Essential Pre-Uni Physics F1.3

GCSE P P P A Level P P P

Please give your answer to the lowest number of significant figures given in the question. You will not get the mark unless the correct unit is given. In this question, ignore the effects of friction & drag.

If a $20000\,\mathrm{kg}$ bus accelerates from $10\,\mathrm{m\,s^{-1}}$ to $25\,\mathrm{m\,s^{-1}}$, what is the change in momentum?

Essential Pre-Uni Physics F1.4

GCSE C C C A Level P P P

Please give your answer to the lowest number of significant figures given in the question. You will not get the mark unless the correct unit is given. In this question, ignore the effects of friction & drag.

A $50\,\mathrm{g}$ ball is travelling at $2.0\,\mathrm{m\,s^{-1}}$ when it hits a wall and rebounds at $1.5\,\mathrm{m\,s^{-1}}$. Calculate the magnitude of the change in momentum.

Gameboard:

STEM SMART Physics 17 - Momentum and Materials Revision

Essential Pre-Uni Physics F1.9

GCSE C C C A Level C C C

Please give your answer to the lowest number of significant figures given in the question. You will not get the mark unless the correct unit is given. In this question, ignore the effects of friction & drag.

An alpha particle (mass $= 6.7 \times 10^{-27}\,\text{kg}$) is fired at the nucleus in a gold atom with a speed of $3.5 \times 10^{6}\,\text{m}\,\text{s}^{-1}$. It bounces off at the same speed in the opposite direction. If the collision takes $10^{-19}\,\text{s}$, what is the magnitude of the average force? Give your answer to 2 significant figures.

Gameboard:

STEM SMART Physics 17 - Momentum and Materials Revision

Essential Pre-Uni Physics F2.5

GCSE C C C A Level C C C

A rocket (containing a space probe) is travelling at $7000\,\mathrm{m\,s^{-1}}$ in outer space. The $2000\,\mathrm{kg}$ probe is ejected from the front of the rocket (forwards) using a big spring. If the speed of the probe afterwards is $7200\,\mathrm{m\,s^{-1}}$, and the rest of the rocket has a mass of $6000\,\mathrm{kg}$, what is the speed of the rest of the rocket? Give your answer to 4 significant figures.

Gameboard:

STEM SMART Physics 17 - Momentum and Materials Revision

Physics. You work it out.

Essential Pre-Uni Physics F2.2

GCSE C C C A Level P P P

Charlie is driving her $20\,000\,\mathrm{kg}$ bus. She stops at a roundabout. Percy is driving his $750\,\mathrm{kg}$ Corsa at $15\,\mathrm{m\,s^{-1}}$ behind her. He fails to stop and rams into the back of the bus, sticking to it. The impact releases the brakes on the bus. How fast will the combined vehicle be travelling immediately after the collision? Give your answer to 2 significant figures.

Gameboard:

STEM SMART Physics 17 - Momentum and Materials Revision

Physics. You work it out.

Essential Pre-Uni Physics B7.6

GCSE C C C A Level P P P

A spring with natural length $0.70\,\mathrm{m}$ requires $3.2\,\mathrm{N}$ to stretch it by $17.5\,\mathrm{cm}$. Work out the force required to stretch the spring to a length of $83\,\mathrm{cm}$.

Gameboard:
STEM SMART Physics 17 - Momentum and Materials Revision

Essential Pre-Uni Physics B7.7

GCSE C C C A Level C C C

Part A Tension in series

Two identical springs, each of natural length $2.0\,\mathrm{m}$ and spring constant $80\,\mathrm{N\,m^{-1}}$ are placed in series (that is, one joined to the end of the other), with a weight of $7.5\,\mathrm{N}$ suspended from the bottom spring.

State the tension in each spring.

Part B Total extension in series

Work out the total extension of the system.

Part C Tension in parallel

If the two identical springs were placed in parallel so that they can share the load, with the same weight of $7.5\,\mathrm{N}$ suspended from the combination, work out the tension in each of the springs.

Part D Total length in parallel

What is the total length of the system now? Give your answers to 3 significant figures.

Gameboard:

STEM SMART Physics 17 - Momentum and Materials Revision

Essential Pre-Uni Physics B9.5

GCSE C C C
A Level C C C

Assume that extension is proportional to the tension.

Calculate how much extra work must be done in order to stretch a spring from $17\,\mathrm{cm}$ to $20\,\mathrm{cm}$, if its spring constant is $300\,\mathrm{N\,m^{-1}}$ and natural length $15\,\mathrm{cm}$.

Gameboard:

STEM SMART Physics 17 - Momentum and Materials Revision

Essential Pre-Uni Physics B6.7

A Level

Assuming that the material obeys Hooke's Law and that it is circular in cross section, find the specified values in the table:

Diameter / mm	Cross sectional area / m^2	Original length / m	Tension / N	Extension / mm	Stress / MPa	Strain	Young's modulus / GPa
1.0		56	890	32	(a)	(b)	(c)

Part A Stress

a) Stress in MPa?

Part B Strain

b) Strain?

Part C Young's modulus

c) Young's modulus in GPa (to 2 significant figures)?

Gameboard:

STEM SMART Physics 17 - Momentum and Materials Revision

Essential Pre-Uni Physics B9.7

A Level

C C C

Assume that extension is proportional to the tension.

A wire of natural length $50\,\text{cm}$, diameter $1.5\,\text{mm}$ and Young's modulus $3.2\,\text{GPa}$ is stretched to a new length of $52.4\,\text{cm}$, which is below the limit of proportionality. How much work was done in order for this to happen?