SECOND YEAR HIGHER SECONDARY
FIRST TERMINAL EXAMINATION – SEPTEMBER 2024
Part – III
PHYSICS

Time: 2 Hours
Cool-off time: 15 Minutes

Maximum: 60 Scores

Answer any 5 questions from 1 to 7. Each carries 1 score. (5 × 1 = 5)

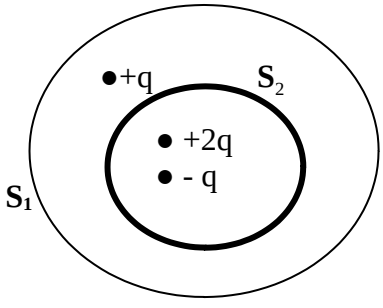
1. The electric flux due to an electric field $\vec{E}$ through a surface $\vec{\Delta}s$ is given by $\vec{E}.\vec{\Delta}s$. The SI unit of electric flux is …… 1
2. Two identical capacitors each of capacitance C are connected in series. The effective capacitance C_s will be 1
3. The direction of electric dipole moment is from ……. to …….. 1
4. The resistance of a conductor depends on its length *l*, area of cross section A and resistivity ρ. Then
   a) $R=\frac{\rho A}{l}$ b) $R=\frac{\rho}{Al}$ c) $\rho=\frac{RA}{l}$ d) $\rho=\frac{R}{Al}$ 1
5. Electrostatic potential at a point at a distance r from a point charge is proportional to
   a) $\frac{1}{r}$ b) $\frac{1}{r^2}$ c) $\frac{1}{r^3}$ d) r^2 1
6. The nature of path when a charged particle is projected at an angle 30° to the direction of magnetic field is ……
   a) helix b) parabola c) cycloid d) straight line 1
7. The direction of magnetic Lorentz force acting on a charge moving with a velocity $\vec{v}$ in a magnetic field $\vec{B}$ is
   a) along $\vec{B}$ b) in the direction of $\vec{v}$ c) in the direction of $\vec{B}\times\vec{v}$ d) in the direction of $\vec{v}\times\vec{B}$ 1

Answer any 5 questions from 8 to 14. Each carries 2 scores (5 × 2 = 10)

8. How many electrons constitute an electric charge of -16μC? 2
9. Write any one difference between polar and non-polar molecules. Give one example for each. 2
10. Distinguish between emf and terminal voltage of a cell. 2
11. Two wires, one made of copper and the other made of germanium are given. On heating them what will happen to their resistivity? Justify. 2
12. Derive the relation connecting drift velocity of electron and relaxation time. 2
13. a) Write down the equation for force between two parallel wires carrying current in the same direction. 1
    b) In the above case will the force be attractive or repulsive? 1
14. Using Ampere's Circuital theorem, obtain the expression for the magnetic field at any point outside due to a straight infinite current-carrying wire. 2

Answer any 6 questions from 15 to 21. Each carries 3 scores (6 × 3 = 18)

15. a) What does the tangent to the electric field line at any point give? 1
    b) Explain why two electric field lines never cross each other. 1
    c) Draw electric field lines due to a charge q<0 1
16. a) Find the ratio of Electric flux through the surfaces S_1 and S_2. 1



b) Name and state the law which is used to find the flux through the surface. 2

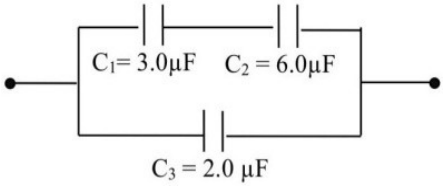
17. The Electric field through a point is normal to equipotential surface. 1
    a) What is meant by equipotential surface? 1
    b) What is the work done to move a charge on an equipotential surface? 1
    c) Draw the equipotential surface for a uniform electric field.
18. a) Arrive at the expression for electric current in terms of drift velocity. 1½
    b) Write the expression for mobility. What is the SI unit of mobility? 1½
19. a) Derive an expression for the energy stored in a parallel plate capacitor. 2
    b) What is meant by energy density of a capacitor? 1
20. a) Write an expression for torque acting on a current carrying rectangular coil placed in a uniform magnetic field. 1
    b) A 100 turn closely wound circular coil of radius 10cm carries a current of 3.2 A. What is the magnetic moment of this coil? 2
21. 21. A particle of charge q is moving with a velocity v through a region, where an electric field E and a magnetic field B are present.
    (a) Write an equation for total force on the charge. 1
    (b) What is the above force called? 1
    (c) What will be force acting on the charge when it comes to rest? 1

Answer any 3 questions from 22 to 25. Each carries 4 scores **(3 × 4 = 12)**

22. a) State true / false.
    "Gauss's theorem is applicable only for regular shaped closed surfaces". 1
    b By using this law arrive in expression for electric field due to a thin plane sheet of charge. 3
23. a) Write relation between electrostatic potential and electric field. 1
    b) Derive an expression for electrostatic potential at any point due to an electric dipole. 3
24. a) State Ohms law and write one example for non ohmic conductors. 2
    b) A wire of resistance 10Ω is stretched 3 times to its original length. What is its new resistance? 2
25. a) State Biot - Savarts law. 1
    b) Derive an expression for magnetic field on the axis of a circular current loop of radius R and carrying a steady current I ampere. 3

Answer any 3 questions from 26 to 29. Each carries 5 scores **(3 × 5 = 15)**

26. a) Define dipole moment of an electric dipole. 1
    b) Derive the expression for electric field at a point along the axial line of an electric dipole. 3
    c) For an electric dipole, write down the relation between axial field and equatorial field, at same distance from the centre of dipole. 1
27. a) Derive an expression for capacitance of a parallel plate capacitor. 2
    b) Find the effective capacitance of the combination of capacitors in figure. 2



    c) Can we produce a parallel plate capacitor of capacitance 1 F with plate separation 1 cm? 1
28. a) State Kirchhoff's loop rule or Mesh rule. 1
    b) With a neat diagram obtain the balancing condition (Wheatstone's Principle) for a Wheatstone's Bridge. 3
    c) If the galvanometer and cell are interchanged at the balance point, will it affect the balancing condition? 1
29. Galvanometer is a device used to identify the presence of current in a circuit.
    a) You have a micro ammeter and a milli ammeter, which one has high resistance? 1
    b) How will you convert a galvanometer into an ammeter? 2
    c) A galvanometer with a coil resistance 20 Ω shows full scale deflection for a current of 2 mA. How will you convert it into an ammeter of range 0 – 5A? 2

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