DPP

DAILY PRACTICE PROBLEMS

Class : XIIth
Date :

Solutions

Subject : PHYSICS
DPP No. : 5

Topic :- Electromagnetic Waves

1 **(b)**

$\frac{Q}{t} = \frac{CV}{t}$ or $i_D = C\left(\frac{V}{T}\right)$

or $\frac{V}{t} = \frac{i_D}{C} = \frac{1.0}{10^{-6}} \text{Vs}^{-1} = 10^6 \text{ Vs}^{-1}$

2 **(b)**

Wavelength, $\lambda = c/v = 3 \times 10^8 / 2 \times 10^{10} = 1.5 \times 10^{-2}$ m

5 **(a)**

K. G. Jansky discovered accidently the radio signals coming from outside the atmosphere and reaching the earth

6 **(a)**

$E = E_0 \sin(kx - \omega t)$

Comparing with standard equation we will get

Wavelength $= \frac{k}{\omega}$

8 **(a)**

As $B \propto r$, since the point is on the axis, where $r = 0$, so $B = 0$

9 **(a)**

Consider a loop of radius $r(< R)$ between the two circular plates, placed coaxially with them. The area of the loop $= \pi r^2$

By symmetry magnetic field is equal in magnetic at all points on the loop. If i'_D is the displacement current crossing the loop and i_D is the total displacement current between plates $i'_D = \frac{i_D r}{\pi R^2} \times \pi r^2$. Using Ampere Maxwell' law we have, $\oint \vec{\mathbf{B}} \cdot \vec{\mathbf{dl}} = \mu_0 i'_D$

or $2\pi r = \mu_0 i_D \frac{\pi r^2}{\pi R^2}$ or $B = \frac{\mu_0 i_D r}{2\pi R^2}$

10 **(b)**

The ozone layer absorbs ultraviolet radiations

11 **(d)**

The X-rays ahs the shortest wavelength among the following radiations

12 **(c)**

$\oint \vec{\mathbf{E}} \cdot \overrightarrow{\mathbf{dl}} = -\frac{d\phi B}{dt}$

or $E \times 2\pi r = \frac{d}{dt}(Kt \times \pi r^2) = K\pi r^2$

or $E = \frac{Kr}{2}$

13 **(b)**

Energy flowing per sec per unit area from a face is $= \frac{1}{\mu_0}[\vec{\mathbf{E}} \times \vec{\mathbf{B}}]$. It will be in the negative z-direction. It shows that the energy will be flowing infaces parallel to $x - y$ plane and is zero in all other faces. Total energy flowing per second from a face in $x - y$ plane $= \frac{1}{\mu_0}$ $(EB \sin 90°)a^2 = \frac{EBa^2}{\mu_0}$

14 **(d)**

Now a days microwaves are used to locate the flying objects by radar

15 **(c)**

$$t = \frac{2s}{c} = \frac{2 \times 38400 \times 1000}{3 \times 10^8} = 2.5 \text{ s}$$

16 **(a)**

$m = 1 \times 10^{-26}$kg, $q = 1.6 \times 10^{-19}$ C,

$v = 1.28 \times 10^6 \text{ ms}^{-1}$

Electric field $\mathbf{E} = -1024 \times 10^3 \,\hat{\mathbf{k}}\, \text{NC}^{-1}$

Magnetic field $\mathbf{B} = 8 \times 10^{-2} \,\hat{\mathbf{j}}\, \text{Wbm}^{-2}$

$$\frac{|\mathbf{E}|}{|\mathbf{B}|} = \frac{102.4 \times 10^3}{8 \times 10^{-2}} = \frac{10.24 \times 10^6}{8}$$

$$= 1.28 \times 10^6$$

Hence, $|\mathbf{v}| = \frac{|\mathbf{E}|}{|\mathbf{B}|}$

So, particle will remain undeflected, hence direction of motion of particle is along the positive X-axis.

17 **(b)**

Initial momentum of surface

$$P_i = \frac{E}{C}$$

Where, c = velocity of light (constant).

Since, the surface is perfectly, reflecting, so the same momentum will be reflected completely.

Final momentum

$P_f = \frac{E}{c}$ (negative value)

∴ Change in momentum

$\Delta p = p_f - p_i$

$$= -\frac{E}{c} - \frac{E}{c} = -\frac{2E}{c}$$

Thus , momentum transferred to the surface is

$\Delta p' = |\Delta p| = \frac{2E}{c}$

18 **(d)**

Generally, temperature of human body is 37°C, corresponding to which IR and microwave radiations are emitted from the human body

19 **(d)**

$d = \sqrt{2hR}$

Population covered

$= \pi d^2 \times$ population density

$= 3.114 \times (2 \times 0.1 \times 6.37 \times 10^3) \times 1000 \approx 40$ lakh

20 **(b)**

Diffraction takes places when the wavelength of wave is comparable with the size of the obstacle in path. The wavelength of radio waves is greater than the wavelength of light waves. Therefore, radio waves are diffracted around building

ANSWER-KEY										
Q.	1	2	3	4	5	6	7	8	9	10
A.	B	B	C	B	A	A	B	A	A	B
Q.	11	12	13	14	15	16	17	18	19	20
A.	D	C	B	D	C	A	B	D	D	B