Just 3 questions. Turn off your wifi. Quit all programs except Scope.

1. Design (do not build) a low-pass filter with a "knee" frequency near 20KHz (20,000 Hz). Its input impedance should be 1Kohm or more, and its output impedance should be 1Kohm or less. You may use an opamp if desired. The basic R and C in your filter should be from among the resistors and capacitors that you have, just one of each. That can be close enough to get the knee frequency within a factor of 2 of the desired 20KHz.

2. Design (do not build) a circuit for a tiny regulated oven, controlled by an opamp circuit. Your heating element is a 330 ohm resistor, capable of developing about 25mW of heat when run from an opamp. Use a diode so that the resistor will only heat if the output of the opamp is positive, as shown.

Your temperature sensing element is a thermistor, a component whose resistance changes with temperature in a well-characterized way. Yours has a negative temperature coefficient meaning that its resistance gets lower as temperature increases, as shown in the graph.

Make up a symbol for a thermistor. Design a circuit so that the 330 ohm resistor heats up whenever the measured temperature falls below about 310K. You can use a potentiometer to adjust the setpoint temperature (~310K) if you wish, but your pot should not need to be adjusted in a finicky way near one end of its rotation to get the setpoint right. Be sure to get the inverting and non-inverting inputs of the opamp assigned as you intend.
3. **Design & build.** Build a light-difference integrator (LDI) Its output is proportional the cumulative difference of light intensity on two phototransistors. When the phototransistors are equally illuminated, the output voltage of your LDI is more or less steady (<0.1V/sec drift). When one phototransistor is strongly shaded, the output voltage of your LDI becomes more positive at **about 1V/sec** and when the other phototransistor is strongly shaded, the output voltage of your LDI becomes more negative at about 1V/sec. Get this rate about right.

If possible, include a reset button to snap the output voltage of your LDI back to zero when pressed.

This can be done with one opamp, but you may use more if you prefer.

Diagram and build. When it's working (and fully diagrammed) raise your hand to demonstrate and get a sticker. It will be tested by strongly and by gently shading one or the other phototransistors; its output should migrate slowly in the sensible direction even with gentle shading.