AQA Physics A-level

RP07 - Simple Harmonic Motion

Practical Flashcards

State the defining equation of SHM.

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$$a = -\omega^2 x$$

What is simple harmonic motion?

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Simple harmonic motion is any periodic motion where the object's acceleration is proportional to and in the opposite direction of the displacement. This results in oscillatory behaviour.

What is relationship between a pendulum's time period and its mass?

What is relationship between a pendulum's time period and its mass?

The time period of a pendulum is independent of its mass.

State the equation used to calculate the time period of a pendulum.

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$$T = 2\pi\sqrt{\frac{l}{g}}$$

What two conditions must be met when carrying out a simple harmonic motion experiment involving a pendulum?

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1. The amplitude of oscillation should be small
2. The pendulum should oscillate in a straight line

Why must the oscillations only be small when carrying out this experiment?

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The equations are derived using a small angle approximation (<10°) and so only apply for relatively small displacements.

PMT
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How should you measure the time period of an oscillating simple pendulum?

How should you measure the time period of an oscillating simple pendulum?

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

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

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

A fiducial marker, such as a small pin, could be added at the centre of oscillation to show exactly when an oscillation has been completed.

When plotting a graph of T^2 against L, what does a straight line passing through the origin demonstrate?

When plotting a graph of T^2 against L, what does a straight line passing through the origin demonstrate?

A straight line through the origin shows that T^2 is directly proportional to L.

How could gravitational field strength be estimated from a graph of T^2 against L for a simple pendulum?

How could gravitational field strength be estimated from a graph of T^2 against L for a simple pendulum?

$$T^2 = \frac{4\pi^2 L}{g}$$

'g' is therefore given by $4\pi^2$/gradient

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

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

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

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

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

The time period of a mass-spring oscillator does not depend on 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?

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

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

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

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

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.

How could the spring constant be calculated from a graph of T^2 against m for a simple mass-spring oscillator?

How could the spring constant be calculated from a graph of T^2 against m for a simple mass-spring oscillator?

$$T^2 = \frac{4\pi^2 m}{k}$$

'k' is therefore given by $4\pi^2$/gradient