At A Glance

Learning Intentions	The Inclined Plane	The Wedge	The Screw	Levers	The Pulley	Wheel and Axle	Compound Machines	Solids, Liquids, Gases	Making It Up!	Sink or Float?	Ships Ahoy!	Magnestism	Magnetic Strength	Hot & Cold Temperature	Insulators
Knowledge and Understanding Content															
• 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							•								
• identify and describe the properties of solids, liquids, and gases								•							
• recognize and compare the amount of liquid absorption by different materials								•							
• demonstrate an understanding that liquids and solids interact in different ways									•						
• demonstrate an understanding that water is matter and can change state									•						
• describe objects on the basis of their buoyancy, and evaluate materials in the construction of watercraft										•					
• recognize the importance of balance and stability in order for watercraft to float, carry a load, and propel											•				
• identify magnetic materials, determine polarity, and demonstrate the attraction or repelling of poles												•			
• demonstrate the effects of magnetic strength and how magnets move and hold things together													•		
• recognize the effects of heating and cooling														•	
• identify methods used to control temperature and describe how insulation keeps things hot or cold															•
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															
• identify the function of simple machines in the immediate environment							•								
• identify how the change in state of matter affects the environment									•						
• identify ways in which temperature changes affect us in our daily lives														•	•

OTM-2145 ISBN: 9781770783386

Table of Contents

Table of Contents

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 am a good listener.				
• I followed the directions.				
• I stayed on task and finished on time.				
• I remembered safety.				
• My writing is neat.				
• My pictures are neat and colored.				
• I reported the results of my experiment.				
• I discussed the results of my experiment.				
• I know what I am good at.				
• I know what I need to work on.				

1. I liked _____

_____

1. I learned _____

_____

1. I want to learn more about _____

_____

OTM-2145 ISBN: 9781770783386

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, "Is water always a liquid?"

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 water can become a solid, liquid, or a gas." 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 fifteen topics that relate to four aspects of physical science: **Movement; Properties of Solids, Liquids, and Gases; Buoyancy and Boats; Magnets; and Hot and Cold Temperature.** 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.

The Inclined Plane

Learning Intention:

Students will learn how the inclined plane is used in daily life to make tasks easier by moving an object from one elevation to another.

Success Criteria:

- identify places in everyday life that the inclined plane is used to make tasks easier
- make a prediction and investigate how the inclined plane works to move an object from one elevation to another, and the ease from which it happens
- gather and record the data in a chart
- make conclusions about the effort needed to move an object up an inclined plane
- make connections to people and places in the environment

Materials Needed:

- shoes boxes (two per group of students)
- several boards of various lengths (one to two yards or meters in length)
- yard or meter sticks, string or rope, several weights of equal mass
- student desks
- a copy of "The Inclined Plane" worksheet 1 for each student
- a copy of "The Inclined Plane (Experiment #1)" worksheet 2 and 3 for each student
- a copy of "The Inclined Plane (Experiment #2)" worksheet 4 and 5 for each student
- pencils

Procedure:

1. Students will take a closer look at a simple machine called an inclined plane, by conducting a couple of experiments. Give students worksheet 1. Read through the meaning of an inclined plane with the students. Lead students in a brainstorming activity/discussion about places they may have seen inclined planes (ramps) used in daily life, either at school, home, or in the neighborhood. Students can complete worksheet 1.
2. Divide students into small groups or partners, and give them the materials they need to conduct the first experiment on worksheet 2. Read through the question, materials needed, and what to do sections with the students. Instruct them to make a prediction about the answer to the question and record it on their worksheet. They will conduct the experiment, record results in the chart and make a conclusion on worksheet 3.
3. Give students the materials they need to conduct the second experiment. Read through the question, materials needed, and what to do sections on worksheet 4. Instruct students to make a prediction about the answer to the question and record it on their worksheet. They will conduct the experiment, record results in the chart, and make a conclusion on worksheet 5.

Differentiation:

Slower learners may benefit by orally stating how the inclined plane makes tasks easier for people and having their answers scribed (worksheet 1).

For enrichment, faster learners can draw places in their school, home, or neighborhood where they have seen inclined planes. They can include an explanation as to how these inclined planes make tasks in daily life easier.

Worksheet 1

Name: _____

The Inclined Plane

An inclined plane is a sloping surface that allows us to move an object from one elevation to another with less effort. Pushing or pulling an object using an inclined plane is easier than lifting the object. It is a simple machine that is used in daily life to make tasks easier.

Under each picture, explain how the inclined plane is making the task easier for the people.

_____ _____

_____ _____

_____ _____

_____ _____

_____ _____

_____ _____

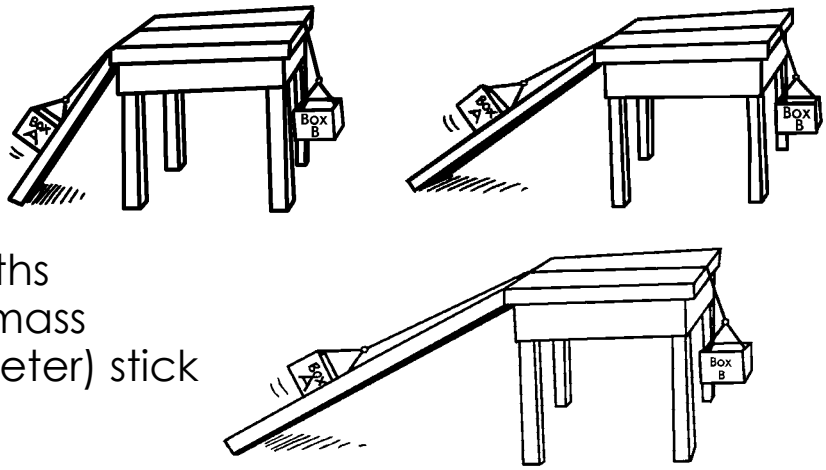
OTM-2145 ISBN: 9781770783386

Worksheet 4 Name: _____

The Inclined Plane (Experiment #2)

QUESTION

Does increasing or decreasing the slope of an inclined plane change the amount of effort needed to lift an object?



MATERIALS NEEDED

- two shoe boxes
- string or rope
- 3 boards of different lengths
- several weights of equal mass
- a student desk, a yard (meter) stick

WHAT TO DO

1. Make a prediction about the answer to the question.
2. Measure the length of the boards and record them.
3. Put one end of the shortest board on the floor, and the other end on the desk.
4. Fasten string or rope to the shoe boxes, label them Box A and Box B.
5. Place Box A on the lower end of the board and hang Box B over the desk. Put weights into Box B until Box A reaches the top of the desk. Record the amount of weight needed to lift Box A.
6. Repeat step 5, using the other lengths of board.
7. Measure the distance the box traveled on the board. Record the amount of weight needed to lift Box A up the board.
8. Make a conclusion about what you observed by comparing the amount of weight needed to lift Box A, using inclined planes of different slopes.

OTM-2145 ISBN: 9781770783386

Worksheet 5

Name: _____

Let's Predict ???

Does increasing or decreasing the slope of an inclined plane change the amount of effort needed to lift an object?

_____

_____

Let's Investigate

Record the distances Box A traveled and the weight needed to lift it, using inclined planes of different lengths.

	SHORTEST INCLINED PLANE	**MEDIUM** LENGTH INCLINED PLANE	**LONGEST** INCLINED PLANE
This is the **distance** Box A traveled from the floor to the top of the desk.			
This is the **weight** needed to lift Box A from the floor to the top of the desk.			

Let's Conclude

Was your prediction correct? Explain.

_____

_____

_____

OTM-2145 ISBN: 9781770783386

Insulators

Learning Intention:

Students will learn how insulation is used to keep things hot or cold.

Success Criteria:

- identify materials that work as insulators to keep things hot or cold
- make predictions, gather findings about insulating properties of materials, using charts, drawings, and written descriptions
- make a plan to build an insulating device, make and record observations of the final product by comparing similarities, differences, and benefits of the design
- make conclusions about insulators and make connections to the environment

Materials Needed:

- a foam cup, a paper cup, a plastic cup, a ceramic cup, a glass, 5 thermometers, a timer (a set for each group)
- kettle, and access to water
- a copy of "Insulators" worksheet 1 and 2 for each student
- ice cubes, aluminum foil, a small plastic bag, an oven mitt (a set for each group)
- a copy of "Test an Insulator" worksheet 3 and 4 for each student
- egg cartons, Styrofoam trays or plates, cardboard tubes, margarine tubs or other plastic containers, newspaper, cardboard, glue, string, tape, elastics, butterfly fasteners, paper clips, aluminum foil, popsicle sticks, pipe cleaners, scissors, hole puncher
- a copy of "Build an Insulating Device" worksheet 5 and 6 for each student
- pencils, markers

Procedure:

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

1. Students will investigate which materials make the best insulators by investigating which type of cup keeps water the hottest. Read through the question, materials needed, and what to do sections on worksheet 1 with the students. They will make their predictions, then conduct the experiment in small groups. Using worksheet 2, students will record results and make conclusions based on their observations.
2. Students will continue to investigate what material makes the best insulator. Give students "Test an Insulator" worksheet 3 and 4, and the materials to do the experiment. Read through the question, materials needed, and what to do sections with the students. In groups of three, they will conduct the experiment, make observations and conclusions.
3. Explain to students that they are going to plan, design, and build an insulating device made out of some recyclable materials. They will compare their final product with a partner. Then, they will test their insulating device to see if it slows down the melting of an ice cube. Give each student a copy of "Build an Insulating Device" worksheet 5 and 6 to complete, as they begin to build their invention. Once all insulators are completed, invite students to present their inventions to the class and share three things about it.

Differentiation:

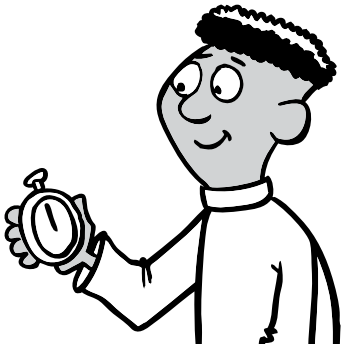
Slower learners may benefit by listing only one thing that is the same and one thing that is different from their partner's invention, and provide only one thing to share with the class about their own invention.

For enrichment, faster learners could build an additional insulator that works to keep things hot or cold that would be useful in their homes.

OTM-2145 ISBN: 9781770783386

Name: _____

Test An Insulator

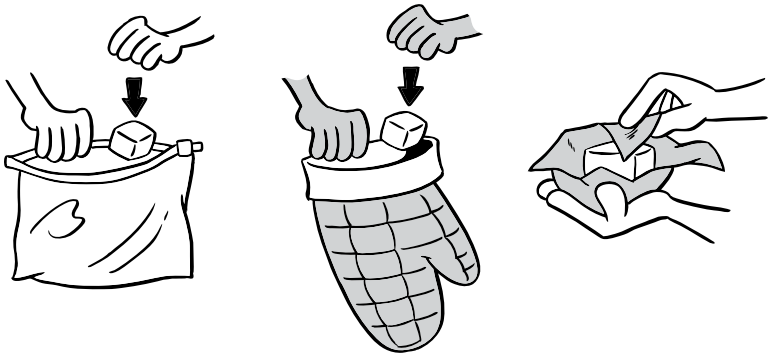


QUESTION

Which material is the best insulator?

MATERIALS NEEDED

- 3 ice cubes
- aluminum foil
- a small plastic bag
- an oven mitt
- a stopwatch or timer



WHAT TO DO

1. Make a prediction about the answer to the question. Record it on worksheet 4.

2. Your teacher will divide your class into groups of three.

3. One person will wrap an ice cube in aluminum foil. The second person will put an ice cube into the plastic bag. The third person will put an ice cube into the oven mitt.

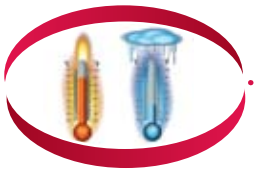
4. Wait 15 minutes.

5. Remove the ice cubes from the foil, plastic bag, and oven mitt.

6. Record your observations on worksheet 4.

7. Make a conclusion about what you have observed.

OTM-2145 ISBN: 9781770783386



Worksheet 4

Name: _____

Let's Predict ???

Which material is the best insulator?

_____

Let's Investigate

After 15 minutes, which ice cube was the largest?

_____

After 15 minutes, which ice cube was the smallest?

_____

Let's Conclude

Which material worked the best to slow down the melting?

_____

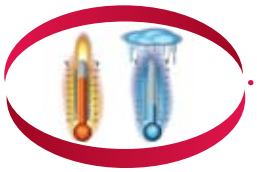
Were you surprised? Explain your thinking.

_____

_____

Draw a picture of a good insulator.

OTM-2145 ISBN: 9781770783386



Worksheet 6

Name: _____

SHARE & COMPARE

Working with a partner, compare your final product. List two things that are the same and two things that are different about your insulators.

Things That Are The Same	Things That Are Different
1. _____	1. _____
2. _____	2. _____

Let's Test It!

Place an ice cube into your insulator. Place another ice cube on a plate and put it on a table. Wait 15 minutes. Record your observations by drawing a picture of what happened to both ice cubes after 15 minutes.

Insulated ice cube

Ice cube on the table

Did your insulator slow down the melting of the ice cube?