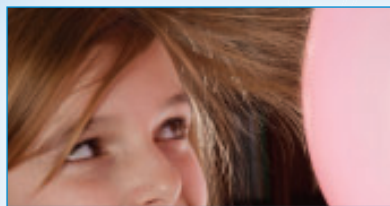## KEY CONCEPTS SUMMARY

Static electricity results from an imbalance of electric charge on the surface of an object.

- Electrons can move from object to object. (11.1)
- The number of electrons and protons determines whether an object is negatively charged, positively charged, or neutral. (11.1)
- The Law of Electric Charges states that like charges repel, opposite charges attract. (11.1)
- Neutral objects can be attracted to charged objects. (11.1)

There are many useful applications of static electricity.

- Electrostatic paint sprayers use static electricity to attract the paint to the object to be painted. (11.1)
- Examples of technologies that use electrostatic charges include electrostatic dusters and electrostatic precipitators. (11.1, 11.2)
- Laser printers use both insulators and conductors to function. (11.6)
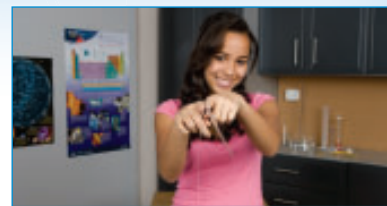
Objects can be charged by contact or by induction.

- Two different neutral objects become oppositely charged when they come in contact or rub against each other. (11.2)
- A neutral object may also become charged if it comes in contact with an already charged object. (11.1)
- When two charged objects come in contact, electrons may move from one object to the other. (11.2, 11.3)
- Objects and parts of objects can be temporarily or permanently charged by induction. (11.6)

Electric discharge can be harmful and must be treated with caution.

- An electric discharge occurs when a large charge imbalance is released. (11.8)
- Electric discharges often produce a visible spark. (11.8)
- Grounding is the safe discharging of excess charge using the ground. (11.8)
- Lightning is a very dramatic electric discharge that occurs because of a huge charge imbalance between clouds or between clouds and the ground. (11.8)

Materials can be conductors or insulators.

- Conductors such as copper wiring allow electrons to move through them easily. Semiconductors, such as carbon and silicon, allow electrons to move through them with some difficulty. (11.4)
- Insulators such as plastic, ebonite, wood, and glass reduce the movement of electrons. (11.4)

Simple procedures can be used to test the ability of materials to hold or transfer electric charges.

- A pith ball electroscope can be used to detect the presence of an electric charge. A charged object will cause the pith ball to move. (11.1)
- A metal leaf electroscope can also be used to determine the presence of an electric charge, either by contact, or by bringing a charged object near the electroscope terminal. (11.1, 11.7)

You thought about the following statements at the beginning of the chapter. You may have encountered these ideas in school, at home, or in the world around you. Consider them again and decide whether you agree or disagree with each one.

1 Clothes always get static cling when dried in a clothes dryer. **Agree/disagree?**

4 Dust sticks to all charged objects. **Agree/disagree?**

2 Static electricity always stays in one place and never moves from object to object. **Agree/disagree?**

5 Going down a plastic slide can make your hair stand up. **Agree/disagree?**

3 Static electricity can damage electronic devices. **Agree/disagree?**

6 Static electricity is a useful form of electricity. **Agree/disagree?**

How have your answers changed since then?
What new understanding do you have?

Vocabulary

electric charge (p.465)
neutral object (p.466)
negatively charged object (p.466)
positively charged object (p.466)
static electricity (p.467)
electric force (p.468)
induced charge separation (p.468)
charging by friction (p.472)
electrostatic series (p.473)
charging by conduction (p.474)
grounding (p.475)
conductor (p.480)
insulator (p.480)
charging by induction (p.486)
electric discharge (p.492)

BIG Ideas

- Electricity is a form of energy produced from a variety of non-renewable and renewable sources.
- The production and consumption of electrical energy has social, economic, and environmental implications.
- Static and current electricity have distinct properties that determine how they are used.