

The logo of Galgottia University is a stylized 'G' composed of three curved, overlapping bands in shades of yellow, blue, and red. Below the logo, the text 'GALGOTTIA UNIVERSITY' is written in a light grey, serif font.

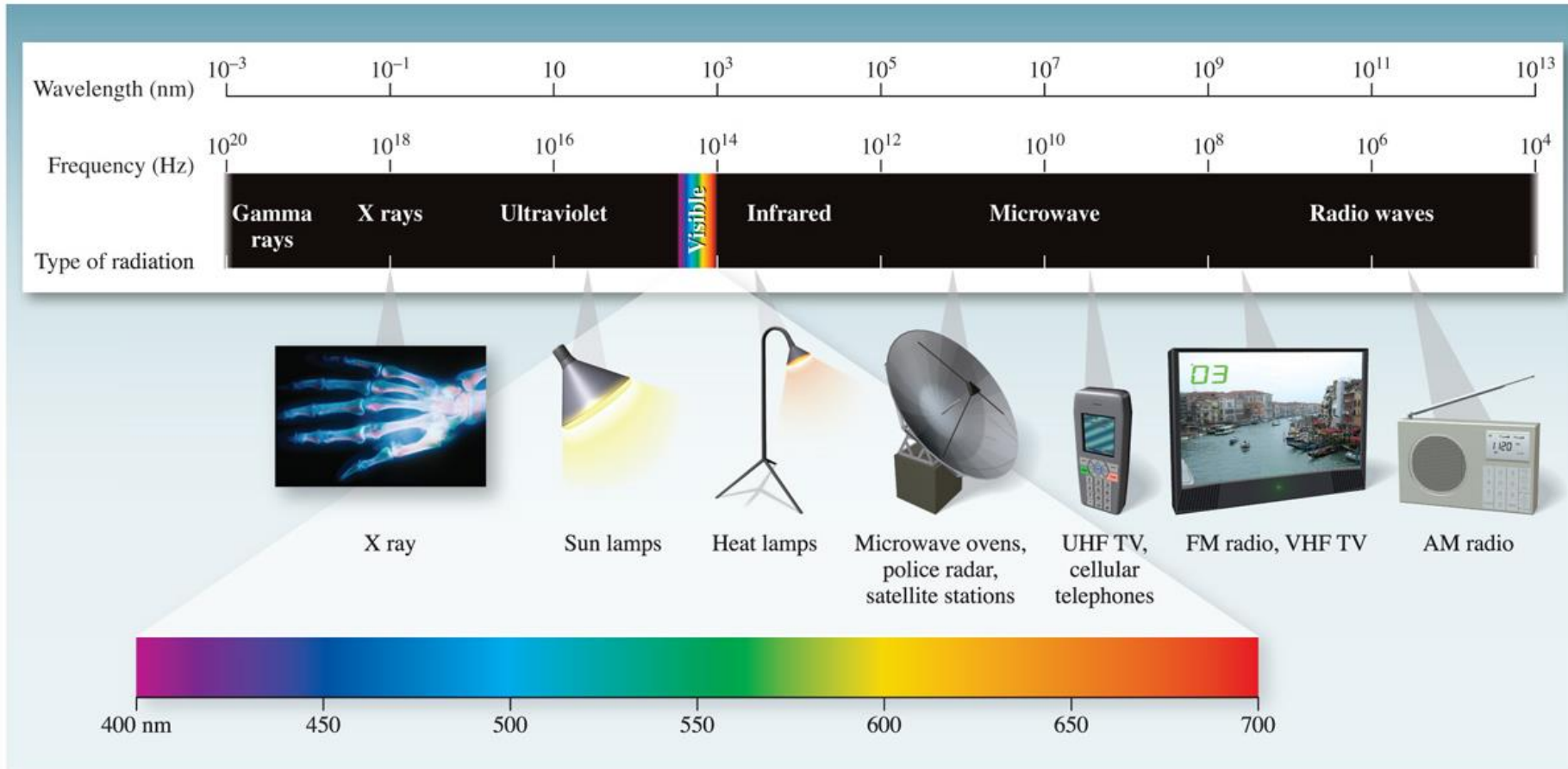
# **Wave theory of electromagnetic radiations**

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# The Nature of Light

- The electromagnetic spectrum includes many different types of radiation.
- Visible light accounts for only a small part of the spectrum
- Other familiar forms include: radio waves, microwaves, X rays
- All forms of light travel in waves

# Electromagnetic Spectrum



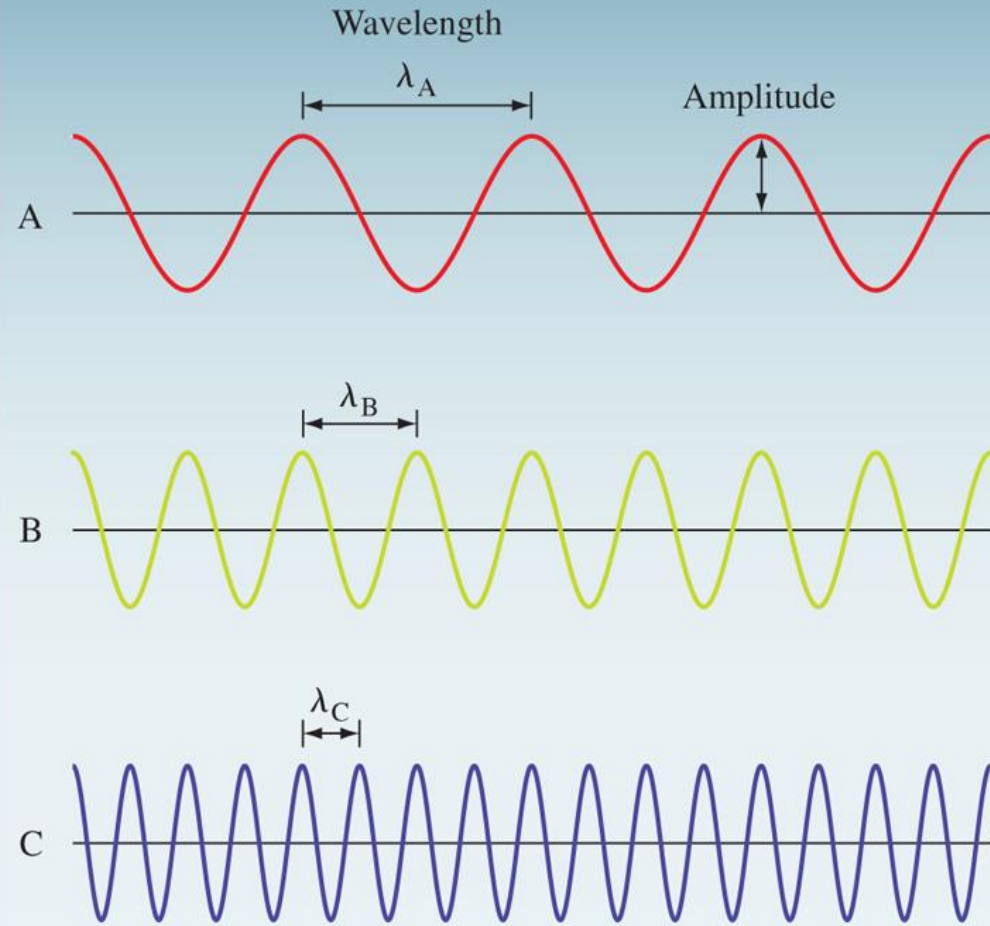
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# Wave Characteristics

- **Wavelength:**  $\lambda$  (lambda) distance between identical points on successive waves...peaks or troughs
- **Frequency:**  $\nu$  (nu) number of waves that pass a particular point in one second
- **Amplitude:** the vertical distance from the midline of waves to the top of the peak or the bottom of the trough

Wavelength = distance between peaks

$$\lambda_A = 2\lambda_B = 4\lambda_C$$



Frequency = cycles (waves) per second

$$\nu_A = \frac{1}{2}\nu_B = \frac{1}{4}\nu_C$$

# Wave Characteristics

- Wave properties are mathematically related as:

$$c = \lambda \nu$$

where

$c = 2.99792458 \times 10^8$  m/s (speed of light)

$\lambda$  = wavelength (in meters, m)

$\nu$  = frequency (reciprocal seconds,  $s^{-1}$ )

# Wave Calculation

The wavelength of a laser pointer is reported to be 663 nm. What is the frequency of this light?

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# Wave Calculation

The wavelength of a laser pointer is reported to be 663 nm. What is the frequency of this light?

$$\nu = \frac{c}{\lambda}$$

$$\lambda = 663 \text{ nm} \times \frac{10^{-9} \text{ m}}{\text{nm}} = 6.63 \times 10^{-7} \text{ m}$$

$$\nu = \frac{3.00 \times 10^8 \text{ m/s}}{6.63 \times 10^{-7} \text{ m}} = 4.52 \times 10^{14} \text{ s}^{-1}$$



Calculate the wavelength of light, in nm,  
of light with a frequency of  $3.52 \times 10^{14} \text{ s}^{-1}$ .

$$\lambda = \frac{c}{\nu}$$

$$\lambda = \frac{3.00 \times 10^8 \text{ m/s}}{3.52 \times 10^{14} \text{ s}^{-1}} = 8.52 \times 10^{-7} \text{ m}$$

$$\lambda = 8.52 \times 10^{-7} \text{ m} \times \frac{10^9 \text{ nm}}{\text{m}} = 852 \text{ nm}$$

# References:

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