



Blue Print (As per PU Board)

Topic	1 mark questions	2 marks questions	3 marks questions	5 marks questions	Total Marks
Electromagnetic Waves	2	-	-	1	7

**One mark questions**

1. **What is displacement current? Write an expression for it.**

Answer: Displacement current is that current produced in a region whenever the electric field and hence the electric flux is changing with time  $I_d = \epsilon_0 \frac{d\phi_E}{dt}$

2. **Write Ampere- Maxwell's law.**

Answer:  $\vec{B} \cdot d\vec{l} = \mu_0 \epsilon_0 \frac{d\phi_E}{dt}$

3. **What is the inconsistency in Ampere's circuital law?**

Answer: It fails to explain the magnetic field produced by the displacement current

4. **What is the most significant consequence of displacement current?**

Answer: The existence of electromagnetic waves is a very important outcome of displacement current.

5. **State Maxwell's equations.**

Answer:

1.  $\oint \vec{E} \cdot d\vec{A} = \frac{Q}{\epsilon_0}$  [Gauss law for electricity]

2.  $\oint \vec{B} \cdot d\vec{A} = 0$  [Gauss law for magnetism]

3.  $\oint \vec{E} \cdot d\vec{l} = -\frac{d\phi_E}{dt}$  [Faraday's law]

4.  $\oint \vec{B} \cdot d\vec{l} = \mu_0 i_c + \mu_0 \epsilon_0 \frac{d\phi_E}{dt}$

6. **Mention the formula for speed of propagation of electromagnetic wave in a material medium?**

Answer:  $c = \frac{1}{\sqrt{\mu\epsilon}}$

Where  $\mu$  = permeability and  $\epsilon$  = permittivity of the medium

7. **Mention the relation which relates the magnitude of electric and the magnetic field in an electromagnetic wave**

Answer:  $c = \frac{E}{B} = \frac{\text{electric field}}{\text{Magnetic field}}$

8. **What are electromagnetic waves?**

Answer: They consist of varying electric and magnetic fields at right angles to each other as well as at right angles to the direction of propagation.

9. **Which is the component of electromagnetic spectrum having the highest frequency or shortest wave length?**

Answer:  $\gamma$ -rays .

10. **Which is the component of electromagnetic spectrum having the longest wavelength or least frequency?**

Answer: Radio waves

11. **Name the components of electromagnetic spectrum and arrange them in the increasing order of frequency or decreasing order of wavelength.**

Answer: Radio waves, Micro waves, Infrared radiation, visible radiation, ultraviolet radiation,  $x$ -rays ,  $\gamma$ -rays .



**12. How are x-rays produced?**

Answer: x-rays are produced when a beam of fast moving electrons are suddenly stopped by metal targets.

**Two marks questions**

**13. State any two properties of displacement current.**

Answer:

(one mark each any two)

- (i) It exists when there is a change in the magnetic flux.
- (ii) It does not exist under steady conditions
- (iii) If  $i_d$  denotes displacement current and  $i_c$  denotes the conduction current, then  $(i_d + i_c)$  satisfies equation of continuity.

**14. Represent linearly polarised electromagnetic wave propagating in z direction graphically**

Answer: x-axis : direction of the electric field  $\vec{E}$ , y-axis : direction of the magnetic field  $\vec{B}$ , z-axis : direction of wave propagation.

(1 mark)

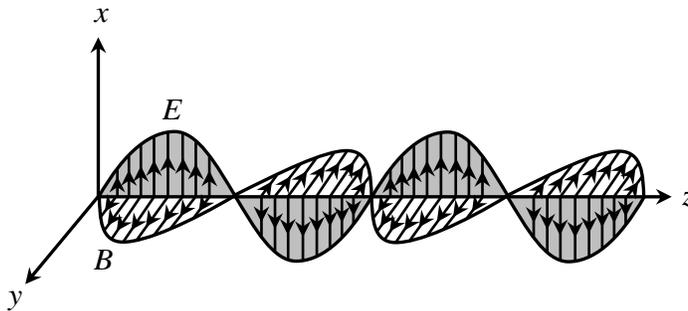


Fig. (1 mark)

**15. Why do welders wear special glass goggles on face masks?**

Answer: To protect their eyes from large amount of ultraviolet rays produced by welding arcs.

(2 marks)

**16. Mention the application of ultraviolet rays.**

Answer:

- 1. Used in LASIK eye surgery. (1 mark)
- 2. Used for killing germs in water purifiers. (1 mark)

**17. Mention two application of x-rays .**

Answer:

- (I) x-rays are used to study crystallographic structure. (1 mark)
- (II) They are used to diagnose fractures in bones, heart diseases ..etc., (1 mark)