

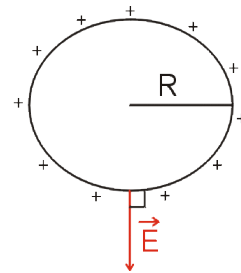


SW N° 03 of Electricity Conductors and Capacitors

Exercise 1

Rubbing an ebonite stick produces a charge of 10 nC. This charge is transferred by contact to a metal sphere of radius $R=10$ cm.

What is the field strength in the vicinity of the sphere?



Exercise 2

Consider a spherical conductor (C) of center O and radius R connected to ground (its potential is zero). This conductor is brought into contact with a conductive sphere (S) with center A such that $OA= d$ and charge $(+Q)$. Neglecting the influence of the conductor (C) on the sphere (S), calculate the charge q of (C).

Exercise 3 :

Consider two conductive spheres, with radius $R_1=2$ cm and $R_2=3$ cm, which are far apart. They carry electric charges $Q_1=10\mu\text{C}$ and $Q_2=15\mu\text{C}$, respectively. The two spheres are connected by a thin conducting wire. If we neglect the charge carried by the wire:

1. Calculate the new charges Q_1' and Q_2' of the two spheres.
2. Calculate the amount of charge passing through the wire. Comment on the result.

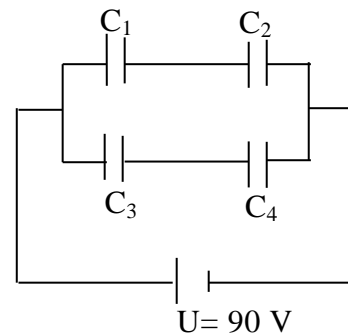
Exercise 4

Consider the following group of capacitors.

- 1- Determine the equivalent capacitance of the assembly.
- 2- Calculate the voltage between the armatures of each capacitor.

3- Calculate the electrical charge carried by each capacitor.

We give: $C_1 = 3 \mu\text{F}$; $C_2 = 6 \mu\text{F}$; $C_3 = 2 \mu\text{F}$; $C_4 = 4 \mu\text{F}$ et $U=90\text{V}$.



Exercise 5

1) What is the equivalent capacitance of the following segment

$$C_1 = C_2 = C_3 = 3.0 \cdot 10^{-3} \text{ F}$$

2) If a voltage $V_{ab} = 6.0 \text{ V}$ is applied, what is the charge of each capacitor?

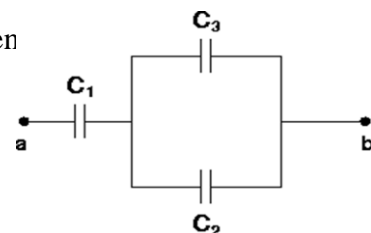
3) What is the voltage across each capacitor?

4) Consider two plates separated by $d = 1.5 \text{ cm}$,

where the electric field between them is 100 V / m , and the charge on the plates is $30.0 \cdot 10^{-3} \text{ C}$.

What is the capacitance of the capacitor formed?

5) A capacitor has a charge of $3.0 \cdot 10^{-9} \text{ C}$ when the voltage across the capacitor is 12 V . How much energy is stored in the capacitor?





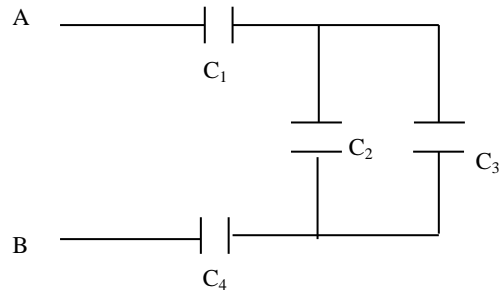
Supplementary exercises

Exercise 1

A. Consider the capacitor bank shown in figure 2.

- 1- Determine the equivalent capacitance between points A and B.
- 2- Find the charge carried by each capacitor when the voltage between A and B is 12 V.
- 3- Calculate the potential difference across each capacitor.

We give : $C_1 = 2 \mu\text{F}$; $C_2 = 10 \mu\text{F}$; $C_3 = 4 \mu\text{F}$; et $C_4 = 7 \mu\text{F}$



B. Consider two plates separated by $d = 1.5 \text{ cm}$, where the electric field between them is 100 V/m , and the charge on the plates is $30 \cdot 10^{-3} \text{ C}$.

What is the capacitance of the capacitor formed?

C. A capacitor has a charge of $3.0 \cdot 10^{-9} \text{ C}$ when the voltage across the capacitor is 12 V. How much energy is stored in the capacitor?

Exercise 2

Consider the circuit below.

- 1- Knowing that capacitor C_1 carries charge $Q_1 = 10 \mu\text{C}$, what will be the voltage V_{AD} between points A and D?
- 2- Determine the charges Q_2 and Q_3 of capacitors C_2 and C_3 respectively.
- 3- Since the voltage between B and D is equal to 2V, calculate the charges Q_4 and Q_5 of capacitors C_4 and C_5 .
- 4- What is the equivalent capacitance C_{eq} of the entire circuit?
- 5- Calculate the energy stored by capacitor C_1 .

We give : $C_1 = 4 \mu\text{F}$, $C_2 = 3.5 \mu\text{F}$, $C_3 = 2.5 \mu\text{F}$, $C_4 = C_5 = C_7 = C_8 = 5 \mu\text{F}$, $C_6 = 10 \mu\text{F}$.

