



Demos, Labs, & Science Stations Feature:

- Hands-on Investigations
- STEM Challenge
- Scientific Literacy
- Inquiry Process Skills

PHYSICAL SCIENCE - 5E

NGSS • TEKS

The image displays a collection of educational materials for a thermal energy unit. At the top, a large orange banner reads "THERMAL ENERGY". Below it, several colorful science stations are visible, including "INVESTIGATION STATION" (blue), "IMAGINATION STATION" (orange), "OBSERVATION STATION" (green), and "CULATION STATION" (purple). To the right, a clipboard holds a worksheet titled "Layer of Insulation" under the heading "THERMAL ENERGY". The worksheet includes a date field, a question about air trapping, a paragraph explaining insulation with examples like plastic, fiberglass, and air, and a list of materials: "twist-ties", "scissors", and "heat lamps (optional if not a sunny day)". Below the list, instructions describe using black construction paper strips, sandwich bags, and a thermometer to create an insulated environment.

DEMOS, LABS, & SCIENCE STATIONS

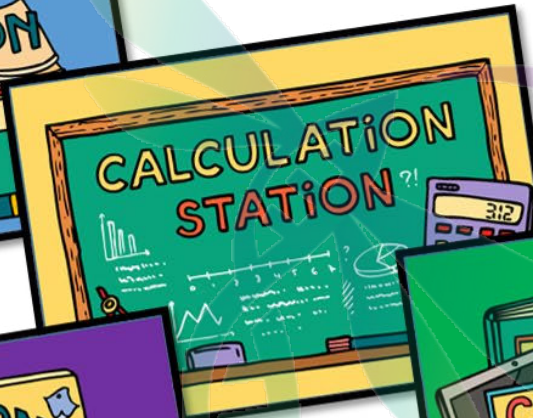
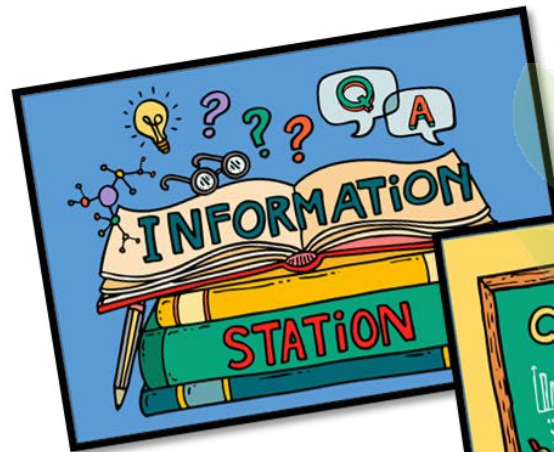
HANDS-ON • STEM • CRITICAL THINKING

**ENGAGING
READING!**

**GRAPHING,
WORD
PROBLEMS &
MEASUREMENT!**

**INQUIRY
SKILLS &
PROCESSES!**

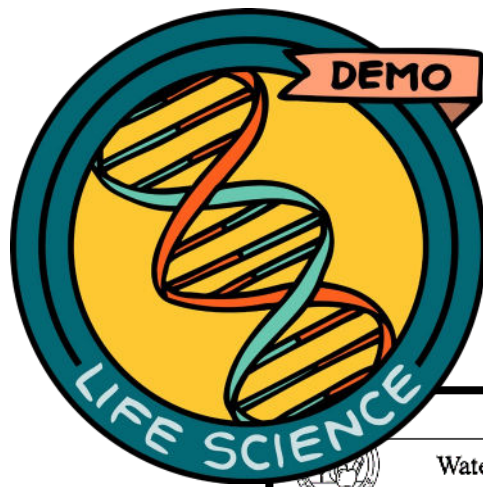
**HANDS-ON
INVESTIGATIONS!**



STEM CHALLENGES!

ALL Station Signage Included!!

Color & Black and White



Teacher guide and answer key
offered for every lab!

Easy-to-get materials!





Water as a Coolant

CELLULAR BIOLOGY

Activity: Students will recognize that some organisms can absorb heat better than others.

Materials:

- 2 balloons
- water
- matches
- candle

Procedures:

1. Blow up a balloon and tie it off.
2. Use a match to light a candle.
3. Hold the balloon high above the flame and move the balloon closer until it pops. Have students make observations.
4. Take the second balloon and fill it with air. Deflate it. Then without tying the balloon, blow up the balloon only air and tie it off.
5. Again, hold the balloon high above the flame and slowly move it closer - watch your students' faces in anticipation of the balloon popping.
6. Bring the balloon as close as you can. You may even get as close as the flame touching the balloon when it pops. (It also may not burn pop. The balloon may just scorch a bit.) Have students make observations.

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Layer of Insulation

THEORY: ENERGY

Problem: How does trapping air between layers conserve energy and heat?

A material is called an insulator if it slows down the transfer of heat. Examples of insulators that are insulators are wood, foam plastic, fiberglass, and air. Buildings use insulation to help keep warm air from flowing out of buildings in cold weather and from flowing into buildings in warm weather. In addition, insulation helps furnaces and air conditioners work more effectively, saving energy and money.

Materials:

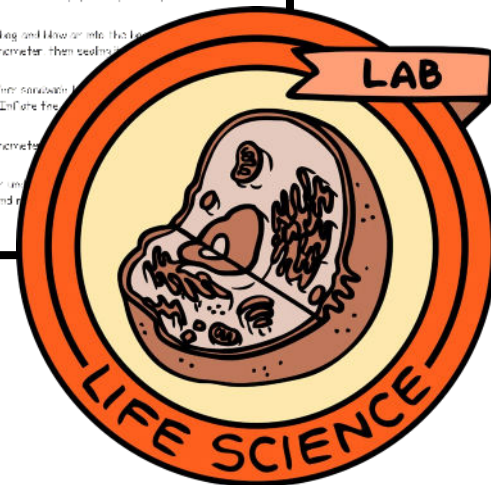
- 2 - thermometers
- 2 - sandwich bags (Ziploc bags)
- cellulose plastic bag
- black construction paper
- tape
- cardstock
- scissors
- heat lamps (optional) (not a sunny day)

Procedure:

1. Cut three 2.5 cm x 1.5 cm strips of black construction paper. Tape a strip over the bulb of each thermometer.
2. Place one thermometer inside a sandwich bag and blow air into the bag by twisting around the thermometer, then sealing off the top.
3. Place the second thermometer inside the other sandwich bag. Blow air into the bag by twisting around the thermometer, then sealing off the top.
4. Read the initial temperature on each thermometer and write on your answer sheet.
5. Place all three thermometers in the sun or under heat lamps. (Optional) (not a sunny day).



Discussion questions and
teacher set-up included!





Group members will read a passage and then complete a task to help increase science literacy and deepen their understanding of the science concept.



Thermoregulation

One of the most critical adaptations an animal needs to regulate their body temperature. Thermoregulation, or the ability to maintain optimal body temperature, is crucial for an animal's body to function.

The animal kingdom can be divided into two categories: warm-blooded and cold-blooded. Warm-blooded animals consist primarily of birds and mammals. These animals need to maintain a relatively constant body temperature, regardless of the outside temperature. The energy generated in warm-blooded animals comes primarily from food. When food is digested, the chemical reactions produce heat. Cold-blooded animals, on the other hand, do not need to maintain a constant body temperature. They get heat from the outside environment, so their body temperature fluctuates with the temperature of the environment in which they live.

A

Why is thermoregulation important to animals?

B

Identify the energy sources of warm-blooded and cold-blooded animals.

C

Explain how lizards use metachromatism.

D

Explain how lizards use metachromatism.

E

Explain how lizards use metachromatism.

B

1. Explain how the hot air balloon is able to rise.

2. What happens to the air inside the balloon when it is heated?

Name: _____ Date: _____

A1: _____

A2: _____

B1: _____

B2: _____

C1: _____

C2: _____

A

C

Explain how the geothermal power station in Iceland uses heat to power this station?

What type of active land formations are usually found in regions that have geothermal energy?

Group members will have images, illustrations, or actual samples at this station that show applications or processes of the science topic.



Group members will work with one another to explore the concept through hands-on activities, so they may practice specific inquiry process skills as they learn.



Thermal Conductors

Problem: Which material is a better thermal conductor?

Materials:

- 2 metal spoons
- 2 bamboo spoons
- 1 plastic spoon
- Wax
- plastic beads

Procedure:

1. Tie a 250 mL beaker, half full of water.
2. Take each spoon and place it in the water. Wait 10 seconds. NOTICE: Try to make sure the spoons are in the water the same way.
3. Finally, press a plastic bead into the end of each spoon.
4. Using the hot wax, remove the spoons from the water.
5. Group members should work together to observe the spoons. Remove the spoons from the water when the wax is still hot.
6. When a bead falls off, record the time it took for the bead to fall off the spoon.
7. Answer the questions on your worksheet.

Analyze and Conclude:

1. How did the material of the spoon affect the time it took for the bead to fall off?
2. How was heat transferred from the water to the spoons?
3. Think about dishes in your kitchen. How do you think they are made to protect you from heat when you're cooking?



Name: _____ Date: _____

Directions: Complete the data table below.

Material of Spoon	Time for Bead to Fall (s)
Bamboo	
Plastic	
Metal	

Analyze and Conclude:

1. How did the material of the spoon affect the time it took for the bead to fall off?
2. How was heat transferred from the water to the spoons?
3. Think about dishes in your kitchen and describe some examples of how things are made to protect you from heat when you're cooking.





A

Describe how conduction and convection are different.



B



A

A: Conduction has heated particles collide with each other and transfer their energy; convection has



B

A: Heat is thermal energy that flows from something with a higher temperature to something with a lower temperature.



Name: _____ Date: _____



A



B



A



B



A



B

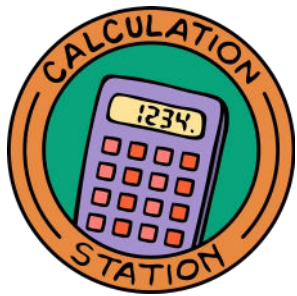


A

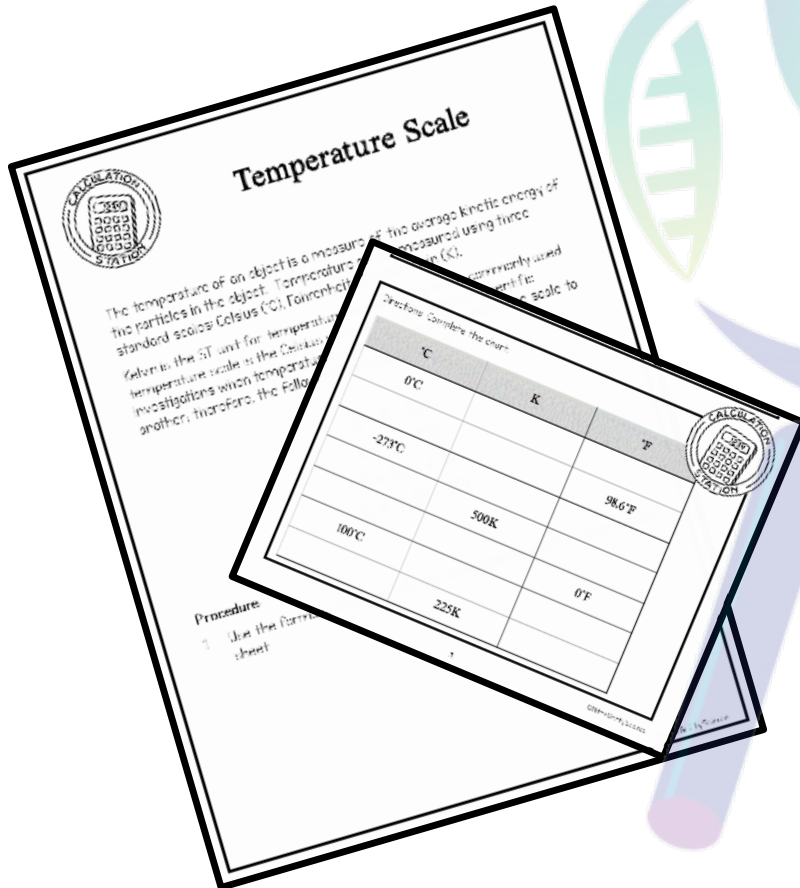


B

There are three different options for this station: interviews, videos, or group essay. Depending on the option you choose, group members will communicate what they know by answering questions in creative ways.



Group members use their math skills to complete the station challenge. Skills may include graphing, analyzing data, using models, measurement, and calculating formulas or word problems.



Solar S'mores

Challenge: Design and create the most efficient solar oven to cook a s'more.

Materials

- plastic bowl
- aluminum foil
- aluminum foil
- cardboard
- paper plate
- wire paper
- Scissors
- clear plastic wrap
- glue
- scissors
- craft sticks
- bamboo skewers
- marshmallows

System Requirements

- Groups will work together to will be measured by the time taken.
- The design must be made on a board of the solar oven on a board.
- Groups will use the materials requirements:
 - Only one plastic bowl
 - Waste (aluminum foil) is disallowed
 - Only one paper plate may be used if they are used.
- When the solar oven is complete, test it.

Testing

At the time of testing, groups will make a s'more on their solar oven. Groups will use the data table during the test.

Name: _____ Date: _____

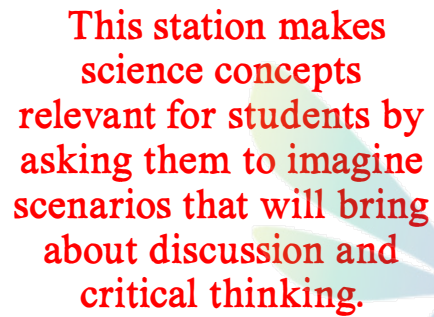
Solar Oven Design (with labels)

Data Table

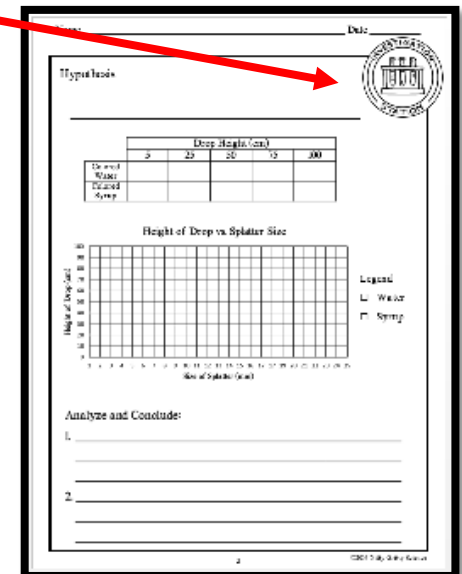
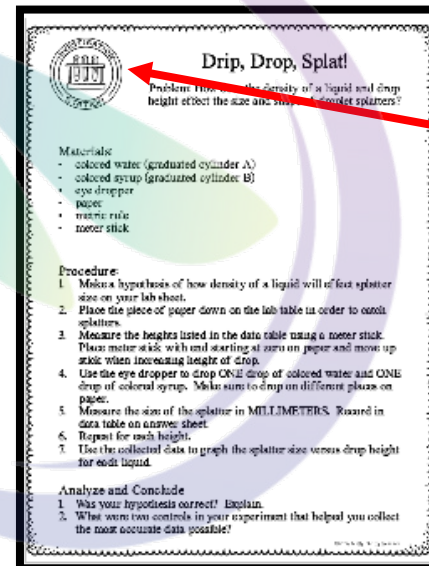
	Time (min)			
	5	10	15	20
Temperature (°C)				

1. Describe the efficiency of your solar oven and share if your group would make any changes if you were to do this challenge again.

Group members will work together to solve a STEM (Science, Technology, Engineering, Math) challenge by creating models or designs that demonstrate their understanding of the science topic being taught.



Students easily recognize which answer sheet to use at each station by matching station icons located on each page!



**Laminate station pages and reuse
for each class and for years to
follow!**

Inquiry and Process Skills

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Demo

Guided Inquiry Lab

Science Stations

Inquiry-Based Science Unit: Thermal Energy	Classifying	Communicating	Compare & Contrast	Creating Models	Gather/Organize Data	Generalizing	Identifying Variables	Inferring	Interpreting Data and Graphs	Making Decisions	Manipulating Materials	Measuring / Calculating	Observing	Predicting
Water as Coolant	X	X	X			X		X		X	X		X	
Thirsty Bird	X	X				X					X	X		X
Layer of Insulation		X	X	X	X		X		X		X	X		X
Information Station: Thermoregulation					X	X		X						
Observation Station: Images & Questions	X		X		X	X		X					X	
Investigation Station: Thermal Conductors	X		X		X		X		X		X	X	X	
Calculation Station: Temperature Scale					X		X			X		X		
Communication Station: Questions	X	X				X				X				
Creation Station: Solar S'mores		X		X	X				X	X	X	X	X	X
Imagination Station: Igloo Challenge		X		X						X				X

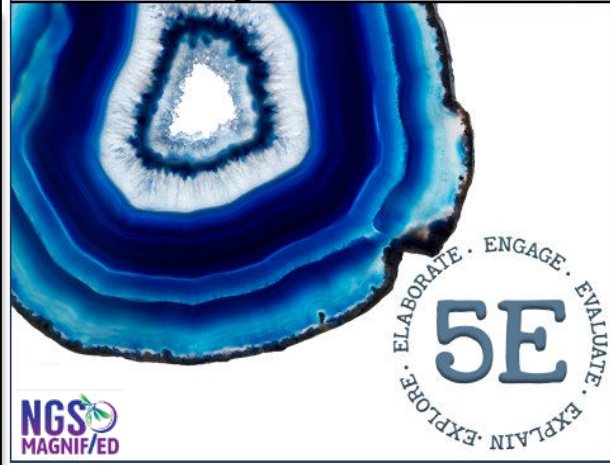
NGS Magnified promotes scientific inquiry throughout the curriculum. Students become more confident and effective learners while developing problem-solving and critical thinking skills. Process skills, such as planning, organizing, and evaluating, help students to complete projects and assignments. These skills allow students to independently gather information, analyze it, and draw their own conclusions.

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