

# A Cheesy Race - Mousetrap Car Competition



**Goal:** Your goal is to design and build a toy car that is powered only by a Victor ® mousetrap. You must design a car that will travel a distance of 10m with only the power supplied by the mousetrap. You should use what you have learned in the kinematics, dynamics and energy units of the grade 11 physics course to aid you in the design and development of the car.

## Design Rules:

1. The car must use a Victor ® brand mousetrap as the only source of energy. No other sources of energy are permitted.
2. Lever arms are allowed (and recommended) to help transfer energy to the axles.
3. You must work individually or with a partner to build the car.
4. Written analysis will be done individually during class as specified by the teacher.

## Components of Project

- The design and race component of the task is a performance project.
- Associated, individual, written work and calculations account for the remaining 100% of the performance task (15% of your final grade).
- Rubrics have been provided for your reference.

## Written Analysis:

The written analysis is broken into **three sections**: design strategy, energy transformations, and calculations

### ***Design Strategy***

- This section must make connections to the SPH3U course. Ideas such as energy transfer, work, energy conservation, kinematics, inertia, friction, forces, etc need to be addressed and used in the discussion

### ***Energy Transformations***

- A complete discussion of how the energy is stored and released must be discussed or diagrammed. A thorough discussion of energy losses must also be discussed.

### ***Calculations***

- Energy, kinematics and dynamics calculations will be presented and completed in the package on the specified summative day. You may use your notes; all equations will be provided.

## Note:

The building and performance of the car is marked out of 50 and will be graded as a project under the Thinking & Inquiry category.

The written components of this performance task are marked out of 100 in three sections. The first two sections have Knowledge, Thinking/Inquiry and Communication components all wrapped together. The calculations section is Application based. This written portion of the performance task is 15% of the final 30%. The other 15% will be your exam.

**Race Day:**

Your car must be ready to race at the specific time that you were scheduled. Failure to race at this time will award you a zero for the project portion of this task.

**Distance Trial:**

Your car must go a minimum of **10 metres** for full marks on the performance. See rubric.

Student's Name: \_\_\_\_\_ Car's Name: \_\_\_\_\_

Race Date: \_\_\_\_\_ Written Component Date(s): \_\_\_\_\_

**Trial Measurements:** Trial 1:  Trial 2:  Trial 3:   
(circle your best trial)

Using the Performance Rubric, determine your points for your cars performance:

Distance (m)	Points Awarded	
10 +	$50 + 0.25 \cdot D_o$	$D_o$ – distance in metres over 10 m.
= 10	50	
< 10	$50 - 2 \cdot D_u$	$D_u$ – distance in metres under 10 m.

/50

**Checklist:**

In order to receive any marks for construction and performance you must score **acceptable** from the checklist below.

Criteria	Unacceptable	Acceptable
Construction	Car is poorly constructed using unsafe, unreliable or non-sturdy materials. Car cannot be set up and released quickly, easily and multiple times without significant effort.	Car is very well constructed using safe, reliable and sturdy materials. Car can be set up and released quickly, easily and multiple times without much effort.

**Marking Rubric: WRITTEN COMPONENT [15% PERFORMANCE TASK]**

Criteria	Level 1	Level 2	Level 3	Level 4
<b>Design Strategy</b> (Knowledge, Thinking/Inquiry & Communication)	Okay design strategy; reference to physics laws and Newton's laws are very limited, and not always correct.	Okay design strategy; reference to physics laws and Newton's laws are limited, and not always correct.	Good design strategy; reference to physics laws and Newton's laws are limited, but correct.	Excellent design strategy; references made to physics laws and Newton's laws (force, inertia, friction, air resistance, energy, mass, etc. Discussion is very thorough, correct and insightful
	1	2	3	4
<b>Energy Transformations</b> (Thinking/Inquiry & Communication)	Very limited discussion of the various energy transformations. Very limited discussion of the energy losses is also included.	Limited discussion of the various energy transformations. Limited discussion of the energy losses is also included.	Thorough discussion of the various energy transformations. Good discussion of the energy losses is also included.	In-depth, thorough and insightful discussion of the various energy transformations. Work, transfer of energy, flow charts, diagrams help show the flow and transfer of energy. Excellent discussion of the energy losses is also included.
	1	2	3	4
<b>Calculations</b> (Application)				Questions are weighted as they are given on the question sheet and then converted to a score out of 4.
	1	2	3	4

/100