

Stretching and Hooke's Law

KS3 Physics · Follows the national curriculum

Name _____ Class _____ Date _____

1. Worked example

A spring is 10 cm long. With a weight on it, it is 14 cm long. Find the extension.

Step 1 · Extension

Extension = stretched length – original length.

Step 2 · Calculate

$$14 - 10 = 4 \text{ cm.}$$

Answer: 4 cm

Check: Extension is the INCREASE in length, not the new length.

2. Now try one with the steps

A spring stretches 2 cm for each 1 N. What is the extension with 3 N?

Step 1 · Hooke's law

Step 2 · Calculate

Answer:

3. Practice

Show your working. The marks tell you how much is expected.

1. What is meant by the 'extension' of a spring? [1]

2. A spring is 10 cm long and stretches to 14 cm. What is the extension, in cm? [1]

3. State Hooke's law. [1]

4. A spring stretches 2 cm per newton. What is the extension with a 3 N load, in cm? [1]

5. A 4 N load gives an extension of 8 cm. What extension will a 6 N load give, in cm (within the limit)? [2]

6. Describe the shape of a force–extension graph for a spring obeying Hooke's law. [1]

7. What is the 'elastic limit'? [1]

8. A spring extends 5 cm with a 2 N load. What load, in newtons, gives a 15 cm extension (within the limit)? [2]

9. A 20 cm spring is squashed to 16 cm. By how many cm has it been compressed? [1]

10. When you stretch a spring, work is done. In which energy store is the energy kept? [1]

11. Results: 0 N 0 cm, 1 N 3 cm, 2 N 6 cm, 3 N 9 cm, 4 N 13 cm, 5 N 18 cm. Up to what force, in newtons, does the spring obey Hooke's law? [2]

12. Why should you read the ruler at eye level when measuring a spring's length? [1]

13. A force–extension graph for a rubber band is a curve. What does this tell you? [1]

14. Two identical springs hang side by side and share a 4 N load equally. Each spring stretches 2 cm per newton. What is the extension of each spring, in cm? [2]

4. Before you hand it in

Plotting the spring's total length instead of the extension.

Subtract the original length each time to get the extension.

"Hooke's law works for any force."

Hooke's law only applies up to the limit of proportionality.

Using masses in grams force.

A 100 g mass has a weight of about 1 N.