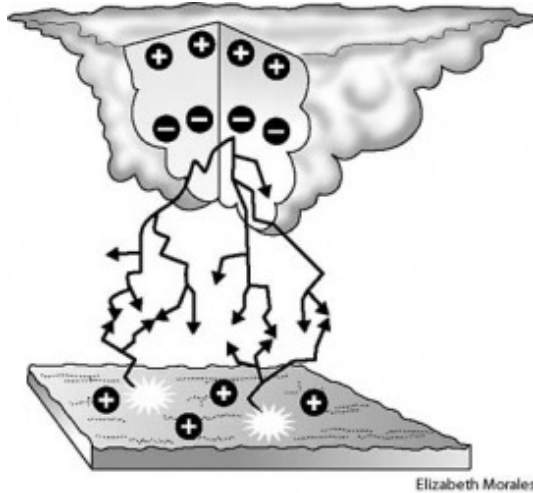


Section 9.4 Controlling Static Electricity – Answer Key

1) What is the name of a person that studies weather? **A person that studies weather is called a meteorologist.**

2) Explain how lightning is created. I nclude a labeled diagram.



**The negative charges on the bottom of the clouds repels electrons on the surface of the Earth**

**Thus, the ground becomes positively charged.**

**The strong attraction between the negative cloud and the positive ground pulls electrons off atoms and molecules in the air.**

3) What is the temperature of the air near a bolt of lightning? **The temperature of the air near a bolt of lightning can reach 33 000° C, many times hotter than the sun.**

4) What does the heat cause? **The heat causes the air to expand rapidly.**

5) What causes thunder? **Thunder is a shock wave produced by air molecules colliding with more air molecules as they move around.**

6) What happens if a person is hit by lightning? **If a person is hit by a bolt of lightning, the electrical activity can stop the heart, almost always resulting in death.**

7) Explain how a lightning rod works. I nclude a labeled diagram (see page 315)

a) **A lightning rod is charged by induction.**

b) **The positively charged lightning rod is the highest point in the area.**

c) The negative ions in the air are attracted to the lighting rod and the positive ions are attracted to the clouds.

d) The chain of ions acts as a conductor for the lighting between the clouds and the lighting rod.

e) The electrons are carried around the building into the ground.

8) Approximately how long does it take for the sound of thunder to travel one kilometer? **It takes approximately 3 seconds for lighting to travel one kilometer.**

9) Using the answer to the previous question, approximately how fast is the speed of sound?

$$\frac{\text{seconds}}{\text{kilometers}} = \frac{3}{1} = \frac{60}{x} \qquad x = (60 \times 1)/3 = 20\text{km} \qquad \frac{60}{20} = \frac{3600}{x}$$

$$= (3600 \times 20)/60 = 1200\text{km}$$

**The speed of sound is approximately 1200km/hour**

10) If you saw a flash of lighting and heard the thunder 9 seconds later, approximately how far was the lightning bolt from you? **The flash of lightning was approximately 3 kilometers away.**

11) About how many lightning bolts strike the Earth every second? **About 100 bolts of lightning strike the Earth every second.**

12) Where do electrons travel most easily? **They travel most easily through conductors.**

13) What did Benjamin Franklin first guess? **He was the first to guess that a lightning discharge was very similar to electric charges moving through the air.**

14) What did he do to test his theory? Include a labeled diagram (see page 316). **He attached a metal key to one end of a long silk thread and a metal rod to the other. He then attached the metal rod to a kite and flew it during a lightning storm. He then observed sparks leaving the key.**

15) What happened to the next two people that tried to recreate Benjamin Franklin's experiment? **They were killed by lightning.**

16) Define electrostatic precipitator. **An electrostatic precipitator is a device used to control air pollution using stationary electric charges.**

17) Explain how electrostatic spray painting can give an object a thin, smooth layer of paint. Include a labeled diagram (page 317).

**The object that is going to be painted is given a positive charge. Paint that leaves the nozzle of the spray gun becomes negatively charged and is attracted to the positively charged target.**

18) What are the benefits of electrostatic spray painting? **Electrostatic spray painting saves paint, speeds drying, and gives a smooth surface.**

19) What happens when clothes with different materials are put into the drier together? **Some clothes become oppositely charged and cling together.**