At A Glance

Learning Intentions	Properties of Matter	States of Matter	A Change of State	Physical or Chemical?	Mixing and Separating	Simple Machines-Part 1	Simple Machines-Part 2	Simple Machines-Part 3	Compound Machines	Forces on Structures	Under Construction	Moving the Load	Electricity	Electromagnetism
Knowledge and Understanding Content														
• identify matter as having mass and taking up space; determine the common properties of matter	•													
• identify the three states of matter and determine their properties		•	•											
• recognize and demonstrate how temperature can change the state of matter		•	•											
• differentiate between physical and chemical changes and determine their versatilities				•										
• describe interactions of solids and liquids; demonstrate how a material is recovered from a mixture					•									
• identify a basic type of simple machine and describe how it is used in daily life to make tasks easier						•	•	•						
• identify compound machines and describe how the parts work together to make tasks easier									•					
• describe the effects of forces on structures, and identify some structural features that help overcome these forces										•	•			
• compare the force required to move a load using simple machines; explain the advantages of mechanical systems						•	•	•				•		
• design, construct, and test simple electrical circuits that use batteries, bulbs, wires, and switches													•	•
• distinguish electrical conductors from insulators													•	
• demonstrate that electricity can be used to create a magnet														•
Thinking Skills and Investigation Process														
• make predictions, formulate questions, and plan an investigation	•		•		•	•	•	•	•		•	•	•	•
• gather and record observations and findings using drawings, tables, written descriptions	•	•	•	•	•	•	•	•	•		•	•	•	•
• recognize and apply safety procedures in the classroom	•	•	•	•	•	•	•	•	•	•	•	•	•	•
Communication														
• communicate the procedure and conclusions of investigations using demonstrations, drawings, and oral or written descriptions, with use of science and technology vocabulary	•	•	•	•	•	•	•	•	•	•	•	•	•	•
Application of Knowledge and Skills to Society and the Environment														
• assess the environmental impacts of processes that change a product through physical or chemical changes				•										
• recognize and evaluate the impact of society and the environment on structures										•	•			
• assess opportunities for reducing electrical consumption in order to conserve this non-renewable resource, and to reduce the impact of electricity generation on the environment													•	

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Student's Name: _____ Date: _____

Teacher Assessment Rubric

Success Criteria	Level 1	Level 2	Level 3	Level 4
Knowledge and Understanding Content				
Demonstrate an understanding of the concepts, ideas, terminology definitions, procedures and the safe use of equipment and materials	Demonstrates limited knowledge and understanding of the content	Demonstrates some knowledge and understanding of the content	Demonstrates considerable knowledge and understanding of the content	Demonstrates thorough knowledge and understanding of the content
Thinking Skills and Investigation Process				
Develop hypothesis, formulate questions, select strategies, plan an investigation	Uses planning and critical thinking skills with limited effectiveness	Uses planning and critical thinking skills with some effectiveness	Uses planning and critical thinking skills with considerable effectiveness	Uses planning and critical thinking skills with a high degree of effectiveness
Gather and record data, and make observations, using safety equipment	Uses investigative processing skills with limited effectiveness	Uses investigative processing skills with some effectiveness	Uses investigative processing skills with considerable effectiveness	Uses investigative processing skills with a high degree of effectiveness
Communication				
Organize and communicate ideas and information in oral, visual, and/or written forms	Organizes and communicates ideas and information with limited effectiveness	Organizes and communicates ideas and information with some effectiveness	Organizes and communicates ideas and information with considerable effectiveness	Organizes and communicates ideas and information with a high degree of effectiveness
Use science and technology vocabulary in the communication of ideas and information	Uses vocabulary and terminology with limited effectiveness	Uses vocabulary and terminology with some effectiveness	Uses vocabulary and terminology with considerable effectiveness	Uses vocabulary and terminology with a high degree of effectiveness
Application of Knowledge and Skills to Society and Environment				
Apply knowledge and skills to make connections between science and technology to society and the environment	Makes connections with limited effectiveness	Makes connections with some effectiveness	Makes connections with considerable effectiveness	Makes connections with a high degree of effectiveness
Propose action plans to address problems relating to science and technology, society, and environment	Proposes action plans with limited effectiveness	Proposes action plans with some effectiveness	Proposes action plans with considerable effectiveness	Proposes action plans with a high degree of effectiveness

Name: _____ Date: _____

Student Self-Assessment Rubric

Put a check mark (✓) in the box that best describes you:

	Always	Almost Always	Sometimes	Needs Improvement
• I listened to instructions.				
• I was focused and stayed on task.				
• I worked safely.				
• My answers show thought, planning, and good effort.				
• I reported the results of my experiment.				
• I discussed the results of my experiment.				
• I used science and technology vocabulary in my communication.				
• I connected the material to my own life and the real world.				
• I know what I need to improve.				

1. I liked _____

_____

2. I learned _____

_____

3. I want to learn more about _____

_____

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Introduction

The activities in this book have two intentions: to teach concepts related to physical science and to provide students the opportunity to apply necessary skills needed for mastery of science and technology curriculum objectives.

Throughout the experiments, the scientific method is used. The scientific method is an investigative process which follows five steps to guide students to discover if evidence supports a hypothesis.

1. **Consider a question to investigate.**
   For each experiment, a question is provided for students to consider. For example, "How does temperature affect the state of matter?"

2. **Predict what you think will happen.**
   A hypothesis is an educated guess about the answer to the question being investigated. For example, "I believe that it can change the appearance of certain matter". A group discussion is ideal at this point.

3. **Create a plan or procedure to investigate the hypothesis.**
   The plan will include a list of materials and a list of steps to follow. It forms the "experiment".

4. **Record all the observations of the investigation.**
   Results may be recorded in written, table, or picture form.

5. **Draw a conclusion.**
   Do the results support the hypothesis? Encourage students to share their conclusions with their classmates, or in a large group discussion format.

The experiments in this book fall under fourteen topics that relate to six aspects of physical science: **Properties of and Changes in Matter; Chemistry in the Classroom; Forces and Simple Machines; Forces Acting on Structures and Mechanisms; Mechanisms Using Electricity; and Electricity and Magnetism.** In each section you will find teacher notes designed to provide you guidance with the learning intention, the success criteria, materials needed, a lesson outline, as well as provide some insight on what results to expect when the experiments are conducted. Suggestions for differentiation are also included so that all students can be successful in the learning environment.

Assessment and Evaluation:

Students can complete the Student Self-Assessment Rubric in order to determine their own strengths and areas for improvement. Assessment can be determined by observation of student participation in the investigation process. The classroom teacher can refer to the Teacher Assessment Rubric and complete it for each student to determine if the success criteria outlined in the lesson plan has been achieved. Determining an overall level of success for evaluation purposes can be done by viewing each student's rubric to see what level of achievement predominantly appears throughout the rubric.

Properties of Matter

Learning Intention:

Students will learn that matter is everything that has mass and takes up space, and that there are different properties of matter.

Success Criteria:

- identify everyday objects that are forms of matter and describe their properties
- compare matter in terms of their properties
- make observations and record information using drawings and written descriptions
- make conclusions about the properties of matter

Materials Needed:

- a copy of "What is Matter?" worksheet 1 for each student
- a copy of "Properties of Matter" worksheet 2 for each student
- a copy of "Investigating Buoyancy" worksheet 3 and 4 for each student
- a copy of "Investigating Density" worksheet 5 and 6 for each student
- a green apple, a ping pong ball, a beach ball, a lime, a shoe box, a hard cover library book (a set for each group of students)
- a marble, a cork, a coin, a pencil, a lemon, a big paper clip, a plastic bowl or dishpan filled with water (a set for each group of students)
- a glass jar, water, cooking oil, corn syrup (1/2 cup of each liquid per group of students)
- pencils, pencil crayons, markers, chart paper

Procedure:

***This lesson can be done as one long lesson, or be divided into three shorter lessons.**

1. Have a brainstorming/discussion session as to what matter is. Record student responses on chart paper. Give students Worksheet 1 to complete, ensuring their understanding of matter as anything that has mass and takes up space.
2. Explain that there are different properties of matter, most common ones being buoyancy, density, color, hardness, shape, size, transparency, and weight. Divide students into small groups to explore these properties. Give them the materials to conduct the exploration on Worksheet 2. An option is to come back together as a large group to discuss their findings.
3. Next, explain to students that they will take a closer look at buoyancy as a property of matter. Divide students into small groups, and give them the materials needed to conduct the experiment on Worksheets 3 and 4. Upon completion of the experiment, students will understand that if an object is denser than the liquid, it will sink; if it is less dense than the liquid, it will float.
4. Next, explain that they will take a closer look at density as a property of matter. Give each group the materials they need to conduct the experiment on Worksheets 5 and 6. Upon completion of the experiment, students will understand that dense liquids will sink and less dense liquids will float.

Differentiation:

Slower learners may benefit by working with a peer to identify and record ideas of matter in the classroom and at home. Also, working together in a small group with teacher direction to conduct the experiments, could allow the opportunity for extra scaffolding of information. **For enrichment**, faster learners could experiment with other liquids to determine their density. Then afterward, orally share their findings with the large group.

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Worksheet 1

Name: _____

What is Matter?

Matter is the term we use to describe something that takes up space and has weight. It includes living and non-living objects, even us!

1. Put a check mark (✓) in front of each word that is a form of matter. Put an **X** in front of each word that is not a form of matter.

- ☐ **my winter coat**
- ☐ **music from the car radio**
- ☐ **a glass of milk**
- ☐ **a chocolate bar**
- ☐ **a story read by my teacher**
- ☐ **my science notebook**
- ☐ **trees in the park**
- ☐ **friendship**
- ☐ **roast turkey dinner**
- ☐ **oranges and bananas**
- ☐ **a whisper**
- ☐ **mud pies**

2. Write some things that you know are matter. Think of ideas from your classroom and from your home. Write your answers in the chart below.

Ideas From My Classroom	Ideas From My Home

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Worksheet 3 Name: _____

Investigating Buoyancy

Buoyancy is the upward force of a liquid that is pushing against a solid object. It will help determine whether an object will sink or float. Let's investigate this idea!

You'll need:

- a marble
- a cork
- a coin
- a pencil
- a lemon
- a big paper clip
- a plastic bowl or dishpan filled ¾ with water

Let's Predict

Test the weight of each object by holding them one by one in your hand. Do you think that weight will affect whether an object will sink or float?

_____

_____

Object	**Prediction:** sink? float?	**Object**	**Prediction:** sink? float?
marble		cork	
lemon		pencil	
coin		big paper clip	

What To Do:

1. Once again, test the weight of each object by holding them one by one in your hand.
2. List the objects in order of **weight**, from the lightest to the heaviest. Write your answers as 1. under "Let's Observe" on Worksheet 4.
3. One by one, drop the objects into the water.
4. After each object is tested, record in the chart, whether it sank or floated.
5. Make conclusions about what you have observed.

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Worksheet 5

Name: _____

Investigating Density

We have learned that density is a factor in whether something will sink or float. In this experiment, you will be investigating the density of three liquids. Let's get started!

You'll need:

- a glass jar
- ½ cup (125 ml) of water
- ½ cup (125 ml) of cooking oil
- ½ cup (125 ml) of corn syrup (or honey)

Let's Predict

What do you think will happen when these three liquids are mixed together?

_____

_____

What To Do:

1. Pour the water into the jar.
2. Pour the cooking oil into the jar.
3. Pour the corn syrup into the jar.
4. Wait for all three liquids to settle.
5. Draw and label a diagram to show your observations. Record your observations.
6. Make conclusions about what you have observed.

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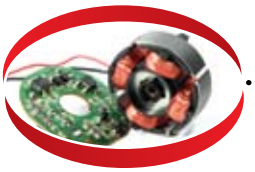


Electromagnetism

Learning Intention:
Students will learn how electricity and magnetism are related by creating an electromagnet.

Success Criteria:
- construct an electromagnet and determine its strength
- determine the strength of an electromagnet
- make predictions, and record observations using drawing and written descriptions
- make conclusions and connections about the materials that conduct electricity
- have some fun trying to catch a burglar!

Materials Needed:
- large nails or iron rods (1 per group of students)
- 6 volt batteries (1 per group of students)
- paperclips, electrical tape, pencils
- 1 metre of wire with alligator clips at each end (1 per group of students)
- 9 volt battery (1 per group of students)
- wire (2 pieces per group of students, each being 1 metre long)
- wooden clothes pegs (1 per group of students)
- thumb tacks (2 per group of students)
- small electric buzzer, like a piezo buzzer (1 per group of students)
- a few pairs of wire strippers
- a copy of "Electromagnetism" worksheet 1 and 2 for each student
- a copy of "Electromagnet Design" worksheet 3 and 4 for each student
- a copy of "Sound the Alarm" worksheet 5 for each student
- a copy of "What Have You Learned?" worksheet 6 for each student

Procedure:
***This lesson can be done as one long lesson, or be divided into two shorter lessons.**

1. After reading and discussing information on worksheet 1, give groups of students the materials to build an electromagnet. They will read through the materials needed, and what to do section. They will make predictions, conduct the experiment, record observations and conclusions, and make connections on worksheet 2.
2. Give groups of students Worksheets 3 and 4. Read through the question, materials needed, and what to do section with students. Give them the materials to build and test the strength of an electromagnet. They will make predictions, conduct the investigation, record observations, and make conclusions and connections on worksheet 4.
3. Give groups of students worksheet 5. Read through the materials needed and what to do section to ensure their understanding of the task. Give them the materials to construct a burglar alarm.
4. Give students Worksheet 6 to complete.

Differentiation:
Slower learners may benefit by working in a small group with teacher direction in order to construct a burglar alarm. **For enrichment**, faster learners could choose an electronic device and prepare a report on the history of the device, what it is used for, an explanation of how it works, and include diagrams.

Worksheet 1

Name: _____

Electromagnetism

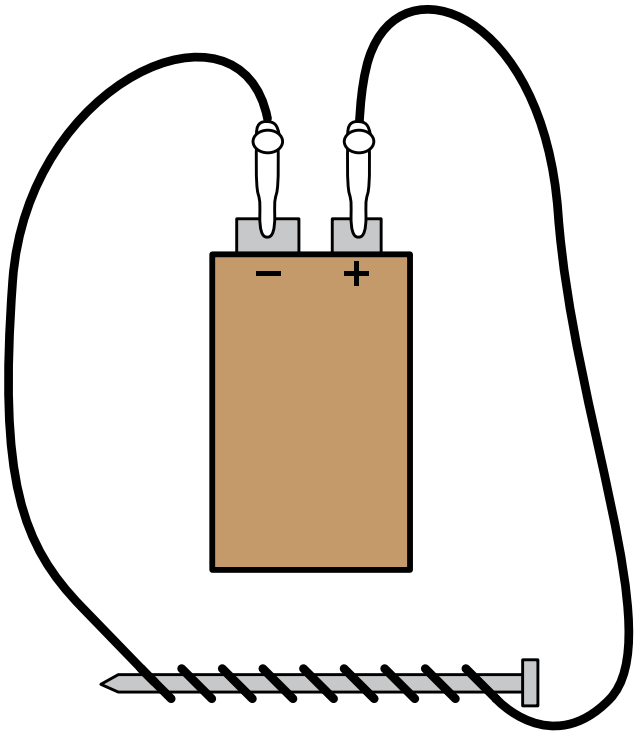
If a coil of wire is wrapped around a metal object and connected to an energy source, the metal object will become magnetized, forming an **electromagnet**. The electromagnet will attract magnetic materials. Let's explore this idea!

Materials Needed:

- a large nail or iron rod (about 10 cm long)
- a 6 volt battery
- paperclips
- 1 metre of electrical wire, with alligator clips at the ends

What to do:

1. Wind the wire around the nail, leaving the ends sticking out by a few centimetres.
2. Make a prediction about what you think will happen to the nail when you connect the battery. Record it on Worksheet 2.
3. Clip the alligator clips to the battery terminals.
4. Dip the nail into the paperclips, and pull it out. What happens?
5. Remove the battery. What happens?
6. Record your observations on Worksheet 2.
7. What conclusion can you make? Record it on Worksheet 2.
8. Make a connection about what you have learned. Tell about it on Worksheet 2.



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Worksheet 3 Name: _____

Electromagnet Design

Question:

Which do you think will be the strongest electromagnet, an electromagnet with a lot of turns, or an electromagnet with a few turns?

Materials Needed:

- a 6 volt battery
- paperclips
- a large nail or iron rod (about 10 cm long)
- 1 metre of electrical wire, with alligator clips at the ends

What to do:

1. Make a prediction about the answer to the question and record it on Worksheet 4.
2. Wind the wire around the nail, leaving the ends sticking out by a few centimetres. Count how many turns you made and record it on Worksheet 4.
3. Clip the alligator clips to the battery terminals.
4. Dip the nail into the paperclips, and pull it out. What happens? Record your findings on Worksheet 4.
5. Unwind half of the turns in the wire. Dip the nail into the paperclips. What happens? Record your findings on Worksheet 4.
6. Unwind the rest of the wire, except for three turns. Dip the nail into the paperclips. What happens? Record your findings on Worksheet 4.
7. Make conclusions about what you have learned on Worksheet 4.

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Worksheet 4 Name: _____

Let's Predict

Which do you think will be the strongest electromagnet? Circle your answer.

an electromagnet with a lot of turns **an electromagnet with few turns**

Let's Observe

Number of Turns	**Observations** (how strong was the magnet?)

Let's Conclude

What happened when you had less turns? Was the magnet stronger or weaker?

_____

How do you know? _____

_____

If you wanted to make a super strong magnet, how would you do it?

_____

_____

_____

_____

Challenge:

Find the smallest number of turns that you can use and still pick up one paperclip. _____

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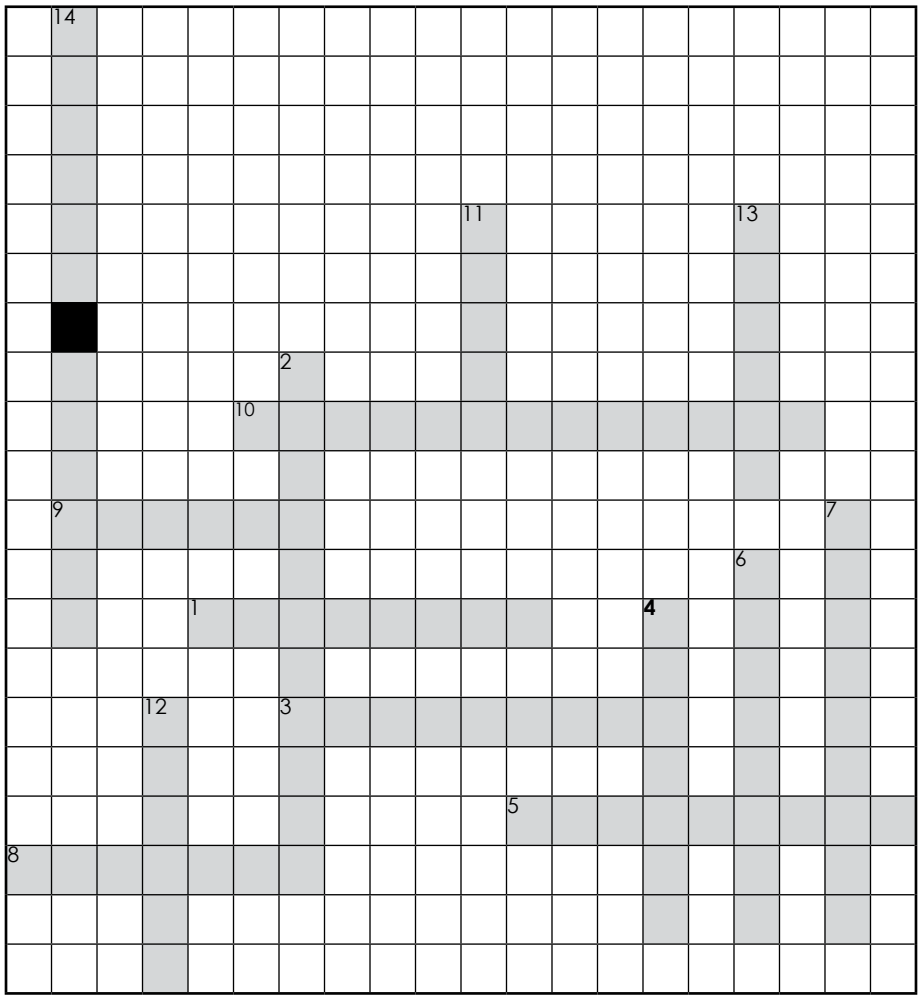
Worksheet 6

Name: _____

What Have You Learned?

You have learned a number of new ideas and terms about electricity. Complete the crossword puzzle using the words in the Word Box.

battery	kilowatt	conductor	switch	electrons
series	static	circuit	insulator	electromagnet
meter	electricity	parallel	Thomas Edison	



Across

1. A type of electrical circuit where output devices are connected separately to the energy source.
3. It allows electricity to flow through it very easily.
5. A material that doesn't allow electricity to flow through.
8. Energy source.
9. The kind of electricity you create by rubbing a balloon on your head.
10. Temporary magnet.

Down

2. A valuable form of energy.
4. Complete path of an electric current including the source of electric energy.
6. Unit used to measure electricity.
7. Electricity is produced by the movement of these particles.
11. Device that measures electricity usage.
12. Controls the flow of electricity.
13. A type of electrical circuit.
14. The inventor of the electric light bulb.

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