HOT AND COLD

THE AMAZING WORLD OF TEMPERATURE

TEACHER GUIDE

WONDER

PLANNING

Here's a suggested schedule for this kit! The activities should be completed in order, but you can choose when the lessons take place over time.

ACTIVITY INFORMATION	SECTION(S)	TIME REQUIRED	DAY/ LESSON
ACTIVITY 1: MAKE A DIY THERMOMETER Make your own thermometer and test how temperature works. **Total time: 45 min**	☐ DIY THERMOMETER	30 minutes	Day 1
	☐ TESTING TIME	15 minutes	Day 2
ACTIVITY 2: HOW DOES A THERMOMETER WORK? Test your thermometer to understand temperature. **Total time: 1 h 15 min**	☐ TEMPERATURE	30 minutes	Day 3
	☐ LARGER AND SMALLER	15 minutes	Day 4
	☐ RISE AND FALL	30 minutes	Day 5
ACTIVITY 3: REVERSIBLE AND IRREVERSIBLE TEMPERATURE CHANGES Understand how reversible and irreversible changes occur. **Total time: 1 h 15 min**	☐ CHANGE	15 minutes	Day 6
	☐ REVERSIBLE AND IRREVERSIBLE CHANGES (THOROUGH STEP 9)	30 minutes	Day 7
	☐ REVERSIBLE AND IRREVERSIBLE CHANGES (THOROUGH	15 minutes	Day 8

Full schedule available with purchase

1 MAKE A DIY THERMOMETER

We observe temperature each day with how warm or cold you feel. Temperature is so much more than that!

In this activity, you will make a do-it-yourself (DIY) thermometer. You will need an adult's help for part of it, so make sure they are nearby.

DIY THERMOMETER

☑ PREPARATION AND SUPERVISION

activity 1

- In this activity, your student will make a do-it-yourself (DIY) thermometer using items from the kit.
- Support your student as they do the first two steps, which are removing the outer and inner caps of the dropping bottle and filling it almost halfway with water. You can see photos for each major step in the Student Workbook.

☑ PREPARATION AND SUPERVISION

activity 2

- Help the student with Steps 3–5. It can be helpful to do these steps over the sink in case of a spill. If a spill does occur, simply use a paper towel to soak up the spilled liquid.
- During Step 3, encourage your student to count the number of drops of food coloring you add as you do it. This can engage younger students in learning number sequencing.

☑ PREPARATION AND SUPERVISION

activity 3

- Support your student as they do Steps 6–10 to shape and seal the clay around the straw at the bottle opening. They might need help in making sure the straw is securely in place, that it's not moving up or down, and that there are no air pockets between the clay and the bottle. If there is space, the alcohol can leak out during the experiments.

☑ PREPARATION AND SUPERVISION

activity 4

- Step 11 should be done by you because it requires precision while handling the alcohol. The alcohol will not go up to the top of the bottle inside the bottle. The student can do Step 12, but make sure the seal is tight so that the alcohol cannot evaporate out of the top of the straw. This completes the preparation of the DIY thermometer and it is now ready to use. If you and your student are struggling, make sure the seal with the clay is tight. It will not work well if the seal is not tight.

THINK ABOUT IT!

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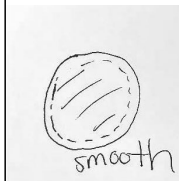
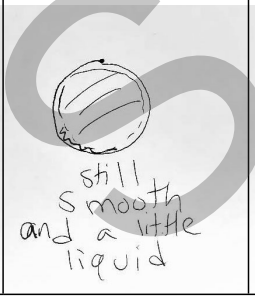
Question 1: Write one reversible change below. Gelatin #___ went from _____to _____.
Answer:One example of a correct answer is, "Gelatin #1 went from the refrigerator to room temperature (or Step 5 to 6)."

How to Help: *If the student provides an incorrect answer, challenge them by asking how they would reverse the temperature change to get it back to how it was before.*

Next, the student will deepen their understanding of that reversible temperature change by making a storyboard (three-part drawing) of what happened to the gelatin in the step they listed in the answer in the last question. This is another type of formative assessment.

Question 2: Make a storyboard, or three-part drawing, of what happened to the gelatin in each step. On the left, draw what it looked like before the temperature change. In the middle, draw what it looked like after the temperature change. On the right, draw what it would look like if your tried to reverse the temperature change. For example, if it was warm before, then after it was cold, the third part would be it going back to warm. Include how warm or cold it was for each step. You can use the number of degrees if you know them, or you can use words like hot, cold, warm, cool, freezing, boiling, and room temperature.
Answer: On the left, they should draw what the gelatin looked like before that temperature change. In the middle, they should draw what it looked like after the temperature change. On the right, they should draw what it would like if they tried to reverse the temperature change. For example, if before was warm, and after was cold, the third part would be going back to warm.

The line for the temperature is to Include how warm or cold it was for each step. The student can use the number of degrees if they know them, or they can use words like hot, cold, warm, cool, freezing, boiling, refrigerator temperature, freezer temperature, and room temperature. Check that the temperatures are reasonable and that the drawings accurately show what the gelatin was like (solid or liquid, smooth or choppy.) Sample student work is shown below.

Before	After	Try to Reverse It!
Temperature: cool in the refrigerator	Temperature: room temperature	Temperature: back to the cool fridge
		

THINK ABOUT IT!

Question 3: Write one irreversible change below. Gelatin #___ went from _____to _____.
Answer: One example of a correct answer is, "Gelatin #2 went from room temperature to the freezer (Step 4 to 5)."

How to Help: *If the student provides an incorrect answer, challenge them by pointing out the steps to reverse the temperature change to get it back to how it was before.*

Question 4: Make a storyboard of what happened to the gelatin in each step like you did for reversible change.
Answer: They should make a storyboard (three-part drawing) of what happened to the gelatin in this step like they did for the reversible change. Check that the temperatures are reasonable and that the drawings accurately show what the gelatin was like (solid or liquid, smooth or choppy.) Sample student work is shown below.

Before	After	Try to Reverse It!
Temperature: room temperature	Temperature: cold in the freezer	Temperature: back to room temperature
		

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activity 4

DESIGN A TEMPERATURE EXPERIMENT

You have learned a lot about temperature, thermometers, reversible temperature changes, and irreversible temperature changes. But, you might have some more questions. That's great!

In this activity, you will design an experiment to test one of the questions you have.

LEARNING GOALS:
I can design an experiment to test how temperature of the air can change.

DESIGN AN EXPERIMENT

WONDER

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