

OCR (B) Physics A-level

PAG 10.2 - Observing Forced and Damped Oscillations

Practical Flashcards

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What are free oscillations?



What are free oscillations?

Free oscillations are natural oscillations of a system, without any driving force or energy addition. They occur at the natural frequency of the system.



What is damping?



What is damping?

Damping is the removal of energy from a system, resulting in the amplitude of the oscillations reducing.



What is resonance?



What is resonance?

Resonance occurs when the oscillations of a system are at the natural frequency. The amplitude of the oscillations, and the rate of energy transfer are at a maximum.



What are forced oscillations?



What are forced oscillations?

Forced oscillations are oscillations caused by a periodic driving force. The frequency of oscillations depends on that of the driver.



How can the resonant frequency of a system be determined from a graph of amplitude against frequency?



How can the resonant frequency of a system be determined from a graph of amplitude against frequency?

The resonant frequency will be the frequency at which the amplitude is at a maximum. This will usually be a sharp peak.



How can the amplitude of a mass-spring system be measured?



How can the amplitude of a mass-spring system be measured?

A position sensor can be used to record the system's amplitude. The amplitude is the maximum displacement from the equilibrium position.



How can the time period of a mass-spring oscillator be measured?



How can the time period of a mass-spring oscillator be measured?

A fiducial marker can be placed at the equilibrium position. The time taken for 10 complete oscillations can be recorded using a stop-clock, and then this value can be divided by 10 to obtain the time period for a single oscillation.



How can damping be added to a mass-spring oscillator?



How can damping be added to a mass-spring oscillator?

A piece of card can be added to the oscillator to damp its oscillations by increasing the air resistance that acts on it.



In what direction does a damping force act?



In what direction does a damping force act?

A damping force acts in a direction such that it opposes the system's oscillations.



What piece of apparatus could be used in the lab to produce forced oscillations?



What piece of apparatus could be used in the lab to produce forced oscillations?

A signal generator could be attached to a vibration generator to produce forced oscillations. The frequency of oscillation can then be varied by changing the frequency of the signal inputted.



What safety precautions should be taken when applying a load to a spring?



What safety precautions should be taken when applying a load to a spring?

Always wear safety goggles in case the spring snaps. The applied load should not exceed the maximum capacity of the spring. If the spring begins to deform plastically, do not add further load.



How can the frequency of oscillation be calculated from the time period?



How can the frequency of oscillation be calculated from the time period?

Frequency is the inverse of the time period.



If a system experiences no damping,
how will the oscillations vary over time?



If a system experiences no damping, how will the oscillations vary over time?

Without damping, the oscillations of a system would carry on infinitely and the amplitude would remain constant.



Why does the amplitude of the oscillations in our experiment decrease even without a damping card attached?



Why does the amplitude of the oscillations in our experiment decrease even without a damping card attached?

The oscillating system will still experience some damping in the form of air resistance and friction.

These forces remove energy from the system over time, and causes the amplitude of oscillation to decrease.



What safety precaution should be taken when hanging a load from a clamp stand?



What safety precaution should be taken when hanging a load from a clamp stand?

A counterweight or G-clamp should be attached to the base of the clamp stand to provide a counter moment and prevent the stand from toppling.



What is the advantage of using a position sensor in this experiment?



What is the advantage of using a position sensor in this experiment?

A position sensor allows you measure the displacement of the oscillator with a greater accuracy. If the sensor and software package can also plot against time, it will also reduce the uncertainty in your time period measurements.



Describe the difference in the decay of amplitude for a system with and without a damping card attached.



Describe the difference in the decay of amplitude for a system with and without a damping card attached.

Both systems will decay over time, but the system with the damping card will experience greater damping and so its amplitude will decrease at a faster rate.

