

UNIT-5 ELECTROMAGNETIC WAVES

QUESTIONS

VERY SHORT ANSWER QUESTIONS (1 Mark)

1. Every *EM* wave has certain frequency. Name two parameters of an em wave that oscillate with this frequency.

2. What is the phase difference between electric and magnetic field vectors in an em wave?
3. Name em radiations used for detecting fake currency notes.
4. Give any two uses of microwaves.
5. Name the phenomenon which justifies the transverse nature of em waves.
6. Arrange the following em waves in descending order of wavelengths :
γ ray, microwaves UV radiations.
7. Which component \vec{E} or \vec{B} of an em wave is responsible for visible effect?
8. Write expression for speed of em waves in a medium of electrical permittivity ϵ and magnetic permeability μ .
9. Which of the following has longest penetration power?
UV radiation, X-ray, Microwaves.
10. Which of the following has least frequency?
IR radiations, visible radiation, radio waves.
11. Which physical quantity is the same for microwaves of wavelength 1 mm and UV radiations of 1600 \AA in vacuum?
12. Name two physical quantities which are imparted by an em wave to a surface on which it falls.
13. Name the physical quantity with unit same as that of

$$\left\{ I_d = \epsilon_0 \frac{d\phi_e}{dt} \right.$$
 where ϕ_e electric flux.
14. What is the source of energy associated with propagating em waves?
15. What is the wavelength range of em waves that were produced and observed by J.C. Bose?
16. Name the device used for producing microwaves.
17. Name the em radiations which are detected using Gieger tube.
18. Relative electric permittivity of a medium is 8 and relative permeability is close to unity. What is the speed of em waves in the medium.

19. Identify the part of the electromagnetic spectrum to which the following wavelengths belong
(i) 10^{-1} m (ii) 10^{-12} m
20. Name the part of the electromagnetic spectrum of wavelength 10^{-2} m and mention its one application.
21. Which of the following, if any, can act as a source of electromagnetic waves?
- A charge moving with a constant velocity.
 - A charge moving in a circular orbit.
 - A charge at rest.
22. Mention the pair of space and time varying E and B fields which would generate a plane em wave travelling in Z-direction.
23. The charging current for a capacitor is 0.2A. What is the displacement Current?
24. Give the ratio of Velocities of light waves of wavelengths 4000\AA and 8000\AA in Vacuum.
25. Which physical quantity, if any has the same value for waves belonging to the different parts of the electromagnetic spectrum?

SHORT ANSWER QUESTIONS (2 Marks)

- Give one use of each of the following (i) UV ray (ii) γ -ray
- Represent *EM* waves propagating along the *x*-axis. In which electric and magnetic fields are along *y*-axis and *z*-axis respectively.
- State the principles of production of *EM* waves. An *EM* wave of wavelength λ goes from vacuum to a medium of refractive index *n*. What will be the frequency of wave in the medium?
- An *EM* wave has amplitude of electric field E_0 and amplitude of magnetic field is B_0 the electric field at some instant become $\frac{3}{4} E_0$. What will be magnetic field at this instant? (Wave is travelling in vacuum).

5. State two applications of infrared radiations.
6. State two applications of ultraviolet radiations.
7. State two applications of x-rays.
8. Show that the average energy density of the electric field E equals the average energy density of the magnetic fields \vec{B} ?

SHORT ANSWER QUESTIONS (3 Marks)

1. Name *EM* radiations used (i) in the treatment of cancer.
(ii) For detecting flaw in pipes carrying oil.
(iii) In sterilizing surgical instruments.
2. How would you experimentally show that *EM* waves are transverse in nature?
3. List any three properties of *EM* waves.
4. Find the wavelength of electromagnetic waves of frequency 5×10^{19} Hz in free space. Give its two applications