

Derive equations for the following:

1. Electric field / magnetic field at a point (a) on the axial line and (b) on the equatorial line of an electric / magnetic dipole.
2. Torque on an electric /magnetic dipole placed in a uniform electric / magnetic field.
3. Potential energy of an electric / magnetic dipole in a uniform electric / magnetic field
4. Electric potential at a given point in an electric field.
5. Gauss' theorem and derivations
6. Capacitance of a parallel plate capacitor.
7. Effective capacitance (a) parallel and (b) series.
8. Capacitance of a capacitor with (i) dielectric & (ii) conducting slab between the plates.
9. Energy and energy density of a charged capacitor.
10. Drift velocity.
11. Effective resistance of resistors connected in series and parallel.
12. Equivalent emf and internal resistance of cells in series and parallel.
13. Biot-Savart's law and applications
14. Ampere's Circuital law and applications
15. Dipole moment of a revolving electron
16. Bar magnet as an equivalent solenoid
17. Time period and frequency of an oscillating dipole in a uniform magnetic field.
18. $\text{Emf} = Blv$, $\frac{1}{2} Bl^2 \omega$, $\frac{1}{2} BR^2\omega$, $E_0 \sin \omega t$,
19. Expression for self inductance and mutual inductance (2 cases), energy density
20. Current, phase difference, Impedance and power of LCR circuit
21. Resonant frequency
22. L-C Oscillations - conservation
23. Radius, velocity and total energy of an electron in the nth orbit of Hydrogen atom.
24. Rydberg-Balmer formula.
25. Radioactive decay law.
26. Huygen's Principle and verification of the laws of reflection and refraction
27. Interference, resultant intensity, conditions for constructive and destructive interference and fringe width
28. Diffraction and angular width
29. Brewster's law
30. $R = 2f$.
31. Mirror equation.
32. Lens equation.
33. Lens Maker's formula
34. Equation for spherical refracting surface.
35. Refractive index of a prism.
36. Combination of thin lenses.
37. Magnifying power of (a) simple microscope, (b) compound microscope and astronomical telescope.
38. Refractive index in terms of real and apparent depths.
39. Displacement current

Describe the following:

1. Van de graf generator
2. Metre Bridge
3. Potentiometer.
4. Kirchoff's rules and Wheatstone's principle
5. Cyclotron
6. Moving coil galvanometer and its conversion to ammeter and voltmeter
7. Transformer
8. Half Wave and full-wave rectifiers and Amplifier
9. Input and output characteristics
10. Oscillator
11. Transistor as a switch
12. Rectifiers
13. Amplitude modulation
14. Detection

