MOST FREQUENTLY ASKED IMPORTANT QUESTIONS:

CHAPTER – 1: ELECTRICAL CHARGES AND FIELDS

1. State and explain Coulomb's Law. Give the vector form of Coulomb's Law.
2. Define SI unit of charge (OR Define coulomb).
3. Give any three properties of electric charge.
4. Give any three properties of electric field lines.
5. Define electric field. Give its SI unit.
6. Define electric flux. Give its SI unit.
7. When will be the flux is (i) maximum (ii) minimum through a surface?
8. What is an electric dipole? Give its SI unit.
9. Define electric dipole moment. Give its SI unit.
10. Derive the expression for torque on an electric dipole placed in a uniform external electric field.
11. Derive the expression of electric field due to a dipole at any point on its axis.
12. Derive the expression of electric field due to a dipole at any point on its equatorial plane.
13. Sketch the electric field lines for a (a) negative point charge [Q< 0] (b) positive point charge [Q> 0] (c) dipole.
14. Define the following and give their SI units
    (a) Linear charge density (ii) Surface charge density (iii) Volume charge density.
15. State & explain Gauss's law in electrostatics.
16. Using Gauss's law in electrostatics, obtain the expression for electric field due toinfinitely long straight charged wire.
17. Using Gauss's law, obtain the expression for electric field due to an infinitely large charged plane sheet.
18. Using Gauss's law in electrostatics, obtain the expression for electric field due toa uniformly charged thin spherical shell at a point. (i) Outside the shell and (ii) Inside the shell

CHAPTER – 2: ELECTROSTATIC POTENTIAL AND CAPACITANCE

19. Derive the relation between electric field and electric potential. OR Derive/Obtain: $E = -dV/dx$
20. Define electrostatic potential. Derive the expression for electric potential due to an isolated point charge.
21. Derive the expression for potential energy of a system of two charges in the absence of external electric field.
22. Define equipotential surface. Give an example.
23. Mention the three properties of equipotential surface.
24. What are polar and non-polar molecules? Give one example for each.
25. Derive the expression for capacitance of a parallel plate capacitor with air as medium between the plate.
26. Name the three factors on which capacitance of a parallel plate capacitor depends.
27. Obtain the expression for effective capacitance of two capacitors when connected in (a) series (b) parallel.
28. Derive the expression for the energy stored in a capacitor with air as the medium between its plates.

CHAPTER – 3: CURRENT ELECTRICITY

29. Derive the relation $\mathbf{J} = \sigma\mathbf{E}$ where terms have usual meaning.
30. Define drift velocity/speed and relaxation time.
31. Derive the expression for drift velocity.
32. Define mobility. Give its SI unit.
33. Derive the relation between current and drift velocity
34. Mention an expression for conductivity of a material in terms of relaxation time

35. State and explain Ohm's law.

36. Write three limitations of Ohm's law.

37. Define resistance and give its SI unit.

38. Mention 2 factors on which resistance of a conductor depends.

39. Define resistivity. Write the SI unit of resistivity.

40. Show the variation of resistivity of (i) conductors (ii) semiconductors (iii) nichrome with temperature graphically.

41. Derive an expression for equivalent internal resistance and equivalent emf of 2 cells in series combination.

42. Derive an expression for equivalent internal resistance and equivalent emf of 2 cells in parallel combination

43. State and explain Kirchhoff's laws/rules.

44. What is the principle/significance of Kirchhoff's (i) node/junction rule (ii) loop rule?

45. Derive an expression for the balancing condition of Whetstone's bridge.

CHAPTER – 4: MOVING CHARGES AND MAGNETISM

46. Obtain the expression for magnetic force on a current carrying conductor.

47. What is Lorentz force? Write the expression for Lorentz force.

48. Mention the expression for magnetic force acting on a moving charge & when it will be the maximum & minimum in a magnetic field?

49. Derive the expressions for (i) radius (ii) angular frequency and (iii) time period of revolution of charged particle moving perpendicular to the the magnetic field.

50. State and explain Biot-savart's law.

51. Derive an expression for the magnetic field at any point on the axis of a circular current loop.

52. State & explain Ampere's circuital law.

53. Using Ampere's circuital law derive an expression for magnetic field at a point due to a long straight wire carrying current.

54. What is a solenoid? Mention the expression for magnetic field at a point inside the solenoid.

55. Derive the expression for force per unit length between two straight parallel current carrying conductors of infinite length. Hence define "ampere".

56. Define current sensitivity and voltage sensitivity of a galvanometer.

57. How can a moving coil galvanometer be converted into voltmeter? Explain with a diagram and expression.

58. How can a moving coil galvanometer be converted into ammeter? Explain with a diagram and expression.

CHAPTER – 5 : MAGNETISM AND MATTER

59. State and explain Gauss's Law in magnetism.

60. Draw magnetic field lines pattern for a bar magnet.

61. What are magnetic field lines?

62. Mention any three properties of magnetic field lines.

63. Define (i) Magnetisation (ii) Magnetic intensity (iii) Magnetic permeability (iv) Magnetic susceptibility and give their SI unit.

64. Write any three differences of (a) Diamagnetic materials (b) Paramagnetic materials (c) Ferromagnetic materials.

CHAPTER – 6: ELECTROMAGNETIC INDUCTION

65. Describe the magnet and coil experiment to demonstrate the phenomenon of electromagnetic induction.

66. Briefly explain coil-coil experiment on electromagnetic induction.

67. State and explain Faraday's law of electromagnetic induction.

68. State Lenz's law in electromagnetic induction. What is the significance of Lenz's law?

69. What is motional emf? Obtain an expression for it.

70. Mention any two factors on which (a) self-inductance of a coil depends (b) mutual inductance of a coil depend.

71. Obtain the expression for energy stored in inductor/solenoid.

72. What is AC generator? State the principle of AC Generator.

73. With the help of a labelled diagram, derive an expression for instantaneous current induced emf in an AC generator.

CHAPTER – 7: ALTERNATING CURRENT

74. Write the relation connected to rms value and peak value of alternating current.

75. Show that voltage leads current by $\pi/2$ when A.C. voltage applied to pure inductance.

76. Show that current leads voltage by $\pi/2$ when A.C. voltage applied to capacitor.

77. With the help of Phasor diagram, derive the expressions for the impedance and current in a series LCR circuit, when an ac voltage is applied to it.

78. Define resonance and resonant frequency in a series LCR-circuit. Obtain the expression for the resonant frequency.

79. (a) What is a transformer? (b) State the principle of transformer.

80. Mention three sources of power loss in a transformer.

81. Explain the construction and working of a transformer with a labeled diagram.

CHAPTER – 8: ELECTROMAGNETIC WAVES

82. (a) What is displacement current? Give the expression for it. (b) Mention the need for displacement current.

83. Write the expression for Ampere-Maxwell's law. Explain the terms.

84. (a) What is the source of electromagnetic waves?(b) What is the nature of electromagnetic waves?

85. Mention any three properties of electromagnetic waves.

86. Mention the expression for speed of light (a) in vacuum (b) in a medium. Explain the symbols.

87. Give the wavelength range of (a) Microwaves (b) Infra-red waves (c) Ultraviolet radiations (d) X-rays (e) gamma rays

88. Give any two applications/uses of (a) Microwaves (b) Infra-red waves (c) Ultraviolet radiations (d) X-rays (e) gamma rays.

CHAPTER – 9 : RAY OPTICS AND OPTICAL INSTRUMENTS

89. Write the Cartesian sign conventions used in the mirrors.

90. Derive f = R/2 for a concave mirror.

91. State and explain Snell's law of refraction. And mention its limitation.

92. (a) Define critical angle. (b) What is total internal reflection? Mention the Conditions for total internal reflection.

93. (a) Mention two applications of total internal reflection. (b) Write the principle and two uses of optical fibers.

99. Obtain the relation between u, v, R and n for spherical surface.

100. Derive Lens-maker's formula.

101. Derive the expression for effective focal length of two thin lenses kept in contact.

102. Define the power of a lens. How does power of a lens related to its focal length?

99. Obtain an expression for the refractive index of the material of the prism in terms of the angle of the prism andangle of minimum deviation.

100. Draw a neat-labelled ray diagram (with arrow marks) of a simple microscope for the image formation and write the expression for its magnification when the image is at near point.

101. Draw a neat labelled ray diagram (with arrow marks) of a compound microscope for the image formation andwrite the expression for its magnification when the image is at near point.

CHAPTER – 10: WAVE OPTICS

102. Define wavefront. What type of wavefront obtained from (i) a point source (ii) a line source (iii) a star?
103. State and explain Huygens's principle.
104. Derive Snell's law of refraction using Huygens's principle.
105. Show that angle of reflection is equal to angle of incidence using Huygens's principle when a plane wave incident on a plane mirror.
106. Give the theory of interference. Hence write the conditions for constructive interference and destructive interference in terms of (i) phase difference and (i) path difference.
107. What is interference of light?
108. What is diffraction of light? Give conditions for minima and maxima in diffraction.
109. What are Polaroid's? Mention any 3 uses of it.
110. State and explain Malus Law.

CHAPTER – 11 : DUAL NATURE OF RADIATION AND MATTER

111. Define (i) Work function of a metal (ii) electron volt (eV) (iii) Threshold frequency and (iv) Stopping potential.
112. Mention three types of electron emission.
113. Write five experimental observations of photoelectric effect.
114. Write Einstein's photoelectric equation and explain the terms.
115. Give Einstein's explanation on photoelectric effect.
116. Mention any three characteristic properties of photon/particle nature of light.
117. What are matter waves? Write the de-Broglie relation for de-Broglie wavelength.

CHAPTER – 12 : ATOMS

118. State the postulates of Bohr's atom model.
119. Mention two limitations of Bohr atom model.
120. Using Bohr's postulates, derive the expression for radius of electron in n^{th} stationary orbit of hydrogen atom. Hence write the expression for Bohr radius.
121. Assuming the expression for the radius of electron orbit, obtain the expression for the total energy of the electron in the stationary orbit of hydrogen atom.
122. Name the spectral series of hydrogen which lies in the ultraviolet region of Electromagnetic spectrum
123. Name the spectral series of hydrogen which lies in the visible region of electromagnetic Spectrum

CHAPTER – 13: NUCLEI

99. Define isotopes/isobars/isotones. Give examples to each.
100. Mention three characteristics/properties of nucleus.
101. Define mass defect and binding energy of a nucleus.
102. What is nuclear force? Mention any four characteristics/properties of nuclear force.
103. Give three differences between nuclear fission and nuclear fusion.

CHAPTER – 14 : SEMICONDUCTOR ELECTRONICS

104. Classify the conductors, semiconductors and insulators on the basis of energy bands (band theory of solids).
105. Give three differences between n-type and p-type semiconductors
106. Give three differences between intrinsic and extrinsic semiconductors.
107. What is a rectifier? Describe the working of a p-n junction diode as a half wave rectifier with the help of a circuit diagram. Draw input and output waveforms.
108. What is full wave rectifier? Describe the working of a p-n junction diode as a as a full wave rectifier, with the help of a circuit diagram. Draw input and output waveforms.