

LESSON TWO

What makes objects attract or repel each other?

SCIENCE

Asking Questions, Investigating, Constructing Explanations,
Interpreting Data, Evaluating Information

ENGLISH LANGUAGE ARTS

Reading Informational Text, Writing an Explanation

GRADE 8

90
minutes



PURPOSE

In this lesson, students build conceptual knowledge about the interaction of charge in atoms. Students gather information from a variety of sources to explore the importance of electric charge in atoms. Students consider these different sources of information to analyze data and write a conclusion to an investigation, summarizing their findings and referencing texts to support their claims.



STANDARDS

● Common Core State Standards

- Determine the central ideas or conclusions of a text; provide an accurate summary of the text distinct from prior knowledge or opinions. CCSS.ELA-LITERACY.RST.6-8.2
- Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks. CCSS.ELA-LITERACY.RST.6-8.3
- Develop the topic with relevant, well-chosen facts, definitions, concrete details, quotations, or other information and examples. CCSS.ELA-LITERACY.WHST.6-8.2.B
- Use precise language and domain-specific vocabulary to inform about or explain the topic. CCSS.ELA-LITERACY.WHST.6-8.2.D



STANDARDS CONTINUED

● Common Core State Standards

- Gather relevant information from multiple print and digital sources, using search terms effectively; assess the credibility and accuracy of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and following a standard format for citation. CCSS.ELA-LITERACY.WHST.6-8.8

● Next Generation Science Standards

- Develop a model to describe that when the arrangement of objects interacting at a distance changes, different amounts of potential energy are stored in the system. MS-PS-3-2
- Relationship Between Energy and Forces. PS3.C

When two objects interact, each one exerts a force on the other that can cause energy to be transferred to or from the object.

● Science and Engineering Practices

- Asking questions and defining problems
- Planning and carrying out investigations
- Constructing explanations and designing solutions
- Analyzing and interpreting data
- Obtaining, evaluating, and communicating information



LEARNING GOALS

- Understand attraction and repulsion in atoms.
- Explain atomic charge.



- 1 Describe electric charge in atoms.
- 2 Summarize understanding of electric charge in atoms.
- 3 Reference evidence from texts and investigations to support summary and investigation conclusion.



SUMMARY OF LESSON TASKS

- 1 Record predictions in Science Notebooks.
- 2 Watch video and compare predictions: [Protons and Electrons](#).
- 3 Read and annotate: [How Does An Atom Get Its Charge?](#).
- 4 Complete Double Entry Journal and discuss text.
- 5 Write a summary.
- 6 Revise Double Entry Journal and discuss.
- 7 Read and annotate investigation activity.
- 8 Conduct investigation [Protons, Neutrons, and Electrons](#) and record in Science Notebooks.
- 9 Write investigation conclusion.



CULMINATING TASK

After you have analyzed the data from your investigations, write a conclusion summarizing your findings. Using information from the reading as well as your relevant personal experience and knowledge about charge in atoms, write a claim about the results of your investigation. Support your claim with evidence. Cite your sources.

PART I: INTRODUCTION

ACTIVATE PRIOR KNOWLEDGE Open the lesson with a connection to the previous lesson's learning goal, the basic structure of an atom, and briefly review the three particles: protons, neutrons, and electrons.

INTRODUCE THE TOPIC Explain that in today's lesson, students will explore attraction and repulsion in atoms. By the end of the lesson, students should be able to answer the question: What makes objects attract or repel each other? To begin this exploration, ask students to think about what they know about electric charge in atoms using what they learned in the previous lesson. Ask your students to predict what will happen when a) two protons are placed side by side, b) two electrons are placed side by side, and c) one electron and one proton are placed side.

RECORD PREDICTIONS Give students a couple of minutes to think about the scenarios and record their predictions in their Science Notebooks.

WATCH ANIMATION AND COMPARE PREDICTIONS [Protons and Electrons](#)

(http://www.middleschoolchemistry.com/multimedia/chapter4/lesson1#protons_and_electrons). Show students a brief animation illustrating particle movement. Once students observe the animation, have them work in small groups to discuss their observations of particle movement and compare these observations to the predictions they recorded in their Science Notebooks. Students make revisions to their recorded predictions on the basis of observation.

PART II: GUIDED PRACTICE



- Describe electric charge in atoms.
- Reference evidence from texts.

During the whole class discussion, check students understand the role that electrons play in determining whether an atom has a positive or negative charge. Use this as an opportunity to assess the degree to which students reference evidence from the text to support their discussion. The Double Entry Journal is also a way to gather evidence of students' ability to identify and record text evidence. Observe students' use of the Double Entry Journal as an aid to support their ability to engage in classroom discussion.

WRITE A SUMMARY Students write a one to two-paragraph summary of the reading. Students use their text, annotations, and Double Entry Journal to support their summary writing.



SUCCESS CRITERION EVIDENCE-GATHERING OPPORTUNITY

- Summarize understanding of electric charge in atoms.

Check that summaries include brief descriptions of each particle's charge, the role that positive and negative charges play in determining an atom's electrical charge, and the relationship to electricity.



ANTICIPATED RESPONSE PEDAGOGICAL ACTION

If students at this point are not providing relevant and appropriate evidence from the text, engage them in a brief rereading activity, pointing them to a specific section in the text. Support the student in paraphrasing the text read orally and then in writing.



SUCCESS CRITERION

EVIDENCE-GATHERING OPPORTUNITY

- Describe electric charge in atoms.

Students share explanations of electric charge, using the information from the text to support their responses. Gather evidence of learning by listening to students' small group discussions and taking notes.



ANTICIPATED RESPONSE

PEDAGOGICAL ACTION

If student responses indicate that they are having difficulty making connections between particle motion (attraction and repulsion) to charge, then invite student to make connections to what they know about atom manipulation using one or both of the video clips in Lesson One, “[How to Move an Atom](https://youtu.be/rNf-A3m6HVo)” (<https://youtu.be/rNf-A3m6HVo>) or “[Ripples on the Surface](https://youtu.be/bZ6Hv_du2Zo)” (https://youtu.be/bZ6Hv_du2Zo) as examples. Use probing questions to support student thinking. Probing questions might include:

- What do you know about the motion of electrons (or protons) when they are near each other?
- How does that compare to the movement we observed in the video, “A Boy and His Atom”?

PART III: CULMINATING TASK



PEER AND SELF-ASSESSMENT

After students complete their investigations, they discuss the following questions with a partner or in small groups:

- What do I know now that I did not know before?
- What questions do I still have?

What makes objects attract or repel each other?

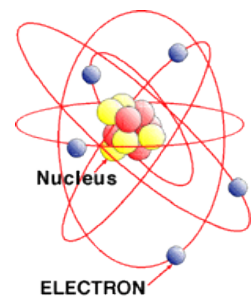
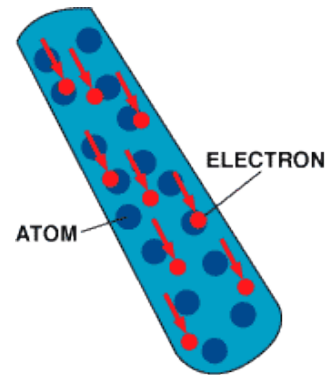
DOUBLE ENTRY JOURNAL

Main ideas	Supporting details

How Does An Atom Get Its Charge?

LEXILE 950L

- All matter is made up of atoms, and atoms are made up of smaller particles. The three main particles making up an atom are the proton, the neutron and the electron.
- Electrons spin around the center, or nucleus, of atoms, in the same way the moon spins around the earth. The nucleus is made up of neutrons and protons.
- Electrons contain a negative charge, protons a positive charge. Neutrons are neutral – they have neither a positive nor a negative charge.
- There are many different kinds of atoms, one for each type of element. An atom is a single part that makes up an element. There are 118 different known elements that make up everything! Some elements like oxygen we breathe are essential to life.
- Each atom has a specific number of electrons, protons and neutrons. But no matter how many particles an atom has, the number of electrons usually needs to be the same as the number of protons. If the numbers are the same, the atom is called balanced, and it is very stable.
- So, if an atom had six protons, it should also have six electrons. The element with six protons and six electrons is called carbon. Carbon is found in abundance in the sun, stars, comets, atmospheres of most planets, and the food we eat. Coal is made of carbon; so are diamonds.
- Some kinds of atoms have loosely attached electrons. An atom that loses electrons has more protons than electrons and is positively charged. An atom that gains electrons has more negative particles and is negatively charge. A "charged" atom is called an "ion."
- Electrons can be made to move from one atom to another. When those electrons move between the atoms, a current of electricity is created. The electrons move from one atom to another in a "flow." One electron is attached and another electron is lost.
- This chain is similar to the fire fighter's bucket brigades in olden times. But instead of passing one bucket from the start of the line of people to the other end, each person would have a bucket of water to pour from one bucket to another. The result was a lot of spilled water and not enough water to douse the fire. It is a situation that's very similar to electricity passing along a wire and a circuit. The charge is passed from atom to atom when electricity is "passed."



SOURCE This document has been modified for length. The original can be found at <http://www.energyquest.ca.gov/story/chapter02.html>

What makes objects attract or repel each other?

SUMMARY: HOW DOES AN ATOM GET ITS CHARGE?

A series of horizontal dashed lines for writing.

What makes objects attract or repel each other?

TRIPLE ENTRY JOURNAL

Procedure	Observation	What's happening? Explain.