What to expect

The exam will consist of 20 multiple choice questions. Only one submission attempt is allowed. The exam will be graded electronically, and the grade returned to you upon submission. Questions will be based on content covered in class and will be primarily pulled from lecture material and the textbook, although some questions may also come from supplemental material such as class videos, homework, or class quizzes.

Instructions

The exam will begin at the start of the scheduled class period through the Respondus Browser and you will have 1 hour and 15 minutes to complete the exam. You will need to have your camera on during the exam and show your TAMU Student ID before you begin.

The exam will be open notes, open computer (within the limits described below), and open book (allows use of the textbook, notes, and google). Using a secondary electronic device such as a tablet, advanced calculator, or computer is allowed, as long as the screen is turned so that it is visible to the camera.

The exam is **NOT** open friend (i.e. you are not allowed to work with other classmates or receive outside help from tutors, study services, other students, etc.) and any form of external help is not allowed (i.e. the use of answer key services such as Chegg, Quizlet, etc. are also explicitly not allowed). Extra time will only be given for exceptional circumstances beyond the students' control.

Note: In the event that you are unable to take the exam at the scheduled time, or an external event beyond your control interferes with your ability to take the examination, you ***MUST*** notify

me as soon as possible so that alternate arrangements can be made (within reason). It is your responsibility to notify me of issues occurring on your end, lack of communication is not a viable excuse for incomplete or missing work.

Recommendations for studying

- Study chapters 2.11+, 3 & 4.
- Review lectures 5, 6, 7 and rework problems in them.
- Review hw assignments 2, 3, 4.
- Do the practice test on Canvas (once it is available)
- Prepare a quick guide sheet for use during the exam. This sheet should include information such as relevant formulas and constants, examples of solved problems, and self-written explanations of the concepts covered. While the exam is open-book, searching for the needed information will whittle away your time; having everything you need in one location will greatly help.
- A calculator is highly recommended

Concepts to know

* This is an overview of items to know, it is not necessarily comprehensive and not all items here may appear on the exam. Use it as a general guideline on what to study. *

- Various universal and common constants (h, c, e^-, m_e, m_p, etc.)
- Unit conversions
- Relativistic Momentum:
  - $p = \gamma m\vec{u}$
- Relativistic Kinetic Energy
  - $K = m_o c^2(\gamma - 1)$
- Rest Mass and Mass-Energy Conversion
- Pair Production and Annihilation
- Discovery of x-ray and electron
- Millikan drop experiment and determining the charge of an electron
- Rydberg Equation: $\frac{1}{\lambda} = R_H\left(\frac{1}{n^2} - \frac{1}{k^2}\right)$ $R_H = 1.096776\times10^7\ \mathrm{m}^{-1}$
- Light = Electro-Magnetic Radiation
- Blackbody radiation
- Concept of Wien's Displacement Law and Stephan-Boltzmann law
  - $\lambda_{\max} T = 2.898\times10^{-3}\ \mathrm{m\cdot K}$
  - $R(T) = \int_0^\infty \mathcal{I}(\lambda,T)d\lambda = \in \sigma T^4$
- Ultraviolet Catastrophe and what it meant for classical physics
- Planck's Radiation Law: $\mathcal{I}(\lambda,T) = \frac{2\pi c^2 h}{\lambda^5}\frac{1}{e^{hc/\lambda kT} - 1}$

Preparation for Exam

- Planck's Postulates:
  - The oscillators (of electromagnetic origin) can only have certain discrete energies determined by $E_n = nhf$, where n is an integer, f is the frequencyof the radiation, and h is called Planck's constant.
    $h = 6.6261 \times 10^{-34}$ J·s.
  - The oscillators can absorb or emit energy in discrete multiples of the fundamental quantum of energy given by: $\Delta E = hf$

- Concept and equations of the photo-electric effect.
  - $E = hf$
  - $\frac{1}{2}mv_{\max}^2 = eV_0 = hf - \phi$

- Compton Effect
  - $\Delta\lambda = \lambda' - \lambda = \frac{h}{mc}(1 - \cos\theta)$

- The various Atom models, their strengths, their weaknesses, and what lead to their conception.

- Bohr radius: $a_0 = 0.529$Å

- How to calculate changes in electron states

- The Correspondence Principle

- Electron shells and Mosely Plot