SEVENTH DAY ADVENTIST MATRIC HIGHER SECONDARY SCHOOL-GUDIYATHAM
PHYSICS PART C&D(3&5) QUESTION BANK -2024-25

STUDENT NAME: SECTION:

UNIT-I: ELECTROSTATICS

1. Discuss the basic properties of electric charges. 3-4
2. Explain in detail Coulomb's law and its various aspects. 4-6
3. Define 'electric field' and discuss its various aspects. 12-13
4. Calculate the electric field due to a dipole on its axial line 22
5. Calculate the electric field due to a dipole on its equatorial plane. 22-24
6. Derive an expression for the torque experienced by a dipole due to a uniform electric field. 24-25
7. Derive an expression for electrostatic potential due to a point charge. 27-28
8. Derive an expression for electrostatic potential due to an electric dipole. 30-31
9. Obtain an expression for potential energy due to a collection of three point charges which are separated by finite distances. 33-34
10. Derive an expression for electrostatic potential energy of the dipole in a uniform electric field.35-36
11. Obtain Gauss law from Coulomb's law. 39-41
12. Obtain the expression for electric field due to an infinitely long charged wire.41-43
13. Obtain the expression for electric field due to an charged infinite plane sheet. 43-44
14. Obtain the expression for electric field due to an uniformly charged spherical shell. 44-46
15. Discuss the various properties of conductors in electrostatic equilibrium. 46-48
16. Explain the process of electrostatic induction. 49-50
17. Explain dielectrics in detail and how an electric field is induced inside a dielectric. 52-53
18. Obtain the expression for capacitance for a parallel plate capacitor. 54-55
19. Obtain the expression for energy stored in the parallel plate capacitor. 56
20. Explain in detail the effect of a dielectric placed in a parallel plate capacitor. 57-59
21. Derive the expression for resultant capacitance, when capacitors are connected in series and in parallel. 60-62
22. Explain in detail how charges are distributed in a conductor, and the principle behind the lightning conductor. 63,65
23. Explain in detail the construction and working of a Van de Graaff generator.66-67

UNIT-II: CURRENT ELECTRICITY

24. Describe the microscopic model of current and obtain microscopic form of Ohm's law.85-86
25. Obtain the macroscopic form of Ohm's law from its microscopic form and discuss its limitation.86-87
26. Explain the equivalent resistance of a series and parallel resistor network. 90-91
27. Explain the determination of the internal resistance of a cell using voltmeter.100-101
28. State and explain Kirchhoff's rules. 104-105
29. Obtain the condition for bridge balance in Wheatstone's bridge. 106-107
30. Explain the determination of unknown resistance using Meter Bridge. 108-109
31. How the emf of two cells are compared using potentiometer?110-111

UNIT-III:MAGENTISM &MAGNETIC EFFECTS OF ELECTRIC CURRENT

32. Discuss Earth's magnetic field in detail. 127-128
33. Deduce the relation for the magnetic field at a point due to an infinitely long straight conductor carrying current using Biot-Savart law. 156-157
34. Obtain a relation for the magnetic field at a point along the axis of a circular coil carrying current using Biot-Savart law. 157-158
35. Compute the torque experienced by a magnetic needle in a uniform magnetic field. 138-139
36. Calculate the magnetic field at a point on the axial line of a bar magnet. 135-136
37. Obtain the magnetic field at a point on the equatorial line of a bar magnet. 137-138
38. Find the magnetic field due to a long straight conductor using Ampere's circuital law.162-163
39. Discuss the working of cyclotron in detail. 174-175
40. What is tangent law? Discuss in detail. 158-160

41. Derive the expression for the torque on a current-carrying coil in a magnetic field. 180-181
42. Discuss the conversion of galvanometer into an ammeter and also a voltmeter. 183-185
43. Calculate the magnetic field inside and outside of the long solenoid using Ampere's circuital law. 164-165
44. Derive the expression for the force between two parallel, current-carrying conductors.178-179
45. Give an account of magnetic Lorentz force.168
46. Compare the properties of soft and hard ferromagnetic materials. 149-150
47. Derive the expression for the force on a current-carrying conductor in a magnetic field. 176-177
48. Explain the principle and working of a moving coil galvanometer.181-182

UNIT-IV: ELECTROMAGNETIC INDUCTION AND ALTERNATING CURRENTS

49. Establish the fact that the relative motion between the coil and the magnet induces an emf in the coil of a closed circuit. 197-198
50. Give an illustration of determining direction of induced current by using Lenz's law. 202-203
51. Show that Lenz's law is in accordance with the law of conservation of energy. 204
52. Obtain an expression for motional emf from Lorentz force. 206
53. Give the uses of Foucault current. 209-211
54. Define self-inductance of a coil interms of (i) magnetic flux and (ii) induced emf. 211-213
55. Assuming that the length of the solenoid is large when compared to its diameter, find the equation for its inductance.213-214
56. An inductor of inductance L carries an electric current i. How much energy is stored while establishing the current in it? 214
57. Show that the mutual inductance between a pair of coils is same (M12 = M21). 216-217
58. How will you induce an emf by changing the area enclosed by the coil? 219-220
59. Show mathematically that the rotation of a coil in a magnetic field over one rotation induces an alternating emf of one cycle. 221-222
60. Elaborate the standard construction details of AC generator. 223-224
61. Explain the working of a single-phase AC generator with necessary diagram. 224-225
62. How are the three different emfs generated in a three-phase AC generator? Show the graphical representation of these three emfs. 227
63. Explain the construction and working of transformer. 228-229
64. Mention the various energy losses in a transformer. 229-230
65. Give the advantage of AC in long distance power transmission with an illustration. 230-231
66. Find out the phase relationship between voltage and current in a pure inductive circuit. 239-240
67. Derive an expression for phase angle between the applied voltage and current in a series RLC circuit. 244-245
68. Define inductive and capacitive reactance. Give their units. 240,241(CUT POINT)
69. Obtain an expression for average power of AC over a cycle. Discuss its special cases.248-249
70. Explain the generation of LC oscillations in a circuit containing an inductor of inductance L and a capacitor of capacitance C. 251-252
71. Prove that the total energy is conserved during LC oscillations. 253
72. Compare the electromagnetic oscillations of LC circuit with the mechanical oscillations of block-spring system qualitatively to find the expression for angular frequency of LC oscillator.253-254

UNIT –V: ELECTROMAGNETIC WAVE

73. Write down Maxwell equations in integral form. 270-271
74. Write short notes on (a) microwave (b) X-ray (c) radio waves (d) visible spectrum 275-277
75. Discuss the Hertz experiment. 272
76. Explain the Maxwell's modification of Ampere's circuital law. 268-269
77. Explain the importance of Maxwell's correction. 270
78. Write down the properties of electromagnetic waves. 272-273
79. Discuss the source of electromagnetic waves. 274-275
80. Explain the types of emission spectrum. 278-279
81. Explain the types of absorption spectrum.279

UNIT-VI: RAY OPTICS

82. Derive the mirror equation and the equation for lateral magnification. 8-9
83. Describe the Fizeau's method to determine the speed of light. 11-12
84. Obtain the equation for radius of illumination (or) Snell's window. 22-23
85. Derive the equation for acceptance angle and numerical aperture of optical fibre. 24-25
86. Obtain the equation for lateral displacement of light passing through a glass slab. 26-27
87. Derive the equation for refraction at single spherical surface. 27-28
88. Obtain lens maker's formula and mention its significance. 30-31
89. Derive the equations for thin lens and for magnification. 31-32
90. Derive the equation for angle of deviation produced by a prism and thus obtain the equation for refractive index of material of the prism.38-40
91. What is dispersion? Obtain the equation for dispersive power of a medium.41-43

UNIT-VII: WAVE OPTICS

92. Prove law of reflection using Huygens' principle.56
93. Prove law of refraction using Huygens' principle.56-57
94. Obtain the equation for resultant intensity due to interference of light.58-59
95. Explain the Young's double slit experimental setup and obtain the equation for path difference.63-65
96. Obtain the equation for bandwidth in Young's double slit experiment. 65
97. Discuss the interference in thin films and obtain the equations for constructive and destructive interference for transmitted and reflected light. 67-68
98. Discuss the diffraction at single slit and obtain the condition for nth minimum. 70-71
99. Discuss the diffraction at a grating and obtain the condition for the mth maximum.74-75
100. Discuss the experiment to determine the wavelength of monochromatic light using diffraction grating. 76-77
101. Discuss the experiment to determine the wavelength of different colours using diffraction grating. 77
102. Obtain the equation for resolving power of optical instruments. 89-90
103. Discuss about the simple microscope and obtain the equations for magnification for near point focusing and normal focusing. 87-89
104. Explain about compound microscope and obtain the equation for the magnification. 90-91
105. Obtain the equation for resolving power of microscope. 89-90
106. Discuss about astronomical telescope. 91-92
107. Mention different parts of spectrometer and explain the preliminary adjustments. 93
108. Explain the experimental determination of refractive index of the material of the prism using spectrometer 94

UNIT-VIII : DUAL NATURE OF RADIATION AND NATURE

109. What do you mean by electron emission? Explain briefly various methods of electron emission.109-111
110. Briefly discuss the observations of Hertz, Hallwachs and Lenard. 111-112
111. Explain the effect of potential difference on photoelectric current. 114-115
112. Explain how frequency of incident light varies with stopping potential. 115-116
113. List out the laws of photoelectric effect.116
114. Explain why photoelectric effect cannot be explained on the basis of wave nature of light. 116-117
115. Give the quantum concept of energy proposed by Max Planck. 118
116. Obtain Einstein's photoelectric equation with necessary explanation. 119-120
117. Explain experimentally observed facts of photoelectric effect with the help of Einstein's explanation. 118-119
118. Give the construction and working of photo emissive cell. 121-122
119. Derive an expression for de Broglie wavelength of electrons. 124-125
120. Briefly explain the principle and working of electron microscope. 126-127
121. Describe briefly Davisson – Germer experiment which demonstrated the wave nature of electrons. 125-126
122. List out the characteristics of photons. 119
123. Give the applications photocell. 122
124. How do we obtain characteristic x-ray spectra?131-132

UNIT-IX: ATOMIC AND NUCLEAR PHYSICS

125. Explain the J.J. Thomson experiment to determine the specific charge of electron. 143-145
126. Discuss the Millikan's oil drop experiment to determine the charge of an electron. 145-147
127. Derive the energy expression for an eletron is the hydrogen atom using Bohr atom model. 155
128. Discuss the spectral series of hydrogen atom. 161-163
129. Explain the variation of average binding energy with the mass number using graph and discuss about its features. 167-168
130. Explain in detail the nuclear force. 168-169
131. Discuss the alpha decay process with example. 169-170-
132. Discuss the beta decay process with examples.171-172
133. Discuss the gamma emission process with example. 173
134. Obtain the law of radioactivity. 173-175
135. Discuss the properties of neutrino and its role in beta decay. 172-173
136. Explain the idea of carbon dating. 177-178
137. Discuss the process of nuclear fission and its properties. 179-181
138. Discuss the process of nuclear fusion and how energy is generated in stars? 184
139. Describe the working of nuclear reactor with a block diagram. 182-183
140. Explain in detail the four fundamental forces in nature. 185
141. Briefly explain the elementary particles present in nature.184-185

UNIT-X: ELECTRONICS & COMMUNICATION

142. Elucidate the formation of n-type extrinsic semiconductors.200-201
143. Explain the formation of depletion region and barrier potential in PN junction diode. 202-203
144. Draw the circuit diagram of a half wave rectifier and explain its working. 207-208
145. Explain the construction and working of a full wave rectifier. 208-209
146. What is an LED? Give the principle of its operation with a diagram. 212-213
147. Write a note on photodiode.213-214
148. Explain the working principle of a solar cell. Mention its applications. 214-215
149. Sketch the static characteristics of a common emitter transistor and bring out the essential features of input and output characteristics. 219-221
150. Transistor functions as a switch. Explain. 222-223
151. Describe the function of a transistor as an amplifier with the neat circuit diagram. Sketch the input and output wave forms. 223-224
152. Give circuit symbol, logical operation, truth table, and Boolean expression of i) AND gate ii) OR gate iii) NOT gate iv) NAND gate v) NOR gate and vi) EX-OR gate. 227-229
153. State and prove De Morgan's first and second theorem. 231-232
154. Explain the ampitude modulation with necessary diagrams. 234
155. Explain the basic elements of communication system with the necessary block diagram. 236-237
156. Explain the ground wave propagation and space wave propagation of electromagnetic waves through space. 238-239
157. List out the advantages and limitations of frequency modulation. 235
158. What is meant by satellite communication? Give its applications.240

UNIT-XI:RECENT DEVELOPMENTS IN PHYSICS

159. Discuss the applications of Nanomaterials in various fields. 260-261
160. What are the possible harmful effects of usage of Nanoparticles? Why? 261
161. Discuss the functions of key components in Robots? 264
162. Elaborate any two types of Robots with relevant examples. 264-265
163. Comment on the recent advancement in medical diagnosis and therapy.271-274

ALL THE BEST FOR YOUR EXAM -PREFERRED BY : C.MOOORTHI M.Sc.,M.Phil.,B.Ed.,