

Electrostatics Practice Problems

1. While enjoying a nice winter weekend at home, you decide to brush your fluffy cat (low electron affinity, like bunny fur) with a plastic (higher electron affinity, like balloons) comb. After several minutes of brushing the cat, suppose $4.5 \times 10^{-6} \text{ C}$ of charge are exchanged between the cat and the comb.

a. Determine the net charges on the comb and the cat. Be sure to indicate + or -.

Comb: $-4.5 \times 10^{-6} \text{ C}$

Cat: $+4.5 \times 10^{-6} \text{ C}$

b. How many electrons were transferred?

2.8×10^{13} electrons were transferred.

c. What kind of charging is this?

Charging by friction

d. The comb and cat will experience a force of attraction / repulsion. (circle one)

Attraction

e. If the comb and cat are held 35 cm apart, what is the force between them?

$F = -1.5 \text{ N}$

2. The force between two corks is 36 N. What will be the new force if

a. the charge of **one** of the corks is doubled?

72N

b. the distance between the corks is tripled?

4.3

You take a charged glass (-1.5 mC) and touch it to a sheet of aluminum foil in the kitchen. Half of the excess charge is transferred to the aluminum foil sheet.

c. Determine the type of charging in this process.

Contact

d. Determine the charge on the aluminum foil sheet. Be sure to indicate + or -

-0.75 mC

e. If the glass and the aluminum foil sheet are placed 5.0 m apart on the kitchen counter, what is the electrostatic force acting between them? Is this an attractive or repulsive force?

$+203 \text{ N Repulsive}$

f. If the aluminum foil has a mass of 1.2 kg and begins to accelerate at 24 m/s^2 away from the glass, determine the force of friction between the aluminum foil and the kitchen counter.

$f = -174 \text{ N}$