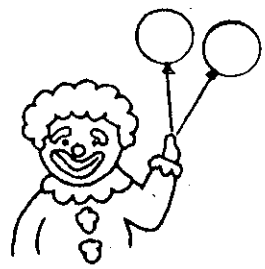
Practice Exercises

Exercise 1: When sugar is poured from the box into the sugar bowl, the rubbing of sugar grains creates a static electric charge that repels the grains, and causes sugar to go flying out in all directions. If each of two sugar grains acquires a charge of 3.0×10^{-11} C at a separation of 8.0×10^{-5} m, with what force will they repel each other?

Answer: _____

Exercise 2: Boppo the clown carries two mylar balloons that rub against a circus elephant, causing the balloons to separate. Each balloon acquires 2.0×10^{-7} C of charge. How large is the electric force between them when they are separated by a distance of 0.50 m?



Answer: _____

Exercise 3: Inez uses hairspray on her hair each morning before going to school. The spray spreads out before reaching her hair partly because of the electrostatic charge on the hairspray droplets. If two drops of hairspray repel each other with a force of 9.0×10^{-9} N at a distance of 0.070 cm, what is the charge on each of the equally-charged drops of hairspray?

Answer: _____

Exercise 4: Bonnie is dusting the house and raises a cloud of dust particles as she wipes across a table. If two 4.0×10^{-14}-C pieces of dust exert an electrostatic force of 2.0×10^{-12} N on each other, how far apart are the dust particles at that time?

Answer: _____

Exercise 5: Each of two hot-air balloons acquires a charge of 3.0×10^{-5} C on its surface as it travels through the air. How far apart are the balloons if the electrostatic force between them is 8.1×10^{-2} N?

Answer: _____

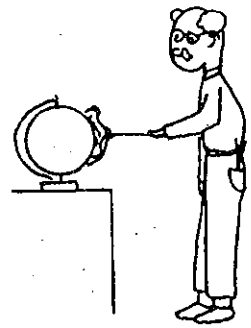
Exercise 6: Mr. Patel is photocopying lab sheets for his first period class. A particle of toner carrying a charge of 4.0×10^{-9} C in the copying machine experiences an electric field of 1.2×10^{6} N/C as it's pulled toward the paper. What is the electric force acting on the toner particle?

Answer: _____

Exercise 7: As Courtney switches on the TV set to watch her favorite cartoon, the electron beam in the TV tube is steered across the screen by the field between two charged plates. If the electron experiences a force of 3.0×10^{-6} N, how large is the field between the deflection plates?

Answer: _____

Exercise 8: Gordon the night custodian dusts off a classroom globe with a feather duster, causing the globe to acquire a charge of -8.0×10^{-9} C. What is the magnitude and direction of the electric field at a point 0.40 m from the center of the charged globe?



Answer: _____

Exercise 9: April is decorating a tree in her backyard with plastic eggs in preparation for Easter. She hangs two eggs side by side so that their centers are 0.40 m apart. April rubs the eggs to shine them up, and in doing so places a charge on each egg. The egg on the left acquires a charge of 6.0×10^{-6} C while the egg on the right is charged with 4.0×10^{-6} C. What is the electric field at a point 0.15 m to the right of the egg on the left?

Answer: _____

Exercise 10: James recharges his dead 12.0-V car battery by sending 28 000 C of charge through the terminals. How much electrical potential energy must James store in the car battery to make it fully charged?

Answer: _____

Exercise 11: If an electron loses 1.4×10^{-15} J of energy in traveling from the cathode to the screen of Jeffrey's personal computer, across what potential difference must it travel?

Answer: _____

Exercise 12: A "bug zapper" kills bugs that inadvertently stray between the charged plates of the device. The bug causes sudden dielectric breakdown of the air between the plates. If two plates in a bug zapper are separated by 5.0 cm and the field between them is a uniform 2.8×10^6 V/m, what is the potential difference that kills the unsuspecting bugs?

Answer: _____

Exercise 13: While getting out of a car, Victor builds up a charge on his body as he slides across the cloth car seats. When he attempts to shut the car door, his hand discharges 12 000 V through a uniform electric field of 3.0×10^6 V/m. How far is his hand from the door at the time the spark jumps?

Answer: _____

Exercise 14: A lightning bolt from a cloud hits a tree after traveling 200 m to the ground through an electric field of 2.0×10^6 V/m. a) What is the potential difference between the cloud and the tree just before the lightning bolt strikes? b) If you are in an open field during a lightning storm and the only thing you see nearby is a tall tree, is it a good idea to stand under the tree for protection from the lightning? Why or why not?

Answer: **a.** _____

Answer: **b.** _____