

A Level Physics – New Student Day Activity

Task – Falling from space!



On October 14th 2012 Felix Baumgartner jumped from the record height of **38,969.3 meters**. During this time, he achieved a maximum speed of **1,357.64 km/h**.

He was accelerated to this speed only under the force of gravity.

Here are some questions which will help you understand acceleration. Use your knowledge from GCSE and internet research to answer them.

Task Questions:

1. Here is the formula for acceleration.
Define all the symbols used. What are the units of acceleration? (2 marks)

$$a = \frac{\Delta v}{\Delta t}$$

2. The acceleration due to gravity on Earth is approximately 9.81 m/s^2 . If an object freefalls under gravity for a time of 10 seconds, estimate the change in speed of the object. (2 marks)

3. Here is a video of the space jump <https://www.youtube.com/watch?v=vvbn-cWe0A0> . Watch this and notice that after 25 m/s, Felix is moving at 806 km/h.
- Convert 806 km/h to meters per second. (1 mark)
 - Use the formula for acceleration to provide a value for the acceleration he experienced. (2 marks)
 - Explain why does his acceleration decrease as he travels deeper into the atmosphere? (2 marks)
4. *Challenge:*
Can you use the video and formula for acceleration to show that his acceleration has decreased as he goes into the atmosphere. *Hint: At 30 seconds his speed is 945 km/h. At 34 seconds his speed is 1044 km/h. Convert these speeds to m/s and use the acceleration formula for these 4 seconds to calculate his acceleration.*
5. How do we know that the acceleration due to gravity is 9.81 m/s^2 ? Use the internet to research and describe one experiment to determine the acceleration of gravity on Earth. Provide a diagram if needed.
- What are the experimental limitations of the experiment you have chosen?
6. The value of g can vary on different locations on Earth and on other planets. Research why that is and provide examples. Reference your sources.