INDIA INTERNATIONAL SCHOOL

PROBLEMS FOR PRACTICES:

CLASS – XII **PHYSICS**

- **Important questions are marked in bold letters.**
- **Some NCERT questions are also mentioned.**

1. A small test is released from rest at a point in electric field. Will it travel along the field line passing through that point?

2. A Van de Graff type generator is capable of building up potential difference of $15 * 10^6$ V. The dielectric strength of the gas surrounding the electrode is $5* 10^7$ Vm-1. What is the minimum radius of the spherical shell required?

3. Under what conditions will the force exerted by the magnetic field on a charged particle be (i) maximum and (ii) minimum?

4. Write any two factors on which internal resistance of a cell depends.

5. An Ammeter is connected in series with R= 3Ω to a battery of 3V. What is the value of current if the ammeter (i) is a G.M. of resistance 60 Ω (ii) is G.M. but shunted by resistance of 0.02Ω.

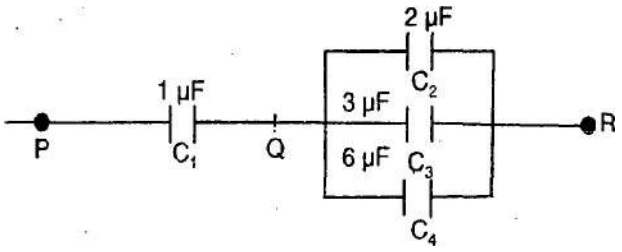
6. A small test is released from rest at a point in electric field. Will it travel along the field line passing through that point?

7. Define corona discharge.

8. Under what conditions will the force exerted by the electric field on an electric dipole be (i) maximum and (ii) minimum?

9. Write any two factors on which capacitance of parallel plate capacitor depends.

10. Find the value of resultant capacitance of the given combination between P and R. If the applied potential is 50 V, find the charge across through C_1, C_2 and C_3.



11. Consider a uniform electric field $E = 3*10^3$ i N/C. (a) what is the flux of this field through a square of 10 cm on a side whose plane is parallel to yz – plane? (b) What is the flux through the same square if the normal to this plane makes a 60^0 angle with the axis?

12. An electrician technician requires a capacitance of 2 μF in a circuit across a potential difference of 1kV. A large no. of 1μF capacitors are available to him each of which can withstand a potential

difference of not more than 400V. Suggest a possible arrangement that requires the minimum number of capacitors.

13. Two charges +10μC and -20μC are placed at a distance of 50mm. A third charge is placed on the line joining the charges such that the system is in equilibrium, find the position and magnitude of that charge.

14. Derive an expression for electric potential due to a point charge at any point.

15. Derive an expression for capacitance of a parallel capacitor when a dielectric slab is inserted between the plates.

16. Using Gauss's theorem, derive an expression for the electric field due to a uniformly charged infinite thick sheet of charge.

17. The resistance of Nichrome wire at 27^0C is found to be 73.5Ω. Find the temperature at which its resistance becomes 85.8Ω, the value of α is $1.70*10^{-4}/0C^{-1}$.

18. The angle of dip at a location in Southern India is about 18^0. Would you expect a greater or smaller dip angle in Britain? Define angle of declination.

19. Derive the expression for the electric field at the surface of a charged non conducting sphere.

20. Show that the force on each plate of a parallel plate capacitor has a magnitude equal to ½ QE, where Q is the charge on the capacitor and E is the magnitude of the electric field between the plates. Explain the origin of the factor ½.

21. Derive an expression for the electric field at any point due to a charged conducting sphere.

22. Draw a schematic diagram of a Moving coil Galvanometer. Explain briefly how it works.

23. (a) A charge +Q is placed on a large spherical conducting shell of radius R. Another small conducting sphere of radius r carrying charge q is introduced inside the large shell and is placed at its centre. Find the potential difference two points, one lying on the sphere and other on the shell.
(b) How would the charge between the two flows if they are connected by a conducting wire? Name the device which works on this fact.

24. Draw a neat labeled diagram of Van de Graff generator. Write its principle and explain its working.

25. Derive an expression for capacitance of a parallel capacitor when a dielectric slab is inserted between the plates.

26. State Coulomb's law for electrostatics. Prove that this law obeys Newton's III law of motion.

27. Derive an expression for Electric field intensity at any point on inert axis of electric dipole. Write SI unit of Electric Dipole moment.

28. State and Prove Gauss's theorem for Electrostatics.

29. Using Gauss's theorem, derive an expression for the electric field due to a uniformly charged infinite plane sheet.

30. Without using Gauss's theorem derive an expression for electric field intensity due to a straright line charged conductor.

31. Draw a circuit diagram used to measure the internal resistance of a cell.

32. Establish a relation between current and drift velocity and derive Ohm's law using this relation.

33. State Biot Savart's law. Using this law, derive the expression for the magnetic field due to a current carrying loop of radius R, at a point, which is at a distance 'x' from its centre along the axis of the loop.

34. State the principle of potentiometer. Draw a circuit diagram used to compare the e.m.f. of two primary cells. Write the formula used.

35. Define magnetic susceptibility of a material. Name two elements, one having positive susceptibility and the other have negative susceptibility. Distinguish between paramagnetic and diamagnetic substances.

36. In a meter bridge, the balance point is found to be at 39.5 cm from + end, when the known resistor is 12.5Ω. Determine the unknown resistance. Why are the connections between resistors in a meter bridge made of thick copper strips? What happens if the galvanometer and the cell are interchanged at the balancing point? Would the G.M. show any deflection?

37. State Kirchhoff's laws for Electric networks. Using these laws state and prove principle of Wheat Stone Bridge.

38. Draw a schematic diagram of a cyclotron. Explain briefly how it works and how it is used to accelerate the charge particles. Derive the required derivations with limitations.

39.**(a)** An electric dipole of length 2 cm is placed with its axis making an angle of 30^0 to a uniform electric field of 10^5 N/C. If it experiences a torque of $10\sqrt{3}$ Nm. Calculate (i) magnitude of charge on dipole (ii) Potential energy of dipole.

(b) Draw electric field lines due to an electric dipole and between two opposite charged plates.

40. **(a)** Using Gauss's theorem derive an expression for electric field intensity due to a thin charged sheet.

(b) An electric dipole of dipole moment $20*10^{-6}$ Cm is enclosed by a closed surface. What is the net electric flux coming out of the surface?

41. Calculate the speed of light in a medium whose critical angle is 30^0.

42. Define the term Wave front and Explain the Young's double slit experiment using the required diagram.

43. Draw a diagram to show refraction of a plane wave front incident in a convex lens and draw the refracted wave front.

44. Why does the intensity of the secondary maximum become less as compared to the central maximum?

45. State the reason, why two independent sources of light cannot be considered as coherent sources?

46. A biconvex lens has a focal length 2/3 times the radius of curvature of either surface. Calculate the refractive index of lens material.

47. Draw a ray diagram of astronomical telescope in general adjustment. Write an expression for its magnifying power.

48. Why does Sun appear reddish at Sun set or Sun rise?

49. Draw a labeled diagram of Newtonian type telescope. Write its one advantage over refracting type telescope.

50. Derive the lens formula for biconvex lens. How is the approximate value of the focal length of such a lens estimated in the laboratory?

51. An object is placed at (i) 10 cm; (ii) 5cm in front of a concave mirror of radius of curvature 15 cm. find the position, nature, and magnification of the image in each case.

52. State Huygens's wave theory and using it prove the Snell's law for refraction.

53. Derive an expression for magnifying power of compound microscope with a labeled diagram.

54.A compound microscope consists of an objective lens of focal length 2 cm and eyepiece of focal length 6.25cm separated by a distance of 15 cm. How far from the objective should an object be placed in order to obtain the final image at (a) the least distance of distinct vision (25cm), (b) infinity? What is the magnifying power in each case?

55. Write the names of defects of human eye with ray diagram of their correction.

56. A right angled glass prism forms images of a small straight object which are deviated by (i) 90^0, (ii) 180^0 and (iii) 0^0.

57. State and prove Brewster's law.

58. Explain an experiment with require diagram which show the transverse nature of light.

59. Derive and expression for the refraction by a convex refractive surface. Using it derive the Lens Maker's formula.

60. What is diffraction of light? Draw a graph showing the variation of intensity with angle in a single slit diffraction experiment. Write one feature which distinguishes the observed pattern from the single slit pattern from the double slit pattern. How would the diffraction pattern of a single slit be affected when: (i) the width of the slit is decreased and (ii) The monochromatic source of light is replaced by a source of white light?

61. What is the significance of a "Q" factor in a series LCR resonant circuit? Prove that it is equal to the ratio of resonant frequency with band width.

62. State Faraday's laws of E.M.I.

63. State the law that gives the polarity of the induced emf.

64. A radio can tune any station in the 7.5 MHz to 12MHz band. What is the corresponding wave length band?

65. Show graphically how the stopping potential for a given photosensitive surface varies with the frequency of the incident radiation.

66. Two circular coils, one of small radius r and the other of very large radius R are placed coaxially with centers coinciding. Obtain the mutual inductance of the arrangement.

67. A square coil 10 cm placed in the east-west plane. A magnetic field of 0.1 T is set up in 0.7 sec and in the north-east direction through the coil. The coil has a resistance of 0.7Ω. What is the magnitude of the induced EMF and the current?

68. A circular coil of radius 8.0 cm and 20 turns rotates about its vertical diameter with an angular speed of 50 c/s in a uniform horizontal magnetic field of magnitude $3*10^{-2}$ T. Obtain the maximum and average EMF induced in the coil. If the coil forms a closed loop of resistance 10Ω, how much power is dissipated as heat? What is the source of this power?

69. A small flat search coil of area 2 cm^2 with 25 closely wound turns, is positioned normal to the field direction, and then quickly rotated by 90^0. The total charge flown in the coil is 7.5mC. The resistance of the rod is 0.50Ω. Estimate the field strength of magnetic field.

70. A resistance of 200Ω and a capacitance of 15 μF are connected in the series to a 220 V, 50Hz AC source. (a) Calculate the current in the circuit (b) Calculate the voltage (RMS) across the resistor and the capacitor. Is the algebraic sum of these voltages more than the source voltage? Explain.

71. Suppose that the electric field part of EMW in vacuum is: E = (3.1N/C) cos {(1.8rad/m)y+(5.4 * 10^6rad/s)t} *i*

72. Give the definition of EMW with their four properties.

73. Obtain Einstein's Photo Electric equation. Explain how it enables us to understand the linear dependence of the maximum K.E. of the emitted electrons on the frequency of the incident radiation.

74. A series LCR circuit with L= 0.12 H, C = 480nF, R = 23Ω is connected to a 230 volt variable frequency supply. (a) What is the source frequency for which current amplitude is maximum? Obtain this maximum value. (b) What is the source frequency for which average power absorbed by the circuit is the maximum? Obtain the value of this maximum power.

75. When a R, L and C are connected with A.C. sources respectively in different circuits. If the frequency of the Alternative EMF be increased, what will the effect on currents in the three cases?

76. Deduce an expression for the mutual inductance of two long coaxial solenoids but having different radii and different number of turns.

77. Derive an expression for wave length associated with an electron with applied potential.

78. What is the principle working of a transformer? Derive a relation for the ratio voltage in primary and secondary. How does it confirm the law of conservation of energy? Write various losses in the transformer.

79. Draw a schematic experiment arrangement used to establish the wave nature of electrons. Describe briefly how the De – Broglie relation was experimentally verified in the case of electrons.

80. State the working principle of A.C generator with the help of a labeled diagram. Derive an expression for the instantaneous value of the e.m.f induced in the coil. Why is the e.m.f maximum when the plane of the armature is parallel to the magnetic field?

81. The ground state energy of H atom is -13.6eV. What are the kinetic and potential energies of electron in this state?

82. Draw a plot of variation of amplitude v/s ω for an AM wave.

83. Distinguish between a conductor and insulator on the basis band theory.

84. Draw a circuit diagram of for use of NPN transistor as an amplifier in CE configuration.

85. Two nuclei have mass numbers in the ratio 1:2. What is the ratio of their nuclear densities?

86. The half life of a radioactive substance is 20s. Calculate: (a) the decay constant (b) time taken for the sample of decay $7/8^{th}$ of initial value.

87. A transmitting antenna at the top of a tower has height 32m and height of receiving antenna is 50m. What is the maximum distance between them for satisfactory communication in LOS mode? Radius of earth is 6400Km.

88. What are ground waves? Why short wave communication over long distance is not possible via ground wave?

89. Draw the graph between Nuclear energy per nucleon v/s Atomic mass Number.

90. Define Decay constant and half life. Derive the expression $N = N_O e^{-\lambda t}$.

91. A radioactive nucleus 'A' undergoes a series of decays according to the following scheme: $A \rightarrow\rightarrow A_1 \rightarrow\rightarrow A_2 \rightarrow\rightarrow A_3 \rightarrow\rightarrow A_4$.(Sequence of the particles are as; α ,β, α and γ)

92. Write nuclear reaction equation for α-decay of $_{88}Ra^{226}$ and find the binding energy of nucleus.

93. Draw the block diagram of Communication system and detection of AM wave.

94. Explain briefly, with the help of circuit diagram, how V-I characteristics of a p-n junction diode are obtained in (i) forward bias (ii) reverse bias. Draw the shape of the curve obtained.

95. With a circuit diagram, explain how a Zener diode can be used as a voltage regulator.

96. Draw the truth table and Boolean expression of OR, NAND & XOR gate.

97. What is photo diode? A photo diode is fabricated from a semiconductor with energy gap of 2.8 eV. Can we use it to detect a wavelength of 6000 A^0?

98. The A & B are inputs for two gates AND & OR respectively, the outputs of these gates are input for NOR gate, find the final output.

99. Explain the working of a PNP transistor as CE amplifier with required expressions.

100. Explain the working of a transistor as an Oscillator.

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