

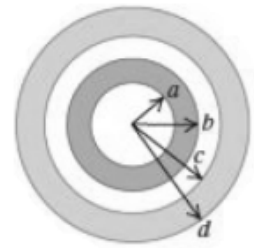
## Physics 02: Electricity and magnetism

University Year 2023-2024

### Series N° 02: CONDUCTORS

#### EXERCISE 01

A small conducting spherical shell with inner radius  $a$  and outer radius  $b$  is concentric with a larger conducting spherical shell with inner radius  $c$  and outer radius  $d$ . The small shell has total charge  $+2q$ , and the large shell has charge  $+4q$ .



What is the total charge on the:

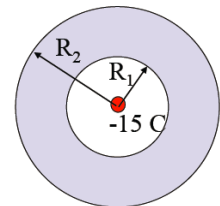
- 1- inner surface of the small shell?
- 2- outer surface of the small shell?
- 3- inner surface of the large shell?
- 4- outer surface of the large shell?

#### EXERCISE 02 (home work)

A spherical conducting shell has an excess charge of  $+10\text{ C}$ .

A point charge of  $-15\text{ C}$  is located at center of the sphere.

- 1- Use Gauss' Law to calculate the charge on inner and outer surface of sphere.



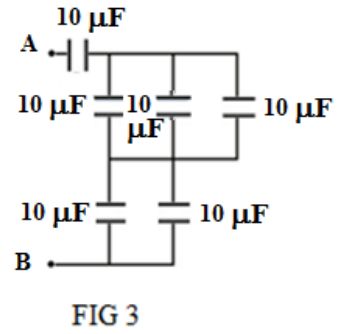
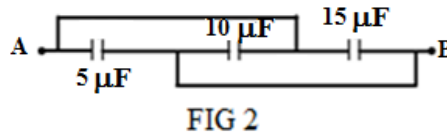
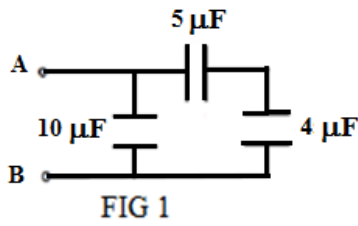
#### EXERCISE 03

A parallel-plate capacitor has circular plates of  $8.2\text{ cm}$  radius and  $1.3\text{ mm}$  separation.

- 1- Calculate the capacitance.
- 2- What charge will appear on the plates if a potential difference of  $120\text{ V}$  is applied?

#### EXERCISE 04

Find the total capacitance  $C_{eq}$  between A and B:

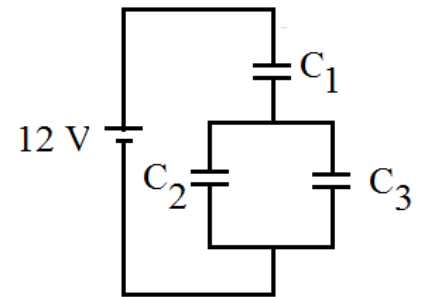


**EXERCISE 05**

Determine the net capacitance **C** of the capacitor combination shown in Figure when the capacitances are:

$C_1 = 12 \mu F, C_2 = 2 \mu F, C_3 = 4 \mu F$

- 1- When a 12 V potential difference is maintained across the combination, find the charge and the voltage across each capacitor.
- 2- Find the energy stored in each capacitor and in a network when the capacitors are fully charged.

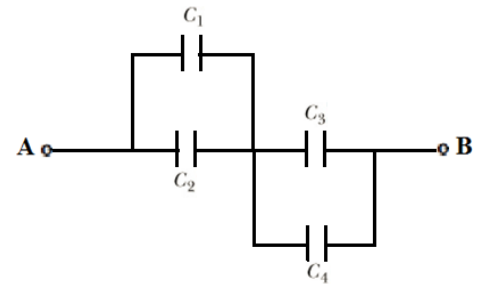


**EXERCISE 06**

Four capacitors are connected as shown in figure.

$C_1 = 1 pF, C_2 = 2 pF, C_3 = 4 pF, C_4 = 5 pF$

- 1- Find the equivalent capacitance between points A and B.
- 2- Calculate the charge on each capacitor if  $V_{AB} = 12V$ .
- 3- Calculate the voltage across each capacitor.



**EXERCISE 07 (home work)**

Determine the net capacitance **C** of the capacitor combination shown in figure

- 1- Find the equivalent capacitance
- 2- Find the charge and the voltage across each capacitor.
- 3- Find the energy stored in each capacitor.

