Transweb Educational Services Pvt Ltd
B -147, Sector -6 Noida, UP - 201301,
www.askiitians.com
Email: info@askiitians.com
Tel: 1800-2000-838

Class: 12
Subject: Physics
Topic: Electromagnetic Waves
No. of Questions: 31

1. Induced electric field due to changing magnetic flux are more readily observed than induced magnetic field due to changing electric field. Why?

   Sol.

   The changing electric field produces displacement current, which is very small and hence the magnetic field set up by it is also small, the same cannot be observed easily. In an a.c. circuit displacement current can be increased by increasing the angular frequency of current. This would increase the induced electric field. On the other hand, the induced electric field due to changing mangetic flux can be increased by taking more number of turns of the coil. The induced e.m.f. in different turns of the same coil are added up, resulting in induced electric field which is easily observed.

2. Rahim was a student of science and was suffering from some disease. He was under treatment of a registered medical practioner. The doctor sent Rahim repeatedly for e-ray examination. Rahim was hestitant for the same. He told the doctor that they had been tanght that the repeated exposure to x-rays would be harmful. The doctor told him not to worry as he knew things better.
   Read the above passage and answer the following question:
   (i) For what purpose x-ray examination of a patient is required by a doctor?
   (ii) Is the doctor right to ask Rahim for repeated x-ray examination?
   (iii) What do you learn from this study?

   Sol.

   (i) X-rays examination of a patient is required to diagnose the location of a defect or disease especially in bones, as x-rays can pass through blood and flesh but not through bones.
   (ii) No, the doctor is not right as repeated x-ray examinations of a human body may destroy small and sensitive tissues of the body which may cause further problems.
   (iii) The doctor in not expected to misguide a patient for extraneous considerations. For a patient, the doctor is next only to God. He should always provide a fair treatment.

Transweb Educational Services Pvt Ltd
B -147, Sector -6 Noida, UP - 201301,
www.askiitians.com
Email: info@askiitians.com
Tel: 1800-2000-838

3. Nitin and Rajeev were studying the effect of certain radiations on flower plants.
Nitin exposed his plants to ultraviolet rays, found that his plants got damaged after a few days.
Rajeev exposed his plants to infrared rays, found that his plants had a beautiful bloom, after a few days.
Read the above passage and answer the following questions:
(i) What is the difference between ultraviolet rays and infrared rays?
(ii) Why were the plants exposed to ultraviolet rays damaged and the plants exposed to infrared rays had a beautiful bloom?
(iii) What are the basic values you have learnt from this study?

Sol.

(i) The frequency of ultraviolet rays (v_{UV}) is 8×10^{14} Hz to 5×10^{16} Hz. The frequency of infrared rays (v_{IR}) is 3 10^{11} Hz to 4×10^{14} Hz. As energy. E = hv, so ultraviolet rays are much more energetic than infrared rays.
(ii) A flower plant is very delicate. It can not tolerate the exposure of high energy rays. As ultraviolet rays are of high energy than infrated rays therefore. The plants exposed to ultraviolet rays were diamaged. And the plants exposed to infrared rays beautiful bloom.
(iii) This study imples that small children are like flower plants. They require soft and gentle care by their mothers. Exposure of young kids to harsher treatment is dangerous and it must be avoided.

4. During Diwali festival, Rajender brought a new microwave oven in his house and told his wife Sarika to use the same carefully. He also told her that microwave oven is to be used for slow heating of the vegetables and food articles upto moderate temperatures as that will preserve the food values. The fast cooking of food items at high temperatures will take away the food values from the food. Further, the vegetables or food items to be heated in oven are to be kept in a porcelain vessel and not in a metallic vessel.
Read the above paragraph and answer the following question:
(i) What is the basic principle of working of microwave oven?
(ii) Why is it advised to use porcelain vessel for heating the food items in microwave oven?
(iii) What basic values do you learn from this study?

Sol.

(i) The basic principle of working of microwave oven is to create microwave radiations of suitable frequency in the working space of oven. Which may match the resonant frequency of rotation of water molecules in the food items (i.e., about 3 GHz). When microwaves of this frequency fall on food items containing water molecules (like fruits, vegetables, cereals etc.) placed in oven. The water molecules absorb these radiations.

Transweb Educational Services Pvt Ltd
B -147, Sector -6 Noida, UP - 201301,
www.askiitians.com
Email: info@askiitians.com
Tel: 1800-2000-838

As a result of it, the energy of water molecules increases. These molecules share their energy with neighbouring molecules. Due to it, the entire food gets heated.

(ii) In microwave oven, a porcelain container is used for heating the food articles in the oven. It is so because the size of the molecules of porcelain container is large and they vibrate and rotate with much smaller frequency than that of microwave and hence can not absorb microwaves. Due to it, the porcelain container remains at relatively lower temperature.

(iii) We find that in a microwave oven, the slow and low heating of food will preserve the food values but fast and intense heating will destroy the food values. The same is true in day to day life. Sudden rises may be harmful. Instead, steady rises are appreciable.

5. Four persons went to an excursion on a hill top where temperature was quite low. One of tham fell sick. The other persons put a blanket on him, collected the pieces of dry wood and ignited fire in his vicinity. After sometime the sick person felt better.
Read the above passage and answer the following questions:

(i) What are the type of rays coming from study?

(ii) Why did the sick person feel better while seating near the fine?

(iii) What basic values do you learn from this study?

Sol.

(i) The rays coming from fire are yellow, red and infrared rays.

(ii) The infrared rays coming fire provide the soothing effect to the body muscles of the sick person sitting near the fire. Due to it, the sick person feels better after some time.

(iii) From the above study we learn that presence of mind and proper use of the things available help to save a difficult situation.

6. A parallel plate capacitor is being charged by a time varying current. Explain briefly how Ampere's circuital law is generalised to incorporate the effect due to the displacement current.

Sol.

While dealing with the charging of a parallel plate capacitor with varying current, it was found that Ampere's circuital law is not logically consistent, because $\overrightarrow{\underset{B.dl}{\rightarrow}}$ has not same value on the two sides of a plate of charged capacitor. The inconsistency of Ampere's circuital law removed by Maxwell by predicting the presence of displacement current in the region between the plates of capacitor, when the charge on capacitor is changing with time. Maxwell also predicted that the sum of conduction current and displacement current has the property of continuity.

The generalised form of Ampere's circuital law, modified by Maxwell states that

$$\oint_{B.dl=\mu_0}^{\rightarrow\longrightarrow} (I + I_d) = \mu_0 \left(I + \epsilon_0 \frac{d\Phi_E}{d_t}\right).$$

7. Answer the following questions:
   A. Long distance radio broadcasts use short wave bands. Why?
   B. It is necessary to use satellites for long distance T.V. transmission. Why?
   C. Optical and radio telescopes are built on the ground but X-ray astronomy is possible only from satellites orbiting the earth. Why?
   D. The small ozone layer on top of the atmosphere is crucial for human survival. Why?
   E. If the earth did not have atmosphere, would its average surface temperature be higher or lower than what it is now?
   F. Some scientists have predicted that a global nuclear war on the earth would be followed by a severe 'nuclear winter' with a devastating effect on life on earth. What might be the basis of this prediction

   Sol.

   A. It is so because ionosphere reflects the waves in these bands.
   B. Yes, television signals being of high frequency are not reflected by the ionosphere. Therefore, to reflect them satellites are needed. That is why, satellites are used for long distance T.V. transmission.
   C. Optical and radio waves can penetrate the atmosphere whereas X-rays being of much smaller wavelength are absorbed by the atmosphere. That is why we can work with optical and radio telescopes on earth's surface but X-ray astronomical telescopes must be used on the satellite orbiting above the earth's atmosphere.
   D. The small ozone layer present on the top of the stratosphere absorbs most of the ultraviolet radiations from the sun which are dangerous and cause genetic damage to the living cells, prevent them from reaching the earth's surface and thus helps in the survival of life.
   E. The temperature of the earth would be lower because the Green House effect of the atmosphere would be absent.
   F. The clouds by a global nuclear war would perhaps cover most parts of the sky preventing solar light from reaching many parts of the globe. This would cause a 'winter'

8. A variable frequency a.c. source is connected to a capacitor. Will the displacement current increases of decrease with increase in frequency?

   Sol.

   The increase in frequency of a.c., will decrease the reactance of the capacitor [$X_c=1/(2\pi\ V\ C)$] and hence will increase the conduction current. Since the displacement current in equal to the

Transweb Educational Services Pvt Ltd
B -147, Sector -6 Noida, UP - 201301,
www.askiitians.com
Email: info@askiitians.com
Tel: 1800-2000-838

conduction current, therefore, the displacement current will increase with the increase in frequency of a.c.

9. Which of the following concepts applies to both sound waves and electromagnetic waves:
   (a) Polarization and
   (b) Intensity? Explain the same.

   Sol.

   Sound waves are longitudinal waves whereas electromagnetic waves are transverse waves. The concept of polarization applies only to electromagnetic waves and not to sound waves because a wave is said to be polarized when its vibrations or oscillations are restricted in a particular direction perpendicular to wave velocity, which is possible for transverse waves and not for longitudinal wave.

   The concept of intensity applies to both, sound waves and electromagnetic waves. In case of sound waves, the intensity is related to the amplitude of pressure variation whereas in the case of electromagnetic waves, it is related to the amplitude of oscillating electric or magnetic field.

10. What happens to the intensity of light from a bulb if the distance from the bulb is doubled? As a laser beam travels across the length of a room, its intensity essentially remains constant. What geometrical characteristic of LASER beam is responsible for the constant intensity which is missing in the case of light from the bulb?

    Sol.

    Intensity of light is reduced to one fourth the light beam spreads as it approaches into a spherical region of area $4\pi r^2, i.e., I \propto \frac{1}{r^2}$. But laser beam does not spread, hence its intensity remains constant. Laser beam is unidirectional, monochromatic and coherent light, whereas the light from a bulb does not possess the above properties.

11. Even though and electric field $=\underset{E}{\rightarrow}$ exerts a force $\underset{qE}{\rightarrow}$ on a charged particle yet the electric field of an EM wave does not contribute to the radiation pressure (but transfers energy). Explain.

    Sol.

    Electric field of an electromagnetic wave is an oscillating field. Due to it, the electric force caused by electric field in em wave on a charged particle is an oscillating one. This electric force averaged over an integral number of cycle is zero, since its direction changes every half cycle. Hence electric field is not responsible for radiation pressure.

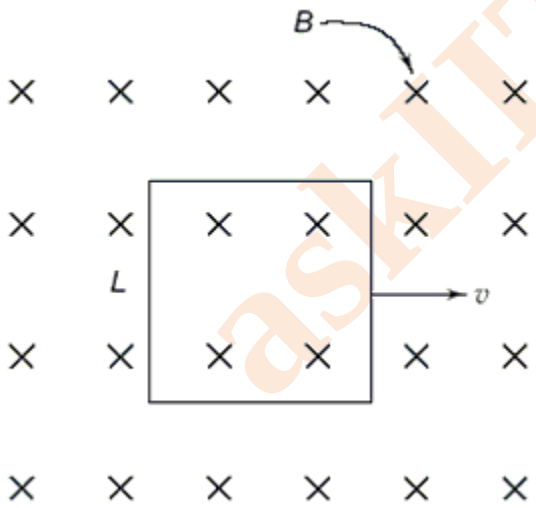
12. An alternating voltage $V = V_0 \sin \omega t$ is applied across a circuit. As a result a current $I = I_0 \sin (\omega t - \pi/2)$ flows in it. The power consumed per cycle is

A. Zero
B. $0.5\ V_0 I_0$
C. $0.707\ V_0 I_0$
D. $1.414\ V_0 I_0$

Right Answer Explanation:

The phase angle between voltage V and current I is $\pi/2$. Therefore, power factor $\cos \phi = \cos (\pi/2) = 0$. Hence the power consumed is zero, which is choice (1).

13. A conducting square loop of side L and resistance R moves in its plane with a uniform velocity v perpendicular to one of its sides. A magnetic field B, constant in space and time, pointing perpendicular and into the plane of the loop exists everywhere as shown in figure given below. The current induced in the loop is



A. BLv/R clockwise
B. BLv/R anticlockwise
C. 2BLv/R anticlockwise
D. Zero

Transweb Educational Services Pvt Ltd
B -147, Sector -6 Noida, UP - 201301,
www.askiitians.com
Email: info@askiitians.com
Tel: 1800-2000-838

Right Answer Explanation:
Since the magnetic field is constant in time and space and exists everywhere, there is no change in magnetic flux when the loop is moved in it. Hence no current is induced, which is choice (4).

14. A thin circular ring of area A is held perpendicular to a uniform magnetic field of induction B. A small cut is made in the ring and a galvanometer is connected across the ends such that the total resistance of the circuit is R. When the ring is suddenly squeezed to zero area, the charge flowing through the galvanometer is

A. $\frac{BR}{A}$
B. $\frac{AB}{R}$
C. ABR
D. $\frac{B^2A}{R^2}$

Right Answer Explanation:

Induced charge $q = \frac{\text{change of flux}}{\text{resistance}} = \frac{\phi_f - \phi_i}{R}$. But final area = 0, therefore, $\phi_f = 0$. Numerically, $\phi_i = BA$. Therefore, $q = BA/R$, which is choice (2).

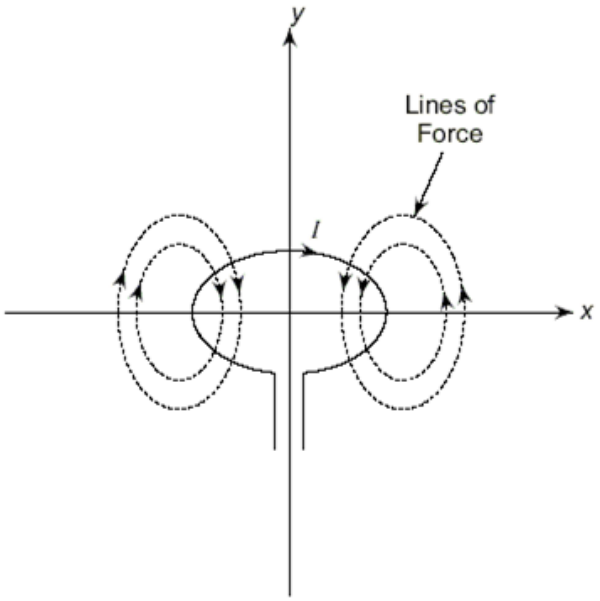
15. A circular loop of radius R, carrying current I, lies in the x-y plane with its centre at the origin. The total magnetic flux through the x-y plane is

A. directly proportional to I
B. directly proportional to R
C. inversely proportional to R
D. zero

Right Answer Explanation:

Transweb Educational Services Pvt Ltd
B -147, Sector -6 Noida, UP - 201301,
www.askiitians.com
Email: info@askiitians.com
Tel: 1800-2000-838

Figure shows the field lines (shown as broken curves) of the magnetic field due to the current flowing in the loop. It is clear from the figure that the magnetic flux in the x-y plane will be zero. Hence the correct choice is (4).



16. A coil of inductance 8.4 mH and resistance 6 Ω is connected to a 12 V battery. The current in the coil is 1.0 A at approximately the time equal to

A. 500 s
B. 20 s
C. 35 ms
D. 1 ms

Right Answer Explanation:

Transweb Educational Services Pvt Ltd
B -147, Sector -6 Noida, UP - 201301,
www.askiitians.com
Email: info@askiitians.com
Tel: 1800-2000-838

The current in the inductor is given by

$$I = \frac{V}{R}\ (1 - e^{-t/\tau}), \text{ where } \tau = L/R.$$

$$\text{Given, } \tau = \frac{L}{R} = \frac{8.4\ \text{mH}}{6\ \Omega}$$

$$= 1.4\ \text{ms (millisecond)}$$

$$\therefore\ 1.0 = \frac{12}{6}\ (1 - e^{-t/1.4\ \text{ms}})$$

$$\text{or} \qquad e^{-t/1.4\ \text{ms}} = 1 - \frac{1}{2} = \frac{1}{2}$$

$$\text{or} \qquad -\frac{t}{1.4\ \text{ms}} = \log_e\left(\frac{1}{2}\right) = -0.693$$

$$\text{or} \qquad t = 0.693 \times 1.4\ \text{ms} = 0.97\ \text{ms}$$

Hence the correct choice is (4).

17. A short-circuited coil is placed in a time-varying magnetic field. Electrical power is dissipated due to the current induced in the coil. If the number of turns were to be quadrupled and the wire radius halved, the electrical power dissipated would be

A. halved
B. the same
C. doubled
D. quadrupled

Right Answer Explanation:

Transweb Educational Services Pvt Ltd
B -147, Sector -6 Noida, UP - 201301,
www.askiitians.com
Email: info@askiitians.com
Tel: 1800-2000-838

The magnitude of the induced voltage is proportional to the rate of change of magnetic flux which, in turn, depends on the number of turns in the coil, i.e. $V \propto n$. The resistance of a wire is given by

$R = \dfrac{\rho l}{\pi r^2}$ or $R \propto \dfrac{l}{r^2}$. Here ρ is the resistivity of the material of the wire.

$\therefore$ Power $P = \dfrac{V^2}{R} \propto \dfrac{n^2}{l/r^2}$ or $P \propto \dfrac{(nr)^2}{l}$

$$\therefore \quad \frac{P_2}{P_1} = \left(\frac{n_2}{n_1}\right)^2 \times \left(\frac{r_2}{r_1}\right)^2 \times \left(\frac{l_1}{l_2}\right) \qquad (1)$$

Now, if a wire of length l_1 and radius r_1 is stretched to a length l_2 such that its radius reduced to r_2, then (since the mass of the wire remains constant)

$m = \pi r_1^2 l_1 d = \pi r_2^2 l_2 d$ (d is the density)

or $\dfrac{l_1}{l_2} = \left(\dfrac{r_2}{r_1}\right)^2$. Using this in Eq. (1), we get

$$\frac{P_2}{P_1} = \left(\frac{n_2}{n_1}\right)^2 \times \left(\frac{r_2}{r_1}\right)^4$$

Given $\dfrac{n_2}{n_1} = 4$ and $\dfrac{r_2}{r_1} = \dfrac{1}{2}$.

Using these values, we get

$$\frac{P_2}{P_1} = (4)^2 \times \left(\frac{1}{2}\right)^4 = 1,$$

which is choice (2).

18. If the flux of magnetic induction through a coil of resistance R and having n turns changes from ϕ_1 to ϕ_2, then the magnitude of the charge that passes through the coil is

A. $\frac{(\phi_2 - \phi_1)}{R}$
B. $\frac{n(\phi_2 - \phi_1)}{R}$
C. $\frac{(\phi_2 - \phi_1)}{nR}$
D. $\frac{nR}{(\phi_2 - \phi_1)}$

Right Answer Explanation:

Induced emf is $|e| = n\,\frac{\Delta\Phi}{\Delta t}$. Now

$$\Delta q = I\,\Delta t$$

$$= \frac{e}{R}\,\Delta t = \frac{n\Delta\Phi}{R\Delta t} \times \Delta t = \frac{n\Delta\Phi}{R}$$

$$= \frac{n(\Phi_2 - \Phi_1)}{R}$$

Hence the correct choice is (2).

19. metallic wheel with 8 metallic spokes each of length r is rotating at an angular frequency ω in a plane perpendicular a magnetic field B. The magnitude of the induced emf between the axle and the rim of the wheel is

A. $\frac{1}{2}\omega r^2 B$
B. $2\,\omega r^2 B$
C. $4\,\omega r^2 B$
D. $8\,\omega r^2 B$

Right Answer Explanation:

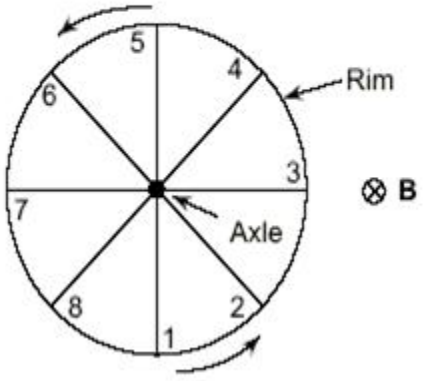
Let ν be the frequency of rotation. The time taken for 1 full rotation is $T = 1/\nu$. Therefore, rate of change of area is

$$\frac{A}{T} = \frac{\pi r^2}{T} = \pi r^2 \nu$$

Now, the emf induced between the axle and rim is e = $B \times$ rate of change of area

$$= B \times \pi r^2 \nu = \frac{1}{2} B r^2 \omega \quad (\because \omega = 2\pi\nu)$$

Since the same emf is produced between the ends of each spoke, and these emfs are in parallel as is evident from Fig. the net emf between the axle and the rim of the wheel will be the same as that across each spoke. We notice that all the eight spokes are connected with one end at the rim and the other at the axle. Hence the magnitude of the net emf between the axle and the rim is independent of the number of spokes.



Transweb Educational Services Pvt Ltd
B -147, Sector -6 Noida, UP - 201301,
www.askiitians.com
Email: info@askiitians.com
Tel: 1800-2000-838

20. A solenoid of inductance L and resistance R is connected to a battery. The time taken for the magnetic energy to reach $\frac{1}{4}$ of its maximum value is

A. $\frac{L}{R}\log_e(1)$

B. $\frac{L}{R}\log_e(2)$

C. $\frac{L}{R}\log_e(3)$

D. $\frac{L}{R}\log_e(4)$

Right Answer Explanation:

The growth of current in an LR circuit is given by

$$I = I_0 (I - e^{-Rt/L}) \qquad (1)$$

where I_0 is the maximum current. The energy stored at time t is

$$U = \frac{1}{2} LI^2$$

We are required to find the time at which the energy stored is one-forth the maximum value, i.e. when

$$U = \frac{U_0}{4} \text{ where}$$

$$U_0 = \frac{1}{2} LI_0^2$$

i.e. $$\frac{1}{2} LI^2 = \frac{1}{4}\left(\frac{1}{2} LI_0^2\right) \quad \text{or} \quad I = \frac{I_0}{2}$$

Using this in Eq. (1), we get

$$\frac{I_0}{2} = I_0 (1 - e^{-Rt/L}) \quad \text{or} \quad \frac{1}{2} = 1 - e^{-Rt/L}$$

or $$e^{-Rt/L} = \frac{1}{2} \quad \text{or} \quad -\frac{Rt}{L} = \log_e \left(\frac{1}{2}\right)$$

or $$t = \frac{L}{R} \log_e(2), \text{ which is choice (2).}$$

21. An LCR series circuit with R = 100 Ω is connected to a 200 V, 50 Hz a.c. source. When only the capacitance is removed, the voltage leads the current by 60°. When only the inductance is removed, the current leads the voltage by 60°. The current in the circuit is

A. $\frac{2}{\sqrt{3}}$ A
B. $\frac{\sqrt{3}}{2}$ A
C. 1 A
D. 2 A

Right Answer Explanation:

Transweb Educational Services Pvt Ltd
B -147, Sector -6 Noida, UP - 201301,
www.askiitians.com
Email: info@askiitians.com
Tel: 1800-2000-838

When capacitance is removed, the circuit contains only inductance and resistance. Phase difference θ between the current and voltage is then given by

$$\tan\theta = \frac{\omega L}{R} \quad \text{or} \quad \omega L = R\tan\theta = 100\tan 60°$$

When the circuit contains only capacitance and resistance, the phase difference between the voltage and current is given by

$$\tan\phi = \frac{1}{RC\omega}$$

$$\therefore \quad \frac{1}{C\omega} = R\tan\phi = 100\tan 60°$$

The impedance of the LCR circuit is given by

$$Z = \sqrt{R^2 + \left(\omega L - \frac{1}{C\omega}\right)^2}$$

$$= \sqrt{R^2 + (100\tan 60° - 100\tan 60°)^2}$$

$$= R = 100\ \Omega$$

The current is given by

$$I = \frac{V}{R} = \frac{200}{100} = 2\ \text{A}.$$

Hence the correct choice is (4).

22. The current in a coil of self-inductance 2.0 H is increasing according to the equation I = 2 sin (t^2) ampere. The amount of energy spent during the period when the current changes from zero to 2 A is

A. 2 J
B. 4 J
C. 8 J
D. 16 J

Right Answer Explanation:

$W = \frac{1}{2} LI_0^2$, where I_0 = peak value of I = 2 A. Thus

$$W = \frac{1}{2} \times 2.0 \times (2)^2 = 4 \text{ J}$$

Hence the current choice is (2).

23. Which of the following electromagnetic has the longest wavelength?

A. Radiowaves
B. Infrared radiation
C. Microwaves
D. X-rays

Right Answer Explanation:
The correct choice is (1).

24. Which of the following electromagnetic waves is used in telecommunication?

A. Radiowaves
B. Visible radiation
C. Ultraviolet rays
D. Microwaves

Right Answer Explanation:
The correct choice is (4).

25. In an electromagnetic wave travelling in air, the amplitudes E_0 and B_0 of the electric and magnetic fields are related as (here c is the speed of the wave in air)

A. $E_0 = cB_0$
B. $E_0 = \frac{B_0}{c}$
C. $E_0 = c^2 B_0$
D. $E_0 = B_0$

Right Answer Explanation:

Transweb Educational Services Pvt Ltd
B -147, Sector -6 Noida, UP - 201301,
www.askiitians.com
Email: info@askiitians.com
Tel: 1800-2000-838

The correct choice is (1).

26. When a plane electromagnetic wave travels in vacuum, the average electric energy density is given by (here E_0 is the amplitude of the electric field of the wave)

A. $\frac{1}{4}\varepsilon_0 E_0^2$
B. $\frac{1}{2}\varepsilon_0 E_0^2$
C. $2\,\varepsilon_0 E_0^2$
D. $4\,\varepsilon_0 E_0^2$

Right Answer Explanation:
The correct choice is (1).

27. The speed of electromagnetic waves in vacuum is given by

A. $\frac{1}{\mu_0 \varepsilon_0}$
B. $\frac{1}{\sqrt{\mu_0 \varepsilon_0}}$
C. $\mu_0 \varepsilon_0$
D. $\sqrt{\mu_0 \varepsilon_0}$

Right Answer Explanation:
The correct choice is (2).

28. Which of the following statements is false?

A. Electromagnetic waves are transverse.
B. Electromagnetic waves travel in free space at the speed of light.
C. Electromagnetic waves travel with the same speed in all media.
D. Electromagnetic waves are produced by an accelerating charge.

Right Answer Explanation:

Transweb Educational Services Pvt Ltd
B -147, Sector -6 Noida, UP - 201301,
www.askiitians.com
Email: info@askiitians.com
Tel: 1800-2000-838

The refractive index (n) of a medium is defined as

$$n = \frac{c}{v}$$

where c is the speed of the electromagnetic wave in free space and v that in the medium. Thus, $v = c/n$. Since the value of n is different for different media, the value of v will also be different for different media. Hence choice (3) is false.

29. Displacement current was first postulated by

A. Ampere
B. Maxwell
C. Hertz
D. Marconi

Right Answer Explanation:
The correct choice is (2).

30. In a plane electromagnetic wave, the electric field oscillates sinusoidally at a frequency of 2.0 × 10^{10} Hz. What is the wavelength of the wave?

A. cm
B. 1.5 cm
C. cm
D. cm

Right Answer Explanation:

$$\lambda = \frac{c}{v} = \frac{3\times10^{8}}{2.0\times10^{10}} = 1.5\times10^{-2}\ \text{m} = 1.5\ \text{cm}$$, which is choice (2)

Transweb Educational Services Pvt Ltd
B -147, Sector -6 Noida, UP - 201301,
www.askiitians.com
Email: info@askiitians.com
Tel: 1800-2000-838

31. An electromagnetic wave is produced by oscillating electric and magnetic fields E and B. Choose the only incorrect statement from the following.

A. E is perpendicular to B.
B. E is perpendicular to the direction of propagation of the wave.
C. B is perpendicular to the direction of propagation of the wave.
D. E is parallel to B.

Right Answer Explanation:
The correct choice is (4).