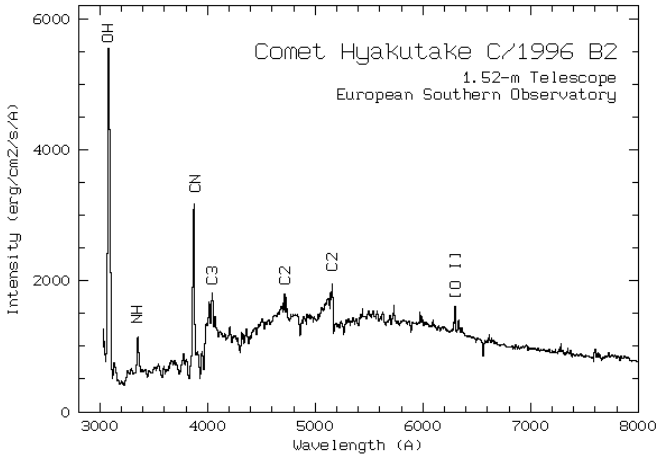
Cometary Compositions

1. Name three different methods that are used to determine the composition of objects in the solar system.

2. Examine the graph at right. What are the sharp "spikes", and what do they tell us about the comet? What region of the comet do they come from?



3. Besides the spikes, the graph also has a "smooth" part that peaks in the middle of the graph. Where does this come from, and what does it tell us?

4. Draw a comet's path around the Sun on the board, and indicate the comet's position at 4 or 5 different times. Draw the comet at each point, paying special attention to the position and orientation of the two tails.

5. Comets have a finite "lifespan". Why? And if they live for such a short amount of time, why do we keep seeing them when the solar system is billions of years old?

6. As you may remember from last time (or the homework), Earth orbits the Sun at about 30 km/s, and an object traveling faster than about 42 km/s when it is at Earth's position will escape the Solar System completely. How fast must a comet be traveling when it is 1 AU from the Sun? What range of speeds (relative to Earth) could a comet that strikes the Earth be traveling on impact?

7. The mass of the bright comet Hale-Bopp is about 5×10^{15} kg. Estimate the energy released if a comet this large were to strike Earth at maximum velocity. (Use the formula $E = \frac{1}{2} m v^2$, where m is in kg and v is in m/s.) Compare the result to the energy released in the largest nuclear explosion ever detonated (2.5×10^{17} joules).