**Photoelectric Experiment Grading latter to Gökhan Kebir**

**Hi,**

**Here are your mistakes and points you lose for them. If you want to regain half of the points that you lost, correct your mistakes on you report and write me a response letter showing how you corrected them. You have 2 weeks to write a response letter from the moment that you get this grade letter on.**

**Remember that in the second time I will not read all your report again. So, if you cannot convince me in that response letter that you corrected your mistake in the report you may not get your points. Make a change in your report and copy that change in the letter and tell me something like: “You said “……” was incorrect, I replaced it with “…..”.**

**If you think that at some point I was wrong while grading your report, we can discuss.**

**Do not forget to sum your points to check if I made a mistake summing them up.**

1. BONUS: (10 points)

* Latex (5/5)
* Professional data analysis program. (5/5)

1. Abstract (10/10)

* This should include a concise explanation of the rest of you report, giving the reader a motivation to read the rest of it. One paragraph is suﬃcient generally. Although this is the ﬁrst part, you better write it at the end.

1. Introduction / Theory (15 points)

* Tell about the history of the experiment (Who did perform it ﬁrst? Are we using the same setup still?), its importance for scientiﬁc development and how it changed our understanding of the nature. (5/5)
* Construct the theory of light induced electron emission from solids relevant to our experiment. (7/7)
* Read ﬁrst two pages of the introduction part of his paper and discuss in your report why Millikan ﬁnds Einstein’s hypothesis reckless at ﬁrst. Note: Abbreviation P.D. in this paper means potential diﬀerence, (and/or retarding potential). (3/3)

1. Experiment / Method / Setup / Data (20 points)

* Give a detailed account of the experimental setup. (5/5)
* Explain electrical instruments including a drawing (check Fig. 3.1 in the book). What is the name of the simple circuit that we use to control the voltage? (5/5)
* How did you obtain your data? Explain step by step. (5/5)
* Give your raw data as a table. (5/5)

1. Data analysis (40 points)

* Plot photocell current vs. retarding potential for each color you observed. (5/5)
* In each photocell current vs. retarding potential plot ﬁt two lines (using least squares method) to your data, one to the ﬁrst 3-5 data points the other to last 2-4 for data points where the IV curve is linear as indicated by Fig. 3.2 in the book. (7/7)
* Make a table of slopes, y intercepts (of y = m\_i x+ n\_i type line equations that you fitted) and corresponding uncertainties that you extracted from these ﬁgures. (5/5)
* You have 5 retarding potential vs. photocell current graphs for 5 colors. In each graph you have 10 line ﬁts with equations like yi = mix + ni. So, you have 10 m and n’s with uncertainties. From the intersections of two lines in each graph you will ﬁnd the corresponding stopping potentials and their uncertainties. Uncertainties of stopping potentials should be propagated from those of m and n’s that you list in your table. Show how you perform error (uncertainty) propagation. Make a table of 5 stopping potential values with their uncertainties. (4/8)
  + How did you calculate stopping potentials?
  + Show how you do error propagation. That is apply Eq. 14 in this case.
  + I could not understand what do you mean to say in Eq. 15 and 16.
* Why do we ﬁnd the stopping potential value using the technique in that ﬁgure instead of choosing the potential value where the current curve crosses the horizontal axis? Read the paragraph "The method employed…" in Millikan’s paper (page 365). Is his method for determining the stopping potential same as ours? Compare. (0/5)
* Make a stopping energy vs. light frequency plot. Use a line ﬁt (with least squares method) to represent your data points. What is the slope of this graph? What is the uncertainty of the slope? What does this slope with energy/frequency unit signify? (5/5)
* Extrapolate the line ﬁt so that it crosses the energy axis. Why does it not cross the (0,0) point. Does the energy axis intercept give you the work function of the cathode? (Refer to the question in the step 11 in our book.) (3/5)

1. Conclusions / Discussion (10 points)

* Give the Planck’s constant that you computed along with the uncertainty. At the end of his paper (in summary part), Millikan gives the Planck’s constant that he extracted in erg.sec. unit. He also estimates the uncertainty. Covert his result to the units that you use. Compare your results. Which one is a more precise measurement of Plank’s constant when compared to today’s accepted value? (1/5)
  + You need to convert Millikan’s result to the units you use and then compare.
* Comment on possible sources of errors in your setup and calculations. (e.g. back current eﬀect etc.) (5/5)
* Sum up discussion on the experiment, data analysis and your results.

1. References (5/5)

* You should have a references section. Include all the books, journals, websites etc. that you beneﬁt to compose your report.

**IN TOTAL YOU GOT: 95**