HOW TO DESIGN A SCIENTIFIC INVESTIGATION
When you design a scientific investigation, there is always something you want to know...a question you want to answer. Use this handout to help you design and conduct an investigation by using the scientific method.

STEP 1: BRAINSTORM
Ask yourself a few questions about the investigation you’re going to begin. You don’t have to write these things down, but you do have to think about the answers.

Here are a few questions to think about:
1) What do I already know about the topic?
2) What could I change/vary in the investigation? In other words, what would be the manipulated (independent) variable?
3) What could I measure/observe in the investigation? In other words, what would be the responding (dependent) variable?
4) What could I calculate? What equations would I need to use?
5) What variables should I keep the same? In other words, what should be the controlled variables?

STEP 2: QUESTION
Write an experimental question. This question should include the manipulated and responding variables of the investigation.

Example: When (manipulated variable) is changed, what happens to (responding variable)?

STEP 3: HYPOTHESIS
Write a hypothesis. A hypothesis is a prediction of what may happen in the investigation based on prior knowledge.

Example: If (the manipulated variable is changed somehow), then (what you predict will happen to the responding variable), because (why you think so).

STEP 4: PROCEDURES AND MATERIALS
Sketch or describe how you plan on conducting the investigation. Make note of the materials you will need to use.

STEP 5: DATA
Collect your data and write it down in a data table. Decide how many trials you will need to do, because you might need extra columns in your data table. Remember, data tables do not include any calculations!

STEP 6: ANALYSIS
Analysis is an explanation of the results of the data. You must complete any necessary calculations and design graphs. This is where you make interpretations of the data.

Some items that may be in your analysis:
1) Calculate averages for the trials.
2) Graph the averages for the data. Use the handout “How to Construct a Line Graph in 10 Easy Steps” to help you.
3) Make calculations that will help with interpretation. For example: velocity, potential energy, or acceleration. Calculation results may go in a “calculations” table. Show one example problem when you make these types of calculations.
4) Write statements about any patterns or trends you notice in the data. What happened to the (responding variable) when the (manipulated variable) was changed?
5) Discuss if there are any sources of error that should be taken into account.

STEP 7: CONCLUSION
A conclusion is a summary of the investigation that refers back to both the original question and the hypothesis. Actual data, either numeric or observational, must be included in a conclusion.

Make sure to discuss these things in your conclusion:
1) Was this investigation able to answer the original question? How do you know that? Include data.
2) Does the data/observations support or refute your hypothesis? Provide data in your explanation.