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A REVIEW PAPER ON UV VISIBLE SPECTROSCOPY & ITS PHARMACEUTICAL APPLICATIONS.

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Abstract : The main goal of the review paper is to study the all detailed information about UV visible spectroscopy & its pharmaceutical applications. UV visible spectroscopy is a very useful method which is used in industry from long time ago. This is very simple and quick method. The UV visible spectroscopy is used in analytical chemistry for quantitative determination of biological macromolecules, analytes & metal ions.

Keywords : UV spectroscopy, Instrumentation, Beer Lambert law, Choice of solvent etc.

Introduction :

Spectroscopy : Spectroscopy is a branch of science that deals with study of interaction of UV radiation with matter. Spectroscopy is a most useful tool available for study of atomic & Molecular structure.

a) **Atomic Spectroscopy :** The atomic spectroscopy deals with study of interaction of UV radiation with atoms.
b) **Molecular spectroscopy :** The molecular spectroscopy deals with study of interaction of UV radiation with molecules .

Spectrophotometer is a device which are design to determine spectrum of a compound.

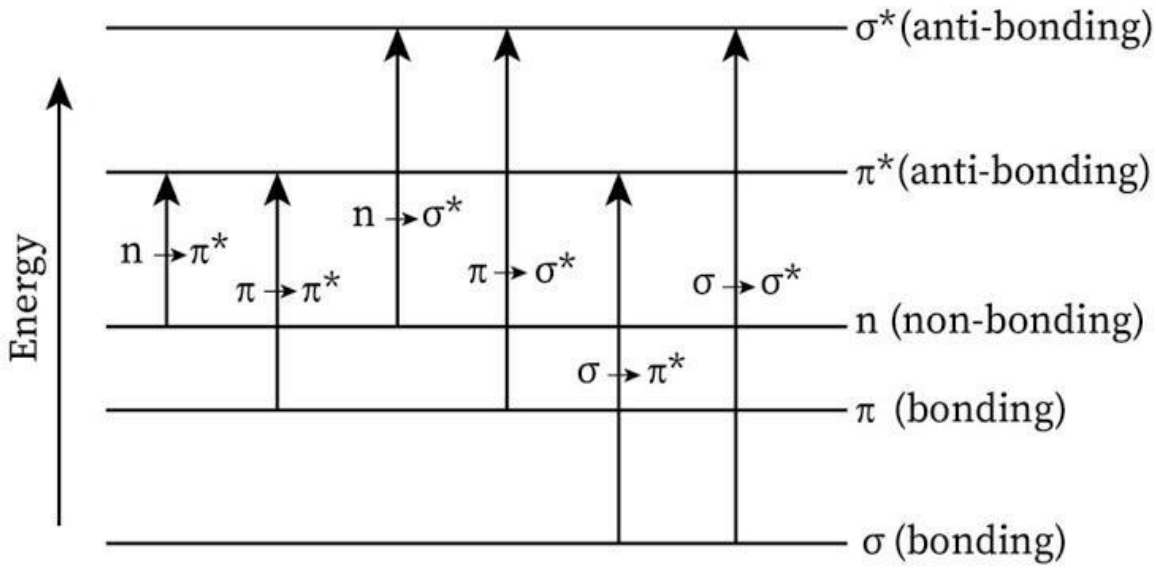
UV spectroscopy = 200 – 400 nm

UV visible spectroscopy =400 – 800 nm.

Principle : The principle of UV visible spectroscopy is based on absorption of ultraviolet light or visible light by a chemical compounds, which gives spectra.

Theory :

The absorption spectra arise from transition of electrons in a molecule. The possible electronic transition can be graphically shown as



1. σ →σ* transition
2. π→π* transition
3. n→σ* transition
4. n→π* transition
5. σ→ π*transition
6. π→ σ* transition.

1. σ →σ* transition : σ electrons is excited to Corresponding anti bonding orbital σ*.
   The energy required is large for this transition.
   Ex : Methane
2. π→π* transition : π electrons is excited to Corresponding anti bonding orbital π*.
   Ex : Alkenes.
3. n→σ* transition : The saturated compound containing atoms with lone pair of electrons like Oxygen, Nitrogen, Sulphur & Halogens are capable of this transition. It requires less energy.
4. n→π* transition : An electron from non bonding orbital is promoted to anti bonding π* orbital. It also requires less energy.
5. σ→ π*transition : This transition are only theoretical possible.
6. π→ σ* transition : This transition are only theoretical possible.

Laws :

Beer Lambert law :

Beer Lambert law states that, "The absorbance (A) of monochromatic beam is directly proportional to concentration (C) & Path length (l).

$$\mathbf{A} = \varepsilon\, \mathbf{C.\, L}$$

Where,

A = Absorbance

ε = Molar absorption coefficient

C = Molar concentration

L = Path length.

Limitations of Beer Lambert law :

1. The light source used must be monochromatic.
2. This is not suitable for concentrated solutions.

Instrumentation :

1. Light Source
2. Monochromator
3. Sample & reference cells
4. Detector
5. Recorder.

1. Light Source : The light source used must provide consistent & stable light.
   a) Hydrogen & deuterium lamps
   b) Tungsten filaments lamps
   c) Xenon arc lamps.
2. Monochromator : It separates polychroma- tic light into single spectral line. A monochromator is an optical device that is used to select a narrow band of a wavelength of light.
   a) Slit
   b) Mirror
   c) Lens
   d) Prism
   e) Grafting

3. Sample & reference cells : The cuvette are generally made up of quartz & borosilicate. One beam pass through sample solution & second beam pass through reference solution. The cuvette are generally transparent.

4. Detector : The Detector is responsible for detection of radiation. The intensity of radiation from reference cell is stronger than beam of sample cell.
   a) Photovoltaic cell
   b) Photo tubes

5. Recorder : The recorder detect & record the data of the experiment. It also stores the data in computer when it connected to computer.

Choice of solvent & solvent effects :

1. The absorption bands in UV spectrum are very broad compared with IR /NMR.
2. UV spectra of compounds are generally identified in vapour phase & dilute solutions
3. Solvent must be transparent.
4. The solvent should not itself absorb radiation.
5. The solvent should not react with solute molecules.
6. The Ethanol (95%) is most commonly used solvent.
7. Hexane & other hydrocarbon are sometimes preferred because they have minimum interaction with solute molecules.
8. Chloroform, Benzene & Carbon tetrachloride cannot be used because it absorb light.

Advantage's of UV visible spectroscopy :

1. UV visible spectroscopy gives accurate results.
2. Easy to handle
3. Cost effective instrument.

Disadvantage's of UV visible spectroscopy :

1. The results can be affected by Temperature, PH, impurities etc.
2. Only liquid samples are possible to analyse.
3. Require proper handling of cuvette.

Applications of UV visible spectroscopy :

1. It is useful in quantitative analysis.
2. It is used in drug identification
3. It is used for determination of different species
4. It is used for beverage analysis
5. It is used in DNA & RNA analysis.
6. It is used to check nucleic acid purity
7. It is used in detection of impurities.
8. Structural elucidation of organic compounds.

Conclusion :

The review paper contains all information about UV visible spectroscopy, its principle, theory, Instrumentation, advantages, Disadvantage's & its applications. The identification of impurities are carried out by using UV visible spectroscopy more accurately & UV visible spectroscopy is a very crucial spectroscopy.

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