

Charge on the Move

Trace how electron transfer creates static electricity.

PS.9.a "an imbalance of charge generates static electricity;"

NAME _____

DATE _____

1 READ AND MARK _____ Read it twice

YOUR JOB Underline each place where electrons move, are gained, or are lost. Circle each word or phrase that tells whether an object is positively or negatively charged.

Why Things Stick and Spark

- ① On a dry winter day, Maya pulls a wool hat over her hair and hears tiny crackles. As the hat rubs against her hair, electrons move from one material to the other. Protons stay locked in the atoms' nuclei. If Maya's hair loses electrons, it has more protons than electrons and becomes positively charged. The hat gains those electrons, so it becomes negatively charged. Neither object has created charge. The rubbing has separated charges that were balanced before.
- ② Because opposite charges attract, Maya's positively charged hairs pull toward the negatively charged hat and may stand apart from one another. Hairs with the same positive charge repel, which also spreads them out. This situation is called static electricity because the extra or missing electrons remain on surfaces for a time instead of flowing continuously through a wire. Dry air helps the charge remain separated. Humid air often lets charge leak away more easily through the air.
- ③ Later, Maya rubs a balloon on a sweater. Electrons transfer to the balloon, giving it a negative charge. When she holds it near a neutral wall, charges inside the wall shift slightly. Positive charge is closer to the balloon than negative charge, so the balloon is attracted and can stick. If Maya touches a metal doorknob after walking on carpet, electrons may move suddenly between her and the knob. The brief movement of charge makes a spark, a static discharge.

2 ANSWER WITH EVIDENCE _____ Use the passage

1 After the hat and hair rub together, what happens to electrons in each object, and what charge does each object have?

2 Why can Maya's hairs spread apart after they become charged?

3 How does dry air affect static charge, according to the passage?

4 Why can the negatively charged balloon stick to a neutral wall?

3 YOUR TURN _____ Your own words

Describe a safe static-electricity event using two materials, such as a plastic comb and a dry cloth. Write 3 or 4 sentences that tell which object gains electrons, which becomes positive or negative, and how the imbalance causes an attraction, repulsion, or spark.

PART 1 • READ AND MARK

Underline each place where electrons move, are gained, or are lost. Circle each word or phrase that tells whether an object is positively or negatively charged. Accept any marking that follows this job and points at the right text.

PART 2 • ANSWERS

#	QUESTION	ANSWER
1	After the hat and hair rub together, what happens to electrons in each object, and what charge does each object have?	The hair loses electrons and becomes positively charged. The hat gains electrons and becomes negatively charged.
2	Why can Maya's hairs spread apart after they become charged?	Each hair has the same positive charge, and like charges repel.
3	How does dry air affect static charge, according to the passage?	Dry air helps charge remain separated on surfaces, so static charge can last longer.
4	Why can the negatively charged balloon stick to a neutral wall?	Charges in the wall shift slightly. Positive charge is closer to the balloon, so the balloon and wall attract.

PART 3 • YOUR TURN (SAMPLE ANSWER)

A plastic comb is rubbed with a dry wool cloth. In this example, electrons move from the cloth to the comb, making the comb negative and the cloth positive. The negative comb attracts small neutral paper pieces because charges in the paper shift slightly.

Accept equivalent descriptions that correctly identify electron transfer as the cause of an imbalance of charge. For the open response, accept either electron-transfer direction if the resulting positive and negative charges are labeled consistently and the effect is scientifically reasonable.