**Force versus Acceleration Graphs**

A group of students conducted an experiment to observe how the force on a system affects its acceleration. They placed hanging masses on the end of string attached to a trolley and measured its acceleration. The acceleration is of the entire system hence the mass of the system must be kept constant. The total mass of the system was 104.6 kg. The table below shows the set of data obtained by the students.

|  |  |  |  |
| --- | --- | --- | --- |
| **Acceleration (m/s2)** | | | **Force on the trolley**  **(N)** |
| **Trial 1** | **Trial 2** | **Trial 3** |
| 0.08 | 0.08 | 0.08 | 49 |
| 0.41 | 0.42 | 0.41 | 98 |
| 0.98 | 1.00 | 0.99 | 147 |
| 1.52 | 1.54 | 1.53 | 196 |
| 2.01 | 2.02 | 2.02 | 245 |

1. Write a suitable aim and hypothesis for this experiment

Aim- To determine the effect of increasing the net force on the acceleration of an object.

Hypothesis – Increasing the net force will cause an increase in the acceleration of an object as determined by Newton’s Second Law

1. Draw a graph of force versus acceleration.
2. State clearly the independent variable and the dependent variable
3. Draw a line of best fit and then calculate the gradient of this line.

Gradient = (249 – 50)/(2 – 0) = 99.5

1. What does the value of the gradient represent?

The mass of the trolley hence it is 99.5 kg

1. Does the experiment verify Newton’s second law of motion? Why or why not?

Yes the experiment verifies Newton’s Second Law of Motion as the experimentally determined mass of the trolley was found to be 99.5 kg and this is very close to the value provided in the question as 104.6 kg

1. What do you think the students did during the experiment to make sure that the data were reliable?

The students repeated each measurement three times and then found the average. This made the data reliable

1. Discuss the accuracy of these results.

As the results were accurate as the experimental mass of the trolley was very close to the value provided.

1. Write a suitable conclusion for this experiment. – You must answer the aim and state major results

The experimental results showed that when the net force on the trolley increased, its acceleration also increased. Another thing that the experiment showed was that the mass of the trolley is equal to the gradient of a Force versus Acceleration graph. The mass of the trolley was determined to be 99.5 kg.