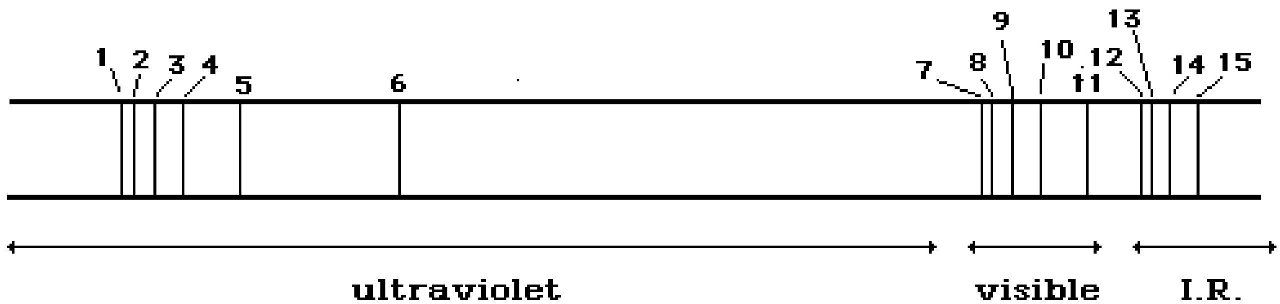
Name ______________________________

Date ______________ Pd ___

Chemistry – Unit 11 Worksheet 2

If the light from a hydrogen discharge tube were passed through a diffraction grating and allowed to strike photographic film, an emission spectrum like the one below would be formed. In the video you learned that each line in the spectrum corresponds to a particular drop made by an electron (from a higher to a lower energy level) as the excited electron makes its way back down to the ground state. Careful analysis of the spectrum allowed scientists to devise the energy-level diagram for the hydrogen atom pictured on the back of this sheet.



Line No.	Frequency (x 10^{14}sec)	Energy (kJ/mole)	Line No.	Frequency (x 10^{14}/sec)	Energy (kJ/mole)
1	32.31	________	9	6.93	________
2	32.06	________	10	6.18	________
3	31.66	________	11	4.57	________
4	30.90	________	12	3.02	________
5	29.30	________	13	2.76	________
6	24.72	________	14	2.36	________
7	7.59	________	15	1.61	________
8	7.34	________			

1. Calculate the energy of each line in the spectrum above. Use Planck's equation, E = h f, to do this. h = $3.98 \times 10^{-13}\ kJ \cdot s/mole$

2. Make a list of all the possible transitions an electron can make from a higher to a lower energy level. Calculate the amount of energy lost by the electron in each of these jumps.

3. Compare the energy of the lines in the spectrum to the energy of the jumps in the model, then match each jump to a line on the spectrum.

4. Label each jump with the corresponding region of the spectrum in which the line is found. (UV, Visible or IR).

level	energy (kJ/mole)
7	1286
6	1276
5	1260
4	1230
3	1166
2	984
1	0

jumps	Δ E	line #	region

1. What do all the lines in a given region of the spectrum (UV, visible, IR) have in common?

2. You probably calculated the frequency of a few lines that didn't appear on the spectrum on the other side. In which region(s) of the electromagnetic spectrum do you suppose you could find them?