Infrared Spectroscopy

In an infrared spectrometer, a sample is placed in a beam of infrared light. A measurement is made of how much light is transmitted through the sample. The y-axis of the spectrum is “% Transmittance,” with 100% at the top (fully transmitted light, no absorption) and 0% at the bottom (complete absorption).

To view the simulation, go to http://www.stolaf.edu/people/hansonr/imt/js/ir/C5H10O2

Questions to think about:

1. Look at the x-axis scale. Which end of the spectrum is at low energy? high energy?
2. What would the spectrum of a substance look like if the substance were transparent in the IR?
3. What would the spectrum of a substance look like if the substance were opaque in the IR?
4. After viewing the simulation, how would you describe the vibrations attributable to absorptions A, B, C, D, and E?
5. Rationalize the order of energy A > B based on bond strength. (Note: OH bonds are stronger than CH bonds due to the partial ionic character of the OH bond.)
6. Rationalize the order of energy B > C based on reduced mass.
7. Rationalize the order of energy C > E and D > E based on bond strength or reduced mass.