ ∑ i = 1 N ε i (λ N) c i . {\displaystyle {\begin{cases}A(\lambda _{1})=\ell \sum _{i=1}^{N}\varepsilon _{i}(\lambda _{1})c_{i},\\\ldots \\A(\lambda _{N})=\ell \sum _{i=1}^{N}\varepsilon _{i}(\lambda _{N})c_{i}.\\\end{cases}}} The molar attenuation coefficient (in units of cm2) is directly related to the attenuation cross section via the Avogadro constant NA:[4] σ = ln ⁡ (10) 10 3 N A ε = 3.82353216 × 10 − 21 ε . {\displaystyle \sigma =\ln(10){\frac {10^{3}}{N_{A}}}\varepsilon =3.82353216\times 10^{-21}\,\varepsilon .} Mass attenuation coefficient The mass attenuation coefficient is equal to the molar attenuation coefficient divided by the molar mass. Proteins In biochemistry, the molar attenuation coefficient of a protein at 280 nm depends almost exclusively on the number of aromatic residues, particularly tryptophan, and can be predicted from the sequence of amino acids.[5] Similarly, the extinction coefficient of nucleic acids at 260 nm can be predicted given the nucleotide sequence. If the molar attenuation coefficient is known, it can be used to determine the concentration of a protein in solution. References ^ IUPAC, Compendium of Chemical Terminology, 2nd ed. (the "Gold Book") (1997). Online corrected version: (2006–) "Extinction". doi:10.1351/goldbook.E02293 ^ IUPAC, Compendium of Chemical Terminology, 2nd ed. (the "Gold Book") (1997). Online corrected version: (2006–) "Absorptivity". doi:10.1351/goldbook.A00044 ^ "Archived copy" (PDF). Archived from the original (PDF) on 2008-09-20. Retrieved 2009-09-02.CS1 maint: archived copy as title (link)"Archived copy" (PDF). Archived from the original (PDF) on 2007-06-09. Retrieved 2009-09-02.CS1 maint: archived copy as title (link)"Archived copy" (PDF). Archived from the original (PDF) on 2007-06-09. Retrieved 2009-09-02.CS1 maint: archived copy as title (link) ^ Lakowicz, J. R. (2006). Principles of Fluorescence Spectroscopy (3rd ed.). New York: Springer. p. 59. ISBN 9780387312781. ^ Gill, S. C.; von Hippel, P. H. (1989). "Calculation of protein extinction coefficients from amino acid sequence data". Analytical Biochemistry. 182 (2): 319–326. doi:10.1016/0003-2697(89)90602-7. PMID 2610349. External links Nikon MicroscopyU: Introduction to Fluorescent Proteins includes a table of molar attenuation coefficient of fluorescent proteins. An example of a Beer’s Law plot (concentration versus absorbance) is shown below. The slope of the graph (absorbance over concentration) equals the molar absorptivity coefficient, ε x l.The objective of this lab is to calculate the molar extinction coefficients of three different dyes from their Beer’s Law plot. The constant \(\epsilon\) is called molar absorptivity or molar extinction coefficient and is a measure of the probability of the electronic transition. On most of the diagrams you will come across, the absorbance ranges from 0 to 1, but it can go higher than that. ... Table 1 gives values for the molar absorptivity of a solution of ethanal in ... molar extinction coefficient

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