

HONORS PHYSICS ELECTROSTATIC REVIEW - w/o field calculations

1. Be able to briefly describe each method of charging. Be able to tell the difference between them, the circumstances in which each occurs and the end result of each.

a. friction b. conduction c. induction d. polarization.

SEE Charging Notes
at THE END

2. After rubbing a balloon on your head, the balloon has a charge of $-2 \mu\text{C}$. What is the charge on your hair?

Charging By FRICTION Ends with Equal & opposite :: $+2 \mu\text{C}$

3. Explain what each of the following equations is used for:

a) $F = \frac{Kq_1q_2}{d^2}$

Equation Finds Electrostatic Force BETWEEN
2 charged objects

$K = 9 \times 10^9$ q_1 & q_2 are charges $d =$ distance in meters

4. When the symbol " μ " is placed in front of a unit, it means multiply by $\underline{\times 10^{-6}}$

5. A $3.0 \mu\text{C}$ charge is located $1.5 \times 10^{-5} \text{ m}$ from a $-6.0 \mu\text{C}$ charge, what is the force between the charges?

$$F = \frac{Kq_1q_2}{d^2} = \frac{(9 \times 10^9)(3 \times 10^{-6})(6 \times 10^{-6})}{(1.5 \times 10^{-5})^2} = \frac{0.162}{2.25 \times 10^{-10}}$$

$$720,000,000 \text{ N}$$

$$\text{or } 7.2 \times 10^8 \text{ N}$$

Is the force attractive or repulsive? How do you know?

ATTRACTIVE Because the signs are opposite

6. Two identically charged objects exert a force of 25 N on each other when they are a distance of 3 m apart, what is the charge of each object?

$$q_1 = q$$

$$q_2 = q$$

$$F = 25$$

$$d = 3$$

start w $F = \frac{Kq_1q_2}{d^2} = Kq_1q_2$

$$25(3)^2 = (9 \times 10^9) q \cdot q$$

$$\frac{225}{9 \times 10^9} = q^2$$

$$q^2 = 2.5 \times 10^{-8}$$

$$q = \sqrt{2.5 \times 10^{-8}} = 0.000158$$

$$\text{or } 158 \mu\text{C}$$

7. Two charges, Q and q , at a certain distance, d , exert a 200 N force on each other. What would the force be if:
- Q were doubled and q were tripled.

$$F' = \frac{q_1 q_2}{d^2} \cdot F \Rightarrow 200 \frac{(2)(3)}{1^2} = 1200 \text{ N}$$

- d were reduced to $1/4$ its original value.

$$F' = 200 \left(\frac{1 \cdot 1}{(1/4)^2} \right) = 3200 \text{ N}$$

- Q were cut into $1/3$, q were doubled and d were doubled.

$$F' = 200 \frac{(1/3)(2)}{2^2} = 33.3 \text{ N}$$

8. How is the direction of the electric field lines determined?

FIELD LINES Point in the direction of the FORCE on a POSITIVE charge.

What can you tell by the spacing between the E-field lines?

CLOSER together means STRONGER field

Electric field lines point toward Negative charged objects and away from Positive charged objects.

9. A positively charged object will (increase -or- decrease) energy when it is moved in the direction of the field. However a negatively charged object will (increase -or- decrease) energy when it is moved in the direction of the field.

An object moved perpendicular to the direction of the field will experience No change in energy.

How do objects become charged?

All objects have both negative and positive charges, electrons and protons.

When an object is said to be charged, we are referring to the net charge on an object.

A neutral object has the same number of electrons and protons.

How do objects become charged?

A negatively charged object has excess electrons

A positively charged object has an electron deficit (too few electrons)

Polarization (no net charge)

Start 1 charged object & a Neutral object

Charges in the neutral object separate while in the presence of the charged object.

Leaving one side of the neutral positive and the other negative.

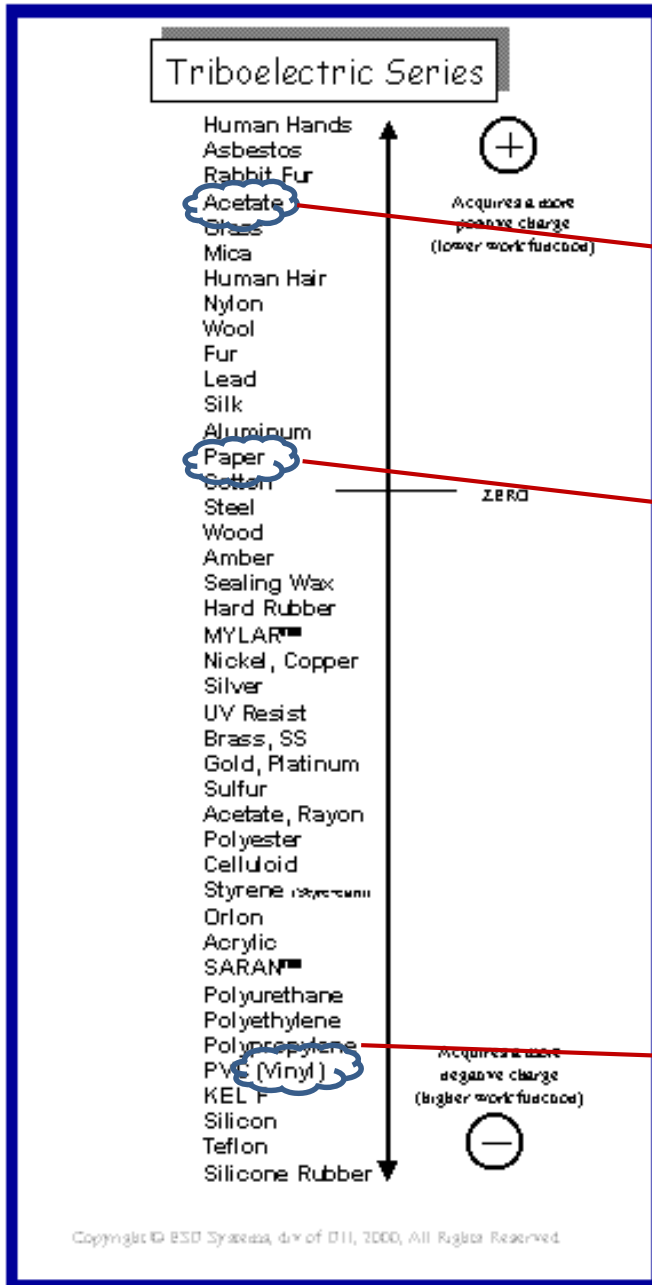
Charging by Friction

Start with two insulators

Friction strips electrons from one object to the other.

End with two equal and oppositely charged objects.

Electrostatic Series



Acetate 

Paper 

Vinyl 



Charging by contact (conduction)

Start 1 charged object & a Neutral Conductor

During contact electrons move to or from the conductor.

Two Like charged objects

Induction

Start charged object & 2 Neutral Conductors in contact with one another.

Polarize the conductors and split apart

Two equal and oppositely charged objects

Induction With Grounding

Start charged object & a Neutral Conductor

Polarize the conductor and ground one side

The Neutral object is opposite charge of the source