



Black Body Radiation - Thermal spectrum

NAM

Black Body Radiation is temperature based production of light. The thermal energy makes the atoms and electrons vibrate causing light from the waves they create in electromagnetic fields.

Use the graphs found in **Black Body Radiation Data** on Schoology to draw some conclusions about some stars based on their light. There is an example at the top to help you read the graphs, and you'll need a calculator to do the math.

1. Use the Star Black Body Spectrums from the data document to find the wavelength of the peak (or λ_{PEAK})

Star Name	Peak Wavelength (nm)	Surface Temp (K)	Spectral Type
Alnitak	80	86,245	O8
Lambda Taurus	110	26,245	B4
Betelgeuse	1000	2838	B3
Aldebaran	700	4140	G4
Gamma Taurus	520	5543.08	G4
Theta Taurus	290	9993.1	A1
Arneb	400	7245	F1

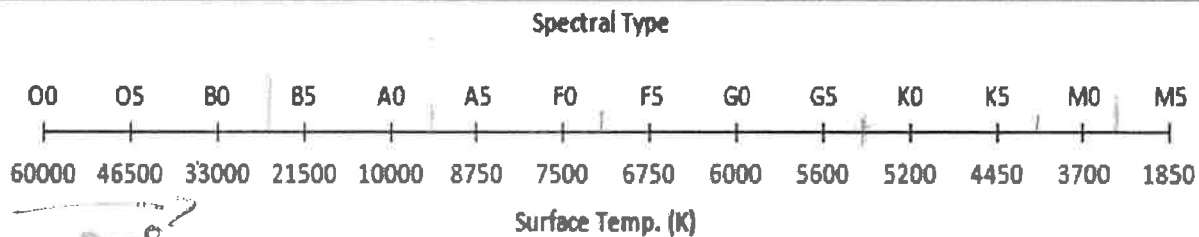
2. From the Peak wavelength we can calculate what the temperature of the star is by using the following equation:

$$(\lambda_{\text{PEAK}})(\text{Temperature}) = 2,898,000 \text{ nm K}$$

where λ_{PEAK} is in nm, and Temp is in Kelvin. **Rearrange the equation so that Temperature is by itself.**

3. Calculate the Surface Temperature of each star in Kelvin using the equation, and record the temperatures in the table above.

4. Use the graph below to estimate the spectral type of each star based on its temperature (K). Each letter counts up from zero to 9, going from left to right.



5. Rank the stars by temperature from hot to cold.

Hot Alnitam, Lambda T, Theta T, Arneb, Gamma T,
Albedarum, Betelgeuse Cold

6. Given what you found today which star should be the brightest (as in most light produced) and which should be the least bright.

Alnitam should be the brightest
Betelgeuse should be the least bright

7. If a star is moving quickly away from Earth, should it be red-shifted or blue-shifted?

It will be red-shifted because its wave length is stretched out

8. Given what you decide for #7, how should that affect the estimated temperature of the star? (You would use a similar process as in #1-3 to estimate the temperature)

the temperature will be colder/lower

$$T = \frac{900}{\lambda_{\text{peak}}}$$

9. In the space below, draw a rough sketch of the black body spectra of Betelgeuse, Aldebaran, and Arneb all on one set of axes. (Think about peak wavelength, height, shape, and size)

