Name: _____
ID #: _____

Physics 222 - Spring 2020
★ Homework ★
Chapter 19

1) 19.2

2) 19.5

3) 19.8

4) 19.9

5 19.10a

6) 19.12

7) a) Calculate the wavelength, λ, for the Hydrogen Balmer (n_f=2) γ transition.

b) Bohr's theory predicts that $f = (E_{n_i} - E_{n_f})/h$, with $f \propto (n_f^{-2} - n_i^{-2})$. Show that when $n_i = n_f + 1$ and $n_f \to \infty$, $f = f_{rot}$, where f_{rot} is the classical orbital rotation frequency, $v/(2\pi r)$. This is an example of Bohr's correspondence principle, which states that quantum mechanical solutions approach their classical solution in the limit of large quantum number.

8) a) Identify all the allowed transitions that make up the famous 'Hα' line (strictly speaking the Balmer α line, e.g. from $n_u = 3 \to n_l = 2$) at $\lambda \simeq 6562.8\mathring{A}$. Label the n, the letter designation for ℓ, and j quantum numbers for the upper and lower states. Assume the relevant selection rules for the hydrogen atom are Δn = anything, $\Delta\ell = \pm 1$ and $\Delta j = 0, \pm 1$.