Today **Ch 18** Electric Force
Friday **Ch 18** Electric Force **HW8**

Intro.

Physics: The study of Motion and Interactions

Chapter 18 Electric Fields and Electric Forces

- **Coulombs Law**

18.1 The Origin of Electricity

- **Sub-Atomic Particles**
  - **Electron:**
  - **Neutron:**
  - **Proton:**
- **Atoms**

18.2 Charged Objects and the Electric Force

- **Macroscopic Charge Neutrality**
- **Charge Quantization**

Example: Pr. 1: How many electrons must be removed form an electrically neutral silver dollar to give it a charge of + 2.4 μC?

- **Conservation of Charge**

Demo: Charge attraction and repulsion. Electrometer

18.3 Conductors and Insulators

- **Egg Carton Model:**
  - **Electrical Insulators:**
  - **Electrical Conductors:**

18.4 Charging By Contact and by Induction

- **Demo: Contact: Charge metal ball and Electrometer with Ebonite Rod.**
- **Demo: Induction: Charge rod and hold near Electrometer plate see dial rise as electrons are pushed further.**
- **Demo: Vander Graff Generator**
- **Demo: Tape Charge**

18.5 Coulomb's Law

18.5.1 The Force That Point Charges Exert on Each Other

18.5.1.1 Coulomb's Law

- **Distance Dependence**
- **Charge Dependence**

18.5.1.2 Example Using Coulomb's Law

Example 2: An electron in a hydrogen atom can get knocked out of its lowest orbital, around $r_1 = 5.29 \times 10^{-11}$m from the proton it orbits to a larger radius. The next radius out that it occupies is 4 times that. $r_2 = 4r_1$. What's the difference in the Coulomb force on the electron at these two radii?

Example 3: What is the Ratio of the new force to the old force?

Example 4: Pr. 13 An equilateral triangle has sides 0.15 m, Charges of –9.0 +8.0 and + 2.0 μC at each corner. Find the magnitude of the net force electric force on the particle with a charge of + 2.0 μC.

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3. A plate carries a charge of -3.0μC, while a rod carries a charge of +2.0 μC. How many electrons must be transferred from the plate to the rod, so that both objects have the same charge?

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8. The nucleus of the helium atom contains two protons that are separated by about 3.0×10^{-15}m. Find the magnitude of the electrostatic force that each proton exerts on the other. (The protons remain together in the nucleus because the repulsive electrostatic force is balanced by an attractive force called the Strong Nuclear Force).

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12. Two tiny conducting spheres are identical and carry charges of -20.0μC and + 50.0 μC. They are separated by a distance of 2.50 cm. (a) What is the magnitude of the force that each sphere experiences, and is the force attractive or repulsive? (b) The spheres are brought into contact and then separated to a distance of 2.50 cm. Determine the magnitude of the force that each sphere now experiences, and state whether the force is attractive or repulsive.

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14. A charge of -3.00 μC is fixed at the center of a compass. Two additional charges are fixed on the circle of the compass (radius = 0.100 m). The charges on the circle are -4.00 μC at the position due north and + 5.00 μC at the position due east. What is the magnitude and direction of the net electrostatic force acting on the charge at the center? Specify the direction in degrees relative to due east.