

Chapter 8 The drop zone

Short investigation 8.1: Investigating Hooke's Law

Name:

Aim

To use Hooke's Law to determine the spring constant for a variety of elastic objects

Materials

Retort stand and clamp, spring, rubber band, set of slotted weights (50 g increments) and hanger, ruler

Method

1. Assemble the retort stand and clamp.
2. Attach the spring to the clamp and suspend the weight hanger from the bottom of the spring.
3. Use the ruler to measure the distance from the bottom of the hanger to the top of the bench. Call this distance d_0 .
4. Add a 50 g mass to the hanger and measure the distance d between the bottom of the hanger and the benchtop. Subtract this measurement from d_0 to determine the extension Δx of the spring. Enter this value into table 8.1A.
5. Repeat step 4 for increasing values of mass up to 400 g.
6. Repeat steps 4–5 for the rubber band, entering the results obtained into table 8.1B.

Results

Table 8.1A: Spring

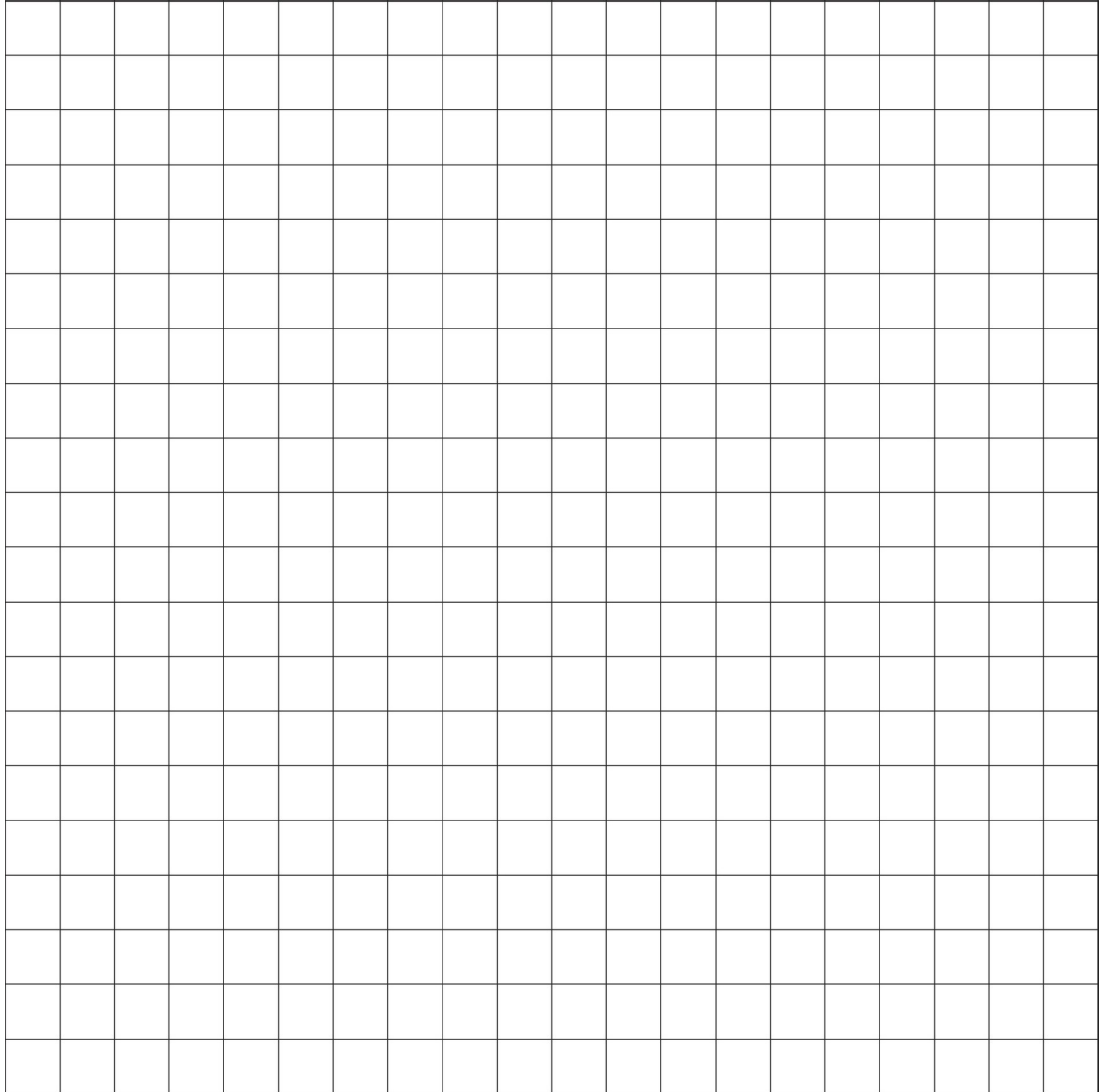
| Mass (kg) | $F = 9.8m$ (N) | Δx (cm) |
|------------------|----------------------------------|-----------------------------------|
| 0.05 | | |
| 0.10 | | |
| 0.15 | | |
| 0.20 | | |
| 0.25 | | |
| 0.30 | | |
| 0.35 | | |
| 0.40 | | |

Table 8.1B: Rubber band

| Mass (kg) | $F = 9.8m$ (N) | Δx (cm) |
|------------------|----------------------------------|-----------------------------------|
| 0.05 | | |
| 0.10 | | |
| 0.15 | | |
| 0.20 | | |
| 0.25 | | |
| 0.30 | | |
| 0.35 | | |
| 0.40 | | |

Analysing the results

7. On the grid below, plot both sets of results with the extension Δx on the horizontal axis and F on the vertical axis. For each set of results, draw a line of best fit.



8. (a) Determine the gradient of the line represented by the spring results.
(b) Given that Hooke's Law indicates that $F = k\Delta x$, where k is the spring constant, what is represented by the gradient of the line?
9. Theorise how far the spring would extend if the mass on the spring were:
(a) 125 g
(b) 500 g.

10. Does the rubber band obey Hooke's Law? If so, determine the spring constant for the rubber band.
11. What were the possible sources of error in this investigation?

Conclusion

State the relationship between the extension of the spring and the force causing the extension.

Notes: