

Learning Target (S8P5.a): I can read a passage and answer questions to support the claim that electric fields exist between objects exerting forces on each other even the objects are not in contact.

FSI Static Electricity: Conduction, Induction, and Friction Reading for Meaning

Static electricity occurs when electrical charges build up on the surface of an object. This buildup happens when electrons move from one material to another. The way charges transfer can occur through friction, conduction, or induction.

Friction involves two objects rubbing together. When different materials make contact and then separate, electrons may transfer from one object to the other. A familiar example is rubbing a balloon on your hair. Electrons move from your hair to the balloon, giving the balloon a negative charge while your hair becomes positively charged.

Conduction occurs when a charged object touches another object. Electrons transfer through direct contact, changing the charge of the object that was touched. Metal materials allow electrons to move easily, making them conductors. If a negatively charged metal rod touches a neutral metal sphere, electrons flow into the sphere, making both objects negatively charged.

Induction does not require direct contact. Instead, a charged object brought near a neutral object causes the charges in the neutral object to rearrange. For example, bringing a negatively charged balloon near small paper pieces causes the electrons in the paper to move away. The side closest to the balloon becomes positively charged, making the paper pieces attract to the balloon.

Understanding how these processes work helps explain everyday phenomena—such as why clothes cling after drying, why doorknobs shock you, or how lightning forms. In every case, the movement and separation of electric charges create forces that act even without direct contact.

1. A student rubs a plastic rod with a wool cloth and the rod becomes negatively charged.

Which explanation best describes why this occurs? (DOK 3)

- | | |
|---|---|
| A. Electrons moved from the rod to the cloth. | B. Electrons moved from the cloth to the rod. |
| C. Protons moved from the rod to the cloth. | D. Protons moved from the cloth to the rod. |

2. A negatively charged rod touches a neutral metal sphere. Which statement best explains the final charges after contact? (DOK 3)

- A. The rod becomes neutral and the sphere becomes positive.
- B. The rod loses electrons and becomes positive.
- C. Both rod and sphere become negatively charged.
- D. The rod becomes more negative and the sphere becomes positive.

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3. A charged balloon is brought near small aluminum cans without touching them. The cans begin to roll toward the balloon. Which process explains this behavior? (DOK 3)

- A. Conduction B. Induction C. Friction D. Grounding

4. A student wants to increase the amount of static electricity transferred through friction. Which modification would have the greatest impact? (DOK 4)

- A. Reduce the contact time between materials.
B. Use two materials with similar electron affinity.
C. Use two materials with very different electron affinity.
D. Lower the pressure of the room.

5. During an investigation, a student charges a metal sphere through conduction. Which observation confirms conduction occurred? (DOK 3)

- A. The sphere becomes positively charged without touching the rod.
B. The sphere gains electrons after touching the charged object.
C. The rod does not change charge at all.
D. The sphere's charges rearrange but do not transfer.

6. A teacher brings a negatively charged balloon near a neutral wall. The balloon sticks to the wall without touching it first. What causes the attraction? (DOK 3)

- A. Electrons flow from the balloon into the wall.
B. The wall gains electrons from the air.
C. Charges in the wall rearrange, creating attraction.
D. Protons move from the balloon into the wall.

7. A student observes that rubbing two identical materials together produces very little charge. Which reasoning best explains this? (DOK 3)

- A. The materials repel each other strongly.
B. The materials have similar ability to gain or lose electrons.
C. One material is a conductor and one is an insulator.
D. One material contains more protons than electrons.

8. A scientist wants to charge a metal object without allowing it to touch a charged rod. Which method should the scientist use? (DOK 3)

- A. Friction B. Conduction C. Grounding D. Induction

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9. Lightning forms when charges in a cloud separate and create a strong electric field that affects the ground below. Which type of charge transfer is this most similar to? (DOK 4)

- A. Friction B. Induction C. Conduction D. Grounding

10. A student places a charged object near a neutral electroscope. The leaves of the electroscope spread apart. What does this reveal about charge movement inside the electroscope? (DOK 3)

- A. Electrons left the electroscope completely.
B. Charges separated inside the electroscope due to induction.
C. Protons moved into the electroscope leaves.
D. The electroscope lost all neutral charge.