California Science Center

CALIFORNIA STATE SCIENCE FAIR
2001 PROJECT SUMMARY

Your Name (List all student names if multiple authors.)
Shant Krikorian

Project Title (Limit: 120 characters. Those beyond 120 will be ignored. See pg. 9)
Finding Planck's Constant using the Photoelectric Effect

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J1414

Division
X **Junior (6-8)** _ **Senior (9-12)**

Preferred Category (See page 5 for descriptions.)
14 - Physics & Astronomy

Abstract (Include Objective, Methods, Results, Conclusion. See samples on page 14.)
Use no attachments. Only text inside these boxes will be used for category assignment or given to your judges.

OBJECTIVE: Finding Planks Constant using the Photoelectric Effect.
I hypothesized that the electron emission process depends strongly on the energy of the frequency or the wavelength of the incident light. The emission of the electrons occurs within a very short time after the arrival of the radiation, and the number of electrons emitted is proportional to the intensity of the radiation. There is a critical energy required to release the electrons, which is hv > ew (w =work function), Lights with lower frequencies than the critical frequency, will not be able to release electrons. If the photon has energy greater than the work function, the excess energy goes to the kinetic energy of the emitted electron. This is expressed by the following equation:
E = hv = KE + ew (w = work function).

MATERIALS & METHODS: I used a photocell and four different frequencies
(or wavelengths) of light and measured stopping potential for the electrons, emitted from the cathode in the photocell. By plotting the stopping potential as a function of frequency and using the relation: Vo=(h/e)v-ew the h/e can be found on the graph, by calculating the slope and h can be verified. My independent variable was the stopping potential, measured in mili-volts, across the photocell and my dependent variable was the frequency, measured in Hz.

RESULTS/CONCLUSIONS: I found that, different frequencies of light have different photon energies; therefore, electrons emitted by the different frequencies of light have different stopping potentials. My data supported my hypothesis; in my hypothesis, I stated that the shorter the wavelength, the energy of the electrons would be greater, thus, the stopping potential was higher. My data/results were close compared to the established value of h (planks constant). My graph and overall results showed a 14% error. I found by calculating: h (planks constant) would = to 5.8 x 10^-34 joules-sec while the real value is 6.63 x 10^-34 joules-sec.

Summary Statement (In one sentence, state what your project is about.)
Finding Planks Constant

Help Received in Doing Project (e.g. Mother helped type report; Neighbor helped wire board; Used lab equipment at university X under the supervision of Dr. Y; Participant in NSF Young Scholars Program) See Display Regulation #8 on page 4.
Advisor helped supply one of the lasers, dad supplied optical mounts, teacher helped give guidance.