**General Format**

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| http://www.cbv.ns.ca/rv/physics/_themes/physics/amodbul1.gif | **Purpose** - Why is the lab being done?  |
| http://www.cbv.ns.ca/rv/physics/_themes/physics/amodbul1.gif | **Hypothesis** - What do you think will be found? Why? References to background material may also be made here.  |
| http://www.cbv.ns.ca/rv/physics/_themes/physics/amodbul1.gif | **Materials**- A concise list of what was used  |
| http://www.cbv.ns.ca/rv/physics/_themes/physics/amodbul1.gif | **Procedure** – State the source of the procedure |
| http://www.cbv.ns.ca/rv/physics/_themes/physics/amodbul1.gif | **Observations** - general observations, data tables, graphs, etc. Pay attention to significant digits when recording measurements.  |
| http://www.cbv.ns.ca/rv/physics/_themes/physics/amodbul1.gif | **Analysis and Calculations** - This is probably the most important part of your lab - you must analyze your results! Explain what your data means, how you've presented it, what conclusions you can draw from your data and why! Your analysis should be logical and take the reader step by step from your raw data to your final conclusion.     Your conclusion should be as specific as possible. If you purpose was to find the relationship between A and B, don't just say that when A was bigger so was B. You should find the actual relationship if at all possible; for example A=3B in the specific case or A=CB in a general case where C is some other variable or constant.    When showing calculations that are necessary for your analysis, just show one sample calculation of each type. Again, be sure to pay attention to significant digits when performing calculations. Also include any questions given in class.  |
| http://www.cbv.ns.ca/rv/physics/_themes/physics/amodbul1.gif | **Estimate of Error** - % error, sources of error (be as specific as possible!)See below! |
| http://www.cbv.ns.ca/rv/physics/_themes/physics/amodbul1.gif | **Conclusion** - Must answer your purpose! Summarize the results from the lab and state the conclusion that was reached in your analysis. You may also suggest any possible improvements to the lab and compare your results to your hypothesis.  |

Additional information regarding error analysis, significant digits, graphing and data analysis can be found on pages 938-949 in your textbook.

## Experimental Data

In any scientific experiment, there are errors present. Some of these may be due to human errors, others may be inherent in the instruments that we are using. Because these errors affect the accuracy and precision of our results, their analysis is extremely important in any experiment. Errors in an experiment can generally be classified as resulting from two sources:

**Instrument Error** It is safe to say that all of the instruments that we use have some error built in to them. The instrument may have been damaged at some point, or their may be a problem with the calibration of the instrument. Take a meter stick, for example. The wood may shrink or warp, the thickness of the lines may vary, the ends of the stick may be chipped. All of these factors will contribute some error to the experiment.

In addition to the fact that instruments may have "flaws", instruments are designed to measure within certain limits. In our meter stick example, the device is only calibrated in millimeters; therefore, use of this meter stick has an uncertainty associated with it. Suppose that a measurement is between 2.3 cm and 2.4 cm. We only know that the correct measurement is 2.3\*, where the \* digit is some number between 0 and 9. If the actual measurement appears past the halfway point between 2.3 and 2.4, we might estimate it to be 2.37; however, this 7 is only an estimate. It may be smaller or larger. The uncertainty in this measurement is in the second decimal place. We could say that the uncertainty is at least 0.1 mm, and probably even more.

**Human Error**

The error introduced by the person using the instrument is often even larger than that due to the instrument itself. Errors may come from such things as improper positioning of the instrument, wrong position of the eye with respect to the scale and the object to be measured, and judging the final digit (see above). Practice with any particular instrument will generally improve one's accuracy with that instrument.

In writing lab reports, you will be expected to do an error analysis. You should attempt to be as specific as possibly in this analysis. In other words, **do not write "human error" or instrument error" as your sources of error. Be Specific!** Errors in procedure, errors in calculation, errors due to rounding off, and errors due to mismeasurement are **not** legitimate. In addition to estimating the uncertainty off specific measurements as described above, focus your attention on the discrepancies between the assumptions made during the analysis of your data based on theoretic considerations and the actual conditions present during the collection of data. For example, was friction considered to be constant, or negligent? Were masses of ropes or strings accounted for? Were objects that were assumed to be fixed in one place actually allowed to move? These are the kinds of questions you should ask yourself.

It is a good idea, either in discussing the sources of error or in the conclusion, to suggest ways the experiment might be improved.

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| **Physics Lab Report Rubric**

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| **Section** | **Criteria** | **Point Value** |
| **Purpose** | Is the purpose clear and to the point? | 0.5 |
| **Materials** | Are all pieces of apparatus identified? | 0.5 |
| **Procedure** | Is the procedure written in the 3rd person, past tense? Is the procedure clear and concise? Are all steps clearly identified? Could someone read the procedure and complete the lab simply by following the procedure? | 0.5 |
| **Observations** | Are data tables clear and legible? Are units included where appropriate? Are graphs labeled and identified clearly? | 2 |
| **Calculations and Analysis** | Are the calculations appropriate? Are they correct? Are units included for each result? Do the calculations follow a logical sequence? Is it clear what the writer is attempting to do? Is the analysis based on the calculations? Are the questions (if any) given for the lab answered clearly and correctly? | 3 |
| **Estimate of Error** | Is the percent error (if any) calculated correctly? Is there a significant attempt to identify valid sources of error in the lab and estimate how important they are? Are the sources of error specific and described clearly? | 1.5 |
| **Conclusion** | Does the conclusion answer the purpose? Is there evidence for this conclusion based on the calculations and the analysis? Is the conclusion logical? | 2 |

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