

## **The Mousetrap Car Analysis Report - Ma Punitha Nagendiran**

Answer the following questions completely (include formulas and/or calculations where appropriate). Your answers may be written below or typed and submitted on SEQTA. It must be a minimum of 300 words.

1. What are the two types of friction that affect the performance of your vehicle?

Two types of friction that affected the performance of my vehicle is static friction due to our car being bent in half from the sheer force of the mousetrap pulling the rod that was connected to the car. However, if it were to move it would be a rolling friction as the mousetrap going off and pulling the rod, connecting the wheels will propel the car forward. By reducing the contact surface area it reduces friction on the axle. A vehicle with a bigger surface area needs energy to overcome friction rather than moving forwards.

2. What problems related to friction did you encounter and how did you solve them?

As our car didn't move, we had no results of a type of friction that might have caused a problem when letting the car go.

3. What factors did you consider to decide the number of wheels you chose in your design?

When deciding the number of wheels, I read countless blogs on how many wheels it would take to make the car go faster. It said that light weight and 3 wheels would make the car go faster as it would be efficient. However, now knowing the results, it is better to have 4 wheels as it gives the car the sturdy-ness it needs to propel it forward in one piece and not fall apart.

4. What kind of wheels did you use in each axle? What is the effect of using large or small wheels?

In the process of designing our car, we used medium sized wheels (DVD's) for all of the axle's of the vehicle. However, researchers suggested that it is better to use a small wheel and two large wheels, resembling that of an olden day bicycle for better efficiency when it comes to building your car.

5. Explain how Newton's first, second and third laws apply to the performance of your vehicle.

The law of Inertia is defined as "An object in motion tends to stay in motion until acted upon by an outside force, An object at rest tends to stay at rest until acted upon by an outside force." The mouse trap car relates to Newton's first law as the car will stay at rest until it is acted upon by an energy that will force the car forward and won't stop until a greater force acts upon it such as a wall or gravity stops it.

The second law relates to the mousetrap car as when the car accelerates forwards, the magnitude of the driving/forward force is higher than that of the frictional and air resistance forces opposing the direction of motion. Once the magnitude of the drag forces exceed that of the driving force, the mousetrap car will then decelerate.

Newton's third law has an impact on the car since every action has an equal and opposite reaction. For example, when the automobile rolls, the friction is pushed against it with reduced force, therefore the car continues to move. However, as the automobile continues to travel, the forces balance out and the car slows down until it ultimately stops.

6. Discuss the effect of the length of the lever arm in the pulling force of your vehicle.

The force exerted on the car's wheels may be modified by modifying the length of the mouse trap's lever arm. Short lever arms maximise pulling force whereas long lever arms diminish it. The more string that can be looped around the driving axle is determined by the length of the lever arm that is used.

7. Discuss the types of energy transformations that occur in your car.

The spring in the mousetrap serves as a reservoir for potential energy. The arm rotates forwards, converting the potential energy into kinetic energy. The driving wheel dowel, which is attached to the wheels and is turned by the arm pulling on the wound-up string, causes the vehicle to go ahead.

8. List the energy types that are wasted in your car.

The energy that is wasted by the mousetrap vehicle is heat and sound energy. Heat is released when the mousetrap pulls onto the string and the string rubs onto the rod holding the wheels creating friction. However, Heat energy is not needed when propelling the car forward thus, it being a wasted energy. Sound is the same as that of heat energy, as it is not needed in propelling the car forward, however still being an energy that the mousetrap produces when the clamp slaps onto the wooden piece of the mousetrap, creating a sound.

9. Discuss how you increased the efficiency of your vehicle (reduced the wasted output energy).

Changing the material of the base, such as using a thin plank of wood, already has a better chance than the one we used for our car as it was a thin piece of layered cardboard. Just by changing the material, it allows the car to become sturdier therefore making it more efficient for the race.

Going away from the idea of a typical four wheel car, there is research that a 3 wheel car is efficient when it comes to how fast you want your car to go. That is why, my group went with three wheels instead of four wheels as well as it adds onto the idea that the lighter the car is, it will travel far and faster than that of a typical 4 wheeled vehicle.