Charge and Coulomb's Law

I. Charge

A. _____ is the **source** of the **electric force**.

B. Two type of charge

1)

2)

C. Charge is _____!!!

You can neither _____ nor

_____ charge.

You can only _____ it!!

D. The unit of charge in the S.I. system is the

_____.

The symbol is _____.

E. Charge is _____ in units of **e** (1.6×10^{-19} C).

F. Charge is free to move in materials called

_____.

TYPE I: Conductors **Type II: Conductors**

G. Charge <u>can NOT move</u> in materials called

_____.

H. A _____ body is one with equal amounts of positive and negative charge.

I. Like charges _____ and unlike charges

_____!!

II. Coulomb's Law

A. The magnitude of the electrostatic force between two point charges is directly proportional to the product of the charges and inversely proportional to the square of the distance between the charges.

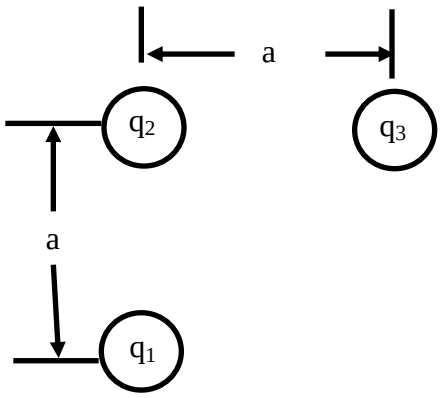
Where ε_o is the permattivity of free space.

B. We often combine the various constants in Coulomb's law into a single constant k. This can also be useful for finding the value of ε_o if you forget.

C. Coulomb's Law is limited to point charges or spherical charges. However, it is extremely important because the formula for any other more complicated charge distribution is found by breaking the charge distribution up into point charges and then the force contributions from Coulomb's law are summed up!! (This is the basis for our work on Electric Fields in the next lesson!!)

EXAMPLE 1:

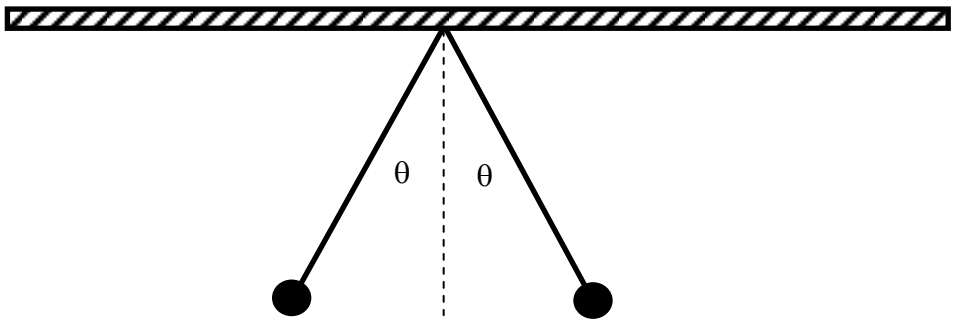
Consider three point charges located at the corners of a triangle, as shown below, where $q_1 = q_3 = 5.0\ \mu C$, $q_2 = -2.0\ \mu C$, and a = 0.10 m. Find the resultant force on q_3.



EXAMPLE 1 (Continued)

EXAMPLE 2:

Two identical small charged spheres, each having a mass of 3.0×10^{-2} kg, hang in equilibrium as shown below. If the length of each string is 0.15 m and the angle $\theta = 5.0°$, find the magnitude of the charge on each sphere.

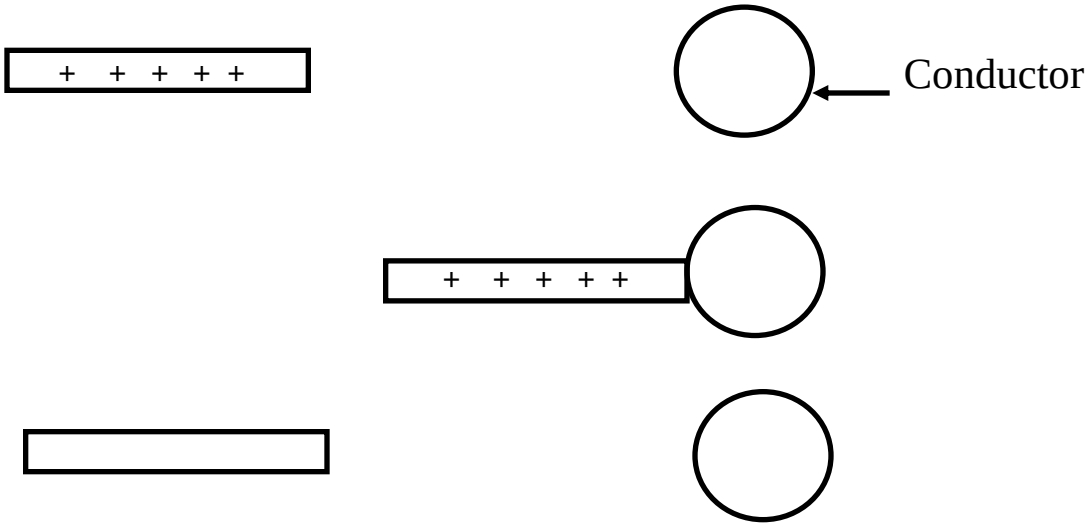


III. Conduction and Induction

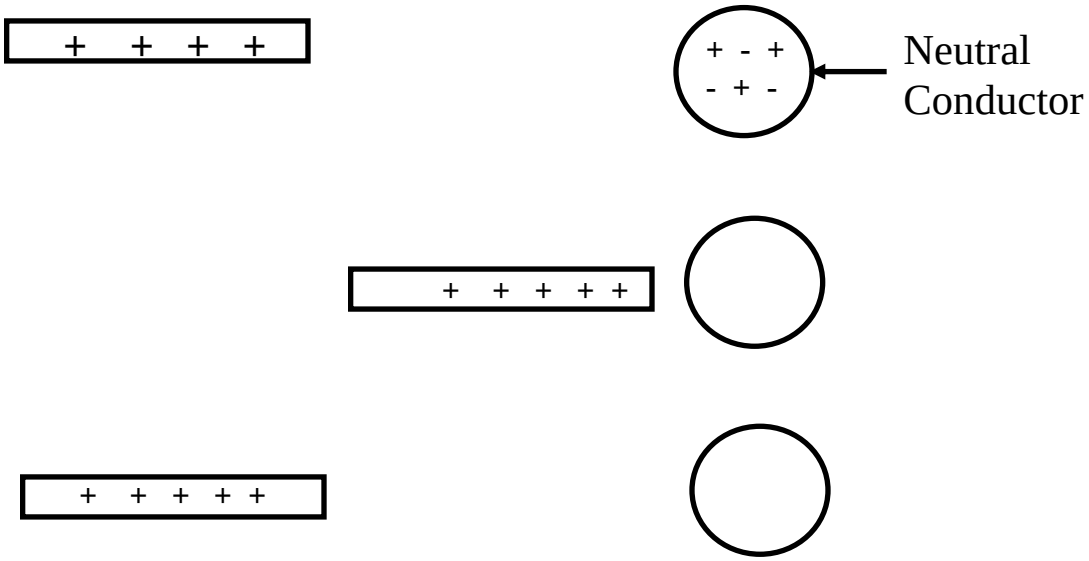
A. Conduction is the transferring of charge between two bodies due to contact between the bodies.

B. Induction is the influencing of charges on a body due to a charged 2nd body that is nearby but NOT TOUCHING the 1st body.

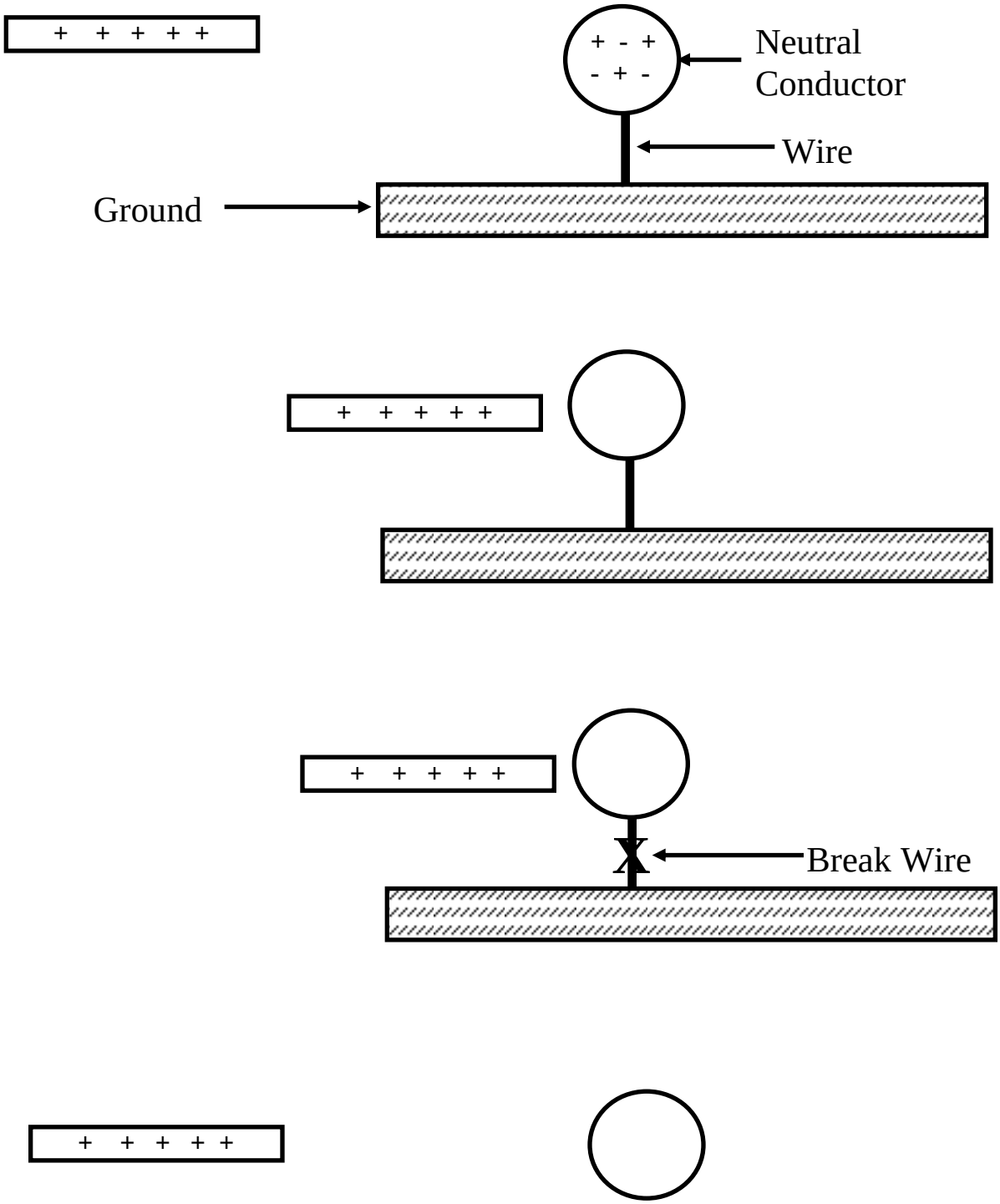
EXAMPLE: Conduction



EXAMPLE: Induction



EXAMPLE: Charging by Induction



IV. Electric Force V.S. Gravity

A. Definitions:

Electric force is

Gravity is

B. Comparison:

Property	Electric	Gravity
Source		
Type		
Range		
Strength		

C. Point Source Results:

Property	Electric	Gravity
Source Dependence		
Space Dependence		
Strength Constant		