8A2 8B2 Heating and Cooling
Lesson 2: Temperature scales

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This lesson I shall be away – see you next time! In my absence, I should like you to complete the work on this sheet during the lesson. Last lesson, we started talking about hot and cold, how our senses are not always a reliable way to tell the temperature, and how we can use thermometers to measure the temperature. Today you will be revisiting thermometers, and looking at temperature scales which have been invented to compare temperatures of different things.

Thermometers and temperature scales

Read *Exploring Science 8*, pp. 104–105 and p. 108.

Answer the following questions in the back of your exercise books. Please answer in full sentences, i.e. just a number will not do—it will mean nothing to you in six months' time.

p. 104 **2**; p. 105 **3**, **6**; p. 108 **2**, **4**, **5**

Read the following information:

"Thermometer design has come a long way since the first known thermometer was made by Galileo in around 1600. This consisted of a glass bulb containing air with an open-ended tube. The whole apparatus was inverted so that the tube dipped into a beaker of water. The height the water rose up the tube was affected by the temperature of the air in the bulb. Unfortunately this was not the only thing that affected the height of the water. In addition, the thermometer had no fixed points and so was not accurate. A replica of an alternative design by Galileo is shown in the photograph. This was more accurate but still had no fixed scale.

"The first sealed thermometer was made by Ferdinand, Duke of Tuscany, in 1694. However, scientists didn't realize the importance of using a temperature scale with two fixed points until Sir Isaac Newton pointed this out in 1701. The fixed points suggested by Newton were the freezing point of

water, to be called 0 °, and the temperature of the human body, to be called 12 °.

"In 1713, Fahrenheit made a thermometer calling the lowest temperature that he could achieve with a salt and ice mixture 0 °, and the temperature of the human body 12 °. He then divided each degree into eight so body temperature became 96 ° and on this scale the freezing point of water was 32 ° and the boiling point 212 °.

"In 1742, Celcius used the fixed points of freezing and boiling water under standard pressure conditions to create the Celcius scale used today.

"Scientists today use a constant volume gas thermometer as a standard against which all other thermometers are calibrated. The ideal gas scale has two fixed points—absolute zero and the triple point of water.

"Many kinds of thermometers are used today to cater for wide-ranging conditions. The strip thermometer which is used to give a quick indication of a child's temperature is just one of the many recent developments in thermometry."

[Credit: *Advanced Questions on Everyday Physics*, Williams, **2003**]

Now answer the following questions:

1. Why was Galileo's first thermometer inaccurate?
2. Until recently both Fahrenheit and Celcius thermometers have been in common use.
   (a) "The temperature in the south will be up in the 80s today" refers to which scale? What is the equivalent value on the other scale?
   (b) "Your normal body temperature is 98.4 °" refers to which scale? What is the equivalent value on the other scale?
3. The article has failed to mention one eminent scientist, Lord Kelvin, who worked in this field. Why is his work important?

This is as far as I want you to get. If you finish all of this, you may either start reading the textbook, pp. 106–107, and answering the questions there, or quietly start your homework in other subjects.