CLASSROOM ACTIVITY
Crazy Cold Air

How does cold air inside a freezer behave as it meets warmer air? Apply your findings to the wind patterns in Antarctica. After you and your team have completed the investigation, respond to these questions directly in your journal.

- If a gas is heated, it expands, becomes lighter and rises. If it is cooled, it becomes denser and sinks. How does this rule apply to the air that rushes out when you open a freezer door?
- How can this phenomenon help to explain wind direction patterns in Antarctica?

Gather with your team and choose a captain and a note taker for today, as well as an artist to illustrate the group's findings. Before you begin your investigation, consider what you already know about wind. Use the questions below to structure your discussion and jot down your notes.

- What are the windiest conditions you ever experienced? Where were you at the time? What factors might have contributed to those conditions?
- How does warm air behave differently from cold air? How do they each move?
- What happens when a strong wind is funneled through a small space?

The captain appoints group members to collect the required materials while the rest of the group reviews today's procedure. Before beginning, the captain makes sure that the group has all required materials, and that everyone knows the day's procedure.

The note taker takes notes on the group's findings for your team. Remember to record your observations and explanations in your journal for your own research notes. Include drawings to illustrate your findings.

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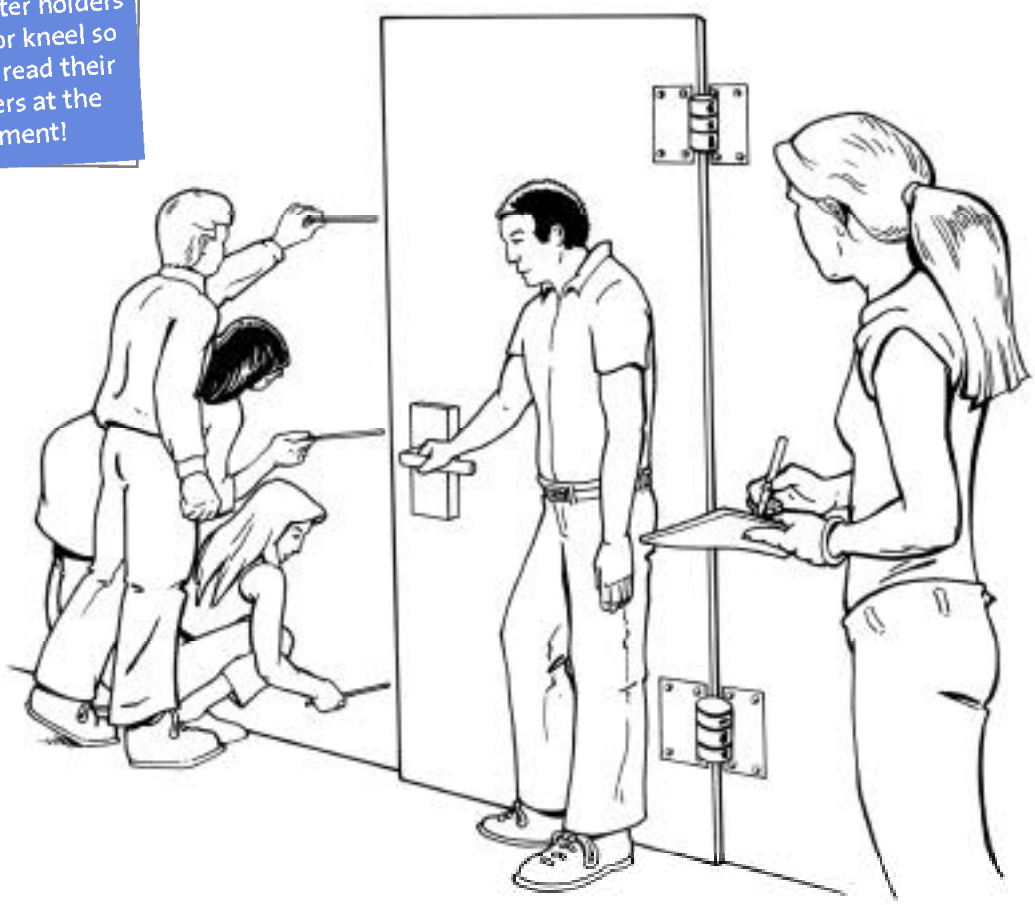
MATERIALS

- ruler/yardstick/meter stick
- masking tape
- walk-in freezer or refrigerator
- 3 thermometers
- scrap paper
- graph paper
- markers
- stopwatch

PROCEDURE

1. Measure the doorframe of the walk-in refrigerator or freezer. Using the masking tape, mark off three evenly spaced intervals along the frame. Your team needs three team members to measure, one team member to open and close the freezer door, and one team member to time the procedure and observe the measurements. Your tallest team member should take the highest measurement; the lowest measurement will require a team member to kneel on the floor.

The thermometer holders should stand or kneel so that they can read their thermometers at the right moment!



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2. Discuss with your team what you think will happen as you open the door. When the cold air rushes out, will there be any difference in temperature at the different heights? Record your predictions on your activity sheet.

3. Record the starting temperature for each thermometer.

4. Be ready for this next step—it will require a lot of physical coordination! Each team member should be ready to read the temperature of his or her thermometer when held at one of the masking tape markers. One team member opens the freezer door and holds it open while the time keeper counts ten seconds; the door person then closes the door as soon as the time keeper says, "ten." (Door person should start moving the door toward closing at eight seconds.) As soon as the door is closed, each team member reads his/her thermometer and records the readings. Calculate the change from the original reading.

5. Allow the thermometers to return to their original readings before repeating the experiment. Record your readings on the activity sheet.

6. Repeat the test two to three times. (Scientists repeat tests as many times as possible to be assured of accurate results. Why is this necessary?)

7. Use your data to create a graph. Use scrap paper to create a rough draft before drawing a neater final draft of the graph.

8. Analyze the data on your graph and use them to develop a hypothesis about wind patterns in Antarctica. Consider how the behavior of winds in Antarctica could be like the behavior of cold air coming from your freezer. Record your ideas on your activity sheet and in your journal. Include illustrations to clarify your ideas.

Remember to record the starting temperature at each thermometer BEFORE each test! It's the temperature change that's important!

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GROUP WORKSHEET 1
ANTARCTIC TEAM __

GROUP MEMBERS _____

CAPTAIN _____ **NOTE TAKER** _____

ARTIST(S) _____

1. Record starting temperatures for each of the thermometers in the first column of the chart below.

	TRIAL 1			TRIAL 2			TRIAL 3			
HEIGHT OF THERMOMETER	ORIG READING	FINAL READING	DEGREE CHANGE	ORIG READING	FINAL READING	DEGREE CHANGE	ORIG READING	FINAL READING	DEGREE CHANGE	AVG DEGREE CHANGE

2. Make a prediction: When the cold air rushes out, will there be any difference in temperature at the different intervals? Explain your answer below.

3. As you conduct each test, record the data in the chart. Then use the data to create your graph.
   - What intervals will you use for the x-axis? _____
   - What intervals will you use for the y-axis? _____

4. After you have graphed the data, analyze them. What patterns do you observe? What does cold air do when it has the option to move?

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GROUP WORKSHEET 2
ANTARCTIC TEAM _

5. Discuss the questions below with your team while the note taker records your ideas on a separate sheet of paper.

- Compare your map of wind speeds and directions in Antarctica to the elevation map in your classroom. How might the behavior of cold air that you observed in your experiment explain the patterns you noticed on the map?

- What were your original hypotheses about wind patterns in Antarctica? Did your theories hold up? Why or why not?

- What were your hypotheses about how topographic features contribute to increased wind speed? How can those hypotheses and your new discoveries about the behavior of cold air explain the wind conditions in Antarctica?

- Using all the discoveries you made today, finalize your hypotheses about wind patterns in Antarctica. Using today's experiment as proof, explain the patterns you observed in the wind data from the Antarctic weather stations.

GROUP DYNAMICS

Comment on how each group member participated in today's discussion.