Spectrophotometric Determination Of "$Mn_{\lambda max}$"

Introduction:

- **What is/are**:

Electromagnetic Radiation?

Spectrophotometry?

UV-Visible Spectra/Spectrophotometry?

Spectrophotometer?

Wave Length?

λ_{max}?

Spectroscopy Solutions Conditions?

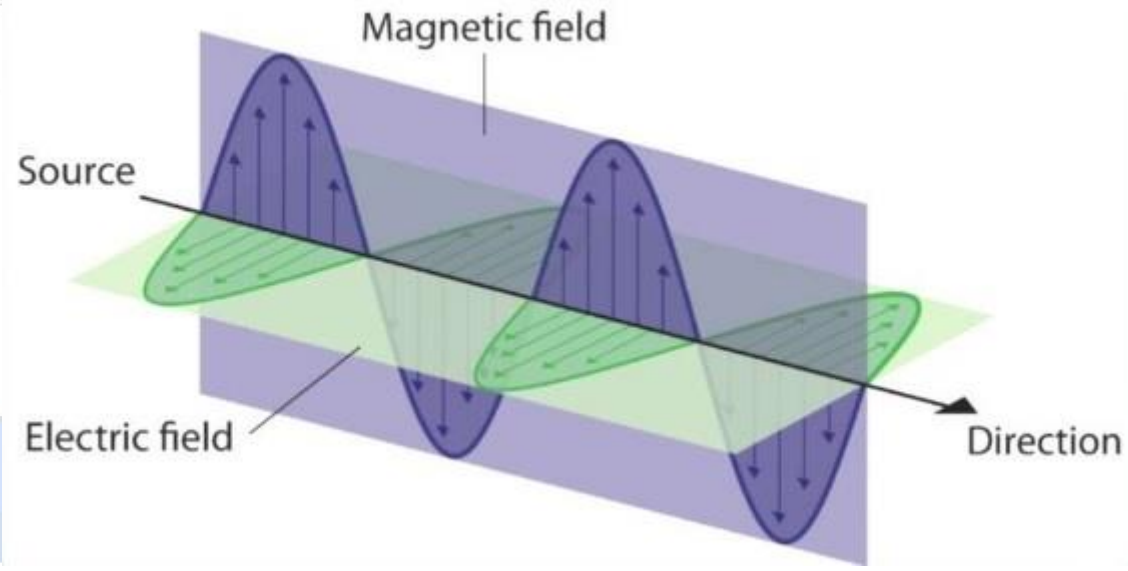
Reaction between Radiation & Matter?

Absorption & Emission?

Beer-Lambert's Law?

Experiment's aims?

Electromagnetic Radiation:



Electromagnetic Radiation is an electric and magnetic disturbance traveling through space at the speed of light (2.998×10^8 m/s). It contains neither mass nor charge but travels in packets of radiant energy called photons, or quanta.

Examples of EM Radiation include radio waves and microwaves, as well as infrared, ultraviolet, gamma, and x-rays. Some sources of EMR include sources in the cosmos (e.g., the sun and stars), radioactive elements, and manufactured devices. EMR exhibits a dual wave and particle nature.

Spectrophotometry:

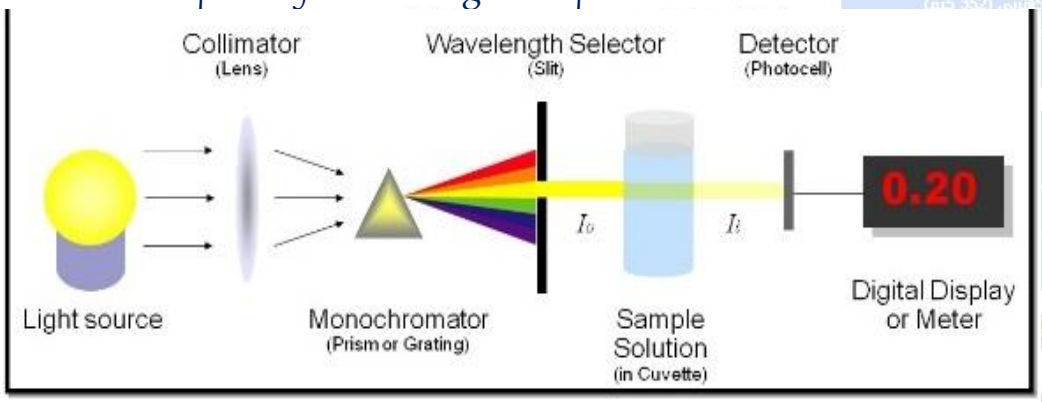
It is study of the absorption and emission of light and other radiation by matter, as related to the dependence of these processes on the wavelength of the radiation. More recently, the definition has been expanded to include the study of the interactions between particles such as electrons, protons, and ions, as well as their interaction with other particles as a function of their collision energy.

UV–Visible Spectra/Spectrophotometry:

This spectroscopy is used to obtain the absorbance spectra of a compound in solution or as a solid. What is actually being observed spectroscopically is the absorbance of light energy or electromagnetic radiation, which excites electrons from the ground state to the first singlet excited state of the compound or material. The UV-vis region of energy for the electromagnetic spectrum covers 1.5 - 6.2 eV which relates to a wavelength range of 800 - 200 nm.

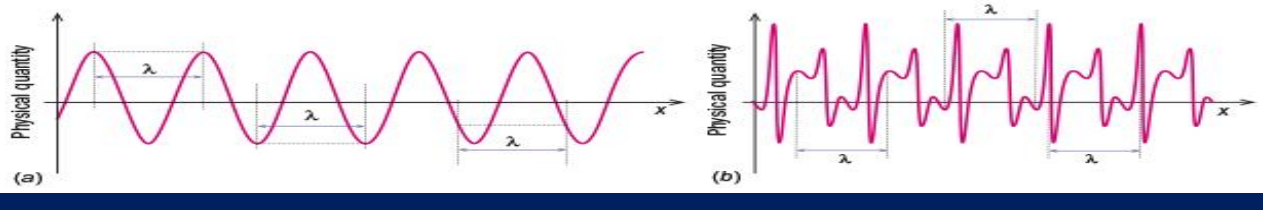
Spectrophotometer:

Analytical instruments used to identify the characteristics of materials by measuring the emissions and absorption of electromagnetic spectra.



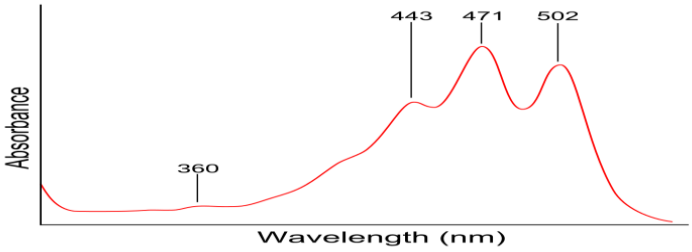
Wave Length:

The distance at a given instant in time between successive identical points on a wave.



λ_{max}:

The wavelength at which a substance has its strongest photon absorption (highest point along the spectrum's y-axis).



Spectroscopy Solutions Conditions:

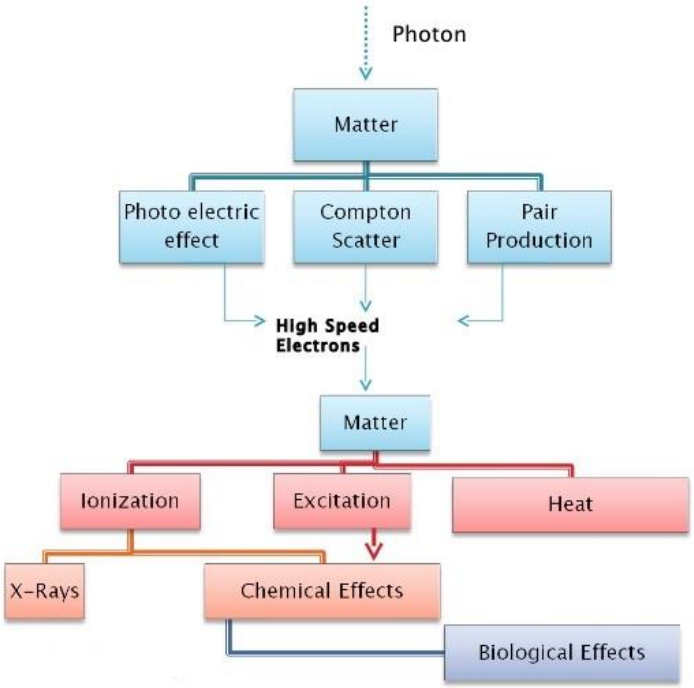
1- Clear (All).

2- Homogeneous (All).

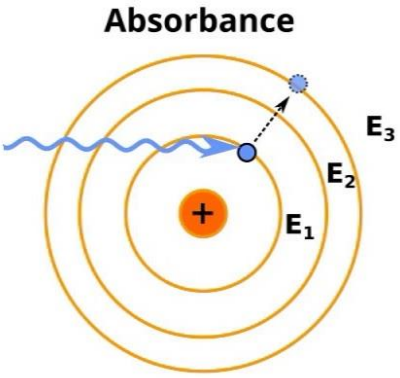
3- Colored (Visible).

Reaction between Radiation & Matter:

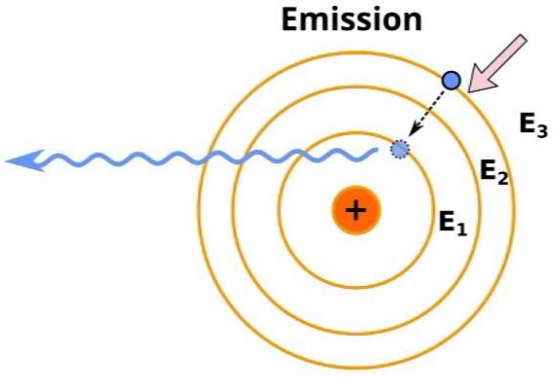
Process	Definition
Attenuation	Removal of radiation from the beam by the matter. Attenuation may occur due to **scattering** and **absorption**
Absorption	The taking up of the energy from the beam by the irradiated material. It is absorbed energy, which is important in producing the radiobiological effects in material or soft tissues.
Scattering	refers to a change in the direction of the photons and its contributes to both attenuation and absorption
Transmission	Any photon, which does not suffer the above processes is transmitted.



Absorption & Emission:



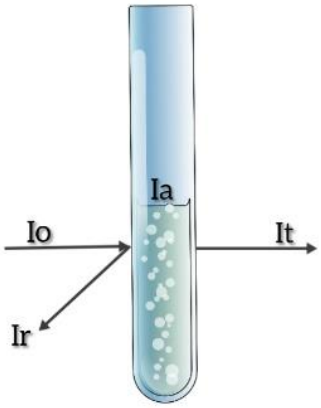
$E_{photon} = \Delta E_{electron} = E_3 - E_1$



$E_{photon} = \Delta E_{electron} = E_3 - E_1$

Beer–Lambert's Law:

The Beer-Lambert law states that the quantity of light absorbed by a substance dissolved in a fully transmitting solvent is directly proportional to the concentration of the substance and the path length of the light through the solution.



$$A = \varepsilon c l$$

A	Absorbance	
ε	Molar absorption coefficient	$M^{-1}cm^{-1}$
c	Molar concentration	M
l	optical path length	cm

Experiment's Aims:

Finding [λ_{max}] of an element.

Expermental:

1- Prepare 50ml Of [15ppm] (Mn^{7+}) from ($KMnO_4$) using Tab water.

2- Prepare the Blank solution.

3- Move to the next Laboratory and follow the given instructions to find the λ_{max} value of (Mn).

Results:

No	λ_{nm}	Absorbance
Blank	800 ⟶ 400	0
Sample	800	A_1
	799	A_2
	798	A_3
	797	A_4
	⋮	A_i
	400	A_n

Calibration Graph: