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Experiment No. 9

Beer - Lambert Law experiment

* Aim - To determine iron concentration in a given sample of water using colorimeter and verify Beer-Lambert law.

* objective - To determine the amount of iron present in water by spectrophotometric measurements. The method applies Beer-Lambert's Law. A calibration curve is constructed using known concentrations of iron from which unknown concentration of iron can be determined.

* Apparatus - Calorimeter, volumetric flasks(50ml), Burette, Cuvette, filter paper etc.

* chemicals - Ammonium thiocyanate solution, ferric ion stock solution, dil HNO_3 etc.

* Questions -

Qs i) What is Beer's and Lambert's law?

Ans → ① Beer's law -

When a beam of monochromatic light is allowed to pass through a transparent medium the rate of decrease of radiant power with concentrations of medium is directly proportional to the intensity of the incident radiation i.e. absorbance of light by the solution is directly proportional to concentration of solution.

② Lambert's Law -

This law can be stated as when a beam of monochromatic light is allowed to pass through a transparent medium, the rate of decrease of radiant power with thickness of the medium is directly proportional to intensity of the incident radiation i.e. absorbance of light by the solution is directly proportional to thickness of the solution.

③ Beer-Lambert's Law -

The combined law states, Absorbance = constant x thickness of medium x concentration of medium.

i.e $A = \text{constant} \times \text{path length} \times \text{concentration}$.

Q 2) What is the significance of determination of Iron concentration in water?

Ans → The significance of determination of Iron concentration in water -

1. It indicates corrosion in water
2. If water corrodes iron will keep increasing
3. In plant effluent iron level increase shows increased corrosion.
4. If iron is constant corrosion level is stationary

Q 3) Explain the terms - Absorbance and ~~%Trans~~ % Transmittance.

Ans →

- **Absorbance -**

  Absorbance (A), also known as optical density (OD), is the quantity of light absorbed by a solution.

  Absorbance equation → $A = \log_{10}(I_0/I)$

- **Transmittance -**

  Transmittance is the quantity of light that passes through a solution.

Q 4) Explain the basic principle behind Colorimeter.

Ans → **Colorimeter -**

A colorimeter is a light-sensitive device used for measuring the transmittance and absorbance of light passing through a liquid sample. The device measures the intensity or concentration of the color that develops upon introducing a specific reagent into a solution.

Principle -

The Colorimeter is based on Beer-Lambert's law, according to which the absorption of light transmitted through the medium is directly proportional to the medium concentration. The results of the unknown sample are compared to that of the known sample on the curve to measure the concentration.

Q 5) Iron is present in water in which forms? what is their source in drinking water?

Ans → Iron is mainly present in two forms: either the soluble ferrous iron or the insoluble ferric iron. water containing ferrous iron is clear and colorless because the iron is completely dissolved. when exposed to air in the pressure tank or atmosphere, the water turns cloudy and a reddish brown substance begins to form. This sediment is the oxidized or ferric form of iron that will not dissolve in water.