Physics 10164 – Exam 5B

Partial credit will be given provided you show all work and are solving parts of the problem correctly. Points will be deducted if you don't show your work even if you get the right answer. Clearly indicate your answer with a circle or a box and remember to include correct units and significant figures.

1. (25 points) Aluminum has a work function of 4.1 eV.

a) What wavelength of light would have to be incident on the aluminum in order for the electrons to leave with a maximum speed of 2.0×10^6 m/s?

b) What is the minimum wavelength of light that would allow electrons to escape the Aluminum?

2. (25 pts) An electron is in energy level 7 of a Hydrogen atom. It jumps from level 7 –> 4 (transition A), then 4 –> 2 (transition B), then 2 –> 1 (transition C).

a) Determine the wavelengths of the photons emitted by the atom when the electron makes each of these transitions.

b) Transition B is also known as “Balmer-Beta.” How many Hydrogen atoms would need to be emitted the photon from this particular transition in order for a cloud of Hydrogen to emit a total of 12 Joules of this energy?

3. (25 pts) Which has a longer wavelength, a photon absorbed during a transition from n = 3 –> 5, or a photon absorbed during a transition from n = 5 –> 8? Calculate both energy (in eV) and wavelength for each photon to come up with the answer.

4. (25 pts) An example of “clean” fusion would be the reaction involving Hydrogen and Boron. Suppose we fuse a proton with Boron-11 (11.009306 amu) to produce 3 Helium nuclei (4.002602 amu each).

a) How much energy (MeV) is liberated in this reaction?

b) How many kg of Boron-11 would be needed in order to satisfy the needs of the TCU campus for one year, which requires about 2.5 billion kW-hr of energy?