TOPIC: ELECTROSTATICS (PART I)

Constants: \( \frac{1}{4\pi \varepsilon_0} = 9 \times 10^9 \text{Nm}^2/\text{C}^2 \), magnitude of charge on electron, proton = \( 1.6 \times 10^{-19} \text{C} \)

SECTION A

Q.1 (i) In which medium electrostatic force is maximum.

(a) metal (b) water (c) vacuum (d) glass

(ii) If a negatively charged rod is brought in contact with neutral metal sphere then sphere will acquire

(a) positive charge (b) positive charge nearer and negative father away (c) no charge (d) negative charge

(iii) An electric field cannot deflect

(a) electron (b) neutron (c) proton (d) \( \propto \)- particle

(iv) A glass rod when rubbed with a piece of fur acquires a charge of magnitude \( 3.2 \mu\text{C} \). The number of electrons transferred is

(a) \( 2 \times 10^{13} \) from fur to glass (b) \( 5 \times 10^{12} \) from glass to fur (c) \( 2 \times 10^{13} \) from glass to fur (d) \( 5 \times 10^{12} \) from fur to glass

Q.2 (i) What will be the net charge on a system if it has five electrons and two protons?

(ii) Write the dimension of permittivity.

(iii) The dielectric constant for a metal is infinity, how much will be the electrostatic force between two charges in the metal?

SECTION B

Q.3 Derive an expression for electric field intensity (in vector) due to a point charge.


Q.5 Calculate electric field intensity at a point \( 5 \) m from a charge of \( 100 \mu\text{C} \) in vacuum?

Q.6 Find the work done when a point charge of \( 2 \mu\text{C} \) is moved through a potential difference of \( 10 \text{V} \)?

SECTION C

Q.7 State Coulomb’s law. Express it in scalar form.

Q.8 Two small identical metal spheres carrying charges \( 3 \times 10^{-9} \text{C} \) and \( -2 \times 10^{-9} \text{C} \) are brought in contact with each other and then separated by \( 1\text{m} \) in a medium of relative permittivity 10. Find electrostatics force between them.

SECTION D

Q.9 Define electric lines of force. State its any four characteristics. What is uniform electric field?