Force, Mass and Acceleration

Aim: investigate how the **force** on an object (of constant mass) affects its **acceleration**.

Apparatus — tick each item as you add it to your diagram

draw your set-up here

Use these to draw your set-up:

- ☐ table
- ☐ trolley
- ☐ masses
- ☐ computer
- ☐ pulley
- ☐ string
- ☐ light gate
- ☐ stop clock

Method — fill in the gaps

1. Compensate for friction by raising one end of the table, so the trolley moves at _____ speed with no force applied.
2. Attach string to the trolley, over a pulley, with masses hanging on the end to provide the _____ .
3. Position the light gate a set distance away and connect it to the computer.
4. Keep the total mass of the trolley + masses _____ . Calculate the force: $F = m \times g$
5. Release the trolley from the same point each time; time from release to the light gate = _____ .
6. Record the _____ and _____ speeds at the light gate; calculate $a = (v - u) / t$
7. Move a mass from trolley to hanger to increase force, keeping total mass _____ . Repeat steps 4–6.
8. Plot a graph of _____ (y) against _____ (x).

Results

mass / kg	force / N	time between start and light gate / s	initial speed (u) / m/s	final speed (v) / m/s	acceleration / m/s²

Graph

Conclusion

SENTENCE STARTER

The _____ is directly proportional to the _____ , as the graph is a _____ line through the _____ . The mass of the trolley and all the masses = force / acceleration ($m = F/a$), which is 1/gradient = _____ kg.

Evaluation

The recorded resultant force is too high as friction acts. To reduce friction, _____ .