Use with textbook pages 248–254.

**Static charge detective**

Use the following diagram to answer the questions.

<table>
<thead>
<tr>
<th>Tendency to lose electrons</th>
<th>Tendency to gain electrons</th>
</tr>
</thead>
<tbody>
<tr>
<td>+</td>
<td>-</td>
</tr>
<tr>
<td>glass</td>
<td>plastic</td>
</tr>
<tr>
<td>human hair</td>
<td>rubber</td>
</tr>
<tr>
<td>wool</td>
<td></td>
</tr>
<tr>
<td>cat’s fur</td>
<td></td>
</tr>
<tr>
<td>silk</td>
<td></td>
</tr>
<tr>
<td>cotton</td>
<td></td>
</tr>
<tr>
<td>paper</td>
<td></td>
</tr>
<tr>
<td>balloon</td>
<td></td>
</tr>
<tr>
<td>vinyl</td>
<td></td>
</tr>
</tbody>
</table>

When two objects are rubbed together

- the material closer to the left of the series will have a greater tendency to **lose electrons** and become **positive**

- the material closer to the right of the series will have a greater tendency to **gain electrons** and become **negative**

1. As you take your clothes out of the dryer, your wool socks are clinging to your silk skirt. What is the charge on the wool socks and on the silk skirt?

   **Charge on socks**

   **Charge on skirt**

2. You use a plastic comb to comb your hair. What is the charge on your hair and on the comb?

   **Charge on comb**

3. You use a paper towel to rub off some dirt on a glass window. What is the charge on the glass and on the paper towel?

   **Charge on window**

   **Charge on paper towel**

4. You rub a balloon along your cat’s back, causing the cat’s fur to stand up. What is the charge on the balloon and on the cat’s fur?

   **Charge on balloon**

   **Charge on cat’s fur**
Static charge

Match each Term on the left with the corresponding Diagram label on the right. Each label may be used more than once.

<table>
<thead>
<tr>
<th>Term</th>
<th>Diagram</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. ___ proton</td>
<td></td>
</tr>
<tr>
<td>2. ___ neutron</td>
<td></td>
</tr>
<tr>
<td>3. ___ electron</td>
<td></td>
</tr>
<tr>
<td>4. ___ has no charge</td>
<td>A</td>
</tr>
<tr>
<td>5. ___ has a positive charge</td>
<td>B</td>
</tr>
<tr>
<td>6. ___ has a negative charge</td>
<td>C</td>
</tr>
<tr>
<td>7. ___ can move from one atom to another</td>
<td></td>
</tr>
<tr>
<td>8. ___ and ___ make up the nucleus (name 2 parts of the atom)</td>
<td></td>
</tr>
</tbody>
</table>

Circle the letter of the best answer.

9. A neutral object has exactly the same number of
   A. protons and neutrons
   B. protons and electrons
   C. neutrons and electrons
   D. protons, neutrons, and electrons

10. What is the electric charge on the object shown above?
    A. neutral
    B. positive

11. What is the electric charge on the object shown above?
    A. neutral
    B. positive
    C. negative
    D. It is impossible to tell.

12. Which of the following describes the object shown above?
    A. It lost protons.
    B. It lost electrons.
    C. It gained protons.
    D. It gained electrons.

13. A vinyl rod is rubbed with a cotton cloth. The vinyl rod becomes negatively charged and the cotton cloth becomes positively charged. Which of the following describes the cotton cloth?
    A. It has gained electrons.
    B. It has more electrons than protons.
    C. It has more protons than electrons.
    D. It has the same number of protons as electrons.

14. Which of the following is a good conductor?
    A. glass
    B. wood
    C. copper
    D. fur
Neutral, positive, or negative charges?

Answer the questions below in the spaces provided.

1. What are the three laws of static charge?
   (a) 
   (b) 
   (c) 

2. For each situation illustrated below, will the objects shown attract or repel each other?

   (a) 
   (b) 
   (c) 

   (d) 
   (e) 
   (f)
Use with textbook pages 258-262.

Positive, negative, and neutral objects

Vocabulary

<table>
<thead>
<tr>
<th>amount of charge</th>
<th>electroscope</th>
</tr>
</thead>
<tbody>
<tr>
<td>attract</td>
<td>increase</td>
</tr>
<tr>
<td>conduction</td>
<td>induction</td>
</tr>
<tr>
<td>contact forces</td>
<td>laws of static charge</td>
</tr>
<tr>
<td>decrease</td>
<td>neutral</td>
</tr>
<tr>
<td>distance between objects</td>
<td>repel</td>
</tr>
<tr>
<td>electric force</td>
<td>type of charge</td>
</tr>
</tbody>
</table>

Use the terms in the vocabulary box to fill in the blanks. Each term may be used more than once. You will not need to use every term.

1. A(n) __________________________ is a push or pull between charged objects.

2. The __________________________ state that like charges ________________ and opposite charges ________________.
   Charged objects are attracted to __________________________ objects.

3. The electric force that acts on any pair of objects depends on the __________________________ and __________________________ on the objects and on the __________________________.

4. If you increase the amount of charge on objects, you __________________________ the electric force. If you __________________________ the distance between objects, you decrease the electric force.

5. A device that can detect the presence of charge is the __________________________.

6. If the leaves of an electroscope become charged, they will __________________________ each other.

7. If a charged rod is brought close to an electroscope and then removed, the electroscope will become __________________________.

8. Charging by __________________________ occurs when objects touch and an electric charge is transferred from one object to the other. A(n) __________________________ can be used to demonstrate this.

9. Charging by __________________________ occurs when objects are charged without touching. A(n) __________________________ can be used to demonstrate this.

10. Neutral objects are attracted to charged objects because they are charged by __________________________.
Electric force

Match each Diagram on the left with the best Descriptor on the right. Each Descriptor may be used more than once.

<table>
<thead>
<tr>
<th>Diagram</th>
<th>Descriptor</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>A. suspended spheres will move away from each other&lt;br&gt;B. suspended spheres will move toward each other&lt;br&gt;C. suspended spheres will not move</td>
</tr>
<tr>
<td>2.</td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td></td>
</tr>
<tr>
<td>4.</td>
<td></td>
</tr>
</tbody>
</table>

Circle the letter of the best answer.

5. Which of the following applies to a neutral object?
   I. It is attracted to a positive surface.
   II. It is attracted to a negative surface.
   III. It has the same number of protons as electrons.
   A. I and II only
   B. I and III only
   C. II and III only
   D. I, II, and III

6. A negatively charged ruler is brought near a suspended ball. The ball is repelled by the ruler. What can you conclude from this observation?
   A. The ball is neutral.
   B. The ball is positively charged.
   C. The ball is negatively charged.
   D. The ball is either neutral or positively charged.

7. Two suspended balloons repel each other when brought close together. What can you conclude about the balloons?
   A. They have opposite charges.
   B. They both have the same charge.
   C. One balloon is neutral and the other balloon is positively charged.
   D. One balloon is neutral and the other balloon is negatively charged.

8. How does the electric force change as the amount of charge is increased?
   A. It increases.
   B. It decreases.
   C. It stays the same.
   D. It increases and then decreases.

9. Which of the following statements is true about the relationship between distance and electric force?
   A. If the distance between charged objects decreases, the electric force decreases.
   B. If the distance between charged objects decreases, the electric force stays the same.
   C. If the distance between charged objects increases, the electric force increases.
   D. If the distance between charged objects increases, the electric force decreases.