Required Practical Force Extension

GCSE Physics · Written to the shared content for AQA, Edexcel and OCR

Name _____ Class _____ Date _____

1. Worked example

Identify the independent variable, the dependent variable and one control variable in the force and extension practical. (3 marks)

Step 1 · Independent

The force (weight) applied to the spring.

Step 2 · Dependent

The extension of the spring.

Step 3 · Control

The same spring (material, thickness, number of coils), or the same ruler and pointer position.

Answer: IV: force; DV: extension; control: same spring

Check: Extension is found from length measurements.

2. Now try one with the steps

A spring is 5.0 cm long. Three 100 g masses are hung from it and it becomes 16.9 cm long. Calculate the force applied and the extension. g = 9.8 N/kg. (3 marks)

Step 1 · Mass in kg

Step 2 · Force (weight)

Step 3 · Extension

Answer:

3. Practice

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

1. State the independent variable in the force and extension practical. [1]

2. State the dependent variable. [1]

3. Describe how to measure the length of the spring accurately. [2]

4. Calculate the weight of a 100 g mass. g = 9.8 N/kg. [1]

5. A spring is 5.0 cm long. With a load it is 9.0 cm long. State the extension. [1]

6. Give one safety precaution for this practical. [1]

7. With a 3.0 N load the extension is 11.9 cm. Calculate the spring constant in N/m to 2 significant figures. [2]

8. Explain why a pointer is attached to the bottom of the spring. [1]

9. Describe the shape of the force–extension graph for the example data. [2]

10. The straight section passes through (0, 0) and (0.240 m, 6.0 N). Calculate its gradient in N/m. [2]

11. Explain why you should wait a few seconds after adding each mass before taking a reading. [1]

12. Use the example data to estimate the limit of proportionality. [1]

13. Explain why the student should check the length of the spring after removing all the masses. [1]

14. The ruler's zero is not level with the top of the spring. Explain why this does not affect the extension values. [2]

4. Before you hand it in

Plotting length instead of extension

Subtract the original length from each reading to get extension, then plot force against extension.

Treating 100 g as 100 N

100 g = 0.1 kg; weight = 0.1 × 9.8 = 0.98 N (about 1 N).

Drawing a straight line through all the points

Draw a straight line through the linear points and a curve for the rest.

Reading the ruler from above or below

Get your eye level with the pointer when reading the scale.