**Observation Experiment**

You have a sealed hollow metal sphere with an unknown gas inside. You also have a thermometer, a pressure gauge, a hot plate, some ice and a container containing water. Design an experiment to determine if there is a relationship between pressure and temperature of the unknown gas when its volume is kept constant. The metal sphere can be submerged in the container of water such that the water provides a temperature bath for the sphere and its contents. Use the ice and the hot plate to construct baths at different temperatures.

**Write in your report :**

a) Describe your experimental design with a labeled diagram. Include how will you vary and measure the pressure and temperature.

b) What assumptions are you making in your design?

c) What are the independent and dependent variables?

d) What are the sources of experimental uncertainty and how they be minimized?

e) Record your observations in an appropriate format. Make a table and a graph if necessary.

f) Use Excel to analyze and find a best-fit function for your data.

g) What pattern did you find from your observations? Write a verbal description and a mathematical relationship.

h) Describe what happens to the gas microscopically as the water in the bath becomes warmer.
i) Based on the relationship you developed in part g, can you consider the gas in the sphere as an ideal gas? Explain why or why not.

j) Draw a graphical representation of the process using the P and T, P and V, and V and T axes as the water in the bath becomes warmer.

k) Use this relationship to predict the value of the lowest temperature to which you can cool that gas.