Unit 3

Forces at a Distance:

How can a magnet move another object without touching it?

Student Work Pages

GRADE 8 Core Knowledge Science®

Core Knowledge®

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How can a magnet move another object without touching it?

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Contact Forces:

How can a magnet move another object without touching it?

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Science Literacy Exercise Pages

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Magnet Interactions Lab

Investigation Question

What can a magnet pull or push without touching?

Investigation Procedures

1. Collect your test objects as your teacher instructs. List each in a different row in the table on this handout.
2. For each test object have one person hold the test object and a different person hold the magnet. Bring them closer and closer together (slowly) until either or both of you feel a push or a pull. Keep moving them together until they eventually touch. Can you get a pull to switch to a push somehow, or a push to switch to a pull?
3. Record your results in the corresponding row in the data table.
4. Discuss the questions below in your group only <u>after</u> you have finished filling out the table on the next page.

Discussion Questions

1. Which materials (if any) produced both attraction (pulls) and repulsion (pushes) with the magnet?
2. For those materials that produced both attraction and repulsion, how did you get the forces to switch from pushes to pulls and back again?
3. Was there a pattern in what kinds of materials the magnet interacted with without touching?
4. What additional data would help you determine what kinds of materials magnets interact with without touching?

Test object	Testing for attraction between the test object and the magnet	Testing for repulsion between the test object and the magnet
	Was there a pull on the test object?	Was there a push on the test object?
Magnet		N/A
Copper coil		

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Magnet and Coil Interactions Investigation

Investigation Question

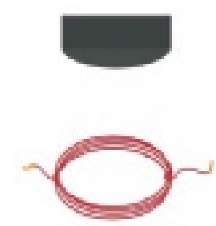
What is the effect on the coil and the magnet when we connect the coil of wire to a battery?

Investigation Procedures

1. Set up your coil and magnet so that the two are repelling (pushing against) each other. Mark the surfaces that are facing each other with a sticker.
2. Fill in the table on the next page. After each observation, remember to return to your initial setup with the stickers facing each other.
3. Discuss the questions below in your group only <u>after</u> you have finished filling out the table on the next page.

Discussion Questions

1. Turn back to the prediction you made in your notebook. How did your results compare to your prediction?
2. Is there a force on the magnet from the coil? How do you know?
3. Is there a force on the coil from the magnet? How do you know?
4. What can we do to switch the direction of the force between the magnet and the coil?
5. Did the kinetic energy of the magnet or coil of wire change? How do you know?

	Change to the system (cause)		The effect on the system		Draw a picture of the forces on the magnet and the coil.
When we	turn the magnet and the coil so that the stickers are facing in	**we will observe**		**because**	
When we	turn the coil around so that the magnet sticker is facing in and the coil sticker is facing out	**we will observe**		**because**	
When we	turn the magnet around so that the magnet sticker is facing out and the coil sticker is facing in	**we will observe**		**because**	
When we	turn both the magnet and the coil around so that both stickers are facing out	**we will observe**		**because**	

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Blocking Air Investigation

To change, measure, or stay constant?

Independent variable	This is the change we make to the system each time we test.	
Dependent variable	This is the variable to observe or measure for effects caused by a change in the independent variable.	
Controlled variable	This is a variable we want to keep the same in each test. There could be more than one in a test.	

Data table

Object between magnets	Effect on energy transfer through magnetic forces

Name: ______________________ Date: ______________________

Framing Hypotheses

Partner Hypotheses Table

	Theory (explanation or model)		Change to the system (cause)		Effect on the system
If	*moving air transfers energy between the coil and the magnet*	**then when we**		**we will observe**	
If	*moving air transfers energy between the coil and the magnet*	**then when we**		**we will observe**	

Consensus Hypotheses Table

	Theory (explanation or model)		Change to the system (cause)		Effect on the system
If	*moving air transfers energy between the coil and the magnet*	**then when we**		**we will observe**	
If	*moving air transfers energy between the coil and the magnet*	**then when we**		**we will observe**	

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Writing an Explanation

Write a scientific explanation that answers the question, “Why did the music and magnets behave this way in the vacuum?”

Include

- **a claim** that answers the question,
- **evidence** from the video or other investigations, and
- **reasoning** that justifies why your evidence supports your claim.

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Lesson 6: Cause-Effect Table

	Change (cause)		Effect on the system		How or why
When we		we observe		because	
When we		we observe		because	
When we		we observe		because	
When we		we observe		because	
When we		we observe		because	
When we		we observe		because	
When we		we observe		because	

Name: ______________________ Date: ______________________

Hypotheses and Variables

The question we are investigating: How does changing the distance between two magnets affect the amount of energy transferred out of the field?

	Explanation		Change to the system (cause)		Effect on the system
If		**then when we**		**we will observe**	

Independent variable	This is the change we make to the system each time we test.	
Dependent variable	This is the variable to observe or measure for effects caused by a change in the independent variable.	
Controlled variable	This is a variable we want to keep the same in each test. There could be more than one in a test.	

Name: ______________________________ Date: ______________________

Data Table and Procedure

Procedure

1. **Make a data table in the space below.** This will be where you record the measurements you collect.
2. **Check the alignment of the magnets in your system:** Bring the cart with the magnet on it toward the magnet on the brick until they touch. Make sure that they are lined up when they touch. Adjust the position of one of the magnets as needed.
3. **Pick a gap distance you want to test.** Hold the end of the magnet on the cart at a fixed distance from the other magnet.
4. **Time the cart.** Someone should reset a timer and then start it when the cart is released. That same person should stop the timer when the cart stops moving.
5. **Record the distance the cart traveled and the total time it took to travel that distance.**
6. **Calculate the average speed the cart was moving.** Use the distance it traveled and the time it took to travel that distance to calculate its average speed. You can do this now or after you collect more data.
7. **Repeat the previous steps** for additional trials and/or gap distances you wanted to collect data on.

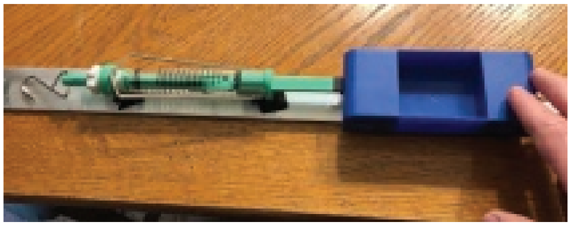
Our Data Table:

Name: ______________________________ Date: ______________________

Making Sense of Your Investigation Results

1) How did changing the distance between the magnets affect the amount of energy transferred out of the magnetic field? Does this evidence support or refute your hypotheses? Why?

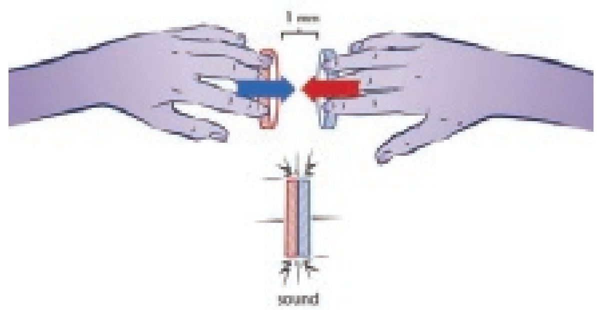
2) *Potential energy* is what we call the energy that is stored in a system. In the Broken Things unit, we learned that anything that is springy can store potential energy that can then be released as kinetic energy to cause motion. You used a spring scale launcher to transfer energy into a cart to get it to move.



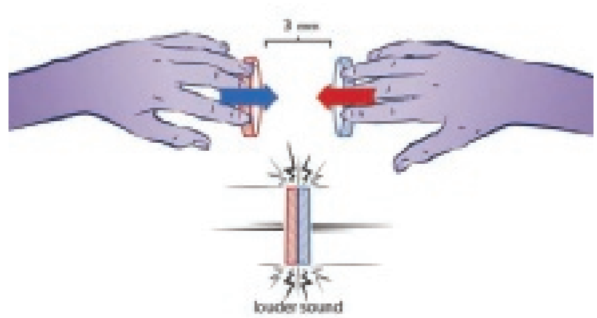
In the spring system, the potential energy was stored in the spring before it was transferred into the cart. Where was the potential energy stored in the magnet system before it was transferred to the cart?

3) Today we found that when the magnets are oriented so that the forces are repulsive, moving them closer together stores more energy in the system. A student proposes the following idea: *Changing the distance between two magnets affects the amount of potential energy stored in the system, even when the magnetic forces are attractive.* The student decides to collect data to support or refute this idea with evidence.

The student takes two disc magnets and flips one of them around so that there are attractive forces between them. Then the student pulls the magnets 1 millimeter apart and lets go. They come back together and make a sound when they collide.



Then the student pulls the magnets 3 millimeters apart and lets go. They come back together and make a louder sound than before when they collide.



Do the results of this student's investigation support or refute their initial idea (shown in italics above)? Why?

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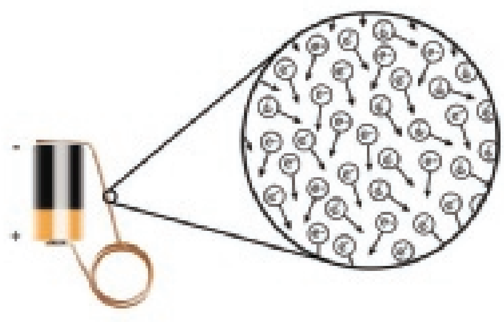
Reading: What is electric current?



Electric current in a wire is due to the flow of tiny charged particles inside the wire. In the image, you can see these tiny particles. These particles are called *electrons.* Electrons are a part of what makes up the atoms of any object. In metals that conduct electricity well, like copper, these particles can easily be moved around to create an electric current. When the copper wire is connected to the battery, the electrons in the wire start to move all at once in a general direction from the negative to the positive end of the battery. This movement is called a *current*. The arrows in the image above show the direction of the current.

The electrons in a wire are not moving very fast. In fact, we talk about the "drift speed" of electrons, because they are moving so slowly it is like they are drifting through the wire. But when you connect a lightbulb to a battery, the light comes on immediately. Why does this happen if electrons are moving so slow? Electrons do not zoom through the wire in a straight line. Instead, the electrons that are in the wire begin to move all at once and move in a random, zig-zag motion. Since the electrons start to move all at once, energy is transferred immediately when the circuit is connected to the battery.

Go to construct your own circuit as part of a computer interactive. Can you turn on the lightbulb without connecting a wire to both ends of the battery? Why or why not?

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Lesson 9: Cause-Effect Table

	Change (cause)		Effect on the system		How or why
When we		we observe		because	
When we		we observe		because	
When we		we observe		because	
When we		we observe		because	
When we		we observe		because	
When we		we observe		because	
When we		we observe		because	

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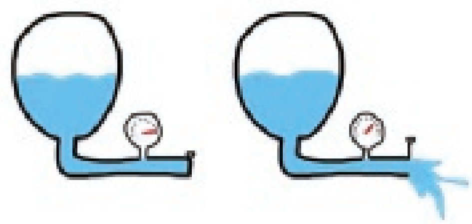
Optional Electricity Extension: Lesson 9

Why do we get shocked?

Voltage is what causes electrons to move through a conductor like a wire. We can think of it as the push or the force that gets the electrons moving. It is measured in volts.

Voltage is measured between two points, for example, the positive and negative ends of a battery. The higher the voltage, the more force experienced by the charged particles in the system. For example, a battery that is 3 volts will exert twice as much force on the electrons as a battery that is 1.5 volts.

Voltage can't do anything unless the electrons are moving and creating an electric current. A good analogy is water that is in a pipe. If the pipe is blocked, there will be a push against the thing that is blocking it, but the water will not be moving. There will not be a current, and no energy will transfer. This is why you need to complete a circuit before a lightbulb will turn on. As soon as the path is created for the electrons, there is an electric current and energy can transfer.



The image on the left represents pressure (an analogy for voltage) without current.
The image on the right represents pressure (an analogy for voltage) with current.

Electrons can move through you, too. If you rub your feet on a rug when you are wearing socks, charged particles—the electrons in the carpet—rub off the carpet and onto your body. You are now negatively charged! If you come near a doorknob, there is a voltage between you and the doorknob. You feel a shock when the extra charges are pushed by the voltage from your body to the doorknob.

You can try this out without shocking yourself by using the following interactive: https://phet.colorado.edu/sims/html/john-travoltage/latest/john-travoltage_en.html

Name: ______________________________ Date: ____________________

Investigating the Effects of Distance on Magnetic Force

The cause-effect relationship we want to test:

A. Consensus hypothesis:

B. To change, measure, or stay constant?

A variable is a factor you want to change or control in an investigation. There are three types of variables you should think about for your investigation:

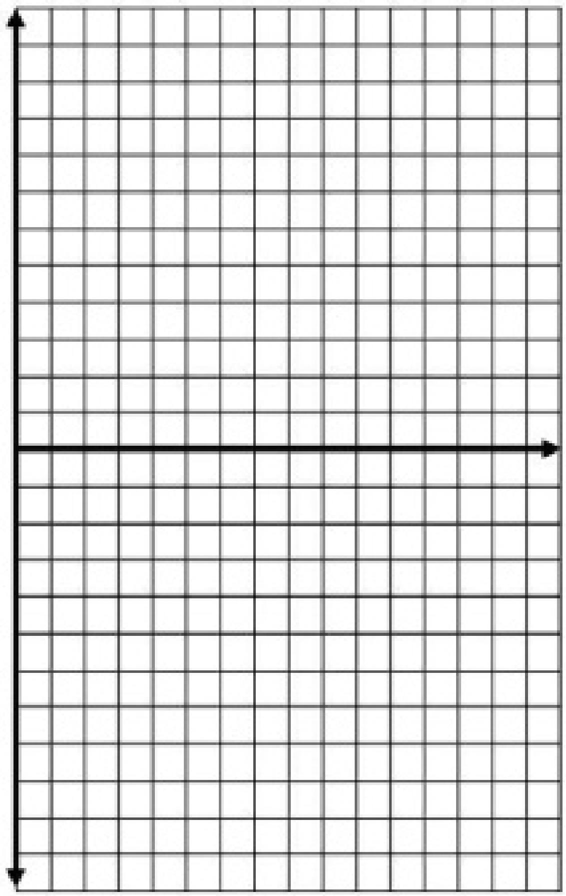
Independent variable	This is the change we make to the system each time we test.	
Dependent variable	This is the variable to observe or measure for effects caused by a change in the independent variable.	
Controlled variable	This is a variable we want to keep the same in each test. There could be more than one in a test.	

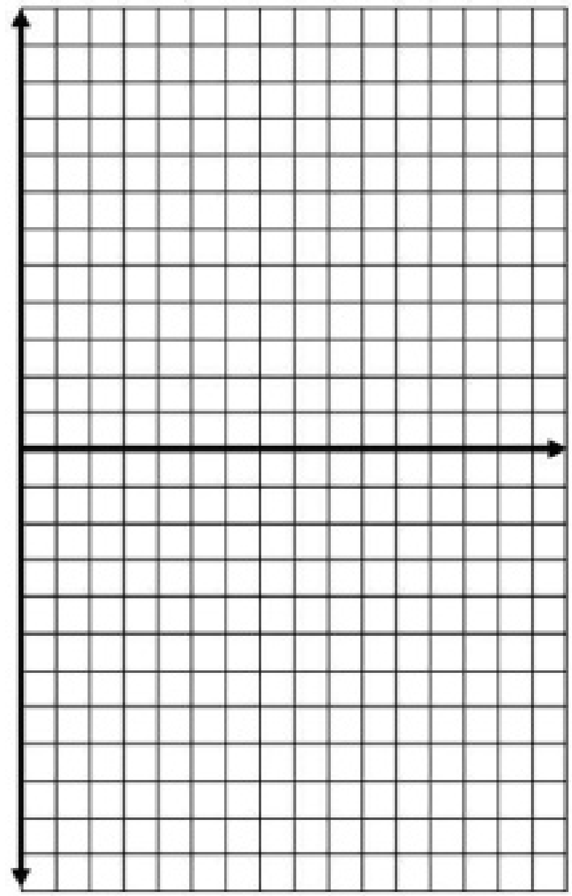
Discuss the types of variables with your class and write in the table above what you will change, control, and measure in your investigation.

What are important things to think about when taking good measurements? List ideas here to help you remember to do these things when you complete the lab.

C. Making predictions

In the graph on the left, make a prediction about what you think your data plot will look like if your hypothesis is correct. In the graph on the right, make a prediction about what you think your data plot will look like if your hypothesis is <u>not</u> correct.





D. Results: Data table

Starting point: __________ cm (This is the measurement point at the top of the magnet taped to the scale.) Use this number to help you figure out the distances between magnets.

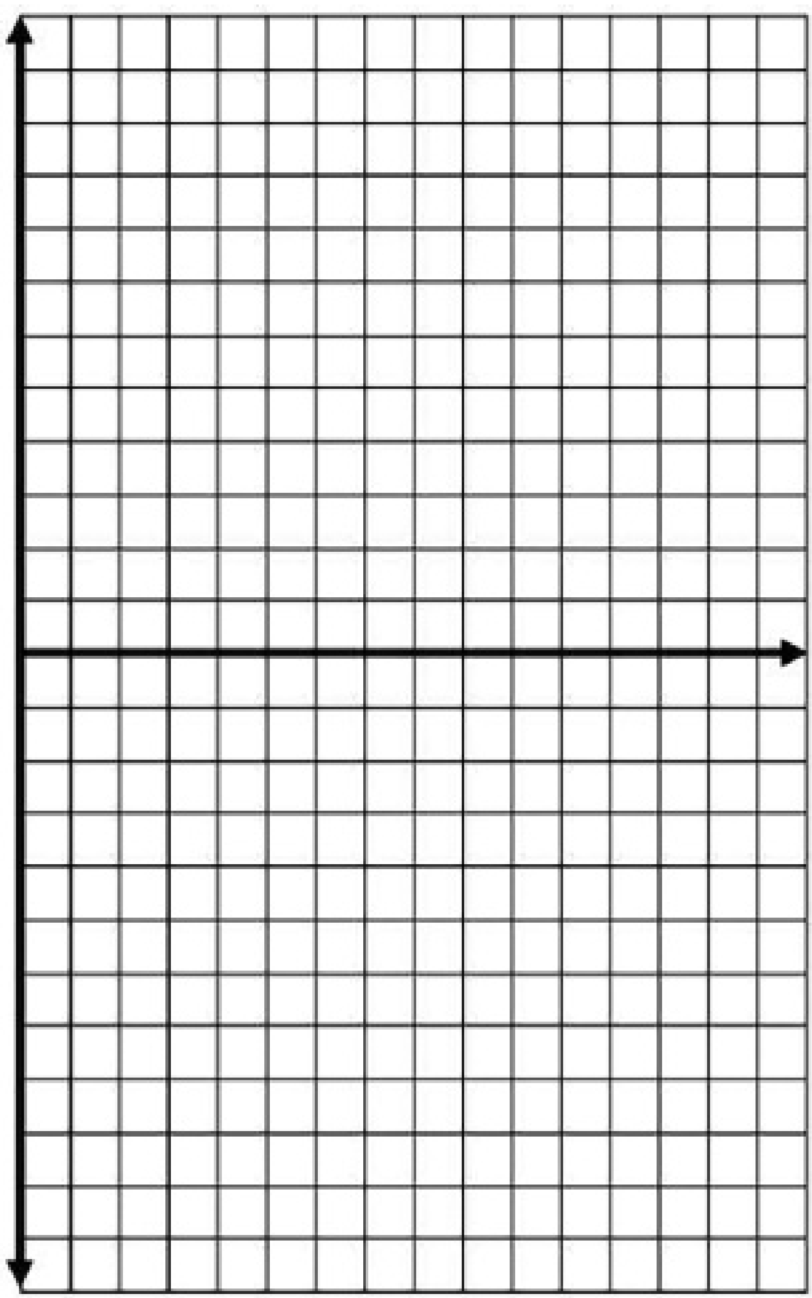
Record the weight at each distance when the poles repulse one another. Flip the magnets and record the weight when the poles attract one another using a different color pencil.

Record these measurements to the nearest hundredths (0.01) of an ounce (oz). Then multiply your numbers by 100 (move the decimal 2 places to the right) to get a whole number. Because you are multiplying all data values for force by the same factor, any patterns and trends will not be affected.

	Distance apart (cm)					
	1	2	3	4	5	6
repulsive forces						
attractive forces						

E. Results: Graph

Graph your data and make a key to show which data are for repulsive forces and which data are for attractive forces.



F. Interpret and discuss your results

1. When we changed the distance between magnets, what pattern in attractive forces did you observe? Use descriptions from math class where appropriate.

2. When we changed the distance between magnets, what pattern in repulsive forces did you observe? Use descriptions from math class where appropriate.

Name: ____________________ Date: ____________________

Investigation Plan

A. What is your group's investigation question?

B. Hypothesis

C. Measuring variables

Record what you will change, control, and measure in your investigation.

D. Plan the investigation below. Use the rubric your teacher provides to guide you.

E. Making predictions

In the graph on the left, make a prediction about what you think your data will look like if your hypothesis is correct. In the graph on the right, make a prediction about what you think your data will look like if your hypothesis is not correct.

F. Results: Data table

G. Results: Graph

Look back at how the graph of your data was structured in the previous lesson. Create and label axes and intervals on the grid below to set it up for graphing your new data.

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Interactive Predictions and Results

Change to the system (independent variable)	Prediction about how the magnetic field will change	Observations of how the magnetic field in the simulation changed
Increase magnet strength		
Flip magnet polarity		
Increase number of coils		
Flip polarity or current of coil		
Increase current through the coil (more or less)		

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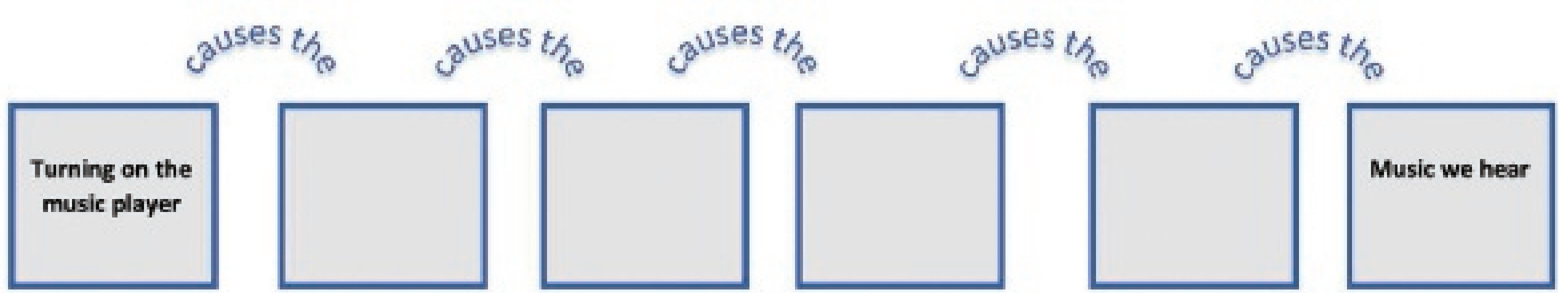
Cause-Effect Chain



Name: ______________________ Date: ______________________

List of Cause-Effect Relationships We Figured Out

	Change to the system (cause)		Effect on the system		How or why
When we	L2: plug the coil into the battery	**we observe**	there are forces between the coil and the magnet (or the coil moves, or it becomes an electromagnet)	**because**	there is a magnetic field around both of them and in between them. (L4)
When we	L2: flip the magnets so that opposite poles are facing each other (S-N)	**we observe**	the force pairs between the magnets become attractive (pulls)	**because**	the shape of the magnetic field between them changes. (L5)
When we	L2: flip the magnets so that similar poles are facing each other (S-S or N-N)	**we observe**	the force pairs between the magnets become repulsive (pushes)	**because**	the shape of the magnetic field between them changes. (L5)
When we	L4: add test objects to the system	**we observe**	the test objects line up in predictable patterns	**because**	there is a magnetic field around a magnet that changes direction as you move around or away from the magnet. (L4)
When we	L5: add a second magnet	**we observe**	the magnetic field changes	**because**	there are now two magnetic fields affecting a test object, so the force on the object is different. (L5)

	Change to the system (cause)		Effect on the system		How or why
When we	L7: bring the magnets closer together when the forces are repulsive	**we observe**	that they will move back apart	**because**	energy stored in the magnetic field transfers into the motion of the magnets. (KE)
When we	L7: bring the magnets further apart when the forces are attractive	**we observe**	that they will move back together	**because**	energy stored in the magnetic field transfers into the motion of the magnets. (KE)
When we	L8: connect the music player to a lightbulb instead of a coil and battery	**we observe**	L8: the lightbulb brightness changes with the volume and pitch (frequency) of music	**because**	there is an electric current coming out of the music player that is changing all the time (direction and strength), whereas the battery only had one kind of current (strength and direction didn't change).
When we	L8: switch the poles of the battery	**we observe**	L8: the lightbulb turned from red to green and back (alternating with the direction of the current)	**because**	the poles of the electromagnet (N and S) switched.

	Change to the system (cause)		Effect on the system		How or why
When we	L8: connect the coil to the music player instead of the battery	**we observe**	the speaker vibrates or moves back and forth	**because**	there is an electric current coming out of the music player that is changing all the time (direction and strength), and that changes the shape of the magnetic field around the electromagnet or permanent magnet.

Name: ______________________ Date: ______________

Peer Feedback Rubric for Planning Investigations

Check if present	Investigation plan includes ...	Peer-written feedback
●	A hypothesis that predicts a cause-effect relationship that would provide evidence for an explanation (cause, effect, and explanation should each be present)	
●	Independent and dependent variables	
●	What will be controlled in the investigation, when appropriate	
●	A description of the tools needed to collect data	
●	How measurements will be recorded	
●	How many data will be collected and why	
●	A description of potential issues or challenges with data collection	
●	A description of what they expect the data will look like if it supports the hypothesis or answers the question	
●	A description of how to carry out the investigation, described in a way that another student or scientist could carry out the investigation from the plan	

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Electricity Extension: Modeling Microphones

Modeling Cause-Effect Relationships in a Microphone

In a speaker, electric current flows into a coil of wire next to a permanent magnet. The changing pattern of current in the coil creates a magnetic field all around it that interacts with the field of the permanent magnet to produce force pairs that transfer energy out of the field to make the coil move. The coil is attached to a speaker cone that also moves. The moving cone pushes air back and forth into the room and creates sound waves we can hear.

A microphone has almost identical parts as the speaker, but they work in exactly the opposite way. We call the speaker cone in a microphone a *diaphragm.* **Can you put the following cause-effect relationships in order in the table below to explain how a microphone works?**

A. When the coil moves back and forth through the magnetic field, it causes magnetic forces that move electrons through the coil of wire.

B. When electrons move through the coil of wire, it causes an electric current to flow into a sound recording device which records the changes in current as a digital signal that can be reproduced later or amplified (made bigger) before being sent to a speaker.

C. When sound waves hit the diaphragm, they cause it to move back and forth.

D. When you speak, it causes compressed waves of air to move outward in all directions.

E. When the diaphragm moves back and forth, it causes the attached coil to move back and forth.

1	2	3	4	5

Using the cause-effect relationships that you re-ordered above, make a diagram below of the microphone system that explains how the microphone works.

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Science Literacy Exercise Page 1 — Use with Reading Collection 1

Roadmap for Reading

This week's reading collection focuses on how magnets play an important role in the everyday items we use.

Collection 1: "Day-to-Day Magnets" consists of 5 selections.

1. Anatomy of Speakers
2. To Be, or Not to Be . . . Magnetic
3. Buzzers and Bells
4. Debate: Outlaw Magnets
5. Flip of a Switch, Turn of a Dial

As you read:

- Consider the general purpose of each part: is it a description, an explanation, a procedure, or an attempt to persuade?
- Consider how data and graphics support the narrative text and how narrative text clarifies the data and graphics.
- Consider how each part of the reading relates to knowledge you gained from the previous part.

Written Response

Create an explanation of how earbuds work so that a third-grade child could understand it. It should include the following:

- the parts of an earbud
- how the parts work together to create sound

Plan your explanation.

- Before you begin, review the criteria in the Evaluation Guidelines that follow to help you clearly understand the expectations of the exercise.
- Draw or write all of the information you have gotten from the selections you have read.
- Do some research using credible sources to add to or edit your ideas.

Create your explanation.

- Use your notes to create your explanation on a separate sheet of paper.
- Use drawings, descriptions, photographs, or other graphics to help make your explanation understandable and clear.
- Read your explanation to make sure it provides a simple explanation.
- Compare your explanation with that of someone else, and discuss how they are the same and different.
- Attach this page to the front of your explanation when you turn it in.

Evaluation Guidelines

Element	1	2	3	Feedback
Content	Work contains or missing information.	Product explains how an earbud works.	Work clearly and simply shows the parts of an earbud and explains how the parts interact to create sound waves.	
Argument	Work provides little or no credible source information.	Product includes basic explanatory information.	Work uses credible information that clearly shows how earbuds work.	
Organization	Disorganized information is present that is difficult to follow.	All information is included but lacks clear explanation.	Information is clearly labeled and explained.	
Grammar and mechanics	Work contains several errors or omissions.	Work contains some errors.	No errors are present.	

Additional Feedback Notes:

Name: ______________________ Date: ______________________

Science Literacy Exercise Page 2 | Use with Reading Collection 2

Roadmap for Reading

This week's reading collection focuses on how magnetism is applied in sciences and even in art.

Collection 2: "Beyond Magnets" consists of 5 selections.

1 Ben Franklin's Kite
2 Engineering Blog
3 Pushing and Pulling Without Touching
4 Earth Is a Magnet
5 No Touching

As you read:

- Consider the general purpose of each selection: is it a description, an explanation, a procedure, or an attempt to persuade?
- Consider how data and graphics support the narrative text and how the narrative text clarifies the data and graphics.
- Consider how each part of the reading relates to the knowledge you gained from the previous part.

Written Response

Create a description of what it would be like to wake up in a zero-gravity room. It should include the following:

- how common objects do not act as they normally do
- what changes you have to make to navigate in zero gravity

Plan your description.

- Before you begin, review the criteria in the Evaluation Guidelines that follow to help you clearly understand the expectations of the exercise.
- Draw or write all of the information you have gotten from the selections you read.
- Do some research using credible sources to add to or edit your ideas.
- Decide if you want to write a funny story, draw a cartoon picture with captions, write a descriptive paragraph, or use some other form of communication.

Create your description.

- Use your notes to create your description on a separate sheet of paper.
- Use drawings, descriptions, photographs, or other graphics to help make your description understandable and clear.
- Read your description to make sure it reflects your ideas.
- Compare your description with that of someone else, and discuss how they are the same and different.
- Attach this page to the front of your description when you turn it in.

Evaluation Guidelines

Element	1	2	3	Feedback
Content	The product contains inaccurate or incomplete information.	The product describes a zero-gravity environment.	The product creatively and specifically details how several objects do not act as expected in zero gravity.	
Purpose	The product shows little or no focus.	The product provides basic description.	The product uses graphics and words that explain what it is like to live in zero gravity.	
Organization	The product includes disorganized information that is difficult to follow.	The product includes basic organization.	The product includes concepts that contain a beginning, middle, and end thought or explanation.	
Grammar and mechanics	The product includes errors or omissions.	The product includes some errors.	No errors appear in the work.	

Additional Feedback Notes:

Name: ______________________________ Date: ______________________

Science Literacy Exercise Page 3 Use with Reading Collection 3

Roadmap for Reading

This week's reading collection focuses on how gravity and magnetism affect Earth, keeping its moon and artificial satellites in orbit and protecting it from space objects.

Collection 3: "Gravity and Earth" consists of 4 selections.

1. The Moon Matters
2. Why Don't Satellites Fall?
3. Gravitational Lensing
4. Solar Winds

As you read:

- Consider the general purpose of each selection: is it a description, an explanation, a procedure, or an attempt to persuade?
- Consider how data and graphics support the narrative text and how narrative text clarifies the data and graphics.
- Consider how each part of the reading relates to knowledge you gained from the previous part.

Written Response

Create an argument for whether magnetism or gravity is the greater force. Your argument should include the following:

- your decision about whether gravity or magnetism is the greater force
- at least three reasons why your position is correct, including a comparison of gravity and magnetism

Plan your argument.

- Before you begin, review the criteria in the Evaluation Guidelines that follow to help you clearly understand the expectations of the exercise.
- Draw a two-column chart. List the things gravity does on one side. List the things that magnetism does on the other side.
- Do some research using credible sources to add to or edit your ideas.

Create your argument.

- Use your notes to create your argument on a separate sheet of paper.
- Start with your decision. Then write at least one sentence for each reason that supports your argument.
- Use drawings, descriptions, photographs, or other graphics to help make your argument understandable and clear.
- Read your argument to make sure it reflects your ideas.
- Compare your argument with that of someone else, and discuss how they are the same or different.
- Attach this page to the front of your argument when you turn it in.

Evaluation Guidelines

Element	1	2	3	Feedback
Content	Unclear position is reflected with little or no supporting reasons.	Work states a position with some supporting reasons.	Work clearly states a position and provides well-reasoned support.	
Purpose	Work shows or no focus.	The product provides a basic argument.	Product uses documented evidence to support an argument.	
Organization	Disorganized information is present that is difficult to follow.	Basic organization is evident.	Work includes clear beginning, supporting evidence, and conclusion.	
Grammar and mechanics	Work contains several errors or omissions.	Some errors are present.	Work contains no errors.	

Additional Feedback Notes:

Name: ______________________ Date: ______________

Science Literacy Exercise Page 4 | Use with Reading Collection 4

Roadmap for Reading

This week's reading collection focuses on products that use noncontact forces to save labor, solve problems, or create new experiences.

Collection 4: "Noncontact Energy Transfer" consists of 5 selections.

1 Unplugged
2 Touchless Music
3 The Triboelectric Effect
4 SciFi or SciFact?
5 Magnet and Motor

As you read:

- Consider the general purpose of each selection: is it a description, an explanation, a procedure, or an attempt to persuade?
- Consider how data and graphics support the narrative text and how narrative text clarifies the data and graphics.
- Consider how each part of the reading relates to knowledge you gained from the previous part.

Written Response

Create a description of a product invention that uses noncontact forces to save labor, solve problems, or create a new experience.

Your description should include:

- what the purpose of your invention is
- how it uses noncontact forces to work
- what benefits it will have to society or the environment

Plan your description.

- Before you begin, review the criteria in the Evaluation Guidelines that follow to help you clearly understand the expectations of the exercise.
- Make a list of five inventions that use noncontact forces of gravity, static electricity, or magnetism to solve a problem or, like the theremin, create a new experience.
- Choose one invention to develop. Make a list of the benefits it will have.
- Do some research using credible sources to add to or edit your ideas.

Create your description.

- Use your notes to create your description on a separate sheet of paper.
- Start with a short name and description or picture of your invention.
- Explain how a noncontact force makes it work.
- List the benefits of your invention.
- Use drawings, descriptions, photographs, or other graphics to help make your creation understandable and clear.
- Read your description to make sure it reflects your ideas.
- Compare your invention with that of someone else, and discuss how they are the same or different.
- Attach this page to the front of your description when you turn it in.

Evaluation Guidelines

Element	1	2	3	Feedback
Content	Invention does not use a noncontact force.	Description references an existing or uncertain product that uses a noncontact force.	Description references an innovative product that clearly uses noncontact forces.	
Purpose	Description includes or uncertain invention benefits.	Description includes some product benefits.	Description includes several significant product benefits.	
Organization	Description includes disorganized information that is difficult to follow or uses no graphics.	Description includes basic organization with description and graphics.	Description includes clear product description, with visual appeal to make the product understandable.	
Grammar and mechanics	Work contains several errors or omissions.	Work contains some errors.	Work contains no errors.	

Additional Feedback Notes:

Name: ______________________________ Date: ______________________

Science Literacy Exercise Page 5 — Use with Reading Collection 5

Roadmap for Reading

This week's reading collection focuses on whether magnetism is good or bad for the human body.

Collection 5: "Magnetism and Bodies" consists of 4 selections.

1 Movie Magnetism
2 Are Humans Magnetic?
3 Magnetic Treatments
4 Magnetic Medicine

As you read:

- Consider the general purpose of each selection: is it a description, an explanation, a procedure, or an attempt to persuade?
- Consider how data and graphics support the narrative text and how narrative text clarifies the data and graphics.
- Consider how each part of the reading relates to knowledge you gained from the previous part.

Written Response

Create an argument for whether magnetism is beneficial to, is harmful to, or has no effect on the human body. Your argument should include the following:

- your decision about whether magnetism has a positive, a negative, or no effect on the human body
- at least three reasons why your position is correct that include evidence of specific effects
- citations from credible sources

Plan your argument.

- Before you begin, review the criteria in the Evaluation Guidelines that follow to help you clearly understand the expectations of the exercise.
- Draw a three-column chart, labeled Benefits, Harmful Effects, and No Effects.
- Research the effects of magnetism on the human body, and fill in your three-column chart based on what you find out.
- In the column titled Benefits, list the benefits of magnetism. In the column titled Harmful Effects, list the harmful effects of magnetism. In the column titled No Effects, list nonexistent or negligible effects.

Create your argument.

- Use your research and the three-column chart to create your argument on a separate sheet of paper.
- Start with your statement that magnetism is beneficial to, is harmful to, or has no effect on the human body.
- List the reasons for why you are making this argument.
- Write at least one sentence for each reason that supports your argument.
- Read and review your argument to make sure it reflects your ideas.
- Attach this page to the front of your argument when you turn it in.

Evaluation Guidelines

Element	1	2	3	Feedback
Content	Writing presents an position with little or no supporting reasons.	Writing states a position with some supporting reasons.	Writing clearly states a position and provides well-reasoned support.	
Purpose	Work displays little or no focus.	Work provides a basic argument with some evidence.	Work uses documented evidence with credible citations/sources to support an argument.	
Organization	Work is disorganized information that is difficult to follow.	Work displays organization.	Work includes clear beginning, supporting evidence, and conclusion.	
Grammar and mechanics	Work contains several errors or omissions.	Work contains some errors.	No errors are present.	

Additional Feedback Notes:

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