Centre University Abdelhafid Boussouf
Institutes of Math and Informatics 1st Year licence

Physic 02

Series N°3: Conductors in Electrostatic equilibrium and Capacitance

Exercice 1

1. If the net electric flux out of a closed surface **is zero**, the electric field must be zero everywhere **on** the surface.
2. If the net electric flux out of a closed surface **is zero**, the charge density must be zero everywhere **inside** the surface.
3. The electric field is zero everywhere **within** the material of a conductor in electrostatic equilibrium.
4. **The tangential component** of the electric field **is zero** at all points just **outside** the surface of a conductor in electrostatic equilibrium.
5. **The normal component** of the electric field is the same at all points just **outside** the surface of a conductor in electrostatic equilibrium.

Exercice 2

A long, straight wire is surrounded by a hollow metal cylinder whose axis coincides with that of the wire. The wire has a charge per unit length of λ, and the cylinder has a net charge per unit length of 2λ. From this information, use Gauss's law to find (a) the charge per unit length on the inner and outer surfaces of the cylinder and (b) the electric field outside the cylinder, a distance r from the axis.

Exercice 3

A square plate of copper with 50.0-cm sides has no net charge and is placed in a region of uniform electric field of 80.0 kN/C directed perpendicularly to the plate. **Find**

(a) the charge density of each face of the plate and
(b) the total charge on each face.

Exercice 4

A parallel-plate air-filled capacitor has a capacitance of 50 pF.
(a) If each of the plates has an area of A=0.35 m^2, what is the separation?

Exercice 5

Four capacitors are connected as shown in Figure.
1-Find the equivalent capacitance between points a and (b)
2-Calculate the charge on each capacitor if ΔV_{ab} =15.0 V.
3-Calculate the energy stored by the capacitor C_{eq}**.**