

## Topic :- Electromagnetic Waves

- An electromagnetic wave going through vacuum is described by  $E = E_0 \sin(kx - \omega t)$ ;  $B = B_0 \sin(kx - \omega t)$   
Which of the following equation is true?  
a)  $E_0 k = B_0 \omega$                       b)  $E_0 \omega = B_0 k$                       c)  $E_0 B_0 = \omega k$                       d) None of these
- If alpha, beta and gamma rays carry same momentum, which has the longest wavelength?  
a) Alpha rays    b) Beta rays  
c) Gamma rays    d) None, all have same wavelength
- The curve drawn between velocity and frequency of a photon in vacuum will be  
a) Straight line parallel to frequency axis                      b) Straight line parallel to velocity axis  
c) Straight line passing through origin and making an angle of  $45^\circ$  with frequency axis                      d) Hyperbola
- An Electromagnetic Wave has  
a) Electric vector only  
b) Magnetic vector only  
c) Electric and Magnetic vector Perpendicular to each other  
d) Neither the Electric vector nor the Magnetic vector
- An electromagnetic radiation has an energy of 13.2 keV. Then the radiation belongs to the region of  
a) Visible light                      b) Ultraviolet                      c) Infrared                      d) X-ray
- The electric field of plane electromagnetic wave in vacuum is represented by  $\vec{E}_x = 0$ ;  $\vec{E}_y = 0.5 \cos [2\pi \times 10^8(t - x/c)]$ ;  $\vec{E}_z = 0$   
What is the direction of propagation of electromagnetic waves?  
a) Along  $x - z$  direction                      b) Along  $y$ -direction  
c) Along  $x$ -direction                      d) A long  $y - z$  direction
- An expression for the magnetic field strength  $B$  at the point between the capacitor plates indicates in figure express  $B$  in terms of the rate of change of the electric field strength *ie*,  $dE/dt$  between the plates  
a)  $\frac{\mu_0 i}{2\pi r}$                       b)  $\frac{\epsilon_0 \mu_0 r}{2} dE/dt$                       c) Zero                      d)  $\frac{\mu_0 i}{2r}$

8. The temperature variation in the region of stratosphere lies from  
 a) 290 K to 220 K      b) 220 K to 280 K      c) 220 K to 380 K      d) 180 K to 700 K
9. Which is having minimum wavelength?  
 a) X-rays      b) Ultraviolet rays      c)  $\gamma$ -rays      d) Cosmic rays
10. The voltage applied across an X-ray tube is nearly equal to  
 a) 10 V      b) 100 V      c) 1000 V      d) 10,000 V
11. Given the wavefunction (in SI units) for a wave to be  $\psi_{(x,t)} = 10^3 \sin \pi(3 \times 10^6 x - 9 \times 10^{14} t)$   
 The speed of the wave is  
 a)  $9 \times 10^{14} \text{ ms}^{-1}$       b)  $3 \times 10^8 \text{ ms}^{-1}$       c)  $3 \times 10^6 \text{ ms}^{-1}$       d)  $3 \times 10^7 \text{ ms}^{-1}$
12. The ozone layer of the atmosphere lies in the region called  
 a) Troposphere      b) Stratosphere      c) Mesosphere      d) Ionosphere
13. Solar radiation is  
 a) Transverse Electromagnetic wave      b) Longitudinal Electromagnetic wave  
 c) Stationary wave      d) None of the above
14. Dimensions of  $\frac{1}{\mu_0 \epsilon_0}$ , where symbols have their usual meanings, are  
 a)  $[L^{-1}T]$       b)  $[L^{-2}T^2]$       c)  $[L^2T^{-2}]$       d)  $[LT^{-1}]$
15. Which of the following shows green house effect?  
 a) Ultraviolet rays      b) Infrared rays      c) X-rays      d) None of these
16. The speed of electromagnetic Wave in vacuum depends upon the source radiation. It  
 a) Increases as we move from  $\gamma$  – rays to radio waves  
 b) Decreases as we move from  $\gamma$  – rays to radio waves  
 c) Is same for all of them  
 d) None of the above
17. The wave of wavelength 5900 Å emitted by any atom or molecule must have some finite total length which is known as the coherence length. For sodium light, this length is 2.4 cm. The number of oscillations in this length will be  
 a)  $4.068 \times 10^8$       b)  $4.068 \times 10^7$       c)  $4.068 \times 10^6$       d)  $4.068 \times 10^5$
18. The average value of electric energy density in an Electromagnetic Waves is ( $E_0$  is peak value)  
 a)  $\frac{1}{2} \epsilon_0 E_0^2$       b)  $\frac{E_0^2}{2\epsilon_0}$       c)  $\epsilon_0 E_0^2$       d)  $\frac{1}{4} \epsilon_0 E_0^2$
19. The maximum distance upto which TV transmission from a TV tower of height  $h$  can be received is proportional to  
 a)  $h^{1/2}$       b)  $h$       c)  $h^{3/2}$       d)  $h^2$
20. The dielectric constant of air is 1.006. The speed of Electromagnetic Wave travelling in air is  $a \times 10^8 \text{ ms}^{-1}$ , where  $a$  is about  
 a) 3      b) 3.88      c) 2.5      d) 3.2