Preview Sheet for Test 2

Chapters 10 and 11 (plus some of Chapter 9)
Lectures from 2/20 through 3/27; Problem Sets 3 and 4; Experiment 2

The test will be on Thursday, April 3, in Olin-Rice 350, starting at 8:30 a.m.

Studying strategies:

- Focus on your lecture notes, homework, and Experiment 2 first, then look at your textbook. (See the course web page for class overheads and homework keys.)
- If a topic was not covered in homework or in lecture, you are not responsible for it!
- Do extra problems at the ends of the chapters.
- It is important to understand concepts from lecture not covered explicitly in the homework problems. These will typically be covered by short essay questions.

Pages in Atkins and de Paula you are responsible for:

- Chapter 9: pp. 297-306
- Chapter 10: pp. 322-326; 328-334; 339-340; 352-354
- Chapter 11: pp. 363; 368-377; 379; 386
- Note that, even with the above pages, you are responsible only for the specific ideas and approaches I presented in class. For example, on p. 306, I did not talk about the idea of operators commuting (or not) with one another, so you do not need to worry about this topic.

Specific comments and clarifications from class:

- With regard to my discussion of L_x and L_y on 2/22 and 2/25, the only thing you need to know is that quantum mechanics forbids that L_x and L_y be known precisely (except when a particle has no angular momentum at all). Disregard my attempts to rationalize this result. The only really correct way to explain this result is to invoke commutators (one of those ideas you are not responsible for!).
- On this test, you will not be tested on the selection rules discussed on 3/12. However, remember them for the final exam!

Test Format: ~40 points based on calculations, and ~60 points based on short essay and other qualitative questions.

Preview of the test instructions:

1. Your exam booklet should have **ten pages** total, with questions on Pages 2-7, and reference data on Pages 8-10. Check to see you have ten pages now. If you do not, ask for another copy of the exam.
2. Write your name in the space above and on the backs of Pages 2-7.
3. You may carefully remove Pages 8-10 from your exam booklet.
4. You may fill both sides of an 8.5" x 11" sheet of paper with whatever information you would like, and refer to it during the exam.

5. You should always demonstrate your thought process in writing. You will be awarded credit only for work I can decipher.
6. You have a maximum of **2 hours and 30 minutes** to work on this exam.

Information that will be provided in the test booklet:

- A periodic table
- The spherical harmonic functions (Atkins and de Paula Table 9.3)
- The hydrogenic radical wavefunctions (Atkins and de Paula Table 10.1)
- The information below:

$$\int_0^\infty x^n e^{-ax}dx = \frac{n!}{a^{n+1}} \qquad \int_0^\infty e^{-a^2x^2}dx = \frac{\sqrt{\pi}}{2a} \qquad \int_0^\infty x^{2n} e^{-ax^2}dx = \frac{1\cdot 3\cdot 5\cdot (2n-1)}{2^{n+1}a^n}\sqrt{\frac{\pi}{a}}$$

$$\int \sin^2 axdx = \frac{1}{2}x - \frac{1}{4a}\sin 2ax \qquad \cos^2 x + \sin^2 x = 1 \qquad d\tau = r^2 \sin\theta dr d\theta d\phi$$

$$\nabla^2 = \frac{\partial^2}{\partial r^2} + \frac{2}{r}\frac{\partial}{\partial r} + \frac{1}{r^2}\Lambda^2 \qquad \Lambda^2 = \frac{1}{\sin^2\theta}\frac{\partial^2}{\partial\phi^2} + \frac{1}{\sin\theta}\frac{\partial}{\partial\theta}\sin\theta\frac{\partial}{\partial\theta}$$

$$e^{ix} = \cos x + i\sin x \qquad \psi_{2px} = \frac{1}{\sqrt{2}}\psi_{21+1} - \frac{1}{\sqrt{2}}\psi_{21-1} \qquad \psi_{2py} = \frac{i}{\sqrt{2}}\psi_{21+1} + \frac{i}{\sqrt{2}}\psi_{21-1}$$

h = 6.626 x 10^{-34} J s $\qquad$ $\hbar$ = 1.055 x 10^{-34} J s $\qquad$ a_o = 0.5292 Å