In week 5 the students are preparing for the mid-term test on kinetic theory. There are no problem classes.

Tutorial problems

1. When the weather is cold, is it cheaper to keep the house at a constant temperature throughout the day, or to let it cool down when you're out and then turn the heating on full when you get home?

2. Why are Canadian children instructed never to stick their tongue on a metal pole in winter?

3. A window of area 1m^2 separates a room at $20°\text{C}$ from the outside which is at $10°\text{C}$. What is the rate of heat loss by conduction if the window is a single sheet of glas 5mm think with thermal conductivity $0.5 \ \text{Wm}^{-1}\text{K}^{-1}$?

   Now consider a double glazed unit. If heat flows steadily through several layers what quantity is the same for each layer? What quantity for the combined layers is equal to the sum of the values for the individual layers?

   How does the rate of heat loss change if the window is replaced with two 5mm thick sheets of glass separated by a 5mm air gap? the thermal conductivity of air is $0.025 \ \text{Wm}^{-1}\text{K}^{-1}$.

   The performance of the double-glazed window could be improved if the air between the sheets of glass was removed. How low would the pressure need to be to have an effect?(the molecular diameter of nitrogen, the main component of air, is 0.35 nm.)