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Answers to NCERT/CBSE PHYSICS Class 12(Class XII)textbook Exercise and Additional exercise

CHAPTER Eight

ELECTROMAGNETIC WAVES

EXERCISES

(For simplicity in numerical calculations, take  $g = 10 \text{ m s}^{-2}$ )

**10.1** Monochromatic light of wavelength 589 nm is incident from air on a water surface. What are the wavelength, frequency and speed of (a) reflected, and (b) refracted light? Refractive index of water is 1.33.

10.1 On reflection the wavelength and speed change but frequency remains the same.

$$(i) \quad \text{refractive index} = \frac{\text{speed of light in air}}{\text{speed of light in water}}$$

$$1.33 = \frac{C}{V}$$

$$V = \frac{3 \times 10^8}{1.33} = 2.25 \times 10^8 \text{ m/s}$$

$$(ii) \quad \text{refractive index} = \frac{\lambda \text{ in air}}{\lambda \text{ in water}}$$

$$1.33 = \frac{589 \text{ nm}}{\lambda \text{ water}}$$

$$\lambda \text{ water} = \frac{589}{1.33} \text{ nm} = 442.8 \text{ nm}$$

$$(iii) \quad f \text{ in air} = \frac{C}{\lambda} = \frac{3 \times 10^8 \text{ m/s}}{589 \times 10^{-9} \text{ m}} = 5.1 \times 10^{14} \text{ Hz}$$

Refracted light has same frequency.