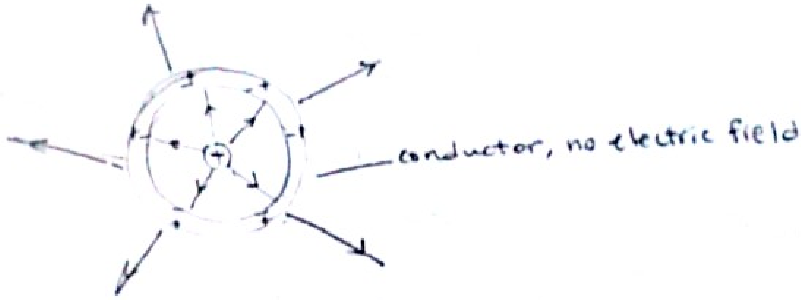
Conductor

- If there is electric field inside the conductor, the electric field will act upon the free electrons.
  the electrons will move until they reach a position where the electric field = 0
  Therefore, there isn't an electric field surrounding a conductor.

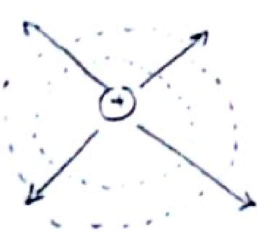
- Electric field is ⊥ to the surface of a conductor

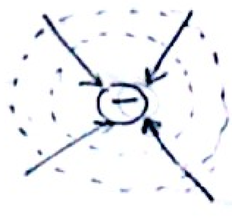


Equipotential : the potential different between 2 points, no work is required from one point to the other. ⊥ to the electric potential lines

Conductors were NOT equipotential, free electrons move at the surface until conductor become equipotential

$E = \frac{kq_1}{R_1^2} = \frac{kq_2}{R_2^2}$





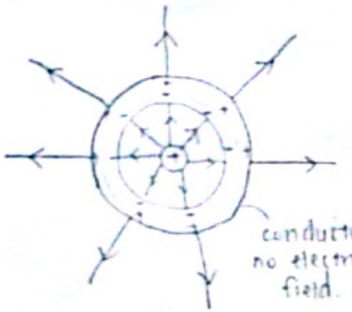
No electric field and potential in the charged conducting sphere

III. ELECTRICITY AND MAGNETISM
B. Conductors, capacitors, dielectrics
1. Electrostatics with conductors
a) Students should understand the nature of electric fields in and around conductors, so they can:
(1) Explain the mechanics responsible for the absence of electric field inside a conductor, and know that all excess charge must reside on the surface of the conductor.

Why is the electric field inside a conductor 0?

- if there is electric field inside the conductor, the electric force will act upon the free electrons:
  ↳ the electrons to move until they reached positions where the electric field = 0

⇒ for a − charged conductor, negative charges will be repelled to the surface of the conductor.



⇒ when a + charge is surrounded by an uncharged conductor, the negative charges in the conductor will draw towards the inner surface of the conductor while the + charges move to the outer surface. Then, an electric field will be caused by the outer surface + charges.

⇒ Electric field is ALWAYS ⊥ to the surface outside of a conductor.

III. ELECTRICITY AND MAGNETISM

B. Conductors, capacitors, dielectrics

1. Electrostatics with conductors

a) Students should understand the nature of electric fields in and around conductors, so they can:

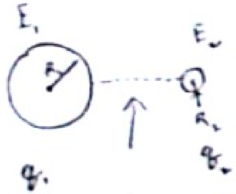
(2) Explain why a conductor must be an equipotential, and apply this principle in analyzing what happens when conductors are connected by wires.

↑ Capacitor

Equipotential - the potential difference between any two points, and no work is required from one point to another. They are ⊥ to the electric potential lines.

If conductors were NOT equipotential, free electrons would move at the surface, until the conductor became equipotential.

If conductors are connect by wires, then the electrical fields of the two conductors become equal.



$$E_1 = \frac{kq_1}{R_1^2} , \frac{kq_2}{R_2^2} = E_2$$

9 A

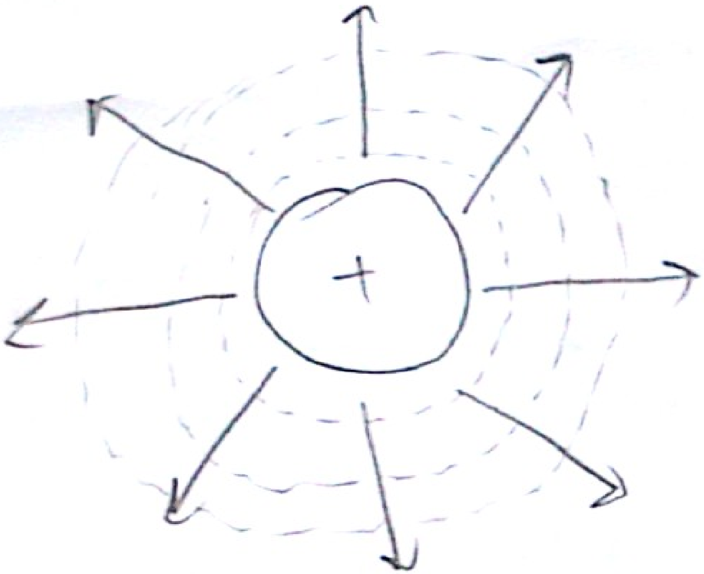
Section 3

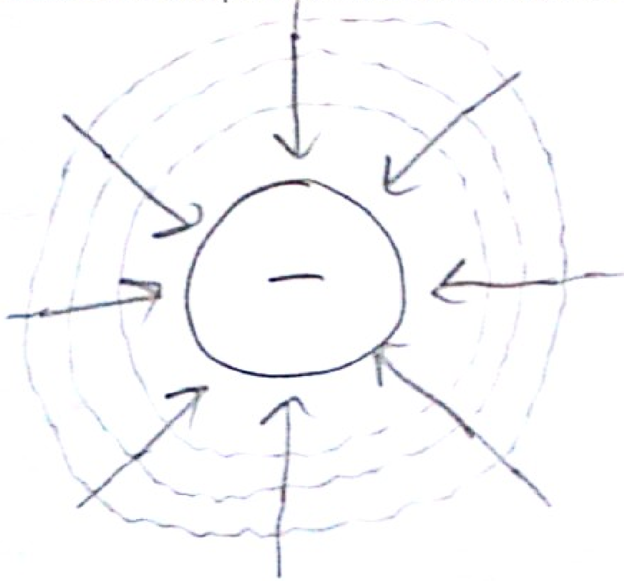
III. ELECTRICITY AND MAGNETISM

B. Conductors, capacitors, dielectrics

1. Electrostatics with conductors

b) Students should be able to describe and sketch a graph of the electric field and potential inside and outside a charged conducting sphere.





--- → equipotential lines

— → Electric field lines

Same Legend for this one

There's no electric field and thus potential inside the charged conducting sphere.

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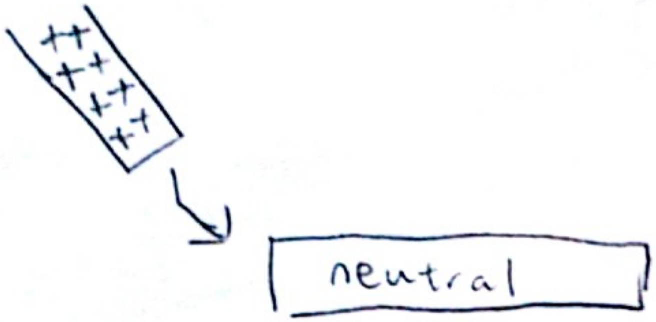
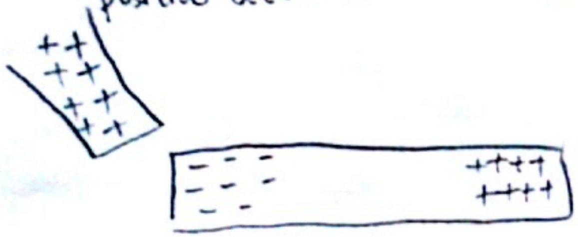
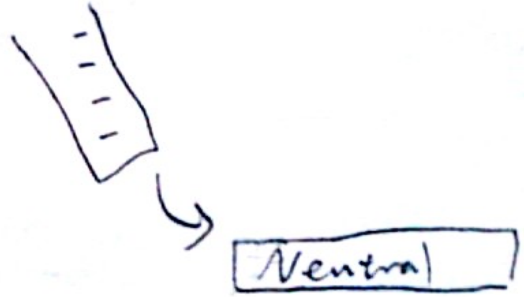
III. ELECTRICITY AND MAGNETISM
B. Conductors, capacitors, dielectrics
1. Electrostatics with conductors
c) Students should understand induced charge and electrostatic shielding, so they can:
(1) Describe the process of charging by induction.



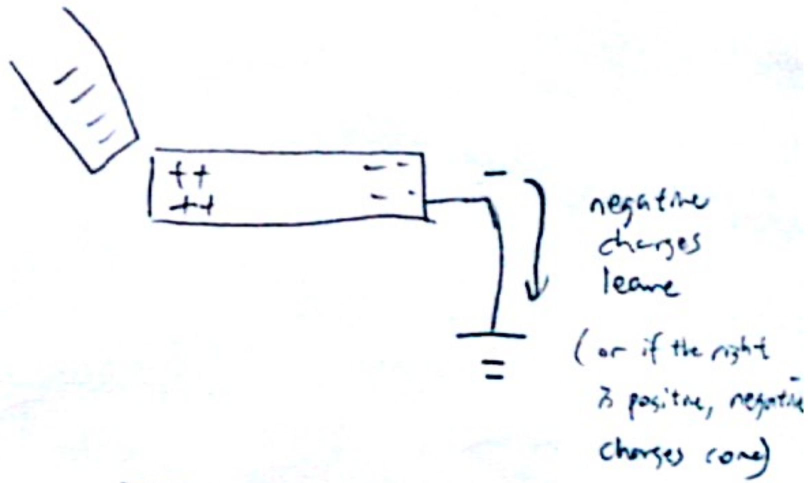
positive attracts the negative charges.

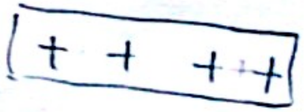


Grounding



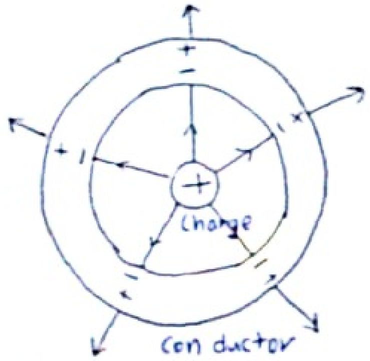
Negative attracts the positive charges





III. ELECTRICITY AND MAGNETISM
B. Conductors, capacitors, dielectrics
1. Electrostatics with conductors
c) Students should understand induced charge and electrostatic shielding, so they can:
(2) Explain why a neutral conductor is attracted to a charged object.

Ch 16
Section 9



* the eletric field exists even beyond the shell but not within the conductor itself
* the positive charge attracts negative charges on the inner surface of metal, and positive charges on outer surface.
* Although a conductor is neutral (uncharged), it still has free electrons that can freely move around to induce an electric field.