ACADEMIC WORLD SCHOOL™
BEMETARA
SUMMER VACATION ASSIGNMENT
SESSION 2020-21
CLASS: XII

SUBJECT- PHYSICS

General Instructions

(i) Attempt all the Questions.

(ii) Write answers of theoretical questions in points.

1 Mark Question

1) Show does the force between two point charges change if the dielectric constant of the medium in which they are kept increase?

2) Which physical quantity has its S.I unit (1) Cm (2) N/C.?

3) Define one coulomb?

4) State Gauss's theorem.

5) What are the limitations of Coulomb's law?

6) The relative permittivity of mica is 6. What is its absolute permittivity?

7) Give two properties of electric charge.

8) If $q_1 q_2 > 0$, what is the nature of force between the two charges?

2 Mark Question

1) A free proton and a free electron are placed in a uniform field. Which of the two experience greater force and greater acceleration?

2) No two electric lines of force can intersect each other? Why?

3) An electric dipole when held at with respect to a uniform electric field of 10^4 N/C experienced a Torque of 9×10^{-26} Nm. Calculate dipole moment of the dipole?

4) When a glass rod is rubbed with a silk cloth, charges appear on both. A similar phenomenon is observed with many other pairs of bodies. Explain how this observation is consistent with the law of conservation of charge.

5) Three point charges (q) are placed at three vertices of equilateral triangle of side a . Find the magnitude of Electrostatic force on any charge due to other two.

6) A charge is placed at the centre of cube. What is the electric flux passing through one of its face?

3 Mark Question

1) Two point charges +q and +9q are separated by a distance of 10 a. Find the point on the line joining the two changes where electric field is zero?

2) Define the term dipole moment of an electric dipole indicating its direction. Write its S.I unit. An electric dipole is placed in a uniform electric field. Deduce the expression for the Torque acting on it.

3) A sphere of radius r1 encloses a charge Q. If there is another concentric sphere S2 of Radius r2 (r2>r1) and there is no additional charge between S1 and S2. Find the ratio of electric flux through S1 and S2.

4) Two point electric charges of value q and 2q are kept at a distance d apart from each other in air. A third charge Q is to be kept along the same line in such a way that the net force acting on q and 2q is zero. Calculate the position of charge Q in terms of q and d.

5) 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?

6) Consider a uniform electric field $E = 3 \times 10^{3}$ i N/C.
   (a) What is the flux of this field through a square of 10 cm on a side whose plane is parallel to the yz plane?
   (b) What is the flux through the same square if the normal to its plane makes a angle 60 ° with the x-axis?

7) A point charge +10 micro coulomb is a distance 5 cm directly above the centre of a square of side 10 cm. What is the magnitude of the electric flux through the square?
   (Hint: Think of the square as one face of a cube with edge 10 cm.)

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

9) 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?

10) Derive an expression for work done in rotating an electric dipole in a uniform electric field from unstable equilibrium to stable equilibrium.

11) Derive the expression for electric field intensity at a point on axial line of electric dipole.

12) Derive the expression for electric field intensity at a point on equatorial line of electric dipole.

5 Mark Questions

1) (a) Sketch electric lines of force due to (i) isolated positive change (ie q>0) and (ii) isolated negative change (ie q<0).

   (b) Two point changes q and –q are placed at a distance 2a apart. Calculate the electric field at a point P situated at a distance r along the perpendicular bisector of the line joining the charges. What is the field when r >> a?

2) Using Gauss's law derive an expression for the electric field intensity due to a uniformly charged thin spherical shell at a point.

   (i) Outside the shell (ii) Inside the shell   (iii) On the shell

3) Using Gauss's law derive an expression for the electric field intensity at a point due to a uniformly charged thin infinite plane sheet. Hence show that it is independent of distance "r".

4) Using Gauss's law derive an expression for the electric field intensity at a point due to a uniformly charged wire.