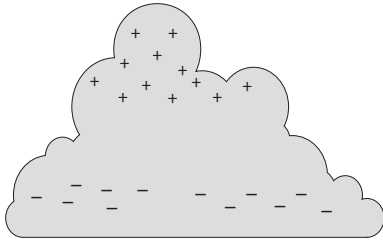


Topic 3.2 How do electrical charges behave?***Charging by Friction, page 117***

1. a)



b) In the cloud, warm, moist air causes strong updrafts. At the same time, hail and ice crystals fall from the top, causing downdrafts. As droplets and crystals collide, electrons are stripped from upward-moving particles and are carried downward. As a result, clouds are negatively charged at the bottom and positively charged at the top.

2. The different clothes in a clothes dryer can become charged by friction if they are made of different materials. In the dryer, the different materials tumble and rub against each other as the dryer rotates. As they do, electrons are transferred from one type of material to another and the materials become oppositely charged. The materials then cling to each other because opposite charges attract each other according to the law of electric charge.

An Application of Electrical Charges, pages 118–119

1. a) A Van de Graaff generator is a device that can build up and transfer a large amount of charge.

b) Answers may vary. For example:

- Inside an insulated column is a rubber belt that runs over two rollers.
- A motor drives the lower roller, and, as the belt moves over it, charging by friction takes place.
- The charges are carried upward as the belt rotates.
- A metal collecting comb is found near the top roller. The comb is attached to the inside of a metal sphere sitting on the column.
- The charged belt induces a redistribution of charges in the comb, and charges accumulate on the metal sphere.

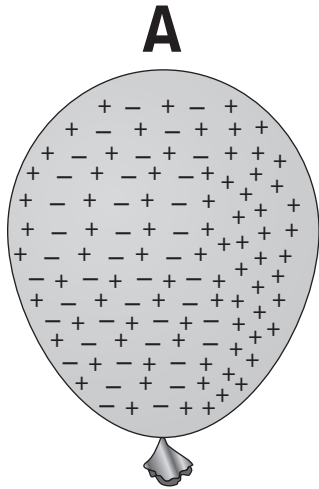
c) Van de Graaff generators have various applications.

d) Van de Graaff generators have been used to break apart atoms since the 1930s. Van de Graaff generators have also been used to test the electronic circuits used in space technology.

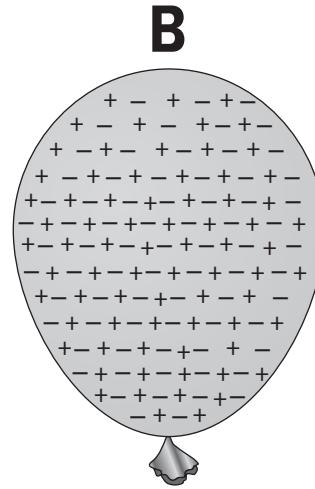
2. A positively charged object can have negative charges, as long as it has more positive than negative charges.

The Law of Electric Charge, page 120

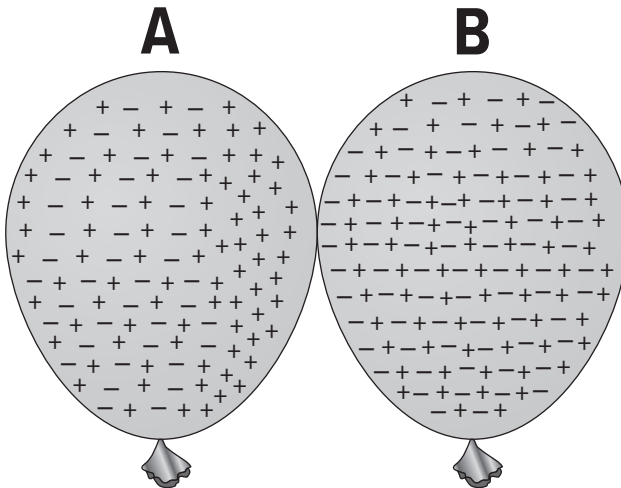
1. a)



b)



c)



d) When you bring a positively charged balloon near a neutral balloon, the positive and negative charges in the molecules of the neutral balloon stretch apart from each other. The positive charges in the stretched molecules are pushed away from the surface of the neutral balloon by the positive charges on the charged balloon. Then the negative ends of the molecules in the neutral balloon are attracted to the positive charges on the charged balloon.

Using Terminology, page 121

1.–3. electrically neutral, no charge transfer, no attraction

4.–6. electrically charged, charge transfer, attraction

3.2 Assessment, pages 122–125

1. D

7. A

13. D

2. B

8. B

14. C

3. C

9. C

15. A

4. A

10. C

16. B

5. E

11. D

17. B

6. D

12. C

18.

