Rat Trap Cars

Aim:
To design a car using a rat trap that is capable of travelling the longest distance possible and to determine which surface the rat trap car travels furthest.

You can design an alternative experiment such as building a rat trap car and changing the wheel size to determine which went furthest. The key is to change one part of your test to analyse a variable scientifically.

Hypothesis:
It was predicted that the rat trap car would travel the furthest distance when tested on carpet as this would provide the greatest level of traction with the wheels.

You need to make a prediction regarding the variable you changed.

Materials and Method:

1 standard rat trap.
2 sticks of dowel (8 cm long).
String.
4 eyelets
Hot glue with hot glue gun.
4 CD's
4 Balloons

4 eyelets were screwed into a rat trap (2 in each end as shown in the picture above). Then two sticks of dowel were inserted the respective ends of the rat trap to act as axles. The 4 cd's were attached to the axles using a hot glue gun. The outside of each wheel was covered with a balloon. Then string was attached between the drive axle and the rat trap arm.

The rat trap car was then tested on four different surfaces – carpet, wood, concrete and vinyl. The distance the car travelled was tested three times on each surface and the maximum distance was recorded.

The method is written in the third person (no I, we, us etc) and past tense. Having a picture of your car will enable you to refer to it to save words.

Results:

SURFACE	Test 1	Test 2	Test 3	Best
Carpet	4.2m	3.5m	4.6m	**4.6m**
Wood	2.4m	1.8m	0.3m	**2.4m**
Concrete	6.7m	5.6m	6.1m	**6.7m**
Vinyl	3.4m	5.6m	4.5m	**5.6m**

Discussion:

A rat trap car operates by converting stored potential energy of the rat trap spring into kinetic energy of the moving car. The stored potential energy of the spring comes from stored chemical energy of the person the sets the trap, by kinetic energy of the person moving the rat trap. The kinetic energy of the moving rat trap car is dissipated into heat energy through the resistive forces that act on the car. These include friction between the car and the surface and air resistance opposing movement.

The most important source of friction for the rat trap car is the traction between the wheels and the test surface. In this case this friction is important for the cars movement and needs to be maximised. Without balloons on the wheels the car barely travelled any distance on any surface. When balloons were placed over the wheels, the traction increased and the car was able to travel increased distance.

Once the rat trap car was optimised the distance it travelled on different surfaces was analysed. It was found that concrete was the best surface. This means that the level of traction, or friction between the wheels and the surface was maximised with concrete. This was not as expected in the hypothesis. It is thought that the carpet was not a flat enough surface to provide maximum traction as the contact between the wheel and the carpet is lowered. The wood was the least effective surface and this was to be expected. The smooth wooden surface of the gym is very slippery to walk on and did not provide good traction to the wheels.

Another source of friction that was important to the cars motion was the friction between the axles and the eyelets used to attach the axles to the car. In this case the friction was not helpful to the movement of the car and needed to be minimised. No improvement to the car was made to minimise this friction, but it could be lowered by using a smoother axle like one made out of plastic rather than the wooden dowel that was used. The thickness of the axle could also be altered to try to lower the level of friction.

You will notice that during this section I have answered parts of the different questions outlined in your report guidelines in the same paragraph. You do not need to answer each question individually and you do not need to repeat each question in the discussion.

Another source of friction that was important to the car was the air resistance of the car. This friction is not helpful to the cars motion and needs to be minimised. This was minimised by not adding any components to the rat trap to keep the slim profile of the car. The CD's also helped with this as they are thin and therefore would not add to the air resistance.

An improvement that could have been made would be to add more weight to the rat trap car near the drive axle. In this case it should add to the traction between the wheels and the ground. The rat trap arm could also be extended such that it would pull more string when the rat trap was released. This would turn the wheels more and therefore it should travel further. Another thing that could be altered would be to add bigger wheels. The larger the diameter of the wheels then the further the car will travel for each rotation of the axle.

Conclusion:

A rat trap car was constructed that proved that a rat trap spring could be used as a potential energy source to power a car. It was discovered that concrete provided the best surface for the rat trap car to travel on as this maximised the traction between the cars wheels and the ground surface. This was contrary to the hypothesis that carpet would provide the most traction.

The conclusion should be short and relate to your aim + hypothesis.