**Task 8 – Constructing an Energy Efficient Vehicle from A Mousetrap**

**Breanna Werndly**

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

The two types of friction that affect the performance of our vehicle are the friction that occurs between the wheels of the car and the surface it rolls upon, and air resistance.

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

We were worried that if we placed the wheels onto an axle with a stopper on the end to prevent the wheels from falling off of the axle, there would be too much friction created between the ground and the wheels. To prevent this from happening, we hot glued the wheels and the axle together. This meant that when the wheels were spinning, so were the front and back axles. If the wheels were not stuck to the axle, the car would not have moved as the string-lever attachment was connected to the axles anyways.

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

We chose to go with four wheels for our design because we wanted something that could balance easily and could closely resemble an actual car.

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

We had 2 large CDs attached to each axle.

**Explain how Newton’s first, second, and third laws apply to the performance of your vehicle?**

Since our car has inertia and will naturally tend to stay at rest or to stay in motion when in motion, Newton’s first law applies to how well it performs. In order for our vehicle to cover the greatest amount of ground, we must use inertia to our advantage by keeping it moving.

The performance of our vehicle is governed by Newton’s second law, which states that acceleration is inversely proportional to mass but directly proportional to nett force. The mousetrap lever-string system must produce the most amount of force while the automobile as a whole must have the least amount of mass in order for our vehicle to have accelerated to its greatest speed.

Newton’s third law is relevant to the operation of our vehicle as it describes the interaction of forces between an object and the surface it must travel. The wheels of the car push against the surface, and the surface pushes back on the wheels, which according to Newton’s third law, states that to every action, there is an opposite and equal reaction. Friction acts in the opposite direction, and gravity and normal force keep the vehicle moving forwards on whatever surface it is placed upon.

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

Since the force must travel a greater distance from the released hammer to the axle, a longer lever arm requires less pulling force to move the vehicle forwards. On the other hand, a shorter lever arm produces more pulling force, which causes the vehicle to go forwards because the force’s path from the released hammer to the axle is short.

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

The mousetrap stores potential energy in the form of the spring. The potential energy transforms into kinetic energy. This happens when the car is wound up and then released. When it is wound up, this is where the potential energy happens. When that is released, the potential energy converts into kinetic energy with the movement of the car. When the car has stopped the energy converts into heat energy.

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

Heat energy was wasted in our car. This is because harder wheels waste more energy than softer wheels. Due to our use of CDs as the wheels on our mousetrap car, the wheels are quite hard in texture. This means more wasted energy.

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

Despite the wheels that we used being hard, they were also thin. This means that although there was some heat energy wasted, there would have been more if the wheels were thicker.