## 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  $5.2 \times 10^{15}$  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?