# MOUSETRAP CARS PROJECT



### Overview:

In this project, you will design and construct a vehicle, which harvests the energy from a single mousetrap (due to the energy crunch) and uses that energy as its sole source of propulsion. The vehicle should be designed for distance (displacement). In doing so, you must manipulate simple machines to achieve a reasonable product. The scientific concepts covered in class will be applied to the mousetrap car and explained through a final paper.

# Specifics:

- 1. **PROVIDED:** Only one mouse trap may be used as the sole source of propulsion. (dimensions of  $1\frac{3}{4}$ " x 3 7/8")
- 2. The spring of the mousetrap **may not** be altered in any way (This is a safety precaution. Winding the spring tighter can result in the spring breaking.)
- 3. The mousetrap must move forward with the vehicle. The mousetrap cannot be used to launch a toy car or other object to the required distance. It must be part of the vehicle.
- 4. NEW THIS YEAR! The mousetrap car must have a minimum of 3 wheels touching the ground...but may have more...
- 5. NO KITS may be used (any pieces packaged together, even if the word 'kit' isn't part of the description, is considered a KIT)!!
- 6. There are some supplies in the classroom for anyone that would like them.
- 7. You may work alone or with the partner of your choice (from the same hour). You are held responsible to have your mousetrap car present the days of the trial and final runs- NO EXCUSES!
- 8. Some class time may be given, but some work will need to be done away from school.

**Testing procedure** The car will be tested by placing the spring of the mousetrap directly above a starting line. The trap will be released and the car will run until it comes to a complete stop. The 'how far' will be a straightline measurement from the starting line to the final stopping point of the spring of the mousetrap. The race track will be a smooth level floor, i.e. gymnasium or hallway. Each contestant will be given three attempts. The winner will be that vehicle which has obtained the farthest displacement in any of the three attempts. Any ties will be decided by a single run-off between the vehicles which tied.

# Objectives/Standards:

The objective of this project is to expose the students to applications of scientific concepts that have been studied during the year which include: energies and their transfer, Law of Conservation of Energy, forces (friction), and Newton's Laws of Motion (which we will be studying in the next unit).

# Timeline:

The majority of the work will be completed in class. A trial run day will be taken halfway through the project to test the cars and to see how far we've come (*tentative* trial run day is Tuesday, March 18<sup>th</sup>). Worth Points.

### Materials:

Construction Materials-The students will supply the materials to fit their own design. Some materials the students may wish to have are the following; however, use your imagination!

- one mousetrap (must be the one provided from teacher-required)
- string
- rubber bands
- material for axles (dowel rods, all thread, ice cream push up axles, etc...)
- wheels (lids, compact disks, records, butter tub lids etc...)
- there are plenty of websites out there for ideas- BE CREATIVE!!
- NO KITS- that includes sold together in a package (to form a kit) and/or any prefabricated (cut/drilled) pieces meant to build a mousetrap car....

# **Testing Materials:**

- Meter stick or trundle wheel for measuring distance
- Masking tape for a starting line

### Assessment:

The assessment portion of this project will be based on several items:

- 1. Car Performance:
  - **A.** Quality, originality, and improvements of design-A portion of the grade will be based on the overall quality of the finished mousetrap car. This will reward those students who invest more time in planning, drawing, and building the project.
  - B. Performance Score-Each student's vehicle will be tested according to how far it traveled. The scale used to assess the performance is as follows (just a portion of the grade-see rubric): A--10 meters

B--8 metersC--6 metersD--4 meters(Awarding Bonus points for distances over twelve meters is a possibility.)

- The paper-Each student's paper will be graded based on the explanation of the scientific concepts as they
  apply to the mousetrap car. Scientific concepts about the science behind the car should be explained
  clearly in the paper- see scoring rubric. \*\*See next pages for the organizational sheet/scoring rubric\*\*
- 3. Dates- Tuesday March 18<sup>th</sup> -practice trial run Thursday April 3<sup>rd</sup> - moment of truth- FINAL RUN FOR MEASUREMENT!

Wednesday April 9<sup>th</sup> - Written Reports due!

PARENT COMPETITION- ANY PARENT WISHING TO BUILD A CAR MAY COMPETE SEPARATELY FROM THE STUDENTS- DATE TO BE ANNOUNCED!@!! See me for a mousetrap if interested!!

- 5- Excellent representation of science concepts- displaying total understanding and application, well written and explained clearly.
- 4- All information represented, and a general understanding of concepts displayed, leaves a little doubt as to complete comprehension.
- 3- Most information represented, and a general understanding of concepts displayed.
- 2- Most information represented, but general understanding of concepts not displayed.
- 1- An attempt made, but missing most information and not showing understanding of concepts.
- 0- Not part of report.

### MOUSETRAP CAR PROJECT SCORING RUBRIC FOR PAPER

Use your organizational sheet to help you write your paper, and attach it to the top of your final paper. Use each section like a new paragraph(s) to explain or list your information.

See back of page for description of numbers in rubric.

Introduction paragraph (Purpose of project): 5 4 3 2 1

This portion should be the first paragraph of your paper and remember to incorporate an attention getter! Remember a paragraph should contain 3-4 sentences. Talk about what you were to build, what was the goal (remember apply science concepts from class (list some of the basic concepts and distance/displacement of \_\_\_\_).

Method: 5 4 3 2 1 0 This next paragraph should list all of the materials that you used for the mousetrap car. Don't just list them, but use this opportunity to describe your car.

Performance Results:543210This paragraph should list the distance/displacement that your mousetrap car did on the practice day and explain the answers to<br/>the questions from your organizational sheet (changes or no changes, and if so what are they and did it help, happy with results?). Also,<br/>please list the farthest displacement on the final day and whether you preferred displacement or distance and why. Application of<br/>Science Concepts:

**4**<sup>th</sup> **paragraph**-describe the energies (include all of the following: elastic potential, kinetic, thermal) and discuss applications to the Law of conservation of energy.

3

3

3

2

2

2

1

1

1

0

0

0

 $5^{\text{th}}$  paragraph-discuss inertia and Newton's Laws of Motion (all three) and how each law applies to your mousetrap car. 5 4 3 2 1 0

5

6<sup>th</sup> paragraph- Discuss both kinds of friction (static/rolling) and how it affects the performance of your car. How does the friction involved affect energy? Did you reduce or increase either kind of friction and how/why did you do that?

4

4

#### Analysis of Project:

This final (closing) paragraph should talk about the overall performances of your mouse trap car and 'mirror' the introduction paragraph. You may include information that you were nervous and did fine. Like/Dislike about the project? 5 4 3 2 1 0

5

#### Grammar:

The student uses proper grammar (attention getter in introduction paragraph, at least 3-4 sentences **per paragraph**, topic sentence for each paragraph, closing paragraph reflects the introduction paragraph), spelling, and complex sentences to describe the applications of science concepts learned and throughout the entire paper are clear-can I tell you understand the concept the way it is worded.

5

#### Illustration:

Attached is a labeled hand drawn illustration. Describe the materials.

5 4 3 2 1 0

TOTAL \_\_\_\_\_

0

Name	Period	
Partner's Name		

# MOUSETRAP CARS PROJECT- ORGANIZATION SHEET

1) Statement of Problem/Purpose of Mousetrap car:

# 2) Method

- A. Materials List:
  - a) \_\_\_\_\_ b) \_\_\_\_\_
  - c) \_\_\_\_\_
  - d) \_\_\_\_\_
  - e) \_\_\_\_\_ f) \_\_\_\_
- B. Illustration/Drawing/Photo:
- 3) Performance results
  - A. Practice Run (March 18<sup>th</sup> ) distance/displacement \_\_\_\_\_
    - a) How well did it do?
    - b) Are you going to make changes, why?
    - c) How do you think the changes (if any) will help with your cars performance?
  - B. Final Run (April 3<sup>rd</sup>)
    - a) Trial 1 how far \_\_\_\_\_
    - b) Trial 2 how far \_\_\_\_\_
    - c) Trial 3 how far \_\_\_\_\_

4) Application of Science Concepts (kinetic/potential energy and how it applies to Law of conservation of Energy, report the calculated average velocity, displacement vs. distance, inertia, Newton's Laws of Motion, friction (static/rolling))

I recommend at least 3-4 paragraphs in this portion of your paper, write out a rough draft/outline for this part below.

5) Analysis: How did your car perform overall? Improvements? Like/Dislike about the project?