RATU NAVULA COLLEGE YEAR 12 PHYSICS SUPPLEMENTARY NOTES 5

LESSON 79 – 80 EXP 9 REFLECTION AND REFRACTION OF WATER WAVES

LESSON 81

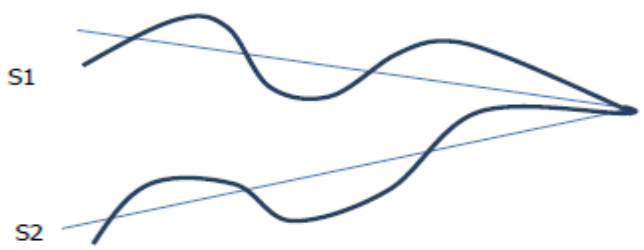
LO: interference and superpositioning in Youngs double slit experiment

INTERFERENCE OF LIGHT

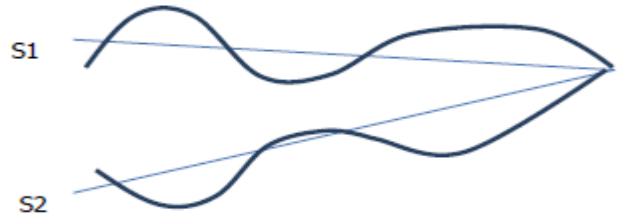
"When two waves of equal amplitude and velocity moving in opposite direction overlap each other."

-THOMAS YOUNG demonstrated that light passing through two holes very close together diffracts and forms an interference pattern.

-**constructive interference:** two waves from individual slit overlap each other and arrive at a particular point at the same time (in phase).

• **Bright band** • **Anti node** • **In phase** • **Crest meets crest** • **Trough meets trough**	

-**destructive interference:** two waves arrive at a particular point not at the same time (out of phase)

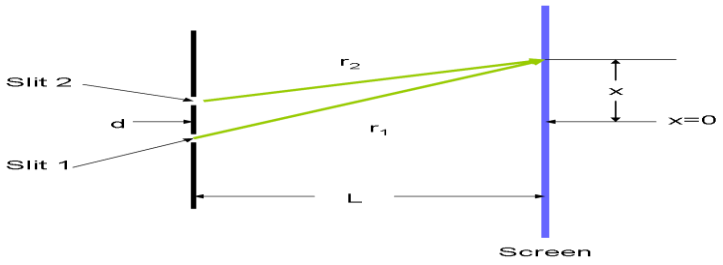
• **Dark band** • **Node** • **Out of phase** • **Crest meet trough** • **Trough meets crest**	

- **Path difference P.D= d sin θ** (**difference** between the distances travelled by two waves meeting at a point.

LESSON 82

LO: Study YOUNG'S DOUBLE SLIT EXPERIMENT

- In Young's INTERFEROMETER, **monochromatic light (light of one color)** from the source is divided into two parts using double slit arrangement.
- wave model of lights supports Youngs Experiment since only waves show interference of light through superpositioning.



Constructive interference (n=0,1,2…)(bright band,maximum)	Destructive interference (n=1,2..)(dark band,minimum)
$d\sin\theta = \frac{dx}{L} = n\lambda$	$d\sin\theta = (n-\frac{1}{2})\lambda = \frac{xd}{L}$

Where:

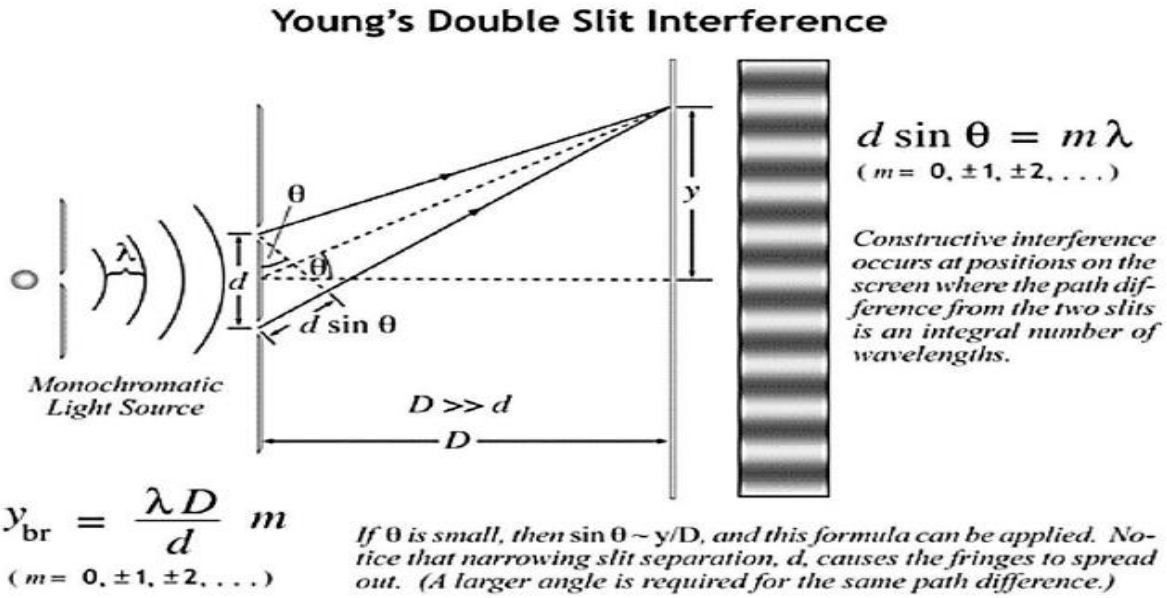
n= nth node on antinode

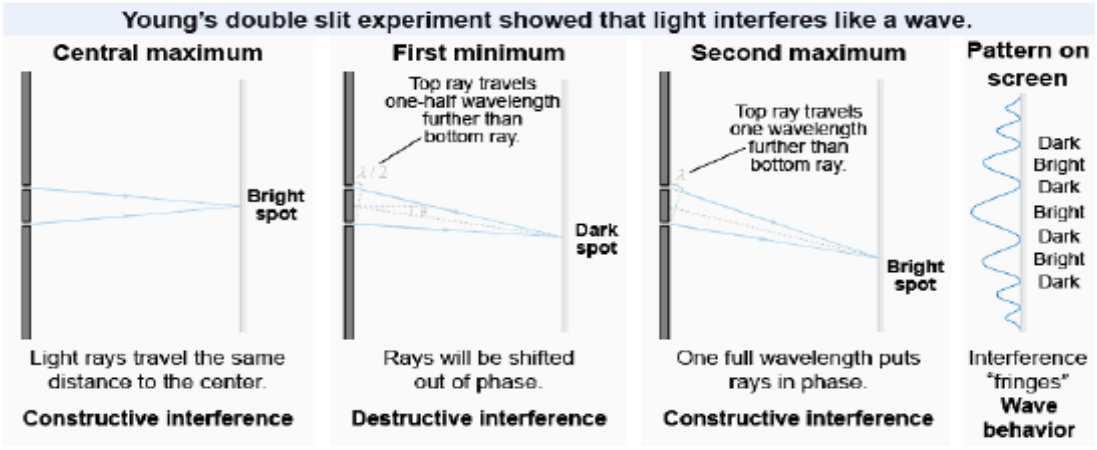
λ= wavelength of light used

L= distance of the screen from slits

d= slit separation

x= fringe distance from central maxima.





Coherent light: lights having same wavelength and a fixed phase relationship.

EFFECT OF CHANGING λ,L and d on fringe spacing (Δx)

Changing λ: Δx α λ	**Changing L: Δx α L**	**Changing d: Δx α 1/d**
If λ ↑, **Δ** x ↑	If L ↑, **Δ**x ↑	If d ↑, **Δ**x ↓

Example:

Find the position of the First bright band from the central bright band if n=1 , d=1mm, L=2m and $\lambda = 10^{-6}$ m

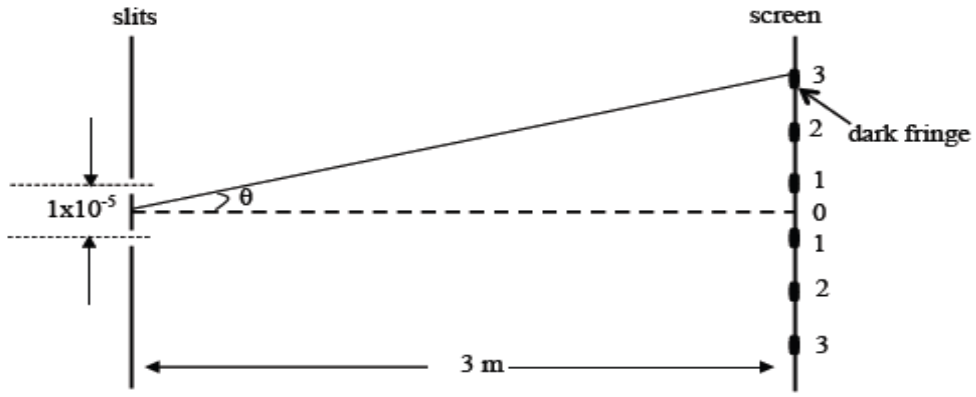
$$n\lambda = \frac{xd}{L}$$

$$(1)\ (10^{-6}) = x.1 \times 10^{-3}/2$$

$$x = 2x\ 10^{-3}\text{m}$$

2019

Monochromatic light of wavelength 700 nm passes through two slits 1 x 10^{-5} m apart and shines on a screen 3 m away. Bright and dark fringes are formed as shown below.



At what angle to the central antinodal line is the 3rd dark fringe formed? **(2 marks)**

LESSON 83 – 84 EXPERIMENT 10 INTERFERENCE AND DIFFRACTION OF WATER WAVES

LESSON 85

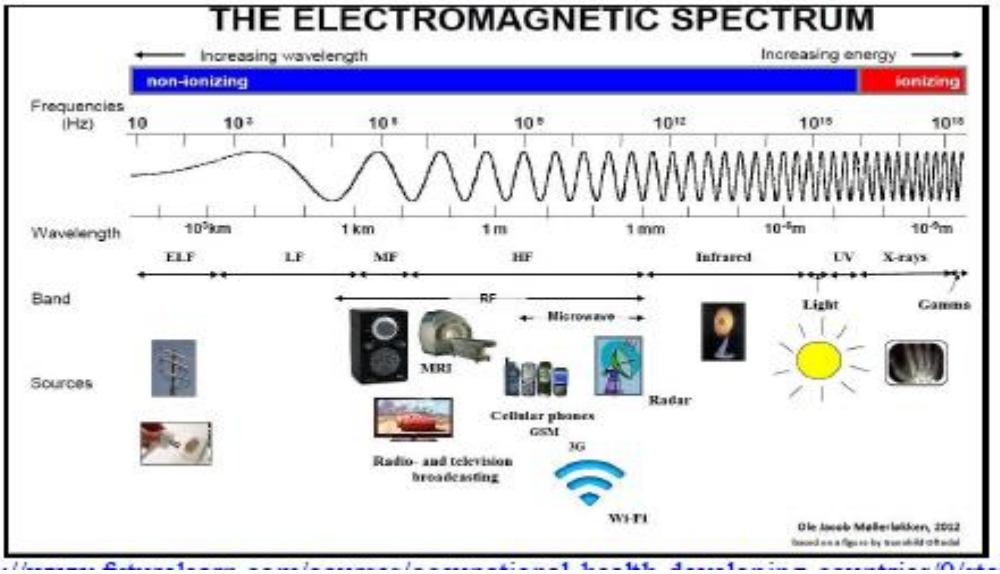
LO: Study electromagnetic spectrum

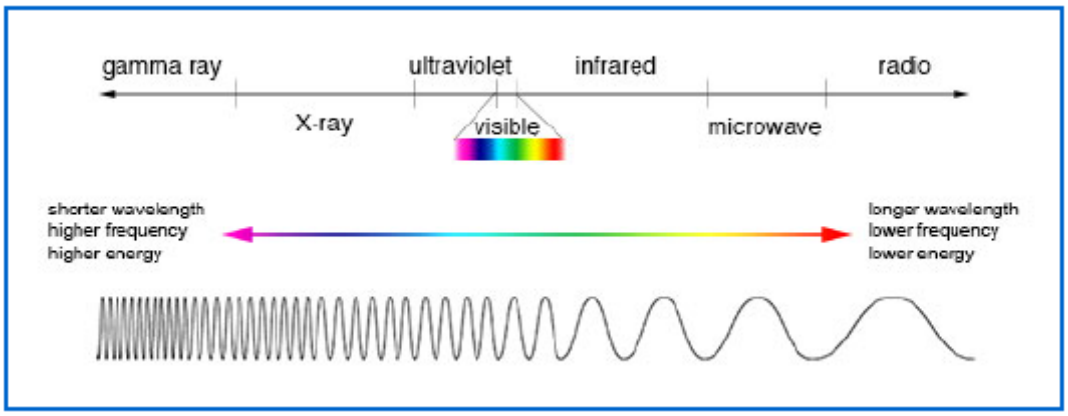
THE ELECTROMAGNETIC SPECTRUM

-examples of electromagnetic waves are: radio waves, microwaves, visible light and x-rays.

-in vacuum, all **electromagnetic waves** have **constant speed c = 3x10^8 m/s.**

- Energy α Frequency. **(E=hf)** h:Planck's constant





Visible Light

R O Y G B I V

Largest λ → smallest λ

Transverse waves	**Longitudinal waves**
EM waves: Light waves, microwaves, radio waves	Sound waves
Water waves (ripples on water surface)	
Vibrations in a guitar string	
Seismic S-waves (earthquake)	Seismic P-waves(earthquakes and explosions)

SAMPLE 2020

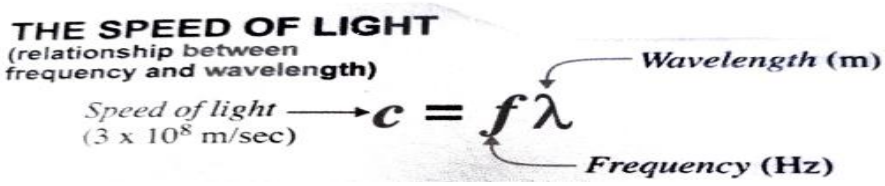
Electromagnetic waves consists of visible and non-visible spectra.

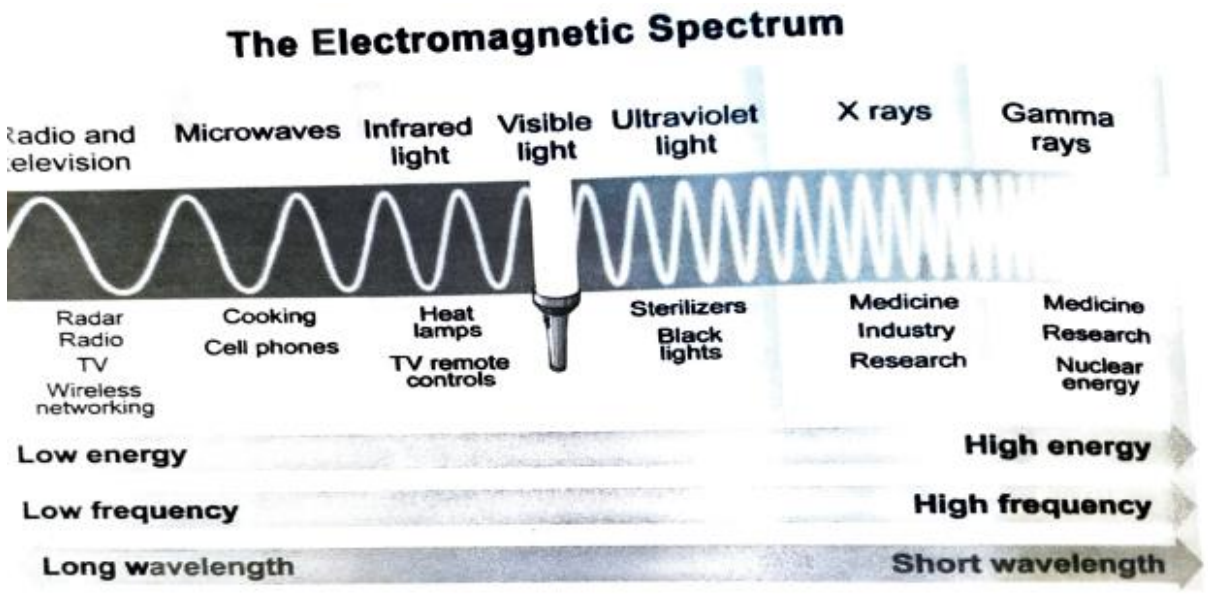
(i) Identify **one** component of the visible spectra.

(ii) Identify the component of the electromagnetic spectra that has the shortest wavelength.

LESSON 86

LO: Describe electromagnetic spectrum and solve practical questions.





2018

Which of the following electromagnetic waves is used to transfer cellular telephone messages?

A. X-rays
B. UV rays
C. Microwaves
D. Gamma rays

2017

The table given below shows the region of the electromagnetic spectrum.

Radio waves	Microwaves	Infrared light	**A**	Ultraviolet light	**B**	Gamma rays

(i) Write down the names of regions **A** and **B**. **(1 mark)**

(ii) Which electromagnetic spectrum has the **longest** wavelength? **(1 mark)**

(iii) Which electromagnetic spectrum has the **highest** energy? **(1 mark)**

2014

1. Which characteristic of the electromagnetic spectrum **always** remains constant?

A. Speed B. Energy C. Frequency D. Wavelength