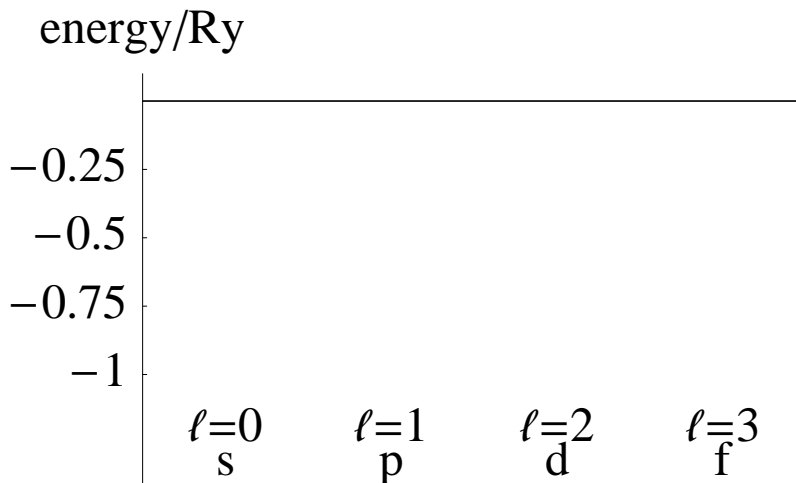


There will be no lecture Friday, November 30. Instead, study these two exercises. Here are the instructions:

1. Do the exercises *before* you look up the answers on the web site.
2. When you are sure that you understand the exercises, look up the answers on the web site.
3. If your answers do not agree with the answers on the web site, then figure out what mistake you were making!

1. For a hydrogen atom ($Z = 1$) make an energy-level diagram. Put the energy levels on the figure below. Show the four lowest energy levels; for each level, include all the allowed ℓ values. Label each state on the diagram using the standard atomic notations: e.g., 1s, 2s, 2p, 3s, 3p, 3d, etc.



2. For a hydrogen atom ($Z = 1$) the radial wave function for states with principal quantum number n and angular momentum quantum number ℓ is $R_{n\ell}(r)$. (Recall that ℓ must be less than n .) Sketch *accurately* graphs of $R_{n\ell}(r)$ versus r for the states listed:

- (a) $R_{10}(r)$ (1s state)
- (b) $R_{20}(r)$ (2s state)
- (c) $R_{30}(r)$ (3s state)
- (d) $R_{21}(r)$ (2p state)
- (e) $R_{31}(r)$ (3p state)
- (f) $R_{32}(r)$ (3d state)