Procedure, Data, and Calculations

0. (This step is usually performed by the laboratory assistant.) *Make certain that the computer is off.* Plug the 3.5 mm plug from the AC adapter into the power port on the back of the Workshop 300 computer interface box. Plug the other end of the adapter into a wall receptacle. Plug the smaller end of the serial cable into the serial port on the back of the computer interface box. Plug the other end of this cable into the serial extension cable attached to the computer. Pull or push the plunger in the syringe until it is at the 20 ml mark. Put a small amount of vacuum wax on the nozzle of the syringe and push the end of the plastic tube that does not have the sensor connector onto the nozzle of the syringe. (Turning while pushing helps.) Plug the sensor connector attached to the other end of the plastic tube into the Pressure Sensor. Plug the DIN connector on the cable coming from the back of the Pressure Sensor into port A of the computer interface. (See Figure 1.) Turn on the interface, the monitor and the computer. After Windows loads, double click on the "Science Workshop" program group. In the Science Workshop window that opens, double click on the icon marked "H-2B". (At this point the program automatically searches for the computer interface. You may ignore the "Cannot find an interface" messages provided they disappear from the screen. However, if a dialog box opens with the message "Cannot find an interface" and this message remains on the screen, stop what you are doing and call the laboratory instructor.) A set of new windows should open on the screen. If no error messages appear, the computer is now ready to collect data for this experiment.

1. Read the initial room temperature and record it on the data table.

2. You will be reading and recording the volumes of air in the syringe with the plunger in six different positions. One lab partner will push the syringe's plunger to the desired volume and the other lab partner will type in the volume of air in milliliters on the computer keyboard, recording it to the nearest 0.1 mL. The partner reading the scale on the syringe should keep his line of sight perpendicular to this scale, in order to minimize parallax errors. When the plunger in the syringe is pushed inward, work is done on the entrapped air causing its temperature to rise. *It is important to hold the plunger in the proper position while the air in the syringe returns to room temperature.* (Use both hands, if necessary, but avoid contact with the part of the barrel enclosing the trapped air.) You can tell that the air in the syringe has returned to room temperature when the pressure reading on the screen (shown in the Pressure (kPa) window) stops dropping. *Be sure to wait at least 10 seconds to verify that the pressure reading is stable.*

3. Make sure that the plunger in the syringe is at the 20 mL mark. Click on the button marked "REC" in the upper left corner of the computer screen until a Keyboard Sampling dialog box opens. See Figure 2. (You may have to click more than once. If you cannot make this dialog box appear, call the laboratory instructor.) Press the backspace key until all the numbers in the box labeled "Entry # 1" disappear. Now type 21.0 on the keyboard and press ENTER. This records data point # 1. (You enter 21.0 mL instead of 20.0 mL to take into account the volume of air trapped both inside and outside the pressure sensor.)

Figure 2