Springs and Hooke's law

Physics Paper 2 calculations | AQA Combined Science 8464 and AQA GCSE Physics 8463 | 12 questions, 32 marks

GCSE science calculations

Scan for the solutions

Equations for this topic (cover this box to practise recalling them)

- force = spring constant × extension learn this one
- elastic potential energy = 0.5 × spring constant × (extension)^2 on the physics equation sheet
- weight = mass × gravitational field strength learn this one

Name: _____ **Date:** _____ **Score:** _____ **/ 32**

1 The spring inside a newton meter has a spring constant of 40 N/m.

The spring is stretched by an extension of 0.15 m.

Calculate the force on the spring.

(2 marks)

Answer _____

2 In a Year 10 practical, Priya measures a spring. Its original length is 0.20 m. When a load is hung on it, its length is 0.26 m.

The spring constant is 50 N/m.

Calculate the force stretching the spring.

(2 marks)

Answer _____

3 A toy launcher uses a spring with a spring constant of 200 N/m. The spring is compressed by 0.05 m.

Calculate the elastic potential energy stored in the spring.

(2 marks)

Answer _____

4 A spring in a toy car has a spring constant of 30 N/m.

The spring is stretched by 12 cm.

Calculate the force on the spring.

(2 marks)

Answer _____

Free for classroom and home use: print, photocopy and share. Not for resale or re-hosting.

5 Kwame hangs a bag of masses on a spring. The spring constant is 60 N/m.

The original length of the spring is 15.0 cm. With the masses on, its length is 22.5 cm.

Calculate the force stretching the spring.

(3 marks)

Answer _____

6 The spring in a click pen has a spring constant of 80 N/m. When the pen is clicked, the spring is compressed by 25 mm.

Calculate the elastic potential energy stored in the spring.

(2 marks)

Answer _____

7 A small parcel hangs from a hand-held luggage scale. It pulls on the spring inside with a force of 2.4 N. The extension of the spring is 0.06 m.

Calculate the spring constant of the spring.

(2 marks)

Answer _____

8 A spring has a spring constant of 120 N/m. A force of 9.0 N is applied to it. The spring does not go past its limit of proportionality.

Calculate the extension of the spring. Give your answer in centimetres.

(3 marks)

Answer _____

9 Chloe plots a force-extension graph for a spring. The graph is a straight line through the origin. These points lie on the line:

Extension in m	0	0.02	0.04	0.06	0.08
Force in N	0	0.5	1.0	1.5	2.0

Use the gradient of the graph to calculate the spring constant of the spring.

(3 marks)

Answer _____

Free for classroom and home use: print, photocopy and share. Not for resale or re-hosting.

10 Oliver adds weights to a spring and measures the extension each time.

Force in N	0	1.0	2.0	3.0	4.0	5.0
Extension in cm	0	2.0	4.0	6.0	8.0	11.5

a. Use the results for forces up to 4.0 N to calculate the spring constant in N/m. Show your working.

b. Which force in the table shows that the spring has gone past its limit of proportionality? (3 marks)

Answer _____

11 A spring has a spring constant of 50 N/m. A force of 4.0 N stretches it. The spring does not go past its limit of proportionality.

Calculate the elastic potential energy stored in the spring. Show your working. (3 marks)

Answer _____

12 Amira hangs a 300 g mass on a spring. The spring constant is 35 N/m. The spring does not go past its limit of proportionality.

Gravitational field strength = 9.8 N/kg.

Calculate the elastic potential energy stored in the spring. Give your answer to 2 significant figures. Show your working. (5 marks)

Answer _____

End of questions | Total 32 marks

Free for classroom and home use: print, photocopy and share. Not for resale or re-hosting.