

Physics 475: Assignment #4

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Due: Apr. 6, 2011

1. Foot 3.6 (10 points)

2. Foot 4.6 (10 points)

A couple of things to keep in mind for this question.

- (a) Because of the selection rules on $\Delta\ell$ these transitions out of the ground state can only go to certain ℓ values.
- (b) It might make more sense to treat the ionized state as the “zero” of energy. That way you can more easily see the $1/n^{*2}$ hydrogen-like dependence.
- (c) Remember that n^* is sometimes treated as a constant $(13.6/\text{IE})^{1/2}$ but there are other times it is treated as a variable $n^* = n - \delta_\ell$.
- (d) There is an additional correction to the quantum defect as a function of n known as the Ritz correction.

$$n - n^* = \delta_\ell + \frac{k}{n^2} \quad (1)$$

where k is a heuristic constant. Make a graph to determine k .

- (e) Z_i should be similar to and scale like Z but it isn't supposed to be the same. It is again another heuristic constant.
- (f) I really recommend using a spreadsheet.

3. Foot 5.4 (10 points)

4. Foot 5.13 (10 points)