

## Activity 1\_1: How to maintain warm your house model

### The problem:

In the winter we need energy to maintain warm our house. By using suitable designed house models it is possible to analyze how much energy it takes to have the inner part of each house model  $15^{\circ}\text{C}$  warmer than the air outside it.

### Material needed for each group:

- Boxes of different materials (of equal dimensions) modeling different kinds of houses.
- Temperature sensors to put in the wall opposite to the heater.
- Heaters (light bulbs covered by aluminium sheets)

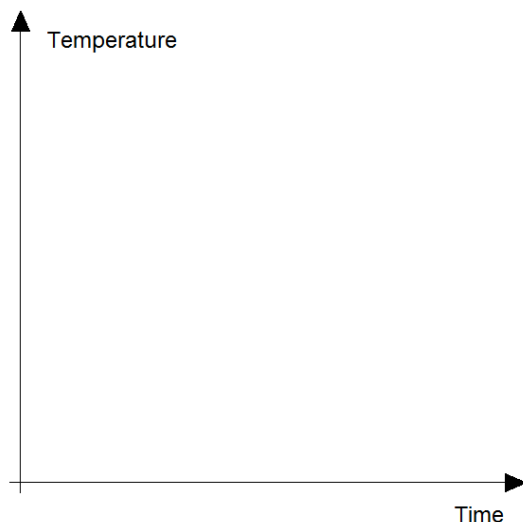
### Suggestions for use:

Follow the suggestions of the teacher and place the heater and the thermometer as shown in figure.

In this experiment you will switch on the heater and start recording the inner temperature of the model house as a function of time.



Before actually performing the experiment, give your prediction of the Temperature-Time graph you are going to obtain and draw it on the right.



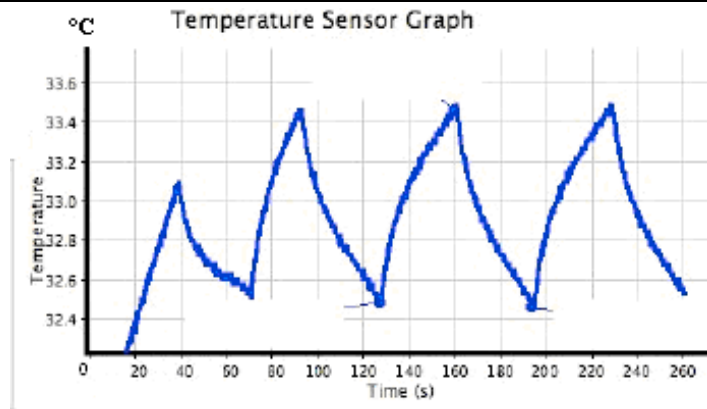
Now turn on the heater and record the inner temperature of the model house until it reaches a value of about  $+15^{\circ}\text{C}$  above the external temperature,  $T_e$ . Turn off the heater so that the temperature decreases until  $T_e$ .

## DATA ANALYSIS

Take note of the time intervals during which the heater is turned on and off and say how much energy was used to heat the house?

Compare your data with those of your schoolmates. What conclusions can you draw with regard to energy saving?

In depth analysis:



The graph above shows an experiment performed by a student that repeatedly switched on and off the heater, aiming at maintaining the temperature of the house at about 33 ° C. Try to calculate how much energy has been used if the heater was a 40W light bulb.