School of Chemistry and Biochemistry, TIET, Patiala
Applied Chemistry (UCB008)
Tutorial Sheet (Lambert-Beer's Law)

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1. State Lambert-Beer's law. What do you mean by absorbance and transmittance?
2. What are the units used for Molar Extinction Coefficient?
3. The molar extinction coefficient of $Coen_2Br_2^+$ is 40 M^{-1} cm^{-1} at 650 mμ (milli micron). Calculate the percent transmission for a 5 cm cell filled with 0.01 M solution. What will be the corresponding absorbance? **(Ans: A =2, %T =1)**
4. A substance in aqueous solution at a concentration 10^{-3} M absorbs 10% of an incident light in a path length 1 cm. What concentration will be required to absorb 90% of the light? **(Ans: 0.0217 M)**
5. At 460 nm a blue filter transmits 72.7% of the light and a yellow filter 40.7% of the light. What is the transmittance at the same wavelength of two filters in combination? **(Ans: T = 0.296)**
6. A 0.003 M solution of $[Co(NH_3)_6]^{3+}$ transmits 75% of incident light of 500 mμ if the path length is 1cm. Calculate the molar extinction coefficient and the percent absorption for a 0.01 M solution. **(Ans: ε = 41.65 $M^{-1}cm^{-1}$, % absorption = 61.67)**
7. An aqueous solution of a compound A of concentration 10^{-3} moles/litre absorbs 50% of incident light in a cell of length 1 cm and another compound B of concentration 2 x 10^{-3} moles/litre absorbs 60% of the incident radiation at a particular wavelength. Calculate the percentage absorbed by a solution containing 10^{-3} moles/litre of A and B each in the same cell at the same wavelength. **(Ans: % absorption = 68.36)**
8. A spectrometer cell when filled with liquid A transmits 50% and when filled with another liquid B transmits only 25% of the incident light of a certain wavelength. What would be the optical density/absorbance at this wavelength when the same cell is filled with a mixture of equal volumes of two liquids? **(Ans: A = 0.45)**
9. A 0.001 M solution of a dye (X) shows an absorbance of 0.20 at 450 mμ and absorbance of 0.05 at 650 mμ. A 10^{-4} M solution of another dye (Y) shows 0.00 absorbance at 450 mμ and an absorbance of 0.42 at 650 mμ. Calculate the concentration of each dye present together in a solution, which exhibits an absorbance of 0.38 and 0.71 at 450 mμ and 650 mμ respectively. The same cell is used in all measurements and its thickness is 1.00 cm. **(Ans: $C_x = 1.9 \times 10^{-3}$ M , $C_y = 1.5 \times 10^{-4}$ M)**
10. In an absorption cell, the transmittance of a 0.1 M solution of a substance X is 80% and that of 0.1M solution of another substance Y is 60% at a given wavelength. What is the transmittance of a solution that is simultaneously 0.1 M in X and 0.1 M in Y? **(Ans: %T = 48)**
11. A series of five standard copper solutions is prepared and the absorbances measured as indicated below. Plot the data and determine the concentration of the unknown (Z). **(Ans: Cz = 3.3 ppm)**

A	C (ppm)
0.104	1
0.198	2
0.310	3
0.402	4
0.500	5
0.334	Z