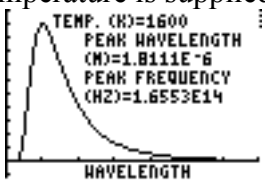
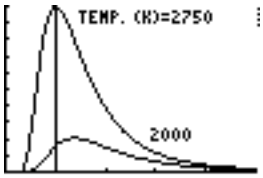
Blackbody Radiation Curves

Run the "BLACKBOD" program on a TI-8X calculator.
Two types of graphs can be produced with the simulation.
One type is produced when a single temperature is supplied:



The other type is produced when two temperatures are supplied:



Note, the temperature(s) is/are in kelvin (K).

Blackbody Radiation Questions

1. As the temperature of an object decreases what happens to the peak wavelength? As the temperature of an object decreases what happens to the peak frequency?
2. In a thermonuclear blast, the temperatures at the blast site ("ground zero") reach 1×10^9 K! What is the peak wavelength and peak frequency during the explosion? In what region of the electromagnetic spectrum does this peak fall in?
3. In 1965 two Bell Telephone physicists, R.A. Penzias and R.W. Wilson, were using a horn-shaped antenna designed to pick up signals from Earth orbiting communication satellites. In the signals that they received they kept on detecting a radiation that seemed to come from all directions. Later that year R.H. Dicke and his Princeton coworkers showed that this background radiation (at 2.73 K) was a remnant of the creation of the universe ("big bang"). What is the peak wavelength of this cosmic background radiation? In what region of the electromagnetic spectrum does the cosmic background radiation exist?
4. The Hubble space telescope has an instrument package designed to observe class O type stars. A class O blue-white star has a surface temperature of 40×10^3 K. What is the peak frequency that this instrument is designed to detect? In what region of the electromagnetic spectrum does the O type star radiate a maximum?
5. Generally, a good radiator of electromagnetic radiation is a good absorber. At what peak wavelength, in nanometres, does the human body "feel" this radiation as heat. In what region of the electromagnetic spectrum does this radiation exist? The average temperature of the human skin in about 35°C.
6. The sun can be considered to be a blackbody radiator. The peak wavelength emitted by the sun is 460 nm. What is the surface temperature of the sun?
7. The temperature of a light bulb depends on the resistance of the resistor inside the bulb. As the current passes through the bulb, the resistor in the bulb heats up and thus radiates electromagnetic radiation. The temperature (T) of a resistor (in kelvin) inside a particular bulb depends on the equation $T = (113\ R)^{0.830}$ where R is the resistance of the resistor. If a potential difference of 9.00 V is applied to this bulb, the current passing through it is 0.156 A. Determine the temperature of the filament inside the bulb. What is the peak wavelength of the radiation emitted by the bulb in nanometres? In what region of the electromagnetic spectrum is this peak in? Explain how the bulb is able to emit <u>visible</u> radiation even though the peak is not in the visible region.