Elastic potential energy

Physics Paper 1 calculations | AQA Combined Science 8464 and AQA GCSE Physics 8463 | 13 questions, 40 marks

GCSE science calculations

Scan for the solutions

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

- elastic potential energy = 0.5 × spring constant × (extension)^2 on the physics equation sheet
- force = spring constant × extension learn this one
- efficiency = $\frac{\text{useful output energy transfer}}{\text{total input energy transfer}}$ learn this one
- kinetic energy = 0.5 × mass × (speed)^2 learn this one

Name: _____ **Date:** _____ **Score:** _____ **/ 40**

1 A spring has a spring constant of 40 N/m. It is stretched so that its extension is 0.15 m.

Calculate the elastic potential energy stored in the spring. (2 marks)

Answer _____

2 A garage door spring has a spring constant of 200 N/m. When the door is closed the extension of the spring is 0.30 m.

Calculate the elastic potential energy stored in the spring. (2 marks)

Answer _____

3 At the bottom of a bungee jump, the rope has an extension of 16 m. The spring constant of the rope is 150 N/m.

Calculate the elastic potential energy stored in the rope. (2 marks)

Answer _____

4 In a Year 10 practical, Zara stretches a spring with a spring constant of 60 N/m. The extension of the spring is 8.0 cm.

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

Answer _____

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5 A spring in a door latch has a spring constant of 1500 N/m. When the latch is pressed, the spring is compressed by 12 mm.

Calculate the elastic potential energy stored in the spring.

(Treat the compression as the extension.)

(3 marks)

Answer _____

6 A spring has an unstretched length of 12.0 cm. When a weight is hung on it, its length becomes 18.5 cm. The spring constant is 30 N/m.

Calculate the elastic potential energy stored in the spring.

Give your answer to 2 significant figures.

(3 marks)

Answer _____

7 A spring stores 2.4 J of elastic potential energy when its extension is 0.20 m.

Calculate the spring constant of the spring.

(3 marks)

Answer _____

8 The elastic band of a catapult stores 3.0 J when it is pulled back so that its extension is 15 cm.

Calculate the spring constant of the elastic band.

Give your answer to 2 significant figures.

(3 marks)

Answer _____

9 **Higher tier**

A spring with a spring constant of 50 N/m stores 0.25 J of elastic potential energy.

Calculate the extension of the spring. Show your working.

(3 marks)

Answer _____

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10 A force of 6.0 N stretches a spring. The spring constant is 80 N/m. The spring does not go past its limit of proportionality.

a. Calculate the extension of the spring.

b. Calculate the elastic potential energy stored in the spring. Show your working. (4 marks)

Answer _____

11 Dev pulls back the elastic band of a catapult. The spring constant of the band is 250 N/m and its extension is 12 cm.

a. Calculate the elastic potential energy stored in the band.

b. When the band is released, 70% of this energy is transferred to the kinetic energy store of a pebble. Calculate the kinetic energy of the pebble. Show your working. (4 marks)

Answer _____

12 **Higher tier**

A toy launcher uses a spring with a spring constant of 400 N/m. The spring is compressed by 5.0 cm and then released, firing a ball of mass 0.020 kg.

Assume all of the elastic potential energy is transferred to the kinetic energy store of the ball. Treat the compression as the extension.

Calculate the speed of the ball as it leaves the launcher.

Give your answer to 2 significant figures. Show your working. (5 marks)

Answer _____

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13 A trampoline is held up by springs. Each spring has a spring constant of 3000 N/m. When Ellie, of mass 35 kg, lands on the trampoline, the length of one spring increases from 16.0 cm to 21.0 cm.

Calculate the elastic potential energy stored in this spring.

(3 marks)

Answer _____

End of questions | Total 40 marks

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