Balloon Charge Lab

Trace electron transfer and test what makes objects attract.

PHY.5.2 "Explore the characteristics of static charge and how a static charge is generated using simulations."

NAME _____ DATE _____

1 READ AND MARK

Read it twice

YOUR JOB Underline where electrons move or shift, circle statements about net charge, and number the two reset-and-compare tests. Use your marks to trace how the simulation supports each claim.

What the Balloon Simulation Shows

1. In a computer simulation, a student rubs a balloon against a wool sweater. Before rubbing, each object has equal amounts of positive and negative charge, so each is neutral. The model shows electrons moving from the sweater to the balloon. Protons remain in place within the materials. The balloon gains extra electrons and becomes negatively charged, while the sweater loses electrons and becomes positively charged. No charge is created by rubbing: electrons are transferred between objects. If the model tracks the balloon and sweater together, their combined net charge remains zero throughout the transfer.

2. The student resets the simulation and tests one rub, then resets again and tests five rubs. In this model, five rubs transfer more electrons than one rub. The balloon then has a larger negative net charge, and the sweater has a larger positive net charge. The charges are opposite because every electron gained by the balloon came from the sweater. Released near the sweater, the balloon moves toward it: opposite charges attract. Objects with matching net charges repel. By resetting and changing only the number of rubs, the student can compare how rubbing affects net charge.

3. The student next resets the model, rubs the balloon, and moves it toward a neutral wall without touching it. The wall's electrons shift slightly away from the balloon. That leaves the wall surface nearest the balloon relatively positive, even though the wall as a whole remains neutral. The balloon is attracted to that nearer region. A neutral object can therefore attract a charged object without gaining a net charge. To investigate this effect, the student can compare the balloon's motion near the wall before and after rubbing, keeping its starting distance from the wall the same.

2 ANSWER WITH EVIDENCE

Use the passage

1. What moves between the sweater and balloon in the simulation, and how does each object's net charge change?

2. How does the five-rub trial differ from the one-rub trial, and why does the student reset the simulation between trials?

3. Why does the charged balloon attract the wall even though the wall's net charge stays zero?

4. In the wall test, why should the balloon start at the same distance before and after rubbing? What change would show that rubbing matters?

3 YOUR TURN

Your own words

Imagine extending the simulation to include two balloons and one sweater. Design a test comparing two rubbed balloons with two unrubbed balloons, then predict each pair's motion and explain your prediction using electron movement. Write four sentences.

ANSWER KEY

Balloon Charge Lab

HIGH SCHOOL · PHY.5.2

PART 1 · READ AND MARK

Underline where electrons move or shift, circle statements about net charge, and number the two reset-and-compare tests. Use your marks to trace how the simulation supports each claim. Accept any marking that follows this job and points at the right text.

PART 2 · ANSWERS

#	QUESTION	ANSWER
1	What moves between the sweater and balloon in the simulation, and how does each object's net charge change?	**Electrons move from the sweater to the balloon. The balloon becomes negative, and the sweater becomes positive.**
2	How does the five-rub trial differ from the one-rub trial, and why does the student reset the simulation between trials?	**Five rubs transfer more electrons and produce larger opposite net charges. Resetting makes both trials start with neutral objects.**
3	Why does the charged balloon attract the wall even though the wall's net charge stays zero?	**The balloon shifts electrons away from the nearest wall surface, leaving that surface relatively positive.**
4	In the wall test, why should the balloon start at the same distance before and after rubbing? What change would show that rubbing matters?	**Keeping distance the same makes rubbing the tested change. Attraction after rubbing, but not before, would show that the balloon's charge matters.**

PART 3 · YOUR TURN (SAMPLE ANSWER)

I would reset the simulation, rub two neutral balloons on the same sweater, and move the balloons close together. I would compare them with two unrubbed balloons placed at the same starting distance. Both rubbed balloons gain electrons from the sweater, so both become negatively charged. I predict the rubbed balloons will repel, while the unrubbed balloons will not repel.

Accept answers that distinguish electron transfer during rubbing from electron shifting in the neutral wall. For the open task, look for a controlled comparison and a prediction that the two negatively charged balloons repel.