

Name: \_\_\_\_\_ Date: \_\_\_\_\_

### Is Energy Conserved?

**GOALS:** The goals of this lab exercise are the following: to get you to think like a scientist, and to get you to make use of the methods and skills you have learned in this class to approach a practical problem scientifically.

**OBJECTIVE:** The overall objective of this experiment is determine if energy is conserved in selected types of events. Your instructor will assign your research group to study one of the following conversion situations:

1.  $PE_s \rightarrow PE_g$
2.  $PE_s \rightarrow KE$
3.  $PE_g \rightarrow KE$
4.  $PE_g \rightarrow PE_s$
5.  $KE \rightarrow PE_g$
6.  $KE \rightarrow PE_s$

In each case, the arrow implies a *complete* change of one form of energy into another. If energy is conserved in such situations, the initial energy should be equal to the final energy. It will be your duty to determine if energy is conserved and to what extent. If it is not completely conserved in your particular situation, an analyses of the loss of energy is indicated.

**APPROACH:** The approach you choose to follow in this project will be up to you within reason. You may use any materials available in the physics classroom to set up and conduct your experiment. This includes measuring apparatus, computers, photogates (both IR and high-speed laser versions), etc. No group will be permitted to begin actual experimentation until **all** project proposals are submitted and approved. The instructor reserves the right to make certain that projects are both "doable" and safe.

Begin your work by selecting a problem and determining an experimental approach. Each group must prepare a project proposal to be submitted in writing to the instructor by Thursday, January 19th. The project proposal should include a statement of the selected problem, a description of the physical situation, an outline of procedures, and an equipment list.

**LAB REPORT:** Your lab report should include theory, data tables, mathematical relationships, graphs, etc., as you deem necessary. You must answer the questions on a typical cover sheet in your report. Any reader should be able to recreate your experiment from the procedures you outline. This report must be typed and well organized. Each cover-sheet question must be thoroughly identified. Each student is required to submit a lab report.

**LAB PRESENTATION:** Your group will be required to make a presentation of findings to the entire class. A standard presentation will have the following elements:

1. statement of the problem
2. theoretical analysis of the problem
3. methodology used to analyze problem
4. conclusion and error analysis

**GRADING:** This lab project is worth 50 points. Not only will you be graded by your instructor, your peers will also take part in the grading effort.

**TIME FRAME:** Students will be allotted approximately five school days for this project once experimentation begins. Classroom presentations should begin around January 28th.

**Is Energy Conserved?  
Project Evaluation  
& Peer Review**

**Lab Work:** (5 points) - Instructor

Independence of thought and action.

Creativity in approach to problem.

Scientific attitude.

Determination and effort.

Effective use of time.

**Presentation:** (25 points) - Class Peers

Was the goal of the project made clear from the outset? (2)

Was the theory dealt with adequately? (2)

Was the experimental process adequately described? (3)

Was adequate data presented? (2)

Was the result clearly indicated? (3)

Was the result derived from the data? (2)

Was error analysis adequate? (2)

Was the presentation clear and well organized? (3)

Was the research team knowledgeable and able to answer questions and/or objective criticism? (3)

Was the task of presenting the lab project evenly shared among the participants? (3)

**Lab Work/Presentation:** (10 points) - Team Peers

**Lab Report:** (10 points) - Instructor

Problem statement.

Conclusion.

Analysis.

Theory.

Error Analysis.

Procedure.

**Is Energy Conserved?  
Team Peer Evaluation  
of Lab Work & Presentation**

Your name:

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Team member being evaluated:

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**Lab Work:**

Independence of thought & action.	1	2	3	4	5
Creativity in approach to problem.	1	2	3	4	5
Scientific attitude.	1	2	3	4	5
Determination and effort.	1	2	3	4	5
Effective use of time.	1	2	3	4	5

**Presentation:**

Shared equally in presentation.	1	2	3	4	5
Provided adequate input in preparation of presentation.	1	2	3	4	5
Prepared adequately for presentation.	1	2	3	4	5
Carried out assigned or agreed-upon responsibilities.	1	2	3	4	5
Completed assigned or agree-upon tasks on time.	1	2	3	4	5

Sub-total:

Normalized point value:

Comments:

**Is Energy Conserved?  
Class Peer Evaluation  
of Group Presentation**

Topic: \_\_\_\_\_

Team Members:


**Presentation:** (25 points)

Was the goal of the project made clear from the outset? (2) \_\_\_\_\_

Was the theory dealt with adequately? (2) \_\_\_\_\_

Was the experimental process adequately described? (3) \_\_\_\_\_

Was adequate data presented? (2) \_\_\_\_\_

Was the result clearly indicated? (3) \_\_\_\_\_

Was the result derived from the data? (2) \_\_\_\_\_

Was error analysis adequate? (2) \_\_\_\_\_

Was the presentation clear and well organized? (3) \_\_\_\_\_

Was the research team knowledgeable and able to answer questions and/or objective criticism? (3) \_\_\_\_\_

Was the task of presenting the lab project evenly shared among the participants? (3) \_\_\_\_\_

Total Points \_\_\_\_\_

Comments:

**Is Energy Conserved?  
Instructor Evaluation  
of Group's Laboratory Work**

Topic: \_\_\_\_\_

Team Members:


**Lab Work:**

Independence of thought & action.	1	2	3	4	5
Creativity in approach to problem.	1	2	3	4	5
Scientific attitude.	1	2	3	4	5
Determination and effort.	1	2	3	4	5
Effective use of time.	1	2	3	4	5

Sub-total:

Point value (normalized to 5 points):

Comments: