Section #4 Example Questions for the Final Exam
PHY361

The final exam will be comprehensive with equal weight to all sections of the course. In particular, about ¼ of the exam will cover material since the last exam. The format will be mainly conceptual questions, with a few short calculations focused not on applying formulas understanding them. There will be no derivations. Remember that the final is worth 30%, the same credit as the first three exams combined. Since the material has already been tested once and answers are available, I will be less lenient in grading.

Review all of the previous exam questions, make sure you understand and are able to answer similar questions, but at a different angle. Same for the previous study sheets, and conceptual questions at the end of each section in the text.

1. Explain how the Maxwell distribution of molecular speeds comes from the Boltzman distribution.
2. Describe ionic and covariant bonds; similarities and differences between covariant and metallic bonds.
3. What is a molecular orbital? What the different forces / potentials are involved?
4. What is the Van der Waals force? What are physical consequences of it?
5. What are general principles in the formation of any bond (atomic, molecular, nuclear)?
6. Know the different interactions of light with matter. What are the differences?
7. What are Einstein's A and B coefficients? How are they related? Which one is important for lasers?
8. How do lasers work? What two are the two requirements for any laser?

9. Describe the process of electrical conduction. What physical properties does it depend on?
10. Describe two methods of showing that materials have energy bands. What is the Fermi energy?
11. What is the difference between conductors, semiconductors, and insulators?
12. How does a diode work? How does a transistor work?
13. How do superconductors work? Similarities with HeII? What is a quench?
14. Describe the properties of superconductors.

15. How many neutrons, protons, and electrons does the ion ${}_{26}{}^{56}Fe^{++}$ have?
16. Name similarities and differences between the 'periodic table' and 'chart of nuclides'?
17. What are isotopes, isotones, isobars, and isomers?
18. What is the 'line of stability'? 'neutron or proton drip line'?
19. Why does fusion occur in light nuclei while fission occurs in heavy nuclei?
20. How does the liquid drop of the nucleus explain fission?
21. What are magic numbers? What do they have to do with the island of stability?
22. What are the fundamental particles of the standard model?
23. What are the 4 fundamental forces? Which particles do they affect?
24. What 'exchange bosons' mediate the electromagnetic, weak, and strong force? Why are they bosons?
25. What are leptons, quarks, mesons, and hadrons? Which are bosons and which are fermions?
26. What are the discrete symmetries P, T, and C? What is antimatter?
27. What is the proton or neutron made up of? Why is it 2000x heavier than the electron?