Lab 5: Guide/Rubric

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For Lab 5, you are responsible for these seven sections of the formal report:
Intro, RQ, Data Collection, Diagram, Analysis, Uncertainty, Conclusion, Appendices

Use the following lists as a GUIDE as you write the report.
I will use it as a RUBRIC when I grade the report.

Introduction:
Below is a GENERAL list for ALL Physics 203 Intros.

1. Introduce key physics concepts relevant to the lab;
2. Introduce the context of the RQ: what is this question about and why is it an interesting question?
3. Discuss any predictions you made prior to performing the experiment.

But the specific content of your Intro will depend on ***what YOUR lab group found interesting/challenging/confusing/important*** in the lab.

I.e. the Intro is ***more flexible*** than other parts of the report.

Keep in mind: the Intro is about what you knew ***before*** the experiment; so you would not want to mention anything that you only learned or figured out during the course of the lab.)

Research Question:

1. Please use the ***GIVEN*** research questions from ***the lab instructions***.
2. But please notice how the first RQ makes clear the setup of the experiment.
3. Notice how the first RQ also mentions the dependent & independent variable. (What are these variables? Do you know?)
4. Notice how the second RQ gives all the information necessary to understand the parameters of the question. "Why?" can be a little vague, but RQ #2 lets the reader know exactly what is meant by "why?"

Data Collection:
Setup:

1. initial arrangement of the track;
2. what factors were considered in deciding how steeply/gently to tilt it;
3. what (if any) problems were encountered in track setup (slanted table surface, etc.);
4. what measurements were taken in order to find the angle of the track;
5. (all length & time measurements should explicitly state ***from*** where/when, ***to*** where/when;)
6. "start/finish" line;

Trials:

1. Describe one full trip of the marble (including initial flick).
2. What measurements were taken during each trip (***from*** where/when, ***to*** where/when)?
3. How many trials were performed?

Main Diagram:

1. all objects involved in the experimental setup (incl. start/finish line);
2. path of marble on some given trial;
3. all spatial variables and constants (length(s) & angle(s));
4. x-axis with pos. & neg. directions—and y-axis as well, if you want to include it.

Analysis:

Angle calculation:

1. What shape was formed in order to find angle (see the appendices list, item #3)
2. What sides of this shape do measured lengths correspond to?
3. What basic definition (trig ratio) was used to find angle?
4. Provide equation with correct formatting.
5. State calculated angle.

Kinematics Analysis:

1. State how raw trial data was averaged.
2. Describe x-axis, directions, and signs (maybe refer to diagram).
3. Introduce equation used to calculate Ave. V, with correct name & formatting.
4. Explain what was plugged in & what was found.
5. ***Explain how*** final up velocity and initial down velocity were known
6. Introduce equation used to calculate other initial/final V's with correct name & formatting.
7. Explain what was plugged in & what was calculated.
8. Introduce equation used to calculate acceleration, with correct name & formatting.
9. Explain what was plugged in & what was found.
10. Discuss the direction of accelerations.
11. Compare magnitude of accelerations & explain how this sheds light on difference in up & down times.

Force Analysis

12. What forces are acting on the marble & what direction do they point on each trip?
13. State where FBDs can be found in appendices.
14. Discuss which force is broken into components and why.
15. Refer to diagrams in appendices that show how these components are found.
16. Explicitly state how the forces on the up trip differ fr the forces on the down trip.
17. Introduce Newton's Second Law of Motion (with equation, properly formatted).
18. Apply this equation to the marble to relate forces to acceleration.
19. Explain how the differences in the forces on the up trip & down trip accounts for the differences in acceleration.

Uncertainty:

1. List each measurement device used in the lab, what measurements it was used for, and the associated measurement uncertainty interval.
2. State which method of uncertainty calculation was used.
3. State where in appendices uncertainty calculations and intervals can be found.
4. Provide uncertainty interval for key values relevant to RQ (time up, time down, a up, a down)

Conclusion:

1. State answer to first RQ.
2. Compare this to pre-experiment prediction & discuss.
3. Discuss uncertainty interval for time and how it relates to your confidence in your answer to first RQ.
4. Discuss (qualitatively) any sources of error that you think may have affected your data.
5. Clearly state answer to second RQ. This answer should have two parts:
    a. How the difference in forces leads to a difference in accelerations;
    b. How the difference in accelerations leads to a difference in times.

Appendices:

1. all raw data;
2. track-angle calculations;
3. diagram showing track, desk, and the right triangle used to calculate track-angle, along with all relevant variables (side-lengths, angle);
4. all calculated kinematics values;
5. pure & component FBDs (including pos. & neg. directions);
6. diagram showing how components of mg were found;
7. expanded Newton's 2nd Law equations;
8. calculation of C_{RR} based on up-trip data;
9. separate calculation of C_{RR} based on down-trip data;
10. uncertainty calculations & intervals for all measured values and all calculated kinematics values (NB: you are ***not*** required to provide uncertainty intervals for forces or for C_{RR}).