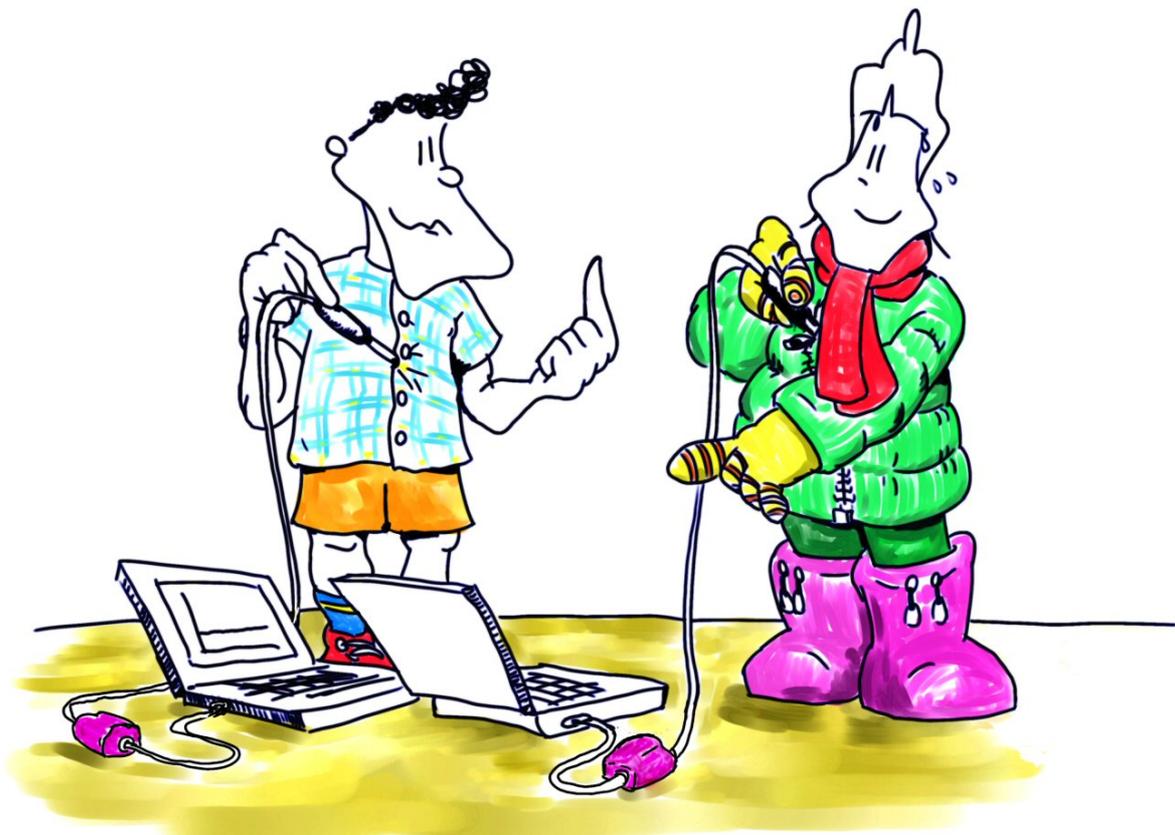


III. Keeping warm

Key Question: How to keep things warm?



Student name:

Class:

.....



Activity 1 – How to make things warm

1. Imagine that you have to make the temperature sensor as warm as possible and you may use warm things for this. How would you do it?

2. How would you make the sensor warm without using other warm objects (heat sources) except yourself?

Activity 2 – Making things warm

- Now you will make the temperature sensor as warm as you can by using warm objects. Read the measured temperature from the digital meter on the computer screen.

Remember!

The sensor cannot measure the temperatures above 100 °C, it **cannot** be placed in a flame.

3. What was the highest temperature you measured?

The highest temperature was _____ °C.

4. How did you get it?

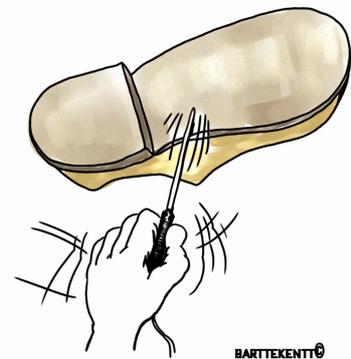
- Now you are going to make the sensor as warm as possible without using other heat sources except yourself.

(One of the ideas is shown on the picture.)

5. What was the highest temperature you measured?

The highest temperature was _____ °C.

6. How did you get it?



Activity 3 – Do mittens make heat?

For this investigation you brought your mittens. You wear them to keep your hands warm. Where do you think the warmth comes from? Choose one the following ideas that you think is correct.

- Mittens produce heat that keep your hands warm.
- Mittens keep heat from your hands inside.

Why do you think so?

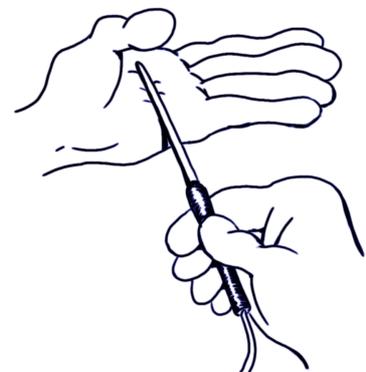


No you are going to check if your hypothesis is right.

- Measure the room temperature. Place the temperature sensor on the table and do not touch it. After few minutes the sensor will have the same temperature as the air in your classroom.

The air temperature in the room is _____ °C.

- Imagine you hold the temperature sensor across the palm of your open hand. What do you think is the temperature of your open hand? Write your prediction in the table on the next page.
- Now place the tip of the metal part of the sensor in the middle of your open hand, holding it by the black end with your other hand and measure the temperature. Wait a little while until the measurement stops changing. Write the measured temperature in the table.



WAY OF MEASUREMENT	YOUR PREDICITON (°C)	MEASURED TEMPERATURE (°C)
Open hand		
Empty mitten		
Open hand in mitten		

- Place your mitten on the table in front of you. What do you think is the temperature inside the mitten? Write your prediction in the table.
- Now put the whole metal part of the temperature sensor in the mitten lying on the table and measure the temperature inside. Do not touch the sensor with your hand! Write the measured temperature value in the table.
- What do you think would be the temperature inside the mitten with your hand inside? Write your prediction in the table.
- Put your hand and the metal part of the temperature sensor inside in the mitten and touch the sensor. Measure the temperature now and write the measured temperature value in the table.



7. What is the source of heat in this experiment?

8. Does your mitten make its own heat? Explain how you know.

9. If the mittens do not produce heat on its own, then how do mittens keep your hands warm?

Activity 4 – How to keep things warm as long as possible?

The mittens do not let the heat go out. Such materials, like mittens, which help to minimize the loss of heat, are called insulators. The better the insulator the less temperature will change over a certain time period.

In this investigation you are going to find out which material will work as the best insulator for the temperature sensor.

Conducting a fair test is one of the most important ingredients of doing good, scientifically valuable experiments. To ensure that your experiment is a fair test, you must change only one factor at a time while keeping all other conditions the same.

- Imagine you warm up the sensor and you want to keep it warm as long as possible. Design and describe below a fair experiment to find out which material will be the best for this.

- 10.** What will you measure in your test?

- 11.** What will you change in your test?

- 12.** What will you keep the same?

- List your insulator materials in the table below.
- Decide which materials you think will best hold in the heat, in other words which material will be the best insulator. (1 means the best).
- Perform your experiments. The measurement in Coach is set to 2 minutes long. Is this long enough? Check!
- Write the measured temperature values in the table.

INSULATOR	PREDICTED RANK	BEGIN TEMPERATURE (°C)	TEMPERATURE AFTER 2 MINUTES (°C)	ACTUAL RANK

13. What insulation material did you predict would be the best one? What was your reasoning?

14. What insulation material actually did retain the heat the longest? Why do you think this was?

Questions

- A.** Explain the difference between heat sources and heat insulators.

- B.** A heat source produces heat. An example of a heat source is fire.
A heat insulator prevents the spread of heat. An example of a heat insulator is Styrofoam.

In the table below give more examples of heat sources and heat insulators.

HEAT SOURCES	HEAT INSULATORS
Fire	Styrofoam

- C.** Do you know how is heat is produced in your home and what is used to retain this heat?

- D.** Explain what the fair test is.