

SECOND YEAR HIGHER SECONDARY FIRST TERMINAL EXAMINATION-AUGUST 2025

HSE II

Part – III
PHYSICS
Maximum: 60 scores

Time: 2 Hrs
Cool-off time: 15 Min

Answer any 5 questions from 1 to 7. Each carries 1 score.

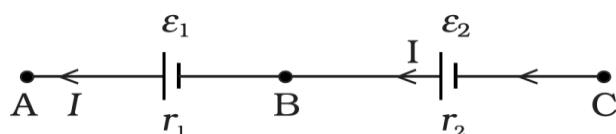
- 1 Name the property of total charge of a body as an integral multiple of a basic charge. 1
- 2 The electric flux through a closed surface enclosing an electric dipole is..... 1
- 3 Relative permittivity of a good conductor is (Zero/Infinity) 1
- 4 In a charged capacitor energy is stored in the..... 1
 - (i) positively charged plate (ii) negatively charged plate
 - (iii) electric field between the plates (iv) none of these
- 5 A wire of resistance R and resistivity ρ is stretched to 5 times its original length. Its resistivity will (increases, decreases, remains the same) 1
- 6 Give the SI unit of resistivity. 1
- 7 A proton is moving along X-axis with a uniform speed, enters in a region of uniform magnetic field applied along Y-axis. Then the trajectory of proton will be 1
 - a) circular b) elliptical c) helical d) straight line

Answer any 5 questions from 8 to 14. Each carries 2 score.

- 8 Write four properties of electric field lines. 2
- 9 a. Calculate the flux, passing through a sphere of radius 10 cm enclosing a charge of $8.85 \mu\text{C}$. 1
b. What is the flux if radius is increased to 20 cm? 1
- 10 Give two properties of equipotential surface. 2
- 11 State Ohm's law. Write one limitation. 2
- 12 a. Write any one difference between polar and non-polar molecule. 1
b. Give one example each for polar and non-polar molecule. 1
- 13 Define mobility. What is its dimensional formula? 2
- 14 A galvanometer of resistance 12Ω shows full scale deflection for a current of 3 mA. How will you convert the meter into a voltmeter of range 0 – 18 V? 2

Answer any 6 questions from 15 to 21. Each carries 3 score.

- 15 a. State Coulomb's law in electrostatics. 1
b. What is the force between two small charged spheres having charges of $2 \mu\text{C}$ and $3 \mu\text{C}$ placed 30 cm apart in air? 2
- 16 a. Define energy density of a capacitor. 1
b. Arrive at an expression for energy density of a parallel plate capacitor. 2
- 17 A cell with emf ε_1 and internal resistance r_1 is connected in series with another cell of emf ε_2 and internal resistance r_2 as shown in figure. The combination can be replaced by a single cell with equivalent emf ε_{eq} and equivalent internal resistance r_{eq} .



- Arrive at an expression for the equivalent emf and equivalent internal resistance of the combination. 3
- 18 a. Define drift speed of electrons in a conductor. 1
b. A current of 10A flows in a conductor of uniform cross-sectional area, 2mm^2 . The conductor has 10^{30} free electrons per cubic meter. What is the drift speed of the free electrons in the conductor? 2
- 19 Derive an expression for torque acting on a rectangular current loop kept in a uniform magnetic field. 3
- 20 a. State Ampere's circuital law. 1
b. Obtain an expression for the magnetic field due to a solenoid. 2

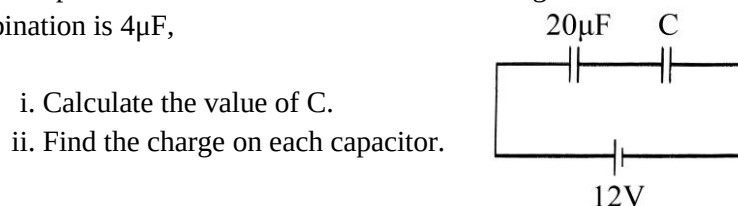
- 21 Consider two long parallel conductors a and b separated by a distance d and carrying currents I_1 and I_2 respectively. 3
 Prove that, the magnitude of force per unit length is $f_{ba} = f_{ab} = \frac{\mu_0 I_1 I_2}{2\pi d}$

Answer any 3 questions from 22 to 25. Each carries 4 score.

- 22 a. Define electric field. 1
 b. What is its unit? 1
 c. Derive an expression for electric field intensity at a point due to a point charge. 2
 23 a. State Gauss's law in electrostatics. 1
 b. Using this law obtain the expression for electric field intensity at a point due to uniformly charged spherical shell when the point is 3
 i. Outside the shell
 ii. On the surface
 iii. Inside the shell
 24 a. What are the factors on which capacitance of a parallel plate capacitor depends? 1½
 b. A parallel plate capacitor of plate area 0.2 m^2 and spacing 0.01 m is charged to 10^3 V . Keeping the voltage as constant what would be the change in energy stored in the capacitor if the separation between the plates were to be decreased by 10%? 2½
 25 a. Name the force acting on a charged particle when it enters into a uniform magnetic field with a velocity (v) 1
 b. Prove that this force is absent when the charge is at rest. 1
 c. Obtain the expression for magnetic force on a current carrying conductor placed in a uniform magnetic field. 2

Answer any 3 questions from 26 to 29. Each carries 5 score.

- 26 Two equal and opposite charges $+q$ and $-q$ are separated by a small distance $2a$. 1
 a. Name the arrangement. 1
 b. What are the conditions for stable and unstable equilibrium when this system is kept in a uniform electric field? 3
 c. Derive an expression for electric field at a point on the equatorial line of the above system.
 27 An equipotential surface is a surface with constant value of potential at all points on the surface. 1
 a. What is the amount of work done in moving a 2 C charge between two points, 3 cm apart, on an equipotential surface? Why?
 b. Two capacitors are connected as shown in the figure below. If the equivalent capacitance of the combination is $4 \mu\text{F}$, 1



- i. Calculate the value of C . 1
 ii. Find the charge on each capacitor. 3
 28 a. State Kirchhoff's laws for an electrical network. 2
 b. Using Kirchhoff's laws, find the relation between the resistance of four arms of a Wheatstone bridge, when the bridge is balanced. 2
 c. Is there any change in balancing condition if the galvanometer and cell are interchanged? 1
 29 a. State Biot-Savart law. 1
 b. Using Biot-Savart law, derive the expression for magnetic field at a distance x from the centre along the axis of a current carrying circular loop. 4

**SECOND YEAR HIGHER SECONDARY
FIRST TERMINAL EXAMINATION – AUGUST 2025**

Part – III

Time: 2 Hours

Maximum: 60 Scores

PHYSICS

Cool-off time: 15 Minutes

1 മുതൽ 7 വരെ ചോദ്യങ്ങളിൽ ഏതെങ്കിലും 5 എണ്ണത്തിന് ഉത്തരമെഴുതുക. 1 സ്കോർ വീതം.

(5 × 1 = 5)

1. ഒരു വസ്തുവി

