Wind Chill

You need

- data tables (see copymaster)
- a 3-speed fan
- a plastic bowl
- a thermometer
- a timer or watch
- 1 litre jug
- hot water
- access to the Internet or a library (for the investigation)

Activity

Experienced trampers and mountain climbers take the effects of wind chill into account. But Henry, Mukasa, and Rua are on their first overnight tramp.

1. With a classmate, carry out this experiment into the cooling effect of wind:

   a. i. Measure 1 litre (L) of hot water into a plastic bowl.

   ii. As it cools, check its temperature regularly with a thermometer.

   iii. Once the water reaches 37°C (body heat), measure and record its temperature each minute for the next 5 minutes.

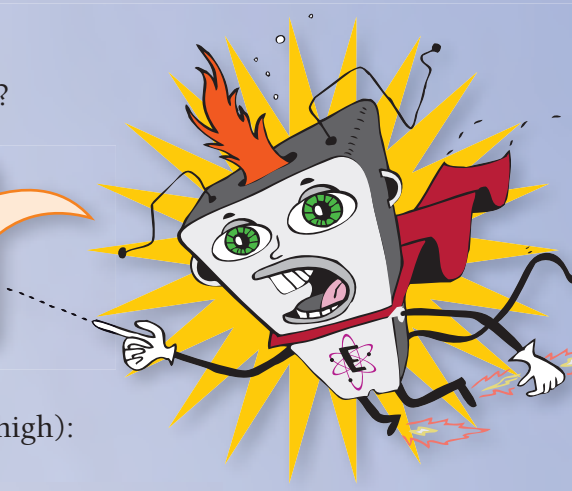
   Record each temperature in your copy of the data table:

Wind Chill Experiment					
"Wind"	Water temperature (°C)				
	1 min	2 min	3 min	4 min	5 min
No fan					
Low					
Medium					
High					

b. Repeat the steps in **i–iii** three times, each time using a fan to blow "wind" onto the water. Set the fan on low, then medium, and then high. Start the fan when you begin the timed measurements.

c. Create a line graph that shows your data.

d. How did the "wind" affect the way the water cooled?



Wind doesn't change air temperature – a thermometer in the wind will read the same as a thermometer that is sheltered. What wind does do is speed up the transfer of energy (in this case, from the warm water to the cooler air).

2. For each of the 4 conditions (no fan, low, medium, and high):

a. Calculate the temperature loss over the 5 minutes.

It takes 4 180 joules of energy to increase or decrease the temperature of 1 L of water by 1°C.

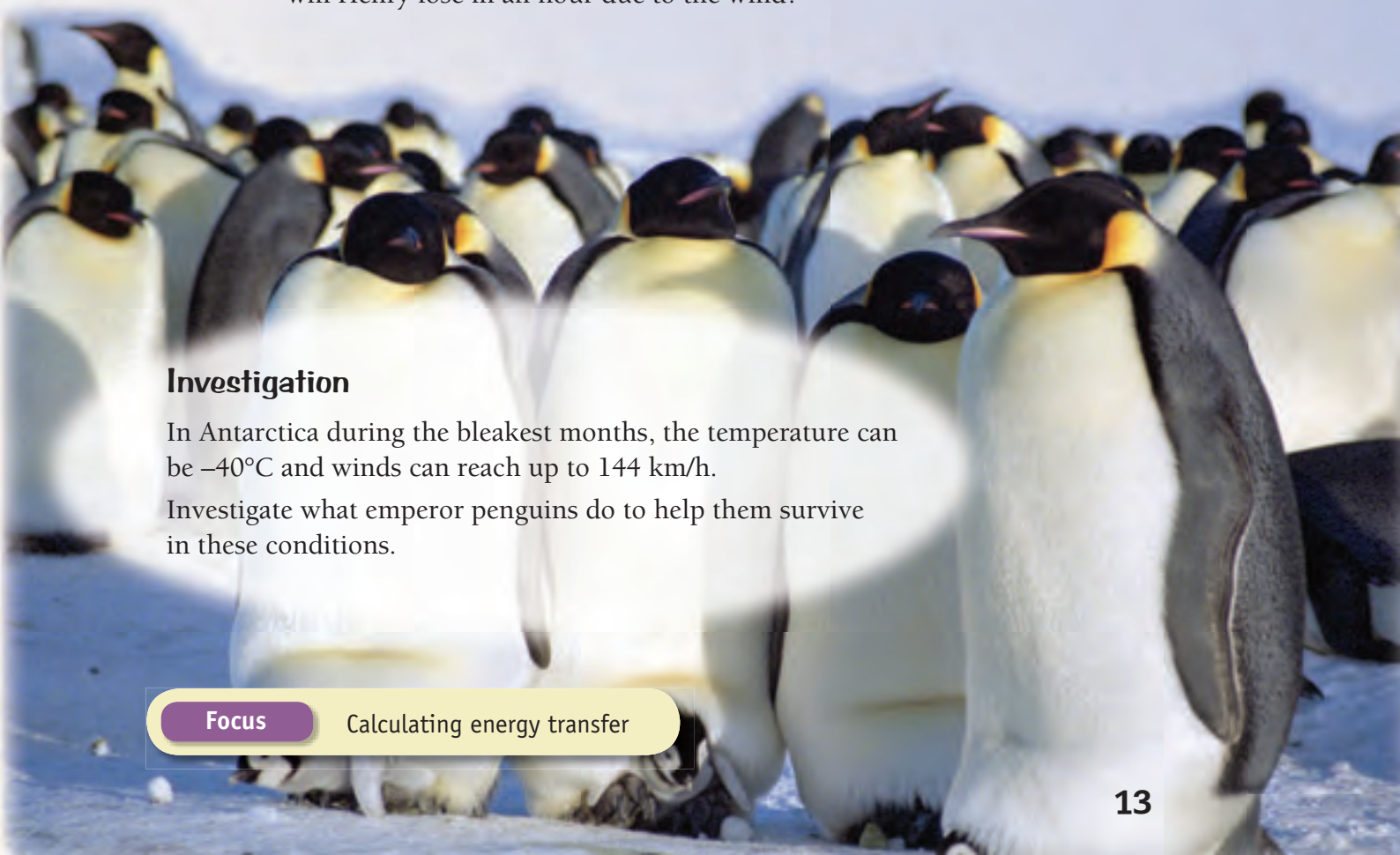
b. Calculate the energy transferred from the water to the air.

3. When the fan is set on high, how much of the energy lost over 5 minutes is due to the "wind"?

4. Henry and his friends are out in a 30 kilometre per hour (km/h) wind.

a. Assume that your fan blows air at 10 km/h when on high. Use this information to estimate how much energy Henry will lose per hour due to the wind.

b. If an apple has 150 kilojoules (kJ) of energy, how many apples' worth of energy will Henry lose in an hour due to the wind?



Investigation

In Antarctica during the bleakest months, the temperature can be –40°C and winds can reach up to 144 km/h.

Investigate what emperor penguins do to help them survive in these conditions.