Energy Levels and Atomic Spectra
Student Worksheet

Answer the following questions during or after your study of energy levels and atomic spectra.

1. Compare (as quantitatively as possible) the peak wavelength and total intensity emitted by an object at 300 K and an object at 150 K.

2. Approximately what temperature must a blackbody be to have its peak wavelength in the visible part of the electromagnetic spectrum?

3. How much energy does a single photon of radio waves carry? The wavelength of the radio wave in a vacuum is 2.00 m.

4. Why does an electron in the second energy level have more energy than one in the ground state, according to the Bohr model of the atom?

5. Why does an electron in neutral Lithium (atomic number = 3) have less energy than an electron in doubly ionized Lithium?

6. In a particular atom, an electron moves from n = 3 to the ground state (n = 1), emitting a photon with frequency 5.2×10^{15} Hz as it does so. What is the difference in energy between n = 3 and n = 1 in this atom?

7. What transitions correspond to the Balmer series? The Lyman series? The Paschen series?

8. Why does a molecule often have more energy levels associated with it than a single atom?

9. What are the three types of spectra, and how are they each produced?

10. Why do most stars produce absorption spectra?

11. Besides using the peak wavelength emitted in its blackbody curve, how can a star's spectrum tell you its temperature?

12. Which is hotter, a B star or a K star?

13. What does a red-shift in a spectrum indicate?

14. What does a magnetic field do to a spectra line? What is this called?