Google "phet blackbody spectrum"' and open the simulation.

1. a) At what wavelength is the peak in spectral intensity
      - λ_{peak} for a black rock on the Earth's surface,
      - λ_{peak} for the black walls of a pizza oven,
      - λ_{peak} for a light bulb,
      - λ_{peak} for the sun.

   b) Check that the peak wavelength decreases with temperature following a $1/T$ relationship.

2. a) Use the numerical integration feature (the checkbox labelled "intensity" near the upper-right corner of the graph) to find the total intensity, in units of W/m^2, emitted by
      - a black rock on the Earth's surface,
      - the black walls of a pizza oven,
      - the surface of a tungsten light bulb filament,
      - the surface of the sun.

   b) Check that these intensities are proportional to T^4. Note, the quick way to check involves ratios: Does $\frac{I_1}{I_2} = \left(\frac{T_1}{T_2}\right)^4$?

3. How cold should you make an object if you want zero thermal radiation emitted?

4. (Extra—if your group has time)

   a) For an incandescent light bulb with a filament surface area of A, estimate how efficiently it converts electrical energy into visible photons. Hint: you will need to estimate the following ratio:

$$\frac{\text{Electromagnetic radiation in visible wavelengths}}{\text{Total electromagnetic radiation}} = \frac{A\int_{400\text{ nm}}^{700\text{ nm}} S_\lambda(\lambda, T)d\lambda}{A\int_0^\infty S_\lambda(\lambda, T)d\lambda}$$

   b) Estimate the filament surface area A for a 60 W light bulb.