

B1 ACTIVITY 1: DESIGNING, CONSTRUCTING AND USING A THERMOMETER

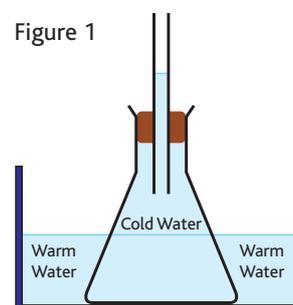
Background

This investigation is not a rigorous calibration of a thermometer (using fixed points of freezing water and boiling water and then dividing the length interval between these points into equal parts). The purpose of the activity is only to show that the physical changes of the expansion and contraction of liquids can be used as a means of constructing a thermometer.

Equipment required – per group:

- Lab flask or colourless medicine bottle
- Glass tube or straw
- Rubber stopper with hole to fit flask or medicine bottle
- Food colouring or ink
- Container of cold water
- Container of hot water
- Container of hand-hot water
- Tea light
- Matches
- Marker suitable for writing on glass

Figure 1



What to do:

1. Fit the lab flask or small medicine bottle with a cork and clear tube or glass straw.
2. Fill the lab flask to the brim with very cold water coloured with a drop or two of ink or food colouring, and cap it securely.
 - ② *Why are we using food colouring?*
3. Mark the water level on the glass tube.
4. Using a tongs lower the lab flask into a beaker of hot water.
5. Mark the water level in the tube.
 - ② *Describe and record what you observe happening to the water in the flask and glass tube.*
6. Remove the flask and put it into the container of cold water.
7. Again mark the water level in the tube.
 - ② *Describe and record what happens to the water level.*
 - ② *Is there a difference in the water level?*
 - ② *What conclusion could you arrive at?*
8. Lower the flask into hand-hot water and mark the water level on the tube.
 - ② *From the data you have collected what is your conclusion?*
 - ② *Consider what other things could increase the sensitivity of the thermometer.*
 - ② *What does 'sensitivity' mean?*

What next:

- Having constructed and used the thermometer, students can now investigate why mercury or alcohol is used in thermometers rather than water, despite water being freely available.
- Galileo is often credited with inventing the thermometer, but his invention is not, in fact, a thermometer. Can you explain?
- Ask the students to research Galileo in groups and present their results to the class. To discourage them from carrying out a cut-and-paste exercise and just reading from the text, do not allow them to use notes.



Figure 2: Familiar item labelled and sold as 'Galileo's thermometer'

Resources:

- [The Galileo Project](#) is an accessible and informative site that might serve as a useful source for students starting their research.
- The [Brannan thermometer manufacturers](#) website gives an overview of thermometer types and the different scales used.