

Class X, Physics, chapter 6

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1. Wavelength (λ) = ?

Frequency $f = 5.4 \times 10^{14}$ Hz

Speed of light (c) = 3 lac km/sec

$$= 300000 \text{ km/sec}$$

$$= 300000 \times 10^3 \text{ m/sec}$$

$$= 3 \times 10^8 \text{ m/sec}$$

$$\text{wavelength} = \frac{\text{speed of light}}{\text{frequency}}$$

$$\lambda = \frac{3 \times 10^8 \text{ m/s}}{5.4 \times 10^{14} \text{ Hz}}$$

$$\lambda = 0.555 \times 10^{-6} \text{ m}$$

$$\lambda = 555 \times 10^{-9} \text{ m}$$

$$\lambda = 555 \text{ nm}$$

2. Frequency (f) = $3.75 \times 10^{14} - 7.5 \times 10^{14}$ Hz

Speed of light (c) = 3×10^5 km/sec

$$= 3 \times 10^8 \text{ m/sec}$$

Let $f_1 = 7.5 \times 10^{14}$ Hz

$$\text{Then, } \lambda_1 = \frac{c}{f_1}$$

$$\lambda_1 = \frac{3 \times 10^8}{7.5 \times 10^{14}}$$

let $f_2 = 3.75 \times 10^{14}$ Hz

$$\lambda_2 = \frac{c}{f_2}$$

$$\lambda_2 = \frac{3 \times 10^8}{3.75 \times 10^{14}}$$

$$\lambda_1 = 4 \times 10^{-7} \text{ m}$$

$$\lambda_2 = 8 \times 10^{-7} \text{ m}$$

so range of wavelength (λ) is $4 \times 10^{-7} \text{ m}$ to $8 \times 10^{-7} \text{ m}$

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1. Frequency (f) = 500MHz = 500×10^6 Hz

Wavelength (λ) = 0.6m

Velocity = frequency \times wavelength

$$V = f \times \lambda$$

$$V = 500 \times 10^6 \times 0.6$$

$$V = 3 \times 10^8 \text{ m/s}$$

Medium is air

2. Frequency (f) = 3×10^{20} Hz

Speed (c) = 3×10^8 m/s

Wavelength (λ) = ?

$$\text{wavelength } (\lambda) = \frac{\text{speed } (c)}{\text{frequency } (f)}$$

$$\lambda = \frac{3 \times 10^8}{3 \times 10^{20}}$$

$$\lambda = 10^{-12} \text{ m}$$

3. Wavelength (λ) = $4000 \text{ \AA} = 4000 \times 10^{-10} \text{ m}$

Speed (c) = $3 \times 10^8 \text{ m/s}$

Frequency (f) = ?

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

$$f = \frac{3 \times 10^8}{4000 \times 10^{-10}}$$

$$f = 7.5 \times 10^{15} \text{ Hz}$$

No change in frequency when it travel through glass, only speed and wavelength changes on change of medium. Frequency remains same.