

## TUTORIAL ANSWERS WAVES

### Question 1

Intensity  $\propto$  Amplitude<sup>2</sup>

Intensity = k(Amplitude)<sup>2</sup>

$$3.0 = k(0.20)^2 \text{ --- (1)}$$

$$I_2 = k(0.40)^2 \text{ --- (2)}$$

Divide (2) / (1)

$$I_2 = 12 \text{ Wm}^{-2}$$

### Question 2

a.) Frequency will increase.

b.) Wavelength will decrease.

c.) speed will remain constant.

### Question 3

Energy is lowest when wavelength is greatest. So answer is X-rays (Ans: D)

### Question 4

Intensity  $\propto \frac{1}{(\text{distance})^2}$

$$\frac{I}{2} = k \frac{1}{(8)^2} \text{ --- (1)}$$

$$I = k \frac{1}{(r)^2} \text{ --- (2)}$$

Divide (2) / (1):

$$2 = \frac{(8)^2}{(r)^2} ; r = \sqrt{32} = 4\sqrt{2} \text{ m (Ans: D)}$$

### Question 5

$$v = f\lambda$$

$$\lambda = 320 / 400 = 0.8 \text{ m}$$

$$\frac{0.2}{0.8} \times 2\pi \text{ rad} = \frac{\pi}{2} \text{ rad (Ans: B)}$$

### Question 6

$v = f\lambda$ , wavelength of red light is about 650 nm

$$f = (3 \times 10^8) / (6.5 \times 10^{-7}) = 4.615 \times 10^{14} \text{ Hz}$$

$$\text{period, } T = (1 / 4.615 \times 10^{14}) = 2.17 \times 10^{-15} \text{ s}$$

$$\text{number of wavelengths} = 2.5 \text{ n} / 2.17 \times 10^{-15} = 1.15 \times 10^6 \text{ wavelengths (Ans: B)}$$

### Question 7

$$5 \sin 30^\circ = 2.5 \text{ m}$$

$$(2.5 / 10) \times 360^\circ = \mathbf{90^\circ \text{ (Ans: C)}}$$

### Question 8

**(Ans: B)**

### Question 9

$$\text{a.) } 1.0 \times 10^{-5} = k \frac{1}{(1)^2} \text{ --- (1)}$$

$$I = k \frac{1}{(5)^2} \text{ --- (2)}$$

Divide (2) / (1)

$$I = \frac{1}{25} (1.0 \times 10^{-5}) = \mathbf{4 \times 10^{-7} \text{ Wm}^{-2}}$$

$$\text{b.) } 1.0 \times 10^{-5} = k(70 \times 10^{-6})^2 \text{ --- (1)}$$

$$4 \times 10^{-7} = kA^2 \text{ --- (2)}$$

Divide (2) / (1)

$$A = \sqrt{\frac{4 \times 10^{-7}}{1.0 \times 10^{-5}}} (70 \times 10^{-6}) = \mathbf{1.4 \times 10^{-5} \text{ m}}$$

### Question 10

$$\text{Intensity} \propto \text{amplitude}^2 \propto \frac{1}{\text{distance}^2}$$

$$(1.0 \times 10^{-7})^2 = k [1/(3)^2] \text{ --- (1)}$$

$$A^2 = k [1/(5)^2] \text{ --- (2)}$$

Divide (2) / (1)

$$\mathbf{A = 6.0 \times 10^{-8} \text{ m}}$$