ROLL NUMBER				

SET A

INDIAN SCHOOL MUSCAT

SECOND PERIODIC TEST

PHYSICS

CLASS: XII | Sub. Code: 042 | Time Allotted: 50 mts.

29.05.2022 | Max. Marks: 20

GENERAL INSTRUCTIONS:

All questions are compulsory.

1. No two equipotential surfaces intersect each other. Why? 2

2. Can the electric potential at a point be zero, while the electric field is non-zero? Justify. 2

3. A regular hexagon of side 10 cm has a charge 6μC at each of its vertices. Calculate the potential at the centre of the hexagon. 2

4. Define an equipotential surface. Draw three equipotential surfaces corresponding to 3

   (i) a constant electric field in the X - direction.

   (ii) a field that uniformly increases in magnitude in the X - direction.

5. Calculate the potential at the centre of a square ABCD of each side $\sqrt{2}$ m due to charges 3
   6 μ C, 2 μ C , -2 μ C and - 3 μ C at four corners of it .

6. State Gauss's theorem of electrostatics. Using Gauss's theorem obtain the expression for the 3
   electric field due to a uniformly charged thin spherical shell of radius R at a point outside the shell.

7. The electric flux through a given area held inside an electric field is a measure of the total 5
   number of electric lines of force passing normally through that area. Electric flux is a property of electric field. The net electric flux through a closed surface due to a charge lying outside the closed surface is zero.

(i) Electric flux is a

(a) Vector quantity

c) Scalar quantity

(b) Constant quantity

d) None of these

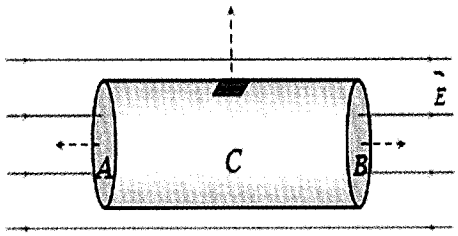
(ii) A charge q is placed at the centre of a cube of side L. What is the electric flux passing through each face to the cube?

(a) $\frac{q}{\varepsilon_0}$ (b) $\frac{q}{3\varepsilon_0}$ (c) $\frac{q}{6\varepsilon_0}$ (d) $\frac{q}{9\varepsilon_0}$

(iii) Total electric flux coming out of a unit positive charge kept in air is

(a) ε_0 (b) $4\pi\varepsilon_0$ (c) $\frac{1}{4\pi\varepsilon_0}$ (d) ${\varepsilon_0}^{-1}$

(iv) A cylinder of radius R and length L is placed in a uniform electric field E parallel to the cylinder axis. The total flux for the surface of the cylinder is given by



(a) πr^2 (b) zero (c) $4\pi ER^2$ (d) $2\pi ER^2$

(v) An electric charge of 8.85 x 10^{-13} C is placed at the centre of a sphere of radius 1 m. The electric flux through the sphere is

(a)0.1 $N\,m^2C^{-1}$ (b) 0.2 $N\,m^2C^{-1}$ (c) 0.01 $N\,m^2C^{-1}$ (d) 0.02 $N\,m^2C^{-1}$

End of the Question Paper

ROLL NUMBER				

SET B

INDIAN SCHOOL MUSCAT

SECOND PERIODIC TEST

PHYSICS

CLASS: XII Sub. Code: 042 Time Allotted: 50 mts.

29.05.2022 Max. Marks: 20

GENERAL INSTRUCTIONS:

All questions are compulsory.

1. Can the electric field at a point be zero, while the electric potential is non-zero? Justify. 2

2. Name the physical quantity whose SI unit is J / C. Is it a vector or a scalar quantity? 2

3. (i) Two charges of magnitudes -2Q and + Q are located at points (a , 0) and (5a ,0) respectively. What is the electric flux due to these charges through a sphere of radius 3a with its centre at the origin? 2

   (ii) A positive charge +q is located at a point. What is the work done if a unit positive charge is carried once round this charge along a circle of radius r about this point?

4. State Gauss's theorem of electrostatics. Derive an expression for the electric field due to a uniformly charged infinite plane sheet of surface charge density σ. 3

5. (i) Why must electrostatic field be normal to the surface at every point of a charged conductor? 3

   (ii) Draw the equipotential surfaces corresponding to a single positive charge at the origin.

6. (i) Calculate the potential at a point P due to a charge of 8×10^{-7} C located 9 cm away. 3

(ii) Hence obtain the work done in bringing a charge of $4 \, x \, 10^{-9}$ C from infinity to the point P. Does the answer depend on the path along which the charge is brought? Why?

7. The electric flux through a given area held inside an electric field is a measure of the total number of electric lines of force passing normally through that area. Electric flux is a property of electric field. The net electric flux through a closed surface due to a charge lying outside the closed surface is zero. 5

(i) A charge q is placed at the centre of a cube of side L. What is the electric flux passing through each face to the cube?

(a) $\frac{q}{\varepsilon_0}$ (b) $\frac{q}{3\varepsilon_0}$ (c) $\frac{q}{6\varepsilon_0}$ (d) $\frac{q}{9\varepsilon_0}$

(ii) Electric flux is a

(a) Vector quantity c) Scalar quantity

(b) Constant quantity d) None of these

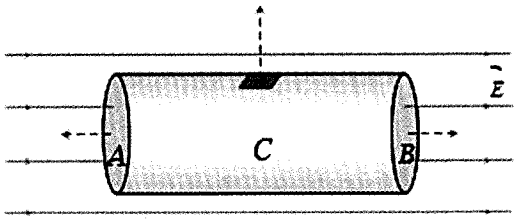
(iii) An electric charge of $8.85 \, x \, 10^{-13}$ C is placed at the centre of a sphere of radius 1 m. The electric flux through the sphere is

(a) $0.1 \, N \, m^2 C^{-1}$ (b) $0.2 \, N \, m^2 C^{-1}$ (c) $0.01 \, N \, m^2 C^{-1}$ (d) $0.02 \, N \, m^2 C^{-1}$

(iv) Total electric flux coming out of a unit positive charge kept in air is

(a) ε_0 (b) $4\pi\varepsilon_0$ (c) $\frac{1}{4\pi\varepsilon_0}$ (d) ε_0^{-1}

(v) A cylinder of radius R and length L is placed in a uniform electric field E parallel to the cylinder axis. The total flux for the surface of the cylinder is given by



(a) πr^2 (b) zero (c) $4\pi ER^2$ (d) $2\pi ER^2$

End of the Question Paper

ROLL NUMBER				

SET C

INDIAN SCHOOL MUSCAT

SECOND PERIODIC TEST

PHYSICS

CLASS: XII | Sub. Code: 042 | Time Allotted: 50 mts.

29.05.2022 | Max. Marks: 20

GENERAL INSTRUCTIONS:

All questions are compulsory.

1. Name the physical quantity whose SI unit is J / C. Is it a vector or a scalar quantity? 2

2. A regular hexagon of side 10 cm has a charge 8μC at each of its vertices. Calculate the potential at the centre of the hexagon. 2

3. Can the electric field at a point be zero, while the electric potential is non-zero? Justify. 2

4. State Gauss's theorem of electrostatics. Derive an expression for the electric field due to a straight uniformly charged infinite line of charge density λ C/m. 3

5. a) A charge of 24 μ C is given to hollow metallic sphere of radius 0.2 m. Find the potential 3

   (i) at the surface of the sphere

   (ii) at a distance of 0.1cm from the centre of the sphere.

6. (i) Define an equipotential surface. 3

   (ii) Two charges $3\mu C$ and $-3\mu C$ are placed at points A and B 8 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?

7. The electric flux through a given area held inside an electric field is a measure of the total number of electric lines of force passing normally through that area. Electric flux is a property of electric field. The net electric flux through a closed surface due to a charge lying outside the closed surface is zero. 5

(i) Total electric flux coming out of a unit positive charge kept in air is

(a) ε_0 (b) $4\pi\varepsilon_0$ (c) $\frac{1}{4\pi\varepsilon_0}$ (d) $\varepsilon_0{}^{-1}$

(ii) An electric charge of 8.85×10^{-13} C is placed at the centre of a sphere of radius 1 m. The electric flux through the sphere is

(a) $0.1\ N\ m^2C^{-1}$ (b) $0.2\ N\ m^2C^{-1}$ (c) $0.01\ N\ m^2C^{-1}$ (d) $0.02\ N\ m^2C^{-1}$

(iii) A charge q is placed at the centre of a cube of side L. What is the electric flux passing through each face to the cube?

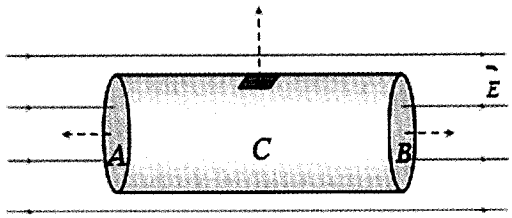
(a) $\frac{q}{\varepsilon_0}$ (b) $\frac{q}{3\varepsilon_0}$ (c) $\frac{q}{6\varepsilon_0}$ (d) $\frac{q}{9\varepsilon_0}$

(iv) Electric flux is a

(a) Vector quantity c) Scalar quantity

(b) Constant quantity d) None of these

(v) A cylinder of radius R and length L is placed in a uniform electric field E parallel to the cylinder axis. The total flux for the surface of the cylinder is given by



(a) πr^2 (b) zero (c) $4\pi ER^2$ (d) $2\pi ER^2$

End of the Question Paper