Practice Question Set For A-Level
Subject : Physics
Paper-2 Topic : 13_Oscillations

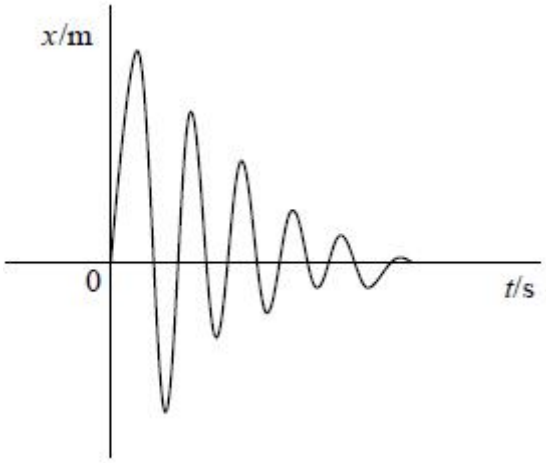
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Name of the Student:_____
Max. Marks : 20 Marks **Time : 20 Minutes**

Q1.

A tennis player uses a racket to hit a ball over a net. When the racket strikes the ball the racket frame is set into oscillation.

The graph shows how the displacement *x* of the centre of the frame varies with time *t* immediately following the strike.



Hollow spaces are built into the racket frame and small lead spheres are packed into these spaces.

Explain how this results in the graph shown.

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(Total for question = 6 marks)

Q2.

A student investigated the behaviour of a pendulum. The student used a 'spring gun' to fire a small sphere of modelling clay at the wooden pendulum bob, as shown in Figure 1. The clay stuck to the pendulum bob, which

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swung to one side, as shown in Figure 2.

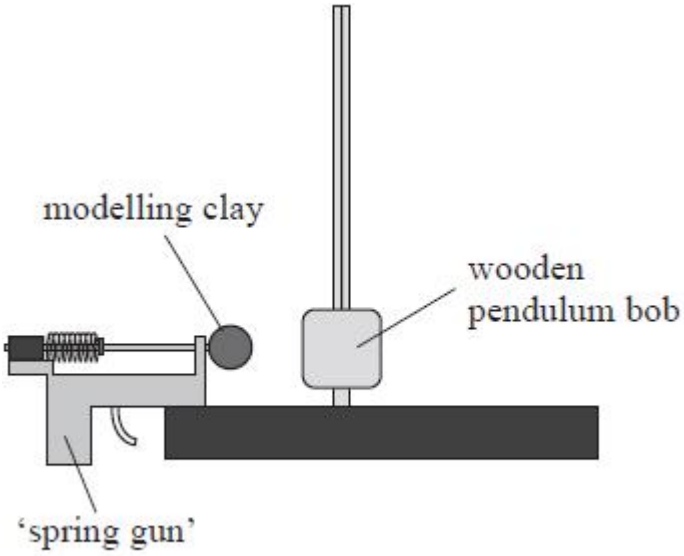


Figure 1

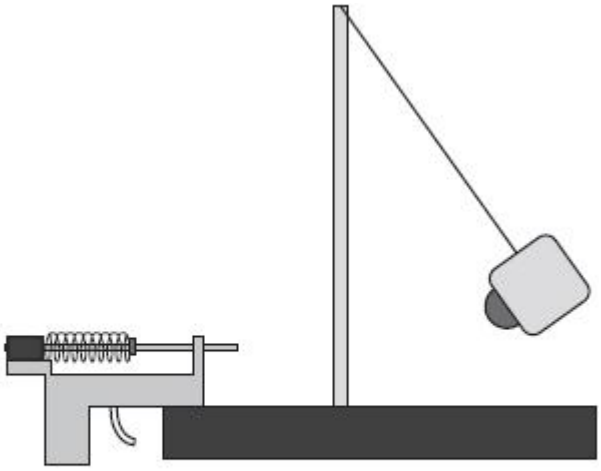


Figure 2

When the modelling clay hits the pendulum bob, the pendulum swings to one side.

(i) Show that the time taken for the pendulum bob to move from its lowest position to its highest position is about 0.6 s.

effective length of pendulum = 1.25 m

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(ii) The pendulum bob was then attached to a spring of stiffness 0.12 N m^{-1}. When the bob was displaced vertically and released, it oscillated with a time period equal to that of the pendulum.

Calculate the mass of the pendulum bob.

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Mass of pendulum bob = ...

(Total for question = 5 marks)

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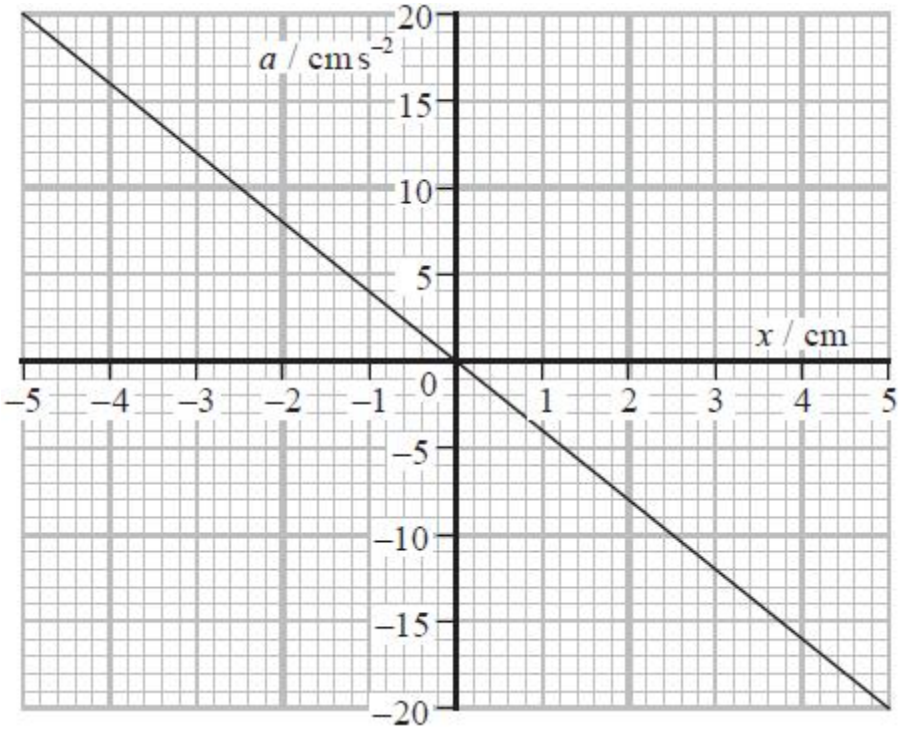
Q3.

A 'jumperoo' is a harness, suspended by a vertical spring, into which a baby can be placed, as shown.



The jumperoo is adjusted so that the baby's feet are a few centimetres above the floor. If the baby is then displaced downwards and released, he oscillates vertically.

The graph shows how the acceleration *a* of the baby depends upon the displacement *x* of the baby from its equilibrium position.



The amplitude of the oscillations quickly decreases, so the baby has to push down on the floor to maintain the oscillations.

When the baby pushes at a particular frequency, the amplitude of oscillation increases to a maximum.

A baby of greater mass is placed in the jumperoo.

This baby pushes on the floor at a frequency that produces a maximum amplitude of oscillation.

Explain how this frequency compares with the frequency of pushing of the original baby.

A calculation is not necessary.

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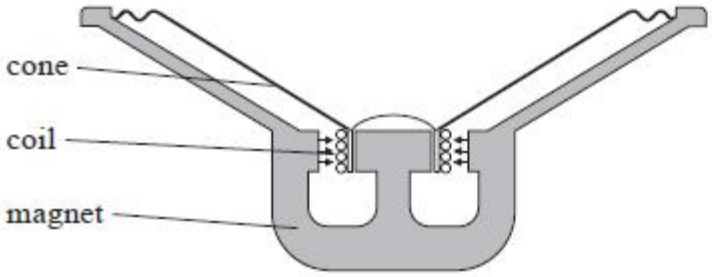
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(Total for question = 3 marks)

Q4.

A simple loudspeaker consists of a cone, a coil of wire and a magnet. The cone and coil are attached to each other and are free to move. An alternating current in the coil causes the cone to oscillate.





Some sand is sprinkled onto the cone. The sand oscillates vertically with the frequency of the cone. Keeping the frequency constant, the current is increased. This increases the amplitude of oscillation of the cone.

At a particular amplitude of oscillation the sand begins to lose contact with the cone.

(i) By considering the forces acting on a grain of sand, explain why this happens.

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(ii) At a particular frequency, when the amplitude of the cone is 0.25 mm, a grain of sand loses contact with the cone.

Calculate this frequency.

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Frequency = ...

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