



# **PHYSICS**

# **BOOKS - DISHA PHYSICS (HINGLISH)**

# **ELECTROMAGNETIC WAVES**

# **Physics**

**1.** Light is an electromagnetic wave. Its speed in vacuum is given by the expression

A.  $\sqrt{\mu_0 \varepsilon_0}$ 





2. The range of wavelength of the visible light is

A. 10 Å to 100 Å

B. 4,000 Å to 8,000 Å

C. 8,000 Å to 10,000 Å

# D. 10,000 Å to 15,000 Å

#### **Answer:**

**Watch Video Solution** 

**3.** Which of the following radiation has the least wavelength ?

A.  $\gamma$ -rays

B.  $\beta$ -rays

C.  $\alpha$ -rays

D. X-rays



**4.** A parallel plate capacitor with plate area A and separation between the plates d, is charged by a constant current i. Consider a plane surface of area A/4 parallel to the plates and drawn symmetrically between the plates. Find the displacement current through this area.

A. I

B. 2i

C. i/4

D. i/2

## **Answer:**

**Watch Video Solution** 

5. The charging current for a capacitor is 1 A, then the

displacement current is

A. 1 A

B. 0.5 A

C. 0

D. 2A



E.M. wave then the direction of propogation of E.M. wave is along the direction.





**7.** An electromagnetic wave travel along *z*-axis. Which of the following pair of space and time varying fields would generate such a wave?

A.  $E_x, B_y$ 

- B.  $E_y, B_x$
- $\mathsf{C}.\,E_z,\,B_y$
- D.  $E_y, B_z$



8. Choose the wrong statement for E.M. wave. They-

A. are transverse

B. travel in vacuum with the speed of light

C. are produced by accelerated charges

D. travel with same speed in all medium



**9.** The intensity of light from a source is  $500/\pi W/m^2$ . Find the amplitude of electric field in the wave-

A.  $\sqrt{3} imes 10^2 N/C$ B.  $2\sqrt{3} imes 10^2 N/C$ C.  $rac{\sqrt{3}}{2} imes 10^2 N/C$ D.  $2\sqrt{3} imes 10^1 N/C$ 



**10.** A point source of 2 watt is radiating uniformly in all direction in vacuum. Find the amplitude of electric field at a distance 2m from it-

A.  $3 imes 10^{-4}$ 

B.  $\sqrt{30}$ 

C. 
$$\sqrt{3} imes 10^{-4}$$

D. 
$$\sqrt{3} imes 10^{-2}$$

#### **Answer:**

Watch Video Solution

11. In an electomegnetic wave, the amplitude of electric field is 10V/m. The frequency of wave is  $5 \times 10^{14} Hz$ . The wave is propagating along Z-axis, find (i) the average energy density of electric field (ii) the average energy density of

magnetic field (iii) the total average energy density of e.m. wave.

A. 
$$2.21 imes 10^{-10} J \, / \, m^3$$

B.  $2.21 imes10^{-8}J/m^3$ 

C.  $2 imes 10^{-8} J/m^3$ 

D.  $2 imes 10^{-10} J/m^3$ 



12. Electro magnetic waves travel in a medium with speed of  $2 \times 10^8 m / \text{sec}$ . The relative permeability of the medium is 1 find relative permittivity.

A. 2.25 B. 1.25

C. 3.25

D. 0.25





**13.** The magnetic field in the plane electromagnetic wave is given by

 $B_z = 2 imes 10^{-7} \sinig( 0.5 imes 10^3 x + 1.5 imes 10^{11} t ig)$  tesla.

The expression for electric field will be:

A. 23.9 Hz

B. 13.9 Hz

C. 33.9 Hz

D. 12.9 Hz



**14.** The electric field of a plane electromagnetic wave in vacuum is represented by

$$E_x = 0, E_y = 0.5 \cosig[2\pi imes 10^8 (t - x \, / \, c)ig] \;\; ext{and} \;\; E_z = 0$$

Determine the wavelength of the wave.

A. 4 m

•

B. 5 m

C. 3 m

D. 6 m

15. A light beam travelling in the *x*-direction is described by the eectirc field  $E_y = (300V/m)\sin\omega(t - x/c)$ . An electron is constrained to move along the *y*-direction with a speed of  $2.0 \times 10^7 m/$  sec. Find the maximum electric force and the maximum magnetic force on the electron.

A.  $3.2 imes10^{-18}$ 

B. `5.1xx10^(-16)

 ${\sf C.6.5 imes10^{-11}}$ 

D. 
$$7.8 imes10^{-12}$$

Watch Video Solution

16. Which of the following waves have the maximum

wavelength?

A. Microwaves

B. Audible waves

C. Ultrasonic waves

D. Radiowaves



**17.** Electromagnetic waves travel in a medium which has relative permeability 1.3 and relative permittivity 2.14. Then the speed of the electromagnetic wave in the medium will be

A. 
$$13.6 imes10^6m/s$$

- B.  $1.8 imes 10^2 m\,/\,s$
- C.  $3.6 imes 10^8 m\,/\,s$
- D.  $1.8 imes 10^8 m\,/\,s$



**18.** if  $\lambda_{v'}$ ,  $\lambda_x$  and  $\lambda_m$  represent the wavelengths of visible light X-rays and microwaves respectively then:

A. 
$$\lambda_m > \lambda_x > \lambda_v$$
  
B.  $\lambda_v > \lambda_m > \lambda_x$ 

C. 
$$\lambda_m > \lambda_v > \lambda_x$$

D. 
$$\lambda_v > \lambda_x > \lambda_m$$

**19.** Light wave is travelling along *y*-direction. If the corresponding  $\overrightarrow{E}$  vector at any time is along the*x*-axis, the direction of  $\overrightarrow{B}$  vector at that time is along



A. y-axis

B. x-axis

 $C. + z - a\xi s$ 

 $\mathsf{D}.-za\xi s$ 

#### Answer:

**Watch Video Solution** 

**20.** A wave is propagating in a medium of dielectric constant 2 and relative permeability 50. The wave impedance is

A.  $5\Omega$ 

 $\mathsf{B}.\,376.6\Omega$ 

C. 1883 $\Omega$ 

D.  $3776\Omega$ 

#### Answer:

**Watch Video Solution** 

21. Which of the following statements are true ?

A. Photographic plates are sensitive to ultraviolet

rays

B. Photographic plates can be made sensitive to

infrared rays.

C. Infrared rays are emitted by hot objects.

D. Infrared photon has more energy than the

photon of visible light.

Answer:

?

Watch Video Solution

22. Which of the following are electromagnetic waves

A. Cosmic rays

B. Gamma rays

C. X-rays

D.  $\beta$ -rays

#### Answer:

Watch Video Solution

23. An electromagnetic wave of frequency v = 3.0MHz passes from vacuum into a dielectric medium with permittivity  $\varepsilon = 4.0$ . Then

A. Wavelength is doubled and the frequency remains unchanged

B. Wavelength is doubled and frequency becomes

half

C. Wavelength and frequency both remain

unchanged

D. Wavelength is halved and frequency remains

unchanged

# Answer:

**Watch Video Solution** 

**24.** The electron density of a layer of ionosphere at a height 150 km from the earth's surface is  $9 \times 109$  per

m3. For the sky transmission from this layer up to a

range of 250 km,

The critical frequency of the layer is

A.  $2.7 imes 10^6$ Hz

B.  $2.7 imes 10^5~{
m Hz}$ 

 $\text{C.}~4.7\times10^6~\text{Hz}$ 

D.  $4.8 imes 10^5~{
m Hz}$ 



**25.** The electron density of a layer of ionosphere at a height 150 km from the earth's surface is 9 × 109 per m3. For the sky transmission from this layer up to a range of 250 km,

Maximum usable frequency is

A.  $3.7 imes10^8Hz$ 

B.  $3.17 imes 10^{6}Hz$ 

C.  $4.57 imes 10^{6}Hz$ 

D.  $4.57 imes 10^{6}Hz$ 



**26.** The electron density of a layer of ionosphere at a height 150 km from the earth's surface is 9 × 109 per m3. For the sky transmission from this layer up to a range of 250 km,

Angle of incidence of this layer is

A.  $34.5^{\circ}$ 

B.  $25.2^\circ$ 

C.  $31.6^{\circ}$ 

D.  $40^{\,\circ}$ 



**27.** Assertion: The electromagnetic waves of shorter wavelength can travel longer distances on earth's surface thane those of longer of longer wavelengths. Reason: Shorter the wavelength, the larger is the velocity of wave propagation. Also, shorter the wavelength, shorter is the velocity of wave propagation.

A. Statement-1 is True, Statement-2 is True, Statement-2 is a correct explanation for Statement-1. B. Statement-1 is True, Statement-2 is True,

Statement-2 is NOT a correct explanation for

Statement-1.

C. Statement -1 is False, Statement-2 is True.

D. Statement -1 is True, Statement-2 is False.

#### Answer:

Watch Video Solution

**28.** Assertion: Ultraviolet radiation are of higher frequency waves are dangerous to huhman beaing.

Reasion: Ultraviolet radiation are absorbed by the atmosphere

A. Statement-1 is True, Statement-2 is True, Statement-2 is a correct explanation for Statement-1. B. Statement-1 is True, Statement-2 is True, Statement-2 is NOT a correct explanation for Statement-1. C. Statement -1 is False, Statement-2 is True.

D. Statement -1 is True, Statement-2 is False.

**29.** Statement-1: Radio waves can be polarised.

Statement-2: Sound waves in air are longitudinal in nature.

A. Statement-1 is True, Statement-2 is True,
Statement-2 is a correct explanation for
Statement-1.
B. Statement-1 is True, Statement-2 is True,
Statement-2 is NOT a correct explanation for
Statement-1.

C. Statement -1 is False, Statement-2 is True.

D. Statement -1 is True, Statement-2 is False.

