

## CLASS – XII

### PHYSICS

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**1. What is quantization of electric charge ?**

**Ans.** The quantization of electric charge means that the total charge of a body (Q) is always an integral multiple of the charge of an electron (e).

**2. What is an Electric Screen ?**

**Ans.** Any arrangement, which can separate any closed space from the influence of an external electric charge, is called an electric screen. Electric screens are based on the property that the charge always resides on the outer surface of a conductor.

**3. If the intensity at a point in an electric field is zero, will the electric potential also be zero at that point ?**

**Ans.** If the intensity of the electric field be E and potential be V, then

$$E = - (dV/dx). \text{ As } E = 0 \text{ then } (dV/dx) = 0, \text{ or } dV = 0, \text{ or } V = \text{constant}.$$

Thus, the potential has a constant value, not necessarily zero at that point.

**4. Why does charge accumulate at sharp edge of a charged body ?**

**Ans.** The surface density of charge on the surface of a sphere is given by the equation

where  $4\pi r^2 =$  surface area of the sphere

$$\sigma = \frac{Q}{4\pi r^2}$$

$Q =$  charge

$r =$  radius of the sphere.

The surface density of charge is inversely proportional to the square of radius. So the surface density of charge is greater at a position where the radius of curvature is smaller. Charge therefore accumulates on a surface at points that have smaller values of the radius of curvature.

**5. Why is the metallic box of a gold leaf electroscope kept in contact with the ground ?**

**Ans.** Suppose that the leaves of a gold leaf electroscope are imparted a charge (say a negative charge). Therefore a positive charge will be induced on the inner surface of the box, while a negative charge of equal magnitude will be induced on the outer surface of the box. If the box is then grounded, then the charge on the outer surface reaches the earth. Under these conditions, the electrical attraction between the opposite charges inside the box i.e. the attraction between positive charge and the negative charge, leads to a greater deflection of the gold leaves and this makes the instrument more sensitive. If the instrument is not earthed, then the electrical force of attraction between the negative charge of the gold leaves and the induced positive charge on the inner surface of the box will be partially cancelled by the force of repulsion between the negative charge on the gold leaves and that on the outside. This would result in a smaller deflection of the leaves.

6. One plate of a parallel plate air capacitor is hanging from one arm of a balance. The area of each plate of the capacitor is  $A$  and the distance between them is  $d$ . How much charge must be imparted to the capacitor so that it can balance the force of gravity acting on a mass  $m$  that is hung from the other arm of the balance ?

**Ans.** We know that the force acting between the parallel plates of a capacitor is given by the relation

$F = \frac{1}{2} QE$  where  $Q$  is the positive charge on the positive plate of the capacitor and  $E$  is the electric field intensity between the plates .

We have  $Q = CV$  and  $E = \frac{V}{d}$ .

therefore the force acting between the plates,  $F = \frac{1}{2} QE = mg$  , is given by

$$\text{or } \frac{1}{2} CV \frac{V}{d} = mg \qquad \therefore c = \frac{A\epsilon_0}{d}$$

$$\text{or } \frac{1}{2} \frac{A\epsilon_0}{d} \cdot \frac{V^2}{d} = mg$$

$$\text{or } V^2 = \frac{2mgd^2}{A\epsilon_0}$$

$$\text{or } V = d \sqrt{\frac{2mg}{A\epsilon_0}}$$