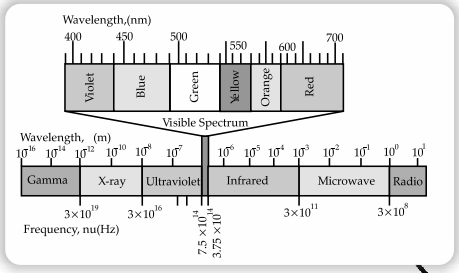
The Electromagnetic Spectrum



$c = \upsilon\lambda$

Electromagnetic waves exist in an enormous range of frequencies and this continuous range of frequencies is known as the electromagnetic spectrum.

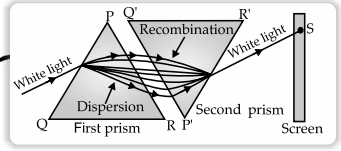
Wave that is capable of transmitting its energy through vacuum.

Relation between speed (c) (υ) frequency and (λ) wavelength

Electromagnetic spectrum

Electromagnetic wave

Recombination of colours

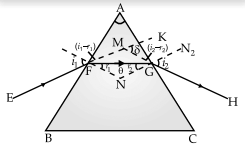


- Electromagnetic waves are transverse waves or non-mechanical waves.
- These wave can propagate through vacuum and thus do not require material medium.
- Speed of waves of electromagnetic wave is same as the speed of light.
- These waves exhibit the phenomena of reflection refraction, diffraction, interference and polarisation.

Properties of electromagnetic waves

Deviation produced by a prism

Angle of deviation (δ)
$= i + e - A$



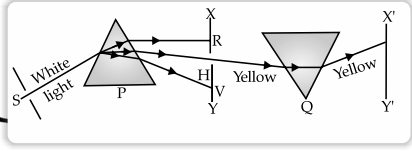
Factors affecting the angle of deviation

Angle of incidence :
Refractive index of prism material (μ)
Angle of Prism (A)
Colour of wavelength of incident light (λ)

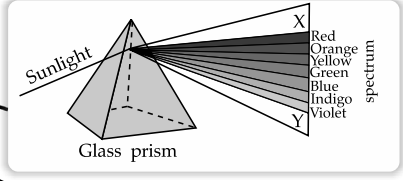
Characteristics of electromagnetic spectrum

Dependence of deviation on colour or wavelength of incident light

Filter the colour by prism



Dispersion of white light through prism



Electromagnetic region	Wavelength	Frequency (in hertz)	Source	Detector	Application
Gamma rays	<0.01 nm	>3 x 10^{19}	Cosmic rays, decay of radioactive substances, nuclear fusion and fission reactions	Spectrometer	For killing cancerous cells, for checking welds in industries
X-rays	0.01-10 nm	3 x 10^{19}- 3 x 10^{16}	When high velocity electrons collide with a heavy metal target	Photographic plate, fluorescent screen	Medical radiography crystallography, for scanning object
Ultraviolet radiation	10-400 nm	3x10^{16}- 7.5 x 10^{14}	Sun, mercury vapour lamp, arc spark lamp	Photographic plate, fluorescence, chemical effect on dyes	Sterilisation of surgical instruments, vitamin D production detection of fake gems, forgery
Visible lights	400-800 nm	7.5 x 10^{14}- 3.75 x 10^{14}	Sun, electric bulb, flame, hot bodies	Eyes, photographic film	Observing objects, fibre optics
Infrared radiation	800 nm to 1 mm	3.75 x 10^{14} 3 x 10^{11}	Sun, hot bodies such as fire burning gases	Blackened bulb thermometer, thermopile	Night-vision devices, developing photographs, sensor in missiles
Microwaves	1mm-10 m	3 x 10^{11} 3x10^{7}	Electronic device special vacuum tubes	Electronic circuits	Radar, television, microwave ovens, cell phones
Radio waves	>10m	below 3.0 x 10^{7}	Electronic circuits and radio transmitters	Aerials of radio and television receiver	TV and radio broadcasting, navigation

Speed of light decreases with decrease in wavelength of light.
As the refractive index of a material increases, angle of deviation also increases.
Deviation produced by prism increases with the decreases in wavelength of light.
Violet colour with the shortest wavelength has minimum speed and undergoes maximum deviation where as red colour with longest wavelength has maximum speed and undergoes minimum deviation.

Trace the Mind Map

First Level ‣ Second Level ‣ Third Level