Chapter- 1 Electric Charges and fields

Question 1: A hollow metal sphere of radius 5 cm is charged such that the potential on its surface is 10 V. The potential at a distance of 2 cm from the centre of the sphere is

a) Zero
b) 10 V
c) 4 V
d) 10 /3 V

Answer: b) 10 V

Question 2: Two charges - 10 C and + 10 C are placed 10 cm apart. Potential at the centre of the line joining the two charges is

a) zero
b) 2V
c) -2V
d) none of these

Answer: a) zero

Question 3: Two plates are 1 cm apart , and low potential difference between them is 10 volt . The electric field between the plates is

a) 10 N/C
b) 500 N/C
c) 100 N/C
d) 250 N/C

Answer: a) 10N/C

Question 4: A particle A has charge + q . & particle B has charge + 4q with each of them having the same mass m . When allowed to fall from rest throught the same electrical potential differce, the ratio of their speeds VA/VB will be come

a) 2:1
b) 1:2
c) 1:4
d) 4:1

Answer: b) 1:2

Question 5: Two point charges + 8q and - 2q are located at x = 0 and x = L respectively . The location of a point on the x axis at which the net electric field due to these two point charges is zero is

a) L/4
b) 2 L
c) 4 L
d) B L

Answer: b) 2L

Question 6: A hollow metal sphere of radius 5 cm is charged so that the potential on its surface is 10 V. The potential at the centre of the sphere is

a) 0 V
b) 10 V
c) Same as at point 5cm away from the surface
d) Same as at point 25cm away from the surface

Answer: b) 10V

Question 7: Which of the following is a volt ?

a) erg per cm
b) joule per coulomb
c) erg per ampere
d) newton /(coulomb x metre2)

Answer: b) joule per coulomb

Question 8: If one penetrates a uniformly charged spherical sheel, the electric field stength E.

a) increases
b) Decreases
c) remains the same as at the surface
d) is zero at all points

Question 9: If n capacitors each of capacitance C are connected in series with a battery of V volt , then the energy stored in all the capacitors will be

a) CV
b) CV2
c) (1/2n) CV2
d) (1/2x) nCV2

Answer: C (1/2n) CV2

Question 10: If one penetrates a uniformly charged spherical shell, the electric field strength E.

a) decreases inversely as the square of the distance
b) decreases inversely as the distance
c) becomes zero
d) increase inversely as the square of distane

Answer: (C) becomes zero

Question 11: A charge Q is enclosed by a Gaussian spherical surface of radius R. If the radius is doubled, then the outward electric flux will

a) be reduced to half
b) remain the same
c) be doubled
d) increased four times

Answer: b) remain the same

Question 12: An electric dipole is placed at an angle of 30 ° with electric field intensity 2 x 10^5 N/C. It experiences a torque equal to 4 Nm. The charge on the dipole, if the dipole length is 2 cm, is

a) 8mC
b) 2mC
c) 5mC

Answer: b) 2mC

Question13: A charged rod P attracts rod R where as P repels another charged rod Q. What type of force is developed between Q and R?

Answer: Suppose rod P be negatively charged since it attracts rod R

a) R is positively charged since it repels rod Q
b) Q is negatively charged. So force between Q and R is attractive in nature.

Question 14: Which physical quantity has its S.I unit (1) Cm (2) N/C

Answer: (1) Electric dipole moment
(2) Electric field Intensity

Question 15: No two electric lines of force can intersect each other? Why?

Answer: Two electric lines of force never intersect each other because if they intersect then at the point of intersection there will be two tangents which is not possible as the two tangents represents two directions for electric field lines.

Question 16: (a) Explain the meaning of the statement 'electric charge of a body is quantized'. (b) Why can one ignore quantization of electric charge when dealing with macroscopic i.e., large scale charges?

Answer: (a) Electric charge of a body is quantized. This means that only integral (1, 2, …., n) number of electrons can be transferred from one body to the other. Charges are not transferred in fraction. Hence, a body possesses total charge only in integral multiples of electric charge.

(b) In macroscopic or large scale charges, the charges used are huge as compared to the magnitude of electric charge. Hence, quantization of electric charge is of no use on macroscopic scale. Therefore, it is ignored and it is considered that electric charge is continuous.

Question 17: 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.

Answer: Rubbing produces charges of equal magnitude but of opposite nature on the two bodies because charges are created in pairs. This phenomenon of charging is called charging by friction. The net charge on the system of two rubbed bodies is zero. This is because equal amount of opposite charges annihilates each other. When a glass rod is rubbed with a silk cloth, opposite natured charges appear on both the bodies. This phenomenon is in consistence with the law of conservation of energy. A similar phenomenon is observed with many other pairs of bodies.

Question 18: (a) An electrostatic field line is a continuous curve. That is, a field line cannot have sudden breaks. Why not?

(b) Explain why two field lines never cross each other at any point?

Answer: (a) An electrostatic field line is a continuous curve because a charge experiences a continuous force when traced in an electrostatic field. The field line cannot have sudden breaks because the charge moves continuously and does not jump from one point to the other.

(b) If two field lines cross each other at a point, then electric field intensity will show two directions at that point. This is not possible. Hence, two field lines never cross each other.

Question 19: What is the net flux of the uniform electric field of Exercise 1.15 through a cube of side 20 cm oriented so that its faces are parallel to the coordinate planes?

Answer: All the faces of a cube are parallel to the coordinate axes. Therefore, the number of field lines entering the cube is equal to the number of field lines piercing out of the cube. As a result, net flux through the cube is zero.

Question 20: What is the Charge on Electron?

Answer: Charge on electron is -1.6 *10-19 C.