Edexcel Physics IAL

CP16 - Determining the Value of an Unknown Mass Using the Resonant Frequencies

Practical Flashcards

State Hooke's Law in words.

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The extension of a spring is directly proportional to the force applied to it, up to the limit of proportionality.

State the defining equation for Hooke's Law.

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Force (N) = Spring Constant (Nm^{-1}) x Extension (m)

$$F = kx$$

If a mass is hung from a spring, how does the value of the mass relate to the spring's extension?

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$$mg = kx$$

$$m = kx/g$$

State the equation used to calculate the time period of a simple mass-spring oscillator.

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$$T = 2\pi\sqrt{\frac{m}{k}}$$

Describe how the time period of a simple mass-spring oscillator varies with the length of the spring.

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The time period of a mass-spring oscillator is independent of the length of the spring. It only depends on the mass and the spring constant.

When hanging a mass-spring system from a clamp stand, what safety precaution should be taken?

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A counterweight or G-clamp should be used to provide a counter moment on the clamp stand to prevent it toppling.

What safety precaution should be taken when adding masses to a spring?

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Safety goggles should be worn in case the spring snaps. It is also important to ensure you never stand with your feet directly below the masses in case they fall.

What is the difference between free and forced oscillations?

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Free oscillations occur without a continual driving force. Forced oscillations occur when energy is continually added to the system, such as by a driving oscillator.

How should you measure the time period of an oscillating mass-spring system?

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Measure the time taken for the system to complete 10 full oscillations. Repeat this measurement three times and then calculate an average time. Divide this average by 10 to produce the average time period for one oscillation.

What could be added to your apparatus to help measure the time period accurately?

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A fiducial marker, such as a small pin, could be added at the centre of oscillation to assist your eye in seeing precisely where an oscillation has been completed.

What graph could be plotted to allow you to quantify the size of a mass attached to a spring, from its period of oscillation?

What graph could be plotted to allow you to quantify the size of a mass attached to a spring, from its period of oscillation?

A graph of T^2 against m can be plotted using your experimental data. The time period of the unknown mass can then be squared and matched with a value for mass from your graph.

How could a data logger be used in this experiment?

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A data logger could be connected to a motion sensor. This could be positioned below the mass hanger to measure the time period and extension of the spring.