For the rate of decent

Variables

Dependent

Independant

Weight

Diameter

Card thickness

Height

Angle

Length

I will be using the diameter as a variable. I will time how long it takes the cone to reach the floor from when it reaches terminal velocity.

Equipment list

* Card

* Scissors

* A pair of compasses

* Pencil

* Meter rule

* String

* Small Paper clips

* Stopwatch

Diagram

Diagram of experiment layout:

Preliminary method

-First of all I will find the terminal velocity for my cone, to do this I will drop the cone from the ceiling and watch for the cone to get to a steady speed, this will not be accurate at all as the terminal velocity will be an " eye estimate".

-Then I will hang a length string from the ceiling the same length as the terminal velocity so it is easily visible for timing purposes.

-I will cut the cone diameter to a specified size.

-The cone will be dropped from the ceiling, and the time will be recorded from the time it reaches terminal velocity to the time it reaches the floor.

-To keep the experiment fair I will take two results for each drop and find the average, I will keep the cone the same weight by using paperclips.

-The variable is the diameter I will use scissors to change this.

Preliminary experiment

In my preliminary experiment I used the diameters; 18cm, 16cm, 14cm and 12cm, The weight of the preliminary cone was 5. 7grams

The angle of the cone nose was 21ï¿½

Here are the results:

Diameter Drop1 Drop2

18cm 1. 25sec 1. 20sec

16cm 1. 10sec 1. 06sec

14cm 0. 85sec 0. 80sec

12cm 0. 70sec 0. 74sec

Background knowledge:

Kinetics

Kinetics is a branch of dynamics dealing with the action of forces producing or changing the motion of a body. Kinematics deals with motion without reference to force or mass.

Dynamics

Dynamics are the mathematical and physical study of the behaviour of bodies under the action of forces that produce changes of motion in them.

Force

Any influence that tends to change the state of rest or the uniform motion in a straight line of a body is known as a force.

The action of an unbalanced or resultant force results in the acceleration of a body in the direction of action of the force, or it may, if the body is unable to move freely, result in its deformation. Force is a vector quantity

Vector quantity

Any physical quantity that has both magnitude and direction (such as the velocity or acceleration of an object) as distinct from scalar quantity (such as speed, density, or mass), which has magnitude but no direction. A vector is represented either geometrically by an arrow whose length corresponds to its magnitude and points in an appropriate direction, or by two or three numbers representing the magnitude of its components. Vectors can be added graphically by constructing a parallelogram of vectors (such as the parallelogram of forces commonly employed in physics and engineering). This will give a resultant vector.

Newton's laws of motion

In physics, three laws that form the basis of Newtonian mechanics:

(1) Unless acted upon by an unbalanced force, a body at rest stays at rest, and a moving body

continues moving at the same speed in the same straight line.

(2) An unbalanced force applied to a body gives it an acceleration proportional to the force

(and in the direction of the force) and inversely proportional to the mass of the body.

(3) When a body A exerts a force on a body B, B exerts an equal and opposite force on A that is, to every action there is an equal and opposite reaction.

Speed and distance

In order to understand movement and what causes it, we need to be able to describe it.

Speed is a measure of how fast something is moving. Speed is measured by dividing the distance travelled by the time taken to travel that distance. Hence speed is distance moved in unit time.

Speed is a scalar quantity in which the direction of travel is not important, only the rate of travel.

It is often useful to represent motion using a graph. Plotting distance against time in a distance-time graph enables one to calculate the total distance travelled. The gradient of the graph represents the speed at a particular point, the instantaneous speed. A straight line on the distance-time graph corresponds to a constant speed.

Velocity and acceleration

Velocity is the speed of an object in a given direction. Velocity is therefore a vector quantity, in which both magnitude and direction of movement must be taken into account. Acceleration is the rate of change of velocity with time. This is also a vector quantity. Acceleration happens when there is a change in speed, or a change in direction, or a change in speed and direction.

With a stationary car, it will cause the stationary car to move. The force from the moving object is used to move the stationary object by a certain distance.

(Background knowledge from Britannica and exercise book)

Main experiment

Intro

After my preliminary work I am going to do a main experiment, this will be a more accurate experiment compared to the preliminary as the problems I found in my preliminary I will solve in my main experiment.

Equipment list

My equipment list is the same as in my preliminary but I am using plasticine instead of paper clips as it would be easier to get a correct weight.

* Card

* Scissors

* A pair of compasses

* Pencil

* Meter rule

* String

* Plasticine

* Stopwatch

Prediction

From my preliminary experiment and background knowledge I am able to make a prediction.

I predict that the smaller the diameter of the cone the faster it will fall. The smaller the cone is, the less air resistance is acting upon the cone therefore the cone is more aerodynamic and falls faster.

Main Cone

Main Method

-First of all I will find the terminal velocity for my main cone, to do this I will do the same as the prelim, but I will stand on a stall so that the terminal velocity will be near my eye level, this will help to improve accuracy as the terminal velocity will be easier to estimate.

-Then I will hang a length string from the ceiling the same length as the terminal velocity so it is easily visible for timing purposes.

-I will cut the cone diameter to a specified which I have determined from my preliminary experiment.

-My diameters are:

* 24cm

* 22cm

* 20cm

* 18cm

* 16cm

* 14cm

-The cone will be dropped from the ceiling, and the time will be recorded from the time it reaches terminal velocity to the time it reaches the floor, this will be done three times for each diameter.

-To keep the experiment fair I will take three results for each drop and find the average, I will keep the cone the same weight by using plasticine.

-The variable is the diameter I will use scissors to change this.

Table of results for main experiment

Diameter

Time taken in seconds

Average

Drop 1

Drop 2

Drop 3

24cm

1. 61

1. 64

1. 63

1. 63

22cm

1. 39

1. 36

1. 38

1. 38

20cm

1. 20

1. 18

1. 21

1. 20

18cm

1. 03

0. 97

1. 01

1. 00

16cm

0. 89

0. 84

0. 85

0. 86

14cm

0. 67

0. 66

0. 69

0. 67

Above: Graph showing the 3 different drops for each diameter

Next page: Graph showing the average results of each diameter

Conclusion

Both my graphs and my results strongly support my prediction in saying that the smaller the diameter of the cone the faster it will fall. My graphs have strong positive correlations, this shows that if the diameter increases so does the time taken to reach the ground.

This is because the cone with the smaller diameter will produce less air resistance (drag) but will have the same weight to make it drop therefore dropping through the air at a faster rate. It produces less air resistance (drag) because more air passes smoothly over the smaller diameter cone and less air passes smoothly over the larger diameter cone.

So my experiment has been successful in providing some proof to support my prediction as all results show the pattern I predicted would occur.

Anomalous results: human error

I had no anomalous results, if I did they may be due to human error, one or two results may have been wrong because I misread them or wrote them down incorrectly. I would have clearly identified in them my results and would not have used them in the conclusion.

Extending the Investigation

Other variables

To extend on my investigation I could have used more variables and expanded on my results and got a more accurate average, resulting in a firmer conclusion.

Equipment

I could use equipment that could time the decent or the cone, e. g: a multi-flash photograph that takes several photos over a period of time so that the speed could be worked out and time taken.

More repetitions

If I had done more drops for each diameter I would have gained a more accurate result as I would have a wider range of results improving accuracy.