PHYSICS IN MOTION
gpb.org/physics-motion

Unit 5C
Coulomb's Law
Practice Problems

Name:

Date:

Work each of the following problems. SHOW ALL WORK.

1. A lightning bolt transfers 22 C of charge to Earth. How many electrons are transferred from this one bolt? The Earth is struck by an average of 100 lightning bolts each second. How many electrons pour into the Earth from lighting each second?

2. How far apart are two protons if they exert a force of 0.5 N on one another?

3. Two electrons in bulk matter are an angstrom ($1x10^{-10}$ m) apart. What electrostatic force do they exert on one another?

questions continued on next page

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4. One point charge has a magnitude 5.4×10^{-7} C. A second charge 0.25 meters away has a magnitude of 1.1×10^{-17} C. What is the electric force magnitude of one charge on the other?

5. A piece of styrofoam has a charge of 0.002 mC and is placed 0.5 meters from a grain of salt with a charge 0.03 nC. How much electrostatic force is produced?

6. A charged object has 82 protons, 82 neutrons, and 109 electrons on it. What is its overall charge (be sure to include the sign!)

questions continued on next page

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7. Wishing to collect weather data on a remote island, you come up with an idea for sending a weather balloon to the location. You attach a +1 C charged object to the balloon and plan to propel the balloon to the island using electrostatic force. Given the balloon's size and standard wind patterns en route, you realize you will need to be able to overcome an opposing air resistance of up to 100 N at any point on the balloon's 750 km journey to the island. How big of a charge will you need at your location to propel the +1 C balloon, even in the face of opposing wind, up to a distance of 750 km away? Ignore the curvature of the Earth.

8. A metal sphere as a charge of $+2.3 \times 10^{-6}$ C and lies 2 meters away from another metal sphere of unknown charge. If the attractive force present between the spheres is 0.05 N, what is the charge on the second sphere?

9. Four electrons are located on the corners of a square, one on each corner, with the sides of the square being 1m long. What is the total force (magnitude and direction) on one of the electrons from the other three?