🌅 Bhartiyam International School

Pre - Mid Term Assessment (2022-23)
Subject: Physics
Class: XII

Date: 18/07/2022   Max. Mark: 40
Name: _____   Roll No: _____   Duration: 90 Mins

General Instructions:

(i)   There are 14 questions in all. All questions are compulsory.
(ii)   This question paper has two sections: Section A, Section B.
(iii)   Section A contains ten questions of two marks each, Section B contains four questions of five marks each.
(iv)   There is no overall choice. However, an internal choice has been provided in one question of two marks and two questions of five marks. You have to attempt only one of the choices in such questions.
(v)   You may use log tables if necessary but use of a calculator is not allowed.

SECTION- A

1. (a) Explain the meaning of the statement 'electric charge of a body is quantised'. (b) Why can one ignore quantisation of electric charge when dealing with macroscopic i.e., large scale charges?

2. What is the force between two small charged spheres having charges of 2×10^{-7}C and 3×10^{-7} C placed 30 cm apart in air?

<div align="center">Or</div>

State Coulomb's law and write its mathematical interpretation.

3. An infinite line charge produces a field of 9×10^4 N/C at a distance of 2 cm. Calculate the linear charge density.

4. A 12pF capacitor is connected to a 50V battery. How much electrostatic energy is stored in the capacitor?

5. Two charges 2 μC and −2 μC are placed at points A and B 6 cm apart. (a) Identify an equipotential surface of the system. (b) What is the direction of the electric field at every point on this surface?

6. The electrostatic force on a small sphere of charge 0.4 μC due to another small sphere of charge −0.8 μC in air is 0.2 N. (a) What is the distance between the two spheres? (b) What is the force on the second sphere due to the first?

7. A polythene piece rubbed with wool is found to have a negative charge of 3×10^{-7} C. (a) Estimate the number of electrons transferred (from which to which?) (b) Is there a transfer of mass from wool to polythene?

8. A point charge of 2.0 μC is at the center of a cubic Gaussian surface 9.0 cm on edge. What is the net electric flux through the surface?

9. A uniformly charged conducting sphere of 2.4 m diameter has a surface charge density of 80.0 μC/m². (a) Find the charge on the sphere. (b) What is the total electric flux leaving the surface of the sphere?

10. When a charged particle is placed in an electric field, then write both values of Torque & Potential Energy.

SECTION- B

11. Two large, thin metal plates are parallel and close to each other. On their inner faces, the plates have surface charge densities of opposite signs and of magnitude 17.0×10^{-22} C/m². What is E: (a) in the outer region of the first plate, (b) in the outer region of the second plate, and (c) between the plates?

Or

The capacity of two conductors are C_1 & C_2 and their respective potentials V_1 & V_2. If they are connected by a thin wire, then find the loss of energy.

12. Derive the equation for the electric field due to an infinite line charge.

13. Write the types of capacitor and derive the equation of capacitance for- (a) Parallel plate capacitor & (b) Spherical capacitor.

14. State Gauss's law and write its application in detail.

Or

The electric potential existing in space is $V(x,y,z) = A(xy + yz + zx)$.

(a). Find the expression for the electric field.

(b). If A is 10 SI units, find the magnitude of the electric field at (1m, 1m, 1m).