Achieved

NZQA Intended for teacher use only

On 14 October 2012, Felix Baumgartner broke multiple world records when he jumped from a helium balloon in Earth's stratosphere, skydiving 39 km and reaching a top speed of 1357 km/h before landing safely back on Earth with a parachute.

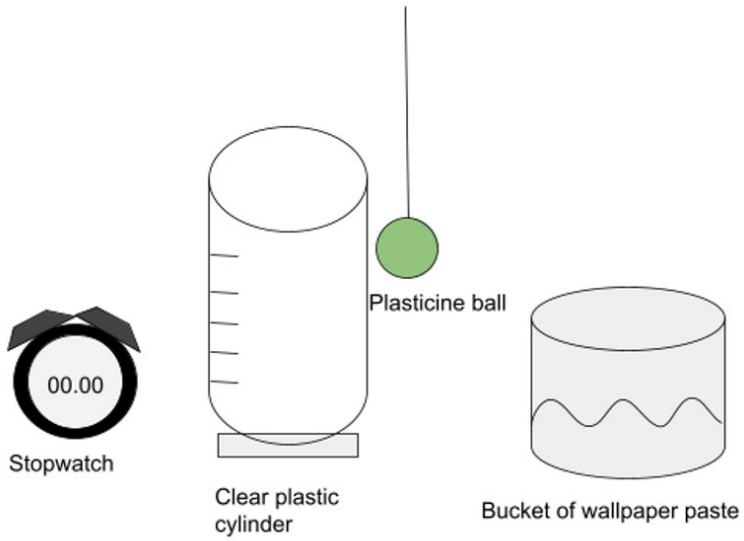
You will be provided with a large measuring cylinder, stop watch, ruler, plasticine and balance.

The AIM of the experiment is:
The aim of the experiment is to find the relationship of the time it takes for the plasticine ball to fall in the different amounts of wallpaper paste in the measuring cylinder.

Which is the INDEPENDENT VARIABLE?
The amount of wallpaper paste in the cylinder.
We will be putting different measurements of wallpaper paste in the cylinder to drop the plastercine ball in.

What range of values will be used?
0 to 0.50cm

Which is the DEPENDENT VARIABLE?
The speed that the plastercine ball travels.

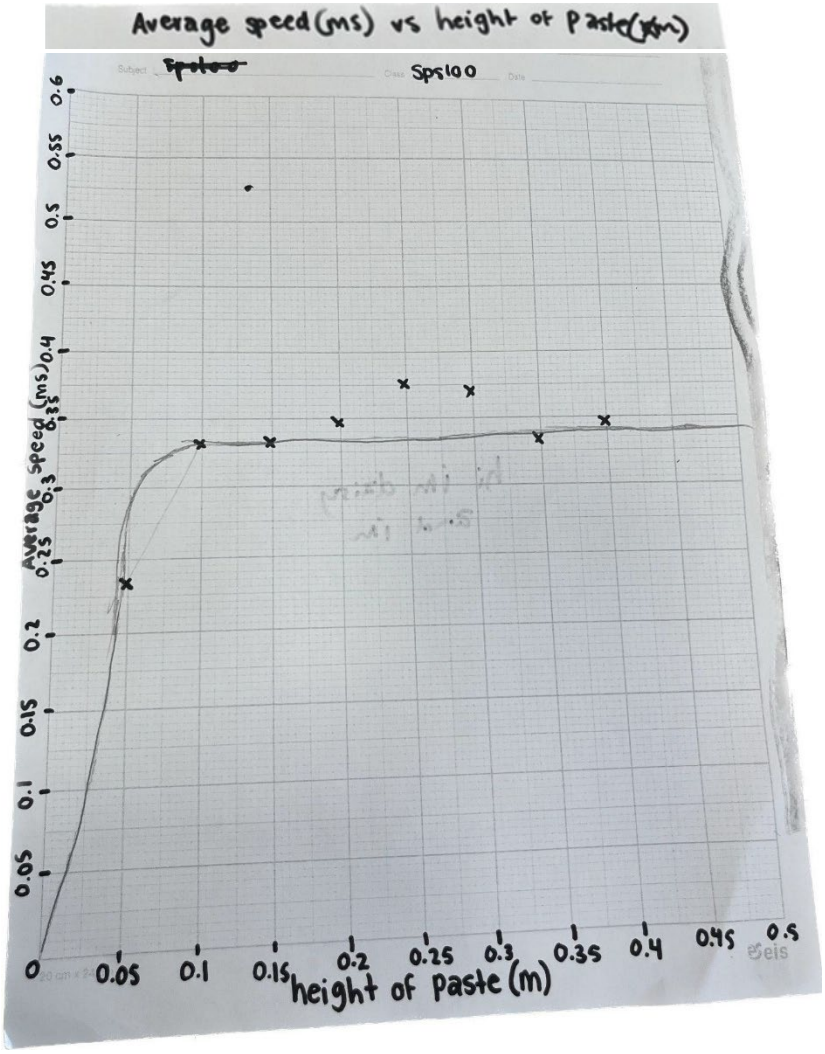


Method -

● Gather a plasticine ball, measuring cylinder, a stopwatch, a metre of string, and some wallpaper paste.
● Tie the string around the plasticine ball.
● Mark sellotape on the cylinder every 5 centimetres upwards starting from the bottom.
● Have the same person drop the plasticine from the top of the measuring cylinder while simultaneously starting the stopwatch.
● Once the plasticine hits the bottom of the measuring cylinder, stop the stopwatch and record the time. Use the string to pull the plasticine out of the measuring cylinder.
● Repeat the previous step three times then find the average.
● Add wallpaper paste up to the lowest mark on the measuring cylinder and time three drops. Repeat for each mark of sellotape until you have three results for all of the marked points.

**TASK 2: Gathering Evidence**

| Paste height (m) | average time (s) | | time 1 | time 2 | time 3 | | avg speed (m/s) |
|---|---|---|---|---|---|---|---|
| 0.05 | 0.21 | | 0.16 | 0.22 | 0.25 | | 0.238 |
| 0.1 | 0.3 | | 0.28 | 0.31 | 0.31 | | 0.333 |
| 0.15 | 0.45 | | 0.38 | 0.44 | 0.53 | | 0.333 |
| 0.2 | 0.577 | | 0.54 | 0.63 | 0.56 | | 0.347 |
| 0.25 | 0.663 | | 0.63 | 0.66 | 0.7 | | 0.377 |
| 0.3 | 0.81 | | 0.81 | 0.78 | 0.84 | | 0.37 |
| 0.35 | 1.04 | | 1.3 | 0.97 | 0.85 | | 0.337 |
| 0.4 | 1.157 | | 1.31 | 1.06 | 1.1 | | 0.346 |




Conclusion (what does the graph tell you?)

The graph tells me that we had a linear relationship for the average speed and height of the paste. The speed started to accelerate at 0.05m of paste and when we dropped the ball at 0.21. It stayed at a constant speed for most of the graph and accelerated and reached terminal velocity, at 0.25m of paste and at 0.663 speed.

Discussion (How does your conclusion relate to the real life scenario? What are the science ideas involved?)

A real life scenario is skydiving because there are two forces acting in the person. Gravity, is pulling the person downwards while also resisting motion just like the ball falling into the paste. When the person first jumps out the plane the drag will be small and the velocity will be low. As it gets to the middle the speed and the drag will reach the accelrated speed and wont get any higher and then will just decrease again.
However, the difference is the wallpaper paste is thicker so it will have a difference in speed due to its density, which causes more friction and resistance.