

GCSE Hooke's law and elastic energy

Questions · Set 42 · Selected AQA 8463 / OCR Gateway J249 skills
Treat the given values as exact unless an uncertainty is stated.

Question 1

A spring has constant 80 N m^{-1} and extension 5 cm . The spring obeys Hooke's law over this range. Find the force. Give your answer to 3 significant figures.

gcse-springs / force / v1.0.0 / seed 42

Check this question online: [physicshelp.co.uk/gcse/hookes-law-springs/](https://www.physicshelp.co.uk/gcse/hookes-law-springs/)

Question 2

A 3 N force stretches a spring with constant 50 N m^{-1} . The spring obeys Hooke's law over this range. Find its extension in metres. Give your answer to 3 significant figures.

gcse-springs / extension / v1.0.0 / seed 104771

Check this question online: [physicshelp.co.uk/gcse/hookes-law-springs/](https://www.physicshelp.co.uk/gcse/hookes-law-springs/)

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Question 3

A spring is 12 cm long unloaded and 20 cm long under a 4 N force. The spring obeys Hooke's law over this range. Find the spring constant. Give your answer to 3 significant figures.

Unloaded length 12 cm



Force 4 N

Loaded length 20 cm

gcse-springs / loaded-length / v1.0.0 / seed 209500

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Question 4

A 400 g mass hangs at rest from a vertical spring of constant 50 N m^{-1} . Use $g = 10 \text{ N kg}^{-1}$. The spring obeys Hooke's law over this range. Find the extension. Give your answer to 3 significant figures.

gcse-springs / hanging-mass / v1.0.0 / seed 314229

Check this question online: physicshelp.co.uk/gcse/hookes-law-springs/

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Question 5

A spring of constant 40 N m^{-1} is stretched 5 cm from its unloaded length. The spring obeys Hooke's law over this range. Find the elastic potential energy stored. Give your answer to 3 significant figures.

gcse-springs / elastic-energy / v1.0.0 / seed 418958

Check this question online: [physicshelp.co.uk/gcse/hookes-law-springs/](https://www.physicshelp.co.uk/gcse/hookes-law-springs/)

Question 6

A straight force-extension line passes through (extension 0.01 m, force 1 N) and (0.09 m, 9 N). Force is on the vertical axis. The spring obeys Hooke's law over this range. Calculate its gradient, which is the spring constant. Give your answer to 3 significant figures.

gcse-springs / graph-gradient / v1.0.0 / seed 523687

Check this question online: [physicshelp.co.uk/gcse/hookes-law-springs/](https://www.physicshelp.co.uk/gcse/hookes-law-springs/)

Worked answers

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Keep intermediate values unrounded. Final answers use 3 significant figures.

Question 1

$$x = 0.05 \text{ m.}$$

$$F = 80 \times 0.05 \text{ N.}$$

Answer: 4.00 N (3 significant figures).

Question 2

$$x = 3 / 50 \text{ m.}$$

Answer: $6.00 \times 10^{-2} \text{ m}$ (3 significant figures).

Question 3

$$x = 20 - 12 = 8 \text{ cm} = 0.08 \text{ m.}$$

$$k = 4 / 0.08 \text{ N m}^{-1}.$$

Answer: $5.00 \times 10^1 \text{ N m}^{-1}$ (3 significant figures).

Question 4

$$m = 0.4 \text{ kg.}$$

$$F = 0.4 \times 10 \text{ N.}$$

$$x = 4 / 50 \text{ m.}$$

Answer: $8.00 \times 10^{-2} \text{ m}$ (3 significant figures).

Question 5

$$E = 0.5 \times 40 \times 0.05^2 \text{ J.}$$

Answer: $5.00 \times 10^{-2} \text{ J}$ (3 significant figures).

Question 6

$$k = (9 - 1) / (0.09 - 0.01) \text{ N m}^{-1}.$$

Answer: $1.00 \times 10^2 \text{ N m}^{-1}$ (3 significant figures).