Name _____ Answer Key _____          Date _____

Physics                                                                Electrostatics WS #2

Period _____                                       Mrs. Nadworny

# A

## Charges

**Directions:** Read online textbook pages 628 – 633. Solve the following problems using the GUESS method and proper significant figures. Be sure to show ALL work.

1. What is a correct value for the charge on an electron?

   (A) $1.60 \times 10^{-12}$ µC          (B) $1.60 \times 10^{-15}$ mC          (C) $1.60 \times 10^{-22}$ kC          (D) $1.60 \times 10^{-24}$ MC

2. An object with +10 elementary charges is grounded and becomes neutral. What is the best explanation for this occurrence?

   (A) The object gained 10 protons from the ground

   (B) The object gained 10 electrons from the ground

   (C) The object lost 10 protons to the ground

   (D) The object lost 10 electrons to the ground

3. An object cannot have a charge of

   (A) $3.2 \times 10^{-19}$C          (B) $4.5 \times 10^{-19}$C          (C) $8.0 \times 10^{-19}$ C          (D) $9.6 \times 10^{-19}$ C

4. The charge to mass ratio of an electron is

   (A) $1.76 \times 10^{-11}$ C/kg          (B) $5.69 \times 10^{-12}$ C/kg          (C) $1.76 \times 10^{11}$ C/kg          (D) $5.69 \times 10^{12}$ C/kg

5. Which quantity of excess electric charge could be found on an object?

   (A) $6.25 \times 10^{-19}$ C                              (C) 6.25 elementary charges

   (B) $4.80 \times 10^{-19}$ C                              (D) 1.60 elementary charges

6. A rubber rod becomes negatively charged when it is rubbed with fur. The net negative charge accumulates because the rubber rod

   (A) gains electrons          (B) loses protons          (C) gains protons          (D) loses electrons

7. What is the smallest electric charge that can be put on an object?

   (A) $9.11 \times 10^{-31}$ C                              (C) $9.00 \times 10^9$ C

   (B) $1.60 \times 10^{-19}$ C                              (D) $6.25 \times 10^{18}$ C

8. Compared to the charge on a proton, the charge on an electron has the

   (A) same sign and a smaller magnitude          (C) opposite sign and the same magnitude
   (B) opposite sign and a small magnitude          (D) same sign and the same magnitude

9. Compared to an insulator, a conductor of electric current has

   (A) more free electrons                              (C) more free atoms
   (B) fewer free electrons                            (D) fewer free atoms

10. Show the charge flow for each situation below. Show the charge on each AFTER.

    a. A balloon is rubbed against a Northport physics student's hair. Electrons flow from the hair to the balloon.
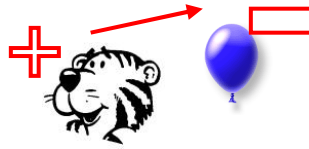
    b. A piece of wool is rubbed against a piece of rubber. The rubber ends up negative.
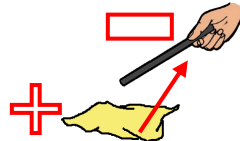
    c. A piece of cotton is rubbed against a piece of acetate. The acetate ends up positive.

11. In the following problems, convert between elementary charges and coulombs.

    a. What is the charge of four electrons in Coulombs?

$$\left(4e^-\right)\left(\frac{-1.60\times10^{-19}C}{1e^-}\right)=-6.40\times10^{-19}C$$

    b. What is the charge of four protons in Coulombs?

$$\left(4e\right)\left(\frac{1.60\times10^{-19}C}{1e}\right)=6.40\times10^{-19}C$$

    c. How many elementary charges are in 5.76 x 10$^{-16}$ C? Are they electrons or protons?

$$\left(5.76\times10^{-19}C\right)\left(\frac{1e}{1.60\times10^{-19}C}\right)=3.60\times10^{3} \text{ protons}$$

    d. How many elementary charges are in -4.3 x 10$^{-6}$ C? Are they electrons or protons?

$$\left(-4.3\times10^{-6}C\right)\left(\frac{1e^-}{-1.60\times10^{-19}C}\right)=2.7\times10^{13} \text{ electrons}$$

Answers in size order: 6.40 x 10$^{-19}$, 6.40 x 10$^{-19}$,  3.60 x 10$^{3}$, 2.7 x 10$^{13}$