



Student Name						Set - 1
Date		Grade	XII	Roll No.		
Subject	Physics	Marks	70	Teacher's Sign		

S A – I [2020-21]

GENERAL INSTRUCTION:

You may use the following values of physical constants wherever necessary.

$$c = 3 \times 10^8 \text{ m/s}$$

$$h = 6.63 \times 10^{-34} \text{ Js}$$

$$e = 1.6 \times 10^{-19} \text{ C}$$

$$\mu_0 = 4 \times 10^{-7} \text{ T m A}^{-1}$$

$$\epsilon_0 = 8.854 \times 10^{-12} \text{ C}^2 \text{ N}^{-1} \text{ m}^{-2}$$

$$m_e = 9.1 \times 10^{-31} \text{ kg}$$

- 1 Name the physical quantity whose S.I. unit is J/C. Is it a scalar or a vector quantity? 01
- 2 What is the work done in moving a charge 10 nC Between two point on equipotential surface? 01
- 3 How does the drift velocity of electrons in a metallic conductor vary with increase in temperature? 01
- 4 How does the relaxation time of electron in the conductor change when temperature of the conductor decreases ? 01
- 5 Define resistivity of a conductor. Draw the variation of resistivity versus temperature for (i) Nichrome (ii) Silicon 01
- 6 Draw a plot showing the variation of terminal voltage (V) vs the current (I) drawn from the cell. Using this plot, how does one determine the internal resistance of the cell ? 01
- 7 Where is the magnetic field at a current element (i) minimum and (ii) maximum? 01
- 8 What will be the path of a charged particle moving in a uniform magnetic field at any arbitrary angle? 01
- 9 Define the term self-inductance of a coil. Give its SI unit. 01
- 10 Write the expression of electromagnetic energy stored in an inductor of inductance L when steady current is passed through it. 01
- 11 What is meant by electrostatic shielding? 01
- 12 Why an electric dipole placed in a uniform electric field does not undergoes acceleration? 01
- 13 How does the drift velocity of electrons in a metallic conductor vary with increase in temperature? 01
- 14 Two wires of equal length one of copper and the other of manganin have the same resistance. Which wire is thicker? 01
- 15 An electron beam is moving vertically upwards. If it passes through a magnetic field directed from South to North in a horizontal plane, in what direction will the beam be deflected? 01
- 16 What is the net magnetic moment of an atom of a diamagnetic material? 01
- 17 Which materials have negative value of magnetic susceptibility? 01
- 18 What can be the cause of helical motion of a charged particle ? 01
- 19 Write condition under which an electron does not experience a force in a magnetic field. 01
- 20 What are eddy currents? 01

- 21 How does the electric flux, electric field enclosing a given charge vary when the area enclosed by the charge is doubled? 02
- 22 Calculate the force between two alpha particles kept at a distance of 0.02mm in air. 02
- 23 Why does Resistance increase in series combination and decrease in parallel Combination 02
- 24 A piece of silver wire has a resistance of $1\ \Omega$. What will be the resistance of the constantan wire of one third of its length and one half of its diameter if the specific resistance of the constantan wire is 30 times than that of the silver? 02
- 25 A proton, alpha particle and deuteron are moving in circular paths with same kinetic energies in the same magnetic fields. Find the ratio of their radii and time periods. 02
- 26 An electron moving with Kinetic Energy 25 keV moves perpendicular to a uniform magnetic field of 0.2 mT. Calculate the time period of rotation of electron in the magnetic field. 02
- 27 Explain any two applications of eddy current. 02
- 28 A 12V battery is connected to a $6\ \Omega$; 10 H coil through a switch drives a constant current in the circuit. The switch is suddenly opened. Assuming that it took 1ms to open the switch calculate the average e.m.f induced across the coil. 02
- 29 The vertical component of earth's magnetic field at a place is $\sqrt{3}$ times the horizontal component. What is the value of angle of dip at this place? 02
- 30 Two electric charges $3\ \mu\text{C}$, $-4\ \mu\text{C}$ are placed at the two corners of an isosceles right angled triangle of side 1 m as shown in the figure. What is the direction and magnitude of electric field at A due to the two charges? 03
- 31 Two charges $5\ \mu\text{C}$, $-3\ \mu\text{C}$ are separated by a distance of 40 cm in air. Find the location of a point on the line joining the two charges where the electric field is zero. 03
- 32 The resistance of a tungsten filament at 150°C is $133\ \Omega$. What will be its resistance at 500°C ? The temperature coefficient of tungsten is $0.0045^\circ\text{C}^{-1}$ at 0°C . 03
- 33 A battery has an emf E and internal resistance r . A variable resistance R is connected across the terminals of the battery. Find the value of R such that (a) the current in the circuit is maximum (b) the potential difference across the terminal is maximum. (c) Plot the graph between V and R 03
- 34 An electron is revolving around the nucleus of an atom in an orbit of radius $0.53\ \text{\AA}$. Calculate the equivalent magnetic moment, if the frequency of revolution of the electron is $6.8 \times 10^9\ \text{MHZ}$. 03
- 35 A square coil of side 10 cm has 20 turns and carries a current of 12amp, the coil is suspended vertically and normal to the plane of the coil makes an angle α with the direction of the uniform horizontal magnetic field of 0.80 T. If the torque experienced by the coil equals .96 Nm, find the value of α . 03
- 36 Sketch the pattern of electric field lines due to (i) a conducting sphere having a negative charge on it. (ii) An electric dipole. 03
- 37 Define electric field intensity and electric dipole moment. Derive expression for electric field intensity at any point along the equatorial line of an electric dipole and at a point on the axial line of a dipole. 05
- 38 (a) State Kirchhoff's rules and explain on what basis they are justified. (b) Two cells of emfs E_1 and E_2 and internal resistances r_1 and r_2 are connected in parallel. Derive the expression for the (i) emf and (ii) internal resistance of a single equivalent cell which can replace this combination. 05

- 39 (a) Draw a labelled diagram of a moving coil galvanometer. Describe briefly its principle and working. (b) Answer the following: (i) Why is it necessary to introduce a cylindrical soft iron core inside the coil of a galvanometer? (ii) Increasing the current sensitivity of a galvanometer may not necessarily increase its voltage sensitivity. Explain, giving reason 05
- 40 (i) Define electric flux. write its SI unit. Gauss' law in electrostatic is true for any closed surface, no matter what its shape or size is. Justify this statement with the help of a suitable example. 05
(ii) Use Gauss' law to prove that the electric field inside a uniformly charged spherical shell is zero.
- 41 Write using Biot-Savart's law, the expression for the magnetic field B due to an element dl carrying current I at a distance r from it in a vector form. Hence derive the expression for the magnetic field due to a point P at distance X from its centre along the axis of the loop. 05

