

The **Blackbody Spectrum** simulation allows students to explore how the blackbody spectrum of an object is affected by its temperature. Discover the relationship between the temperature of a blackbody and the peak wavelength and spectral radiance.

The screenshot shows the PhET Blackbody Spectrum simulation interface. It features a graph of Spectral Radiance (MW/m<sup>2</sup>/μm) versus Wavelength (μm). The graph displays three curves for different temperatures: 6269 K (Sirius A), 7141 K (Sun), and 7728 K (Light Bulb). A vertical color bar indicates the visible spectrum (Ultraviolet, Visible, Infrared) with labels B (Blue), G (Green), and R (Red). A star icon is shown in the top right, and a thermometer on the right indicates the current temperature of 6269 K. A control panel on the right includes checkboxes for Graph Values, Labels, and Intensity, and a numerical input field showing  $8.76 \times 10^7 \text{ W/m}^2$ . A 'ZOOM' callout points to the graph axes. A 'SEE' callout points to the color bar. A 'DRAG' callout points to the spectrum curves. An 'OBSERVE' callout points to the shaded area under the curve. A 'CHANGE' callout points to the temperature slider. A 'SAVE' callout points to the 'Graph Values' and 'Intensity' checkboxes.

**ZOOM** on both axes to adjust scaling

**SEE** how the color of the star changes with the temperature

**DRAG** to explore different values in the spectrum

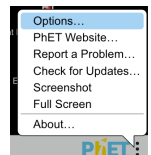
**OBSERVE** the intensity value and the shaded area under the curve

**CHANGE** the temperature

**SAVE** curves and **COMPARE** the spectrum at different temperatures

## Model Simplifications

- The intensity of the blackbody spectrum is calculated as the integral of the Spectral Radiance with respect to the wavelength from zero to infinity, and the value will not change when students zoom.
- Even though the x-axis starts at 0 μm, the smallest wavelength that can be interacted with in the sim is 0.001 μm. For that reason, the Labels checkbox will display Ultraviolet with the shortest wavelength in the electromagnetic spectrum.
- The background of the simulation can be changed for easier projection by going to the PhET menu bar, selecting Options, and checking Projector Mode.



## Suggestions for Use

### Sample Challenge Prompts

- Compare the blackbody spectrum of the sun to visible light.
- Describe the blackbody spectrum of a light bulb. Where is the peak of the spectrum? Why do light bulbs get hot? Do they seem efficient?
- Describe what happens to the shape and peak value of the spectral radiance curve as you change the temperature.
- Imagine that you see two stars in the sky, one is glowing orange and the other is glowing blue. Which one is hotter?
- Determine the relationship between the peak wavelength and temperature of the blackbody.

See all published activities for Blackbody Spectrum [here](#).

For more tips on using PhET sims with your students, see [Tips for Using PhET](#).