Physics 1140 laboratory Grading Guide

DATA PRESENTATION:

Criteria	Not Addressed	Novice	Intermediate	Proficient
Data Presentation: Introduction				
1-2 sentences describing what is measured in the lab and why. This may exist for each part of the lab if there are multiple parts.	• An introduction does not exist	• An introduction is written but is not descriptive of what is measured. • The description does not describe why these particular measurements are being made	• The introduction is descriptive of the measurements and why they are taken but is poorly written and/or formatted.	• The introduction is descriptive of the measurements and why they are made for this experiment • The introduction is well written and formatted (has proper spelling and grammar)
Data Presentation: Data Tables/Arrays				
Measurements are displayed in tables/arrays with proper sig figs and uncertainties. Units are clearly and correctly stated for every measurement and each set of measurements have a short caption describing what the measurements are.	• The data is not presented at all • The data is presented in an incoherent and/or illegible manner • Data in the report does not match data on the written data sheet that should be attached to the lab report	• Data is presented but is hard to understand what it represents • Units, sig figs, and/or uncertainties are not present or incorrectly stated • Captions are missing or not informative	• Data is presented in a coherent manner so the reader knows what it represents • Most units, sig figs and/or uncertainties are present and correctly stated • Captions are mostly informative but could use some improvement • A description of how the error is estimated for each measurement is included	• Data is presented in a very coherent manner so it is clear what each set of measurements represents • Units, sig figs, and uncertainties are all stated correctly • Captions are concise but informative leaving no question what each set of measurements represents in the lab • A description of how the error is estimated for each measurement is included
Data Presentation: Graphs				
If appropriate, graphs and figures should represent the data in an understandable and concise manner. Graphs should show the entire range of the data without	• Graphs and/or figures that are necessary to convey the data in an understandable way are not present or incoherent.	• Graphs and figures are present but missing appropriate titles, axis labels, units etc… • Graphs do not	• Graphs and figures have appropriate titles, axis labels, units etc… • Graphs represent the data well, so that the	• Graphs and figures have appropriate titles, axis labels, units etc… • Graphs represent the data well, so that the

unnecessary space. Figures should accurately represent the experiment apparatus.		represent the data in a reasonable manner (data is squished in the corner of the graph) • Captions are non-existent or do not describe the figures or graphs well	desired relationships can be seen • Captions for graphs and figures are written and are concise	desired relationships can be seen and a theory curve is represented if required • Captions for graphs and figure are concise and convey important information to the experiment

DATA ANALYSIS AND DISCUSSION:

Criteria	Not Addressed	Novice	Intermediate	Proficient
Data Analysis: Calculations and Error Propagation				
Calculations should be shown algebraically and numbers substituted in with short descriptions of each calculation. Error analysis is done properly along with statistical analysis and a comparison with a known value, "Discrepancy" is given if appropriate.	• Calculations for computed quantities are not shown • Error propagation and statistical analysis is not shown or is incoherent	• Calculations for computed quantities are shown algebraically with numbers substituted in (ex: F=ma, F=(3.28kg)*(9.8m/s^2) F=32N)) OR (ex: m=3.28kg, a=9.8m/s^2, F=ma F=32N) • Error propagation and statistically analysis is done properly using the known equation(s) error propagation, average/mean, standard deviation, standard deviation of the mean • Units appear on all calculations	• Calculations for computed quantities are shown algebraically with numbers substituted in (ex: F=ma, F=(3.28kg)*(9.8m/s^2) F=32N)) OR (ex: m=3.28kg, a=9.8m/s^2, F=ma F=32N) • Error Propagation and statistical analysis is done properly and error is commented upon in short captions • Units appear on all calculations along with correct significant figures • Limited mistakes are made in calculations of computed quantities and their errors	• Calculations for computed quantities are shown algebraically with numbers substituted in (ex: F=ma, F=(3.28kg)*(9.8m/s^2) F=32N)) OR (ex: m=3.28kg, a=9.8m/s^2, F=ma F=32N) • Error Propagation and statistical analysis is done properly and error is commented upon in short captions • Units appear on all calculations along with correct significant figures (ex: in the example above F=32.144Joules would be incorrect due to sig figs and improper units) • No mistakes are made in calculations of computed quantities and their errors • The "Final Answer" is given in the Standard Format with proper sig figs and units.
Discussion				
The discussion should talk about the details of the data, computed quantities, and the error analysis done in the previous section. Random and Systematic errors are addressed with specific	• A discussion of the data is absent or only a short discussion with very little detail exists.	• A discussion is present and coherent. • Random and systematic errors are addressed only superficially. • No discussion exists	• The discussion is well written and detailed in most areas • Random and systematic errors are addressed with specific examples	• The discussion is well written and detailed in all areas • The discussion is concise and to the point • Random and

examples given where appropriate. The validity of the data is talked about using statistical analysis of the data and calculations.		dealing with the statistical validity of the data and computed values.	given from the data • Validity of the data is discussed superficially, perhaps the measured value is compared to the known value where appropriate • Some discussion of the reasonableness of the overall error in the measured values exists	systematic errors are addressed in detail, giving specific examples from the data. (ex: "If the length of the pendulum is measured too long/short, the calculation for gravity is too high/low".) • The validity of the data is discussed in detail using statistical analysis • Comparison to the known/accepted value with a discussion of error propagation, statistical error, and systematic error is discussed. • Is the overall error reasonable or is there some that is too high/low and what is causing this

CONCLUSIONS:

Criteria	Not Addressed	Novice	Intermediate	Proficient
Conclusions				
The final "answer(s)" or result(s) should be stated in the Standard Format with correct sig figs and uncertainty. Describe why or why the data is not valid from the statistical and error analysis done. What assumptions/idealizations/ approximations went into the calculations? Were there any assumptions you made about the measurements you made? Are these assumptions valid? Is there any assumption/ idealization/approximation that may contribute to systematic error? How could systematic and random errors be reduced to improve the results? (Note: Human error is NOT a legitimate source of error in an experiment)	• A conclusion is not addressed or has no meaning (ex: "Over all this lab was a good learning experience.")	• A conclusion is written but hardly addresses the major topics of the experiment • Final results are not stated in the proper format and random and systematic errors are discussed superficially • A discussion of the validity of the experiment is only cursory	• The conclusion is generally well written with all results in proper Standard Format • The validity of the data is examined using the statistical and error analysis performed • Assumptions/ idealizations/ approximations made in the model/theory are addressed superficially to help explain discrepancies • Suggestions for possible changes to reduce errors and improve results is mentioned	• The conclusion is well written with all results in Standard Format • The statistical and error analysis is used specifically to justify the data from the experiment • Assumptions/ idealizations/ approximations made in the model/theory describing the experiment are used to explain specific discrepancies between the measured and the given/known value • Specific suggestions are made to improve the results of the experiment along with predictions of how the changes would specifically improve results