

**Question Bank B.Sc. (Physics) Sem –II (H)**  
**Paper- Core 3 (Electricity & Magnetism)**

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**Group A: Short Type Questions**

1. What do you mean by electric field intensity ? Write its unit.
2. Calculate the electric field due to surface charge distribution.
3. Find out the electric potential due to an electric dipole.
4. What do you understand by equipotential surface ?
5. Define electric potential . Show that in an electric field  $\vec{E}$ , the potential difference between two points ' a ' and ' b ' along any path is

$$V_a - V_b = \int_a^b \vec{E} \cdot d\vec{l}$$

6. Establish the relationship between  $\vec{E}$  ,  $\vec{P}$  and  $\vec{D}$ .
7. Write down the Gauss's law in integral form.
8. Difference between magnetic susceptibility and magnetic permeability.
9. What is the physical meaning of polarization of dielectrics ?
10. Distinguish between dia, para and ferro-magnetic materials.
11. Show that  $\vec{B} = \vec{H} + \mu_0 \vec{M}$
12. Write down the Laplace and Poisson equations.
13. What are polar and non-polar molecules. Give examples.
14. Explain Gauss law in di-electrics.
- 15 What do you mean by magnetization?
16. Distinguish dia-, para- and ferro-magnetic materials.
17. What do you mean by hysteresis?
18. What are the importance of hysteresis curve?
19. Define complex number. Mention its importance in AC circuits.
20. Explain the Kirckhoff's laws of AC circuits.
21. Define the reactance and impedance in an AC circuit.
22. Derive an expression for the impedance of a circuit having inductance, capacitance and resistance.
23. Define sharpness of resonance.
24. Define the terms (a) Electromagnetic damping and (b) Logarithmic damping

### Group B: Long type questions

1. Find expressions for electric field and potential at a point due to an electric dipole.
2. Define quadrupole. Find expression of potential due to a quadrupole.
3. Define quadrupole. Find expression of electric field due to a quadrupole.
4. Discuss the various boundary conditions related to electric potential and fields.
5. State and prove uniqueness theorem.
6. Write down the integral form of Gauss law and using this find the field intensity due to
  - (a) uniformly charged spherical shell.
  - (b) solid sphere
  - (c) plane charged sheet
  - (d) parallel charged conductor
7. Define polarization and polarizability of dielectric. Find relation between  $\vec{E}$ ,  $\vec{P}$  and  $\vec{D}$ .
8. Define  $\vec{E}$ ,  $\vec{P}$  and  $\vec{D}$  and show that  $\vec{\nabla} \cdot \vec{D} = \rho_f$ .
9. Derive the Clausius-Mosotti's equation.
10. Define uniform and non-uniform magnetization. Show that for non-uniform magnetization  $\vec{\nabla} \times \vec{M} = \vec{j}$ .
11. Define B, H and M. Establish a relation between them.
12. Define permeability and magnetic susceptibility and show that
$$\mu = \mu_0(1 + \chi_m).$$
13. Give the Langevin's theory of diamagnetism.
14. What are Magnetization (B-H) curves? Explain residual magnetism, Coercive force and hysteresis.
15. Show that the area of B-H cycle represents the energy dissipated per cc of magnetization.
16. Define Susceptibility. Describe Quincke's method to measure it.
17. Give the theory of parallel LCR circuit and discuss the condition for resonance.
18. Obtain expression for power dissipation and quality factor in an LCR ac circuit.
19. Describe with theory the Anderson bridge method to measure the self-inductance of a coil.
20. Draw a neat diagram of De Sauty's bridge and obtain its balance condition. Draw its vector diagram.
21. Give the theory of Carey-Foster's bridge. Draw its vector diagram.
22. Describe the construction and working of a transformer. What are the different losses in transformer?
23. What are the conditions for a galvanometer to be ballistic? Give the theory of a ballistic galvanometer.