Final May 5   3:30-5:30
Office hours/ Review Tuesday 3:00-5:00
Christian Stephan-Otto   Wed. 2:00-5:00

Practice exam, extra problems & list of concepts are in Course Documents

Some questions that students asked:
Q. What should we know about isotopes - 235 and 238 Uranium - separation - thermal separation.
A. U235 is the isotope that undergoes FAST fission. U238 can undergo slower fission, but absorbs neutrons also, so is not useful for the A-bomb. However, U238 is used in the H-bomb to increase the number of fissions, but it is not part of the “primary”. See the handout on the H-bomb.
The separation or “enrichment” of Uranium increases the amount of U235 compared to U238. Naturally occurring Uranium (from mines) is only 0.7% U235, with the rest being almost totally U238. Separation was accomplished in the Manhattan Project by “gaseous diffusion” at Oak Ridge, Tenn. Thermal separation did not work adequately for the huge task. Nowadays centrifuges are used to separate the Uranium Hexafluoride gases into U235 vs. U238.

Q. When you wrote in the list of terms “neutrons per fission ~= 2.3” is that simply the average of neutrons created per fission reaction?
A. Yes.

Q. Do we have to know how to calculate the magnitude of the mean free path?
A. No.

Q. What do we have to know about the curve of binding energy?
A. The curve represents the binding energy per nucleon as a function of atomic weight of the nucleus (the sum of the protons and neutrons). Nuclei with atomic weights much lower than the atomic weights of the peak values may be able to gain energy by fusion. (Deuterons and tritons can undergo fusion.) Those with atomic weights much higher than the atomic weights of the peak values may be able to gain energy by fission. (Uranium and Plutonium can undergo fission.)

Q: I am studying the Alpha, Beta and Gamma rays and I was curious how in depth should we know what characterizes each and their differences?
A: Know what they are, e.g. Gamma rays are high energy photons.

Q: Should we go over the previous exams?
A: Yes, make sure you can do all the problems on Exam 1 and 2. The solutions are in Course Documents. One or two of those problems could reappear in somewhat altered form.

Q: Is the exam going to be cumulative?
A: Yes, but with somewhat more emphasis on the material since the last exam. Look at the Practice Final.

Q: Part VI of the practice exam. I understand the differences between the three (Special Relativity v. Classical Physics, Quantum Mechanics v. Classical Physics), but I am having trouble comparing them and formulating the type of sentences that you are looking for. Could you possibly give a few examples of what you are looking for with that question??
A: a. In CP the passage of time is independent of the motion of any observer, whereas in SR the measurement of time depends on the motion of observers.
b. In CP both the position and speed of an object can be measured with absolute precision (in principle), whereas in QM increasing the precision of a measurement of one quantity increases the uncertainty of the other quantity.

Q: On problem 5e of the final practice why did you multiply the number of Pu nuclei by .69 when we already took into account that ratio in the previous problem?
A: Notice that the formula for the activity (that is on the first page of the exam) involves 0.69 times the number of decaying nuclei (N) divided by the half-life (in seconds). That is why I have the factor of 0.69.

Q: In the Practice Test you gave us, the key shows the equation for Activity as: Activity = 0.69 N / T(1/2)
But then in Problem 4.e. it seems that you do not include the "(1/2)"
A: T(1/2) is my symbol for the half-life. It does NOT mean multiply by one half.

Q: Where does the figure of 1.7 x 10^(27) Pu nuclei formed come from in question V.d on the practice final exam from spring 2003?
A: In part (c) you obtained the number of reactions = 2.5x10^(27). For every 3 of those reactions there will be 2 that produce Plutonium. Hence multiply the number of reactions by 2/3 to get the number of Pu nuclei = 1.7x10^(27). (I am carrying only 2 significant figures when I write the answer.)