**Efficiency of a Pinewood Derby Car**

**Purpose**

The purpose of this activity is to compare the work done on an object to the change in total mechanical energy of that object. In other words, you will determine the relationship of work done to the change in energy.

**Introduction**

Using the concepts and formulas that you have learned during your first semester of Physics, you will be writing a lab report explaining the purpose of this lab.

During your research, make sure that you include information about the method in which you are using to conduct your experiment, the Pinewood Derby Car. Make sure to include some interesting facts about the concepts and method used so that the reader has a full understanding of the context of your experiment.

Your report should cover the following physics concepts, vocabulary and equations:

* Motion
	+ Acceleration
	+ Vectors
	+ Appropriate kinematic equations
* Forces
	+ Force
	+ Force Diagrams
	+ Frictional Forces
	+ Normal Force
	+ Weight
	+ Appropriate force equations
* Transfer of Energy
	+ Total Mechanical Energy
	+ Conservation of Energy
	+ Efficiency
	+ Appropriate energy equations

**Methods/Procedures**

* The materials and procedures used will only concern those used on data collection day. You will not need to list materials and procedures used during research.
* Use diagrams and pictures to help describe the setup of the experiment.
* Make sure that the procedures are written in enough detail that someone else could repeat your work.
	+ Number the steps are when writing the procedures and material lists.
* Safety Procedures
	+ Follow all directions for using the equipment.

**Results and Data**

Determine the variables that affect the energy transfer of objects in motion, and create data tables and line graphs illustrating the energy transfer.

**Calculations**

Show your calculations using the math editor on your word processing software. Make sure to use the proper procedures for solving physics problems. Make sure to include all of the appropriate equations required to support the purpose of the lab.

**Questions and Problems**

Answer questions in complete sentences and in such a way that others would understand the question that was asked.

**Questions**

1. What happens to the kinetic energy as work is done on the system?

2. How does the final kinetic energy compare to the work done?

3. The kinetic energy is measured in joules and the work done is measured in

 newton•meters (N\*m). What is the relationship between a joule and a newton•meter?

**Error Analysis/Conclusion**

Explain when the results support or do not support the purpose of the lab using supporting details referenced from the results section.

Discuss any problems encountered, uncertainty in measurements (error analysis), comparison to others performing the lab, and possible improvement opportunities. In this project, you will be able to name the cause of energy loss.