

Lab Quiz for PHY324

Q1: What experiment are you doing?

Franck Hertz Experiment

Q2: Summarize the physics elements in this experiment.

When an electron hits a vaporized Hg atom, it will transfer its energy.
Collisions will be inelastic due to the large size difference between the electrons and the atom.

Q3: Describe one major goal of the lab.

To find the amount of energy transferred from an electron to an Hg atom in an inelastic collision and to find the wavelength of the photons emitted.

Q4: What do you measure directly in pursuit of the major goal described above?

The accelerating voltage of the electrons and the positions of the relative maxima/minima.
The emission current in amps and the voltage in volts

Q5: Outline how you get the answer to Q3 from the data collected as described in Q4. If you will graph data to achieve the goal in Q3 then explain what you will graph, what the trend-line will look like, and how it achieves the goal in Q3. Include any equations you will use to turn the data described in Q4 into the answer described in Q3.

Electrons will be excited using an accelerating voltage. These electrons will collide with Hg atoms and the energy transferred to the Hg atom can be found using the energy of the electrons ($E=eV$) with the formula for inelastic collisions ($m_1v_1 + m_2v_2 = (m_1+m_2)v$) to find the energy transferred to the Hg atom.

The emission voltage can be used to find the wavelength of the photons emitted. The energy of the electron will be eV and so the wavelength of the emitted photon will be $\lambda = hc/eV$

Q6: Your TA asked you a/some question(s) about the equipment. Write the question(s) and answer(s) here.

1. Identify the largest sources of uncertainty in this experiment

Considering the circuit is very large, I would assume the resistance in the wires would cause the largest uncertainty in this experiment.
Also, the temperature of the bulb may cause large uncertainty.

2. What would you expect the data in this experiment to look like if energy was not quantized

It would be linear.

3. Which of the directly measured quantities will give electron energy and how will you extract it

Voltage: $E = eV$