Examrace

Numerical Questions – Beer Lambert Law: Questions and Answers

Beer Lambert Law

Q1) In a spectrophotometric cell of 2.0 cm path length, the solution of a substance shows the absorbance value of 1.0. If the molar absorptivity of the compound is 2 x 10^4 L mol^{-1} cm^{-1}, calculate the concentration of the substance in solution. What is the concentration of the substance in that solution?

(1) 2.5 x 10^{-5} mol L^{-1}

(2) 4.0 x 10 - 4 mol L-1

(3) 1.0 x 10^4 mol L-1

(4) 5.0 x 10^{-4} mol L-1

Answer: (1) 2.5 x 10^{-5} mol L^{-1}

$A = \varepsilon * C * L$

Where,

Path Length (L) = 2.0 cm

Molar Absorptivity (ε) = 2 x 10^4 L mol^{-1} cm^{-1}

Absorbance (A) = 1.0

1 = 2 x 10^4 x C x 1

$$C = \frac{1}{2x\ 2x\ 10^4}$$

$$C = \frac{1}{4x\ 10^4}$$

C = 2.5 x 10^{-5}

Q2) . A solution of chemical 'A' having its 0.14 mol L – 1 concentration has an absorbance of 0.42. Another solution of 'A' under the same conditions has an absorbance of 0.36. What is the concentration of this solution of 'A' ?

(1) 0.108 mol L – 1

(2) 0.35 mol L – 1

(3) 0.12 mol L – 1

(4) 0.10 mol L – 1

Answer: Option (3) 0.12 mol L – 1

A = ε ∗ C ∗ L

Given Values,

Solution - 1

Absorbance = 0.42

Concentration = 0.14 mol

Solution - 2

Absorbance = 0.36

Concentration = ?

For Solution 1

A = ε ∗ C ∗ L

0.42 = ε ∗ 0.14 ∗ L ... (i)

For Solution 2

A = ε ∗ C ∗ L

0.36 = ε ∗ C ∗ L ... (i)

$$\frac{0.42}{0.36} = \frac{\varepsilon * 0.14 * L}{\varepsilon * C * L}$$

$$0.42 * C = 0.36 * 0.14$$

$$C = \frac{0.36 * 0.14}{0.42}$$

C = 0.12 mol L^{-1}

Q3) A student prepared a calibration curve by measuring of the absorbance of five standard solutions of a compound at 300nm. A cuvette with a path length of 5cm was used in the stratosphere the slope if the curve was 300 L/mol the molar absorptivity of the compound is

(1) 0.2 L $mol^{-1}cm^{-1}$

(2) 60 L $mol^{-1}cm^{-1}$

(3) 5.0 L $mol^{-1}cm^{-1}$

(4) 1500.0 L $mol^{-1}cm^{-1}$

Answer: Option (2) 60 L $mol^{-1}cm^{-1}$

Slope = 300 L/mol

Path Length = 5 cm

Molar Absorptivity = ?

Slope = Molar Absorptivity x Path Length

300 = Molar Absorptivity x 5

Molar Absorptivity = 60 L mol-1cm-1

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