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

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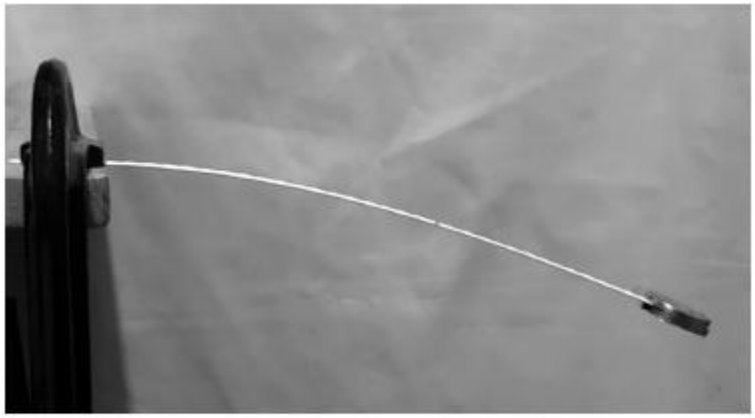
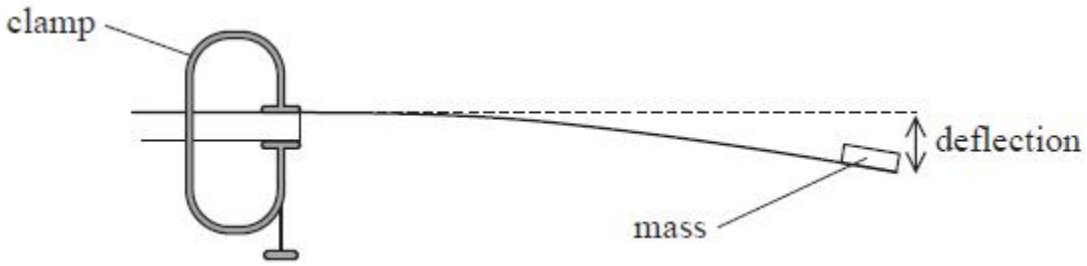
Name of the Student:_____
Max. Marks : 21 Marks **Time : 21 Minutes**

Q1.

A student measured the deflection of a mass attached to the end of a thin strip of metal.

The strip was clamped to a bench at one end as shown.





The student varied the force on the end of the strip by changing the mass attached.

The deflection was measured each time when the mass was in its equilibrium position.

The student obtained the following graph of deflection against force.

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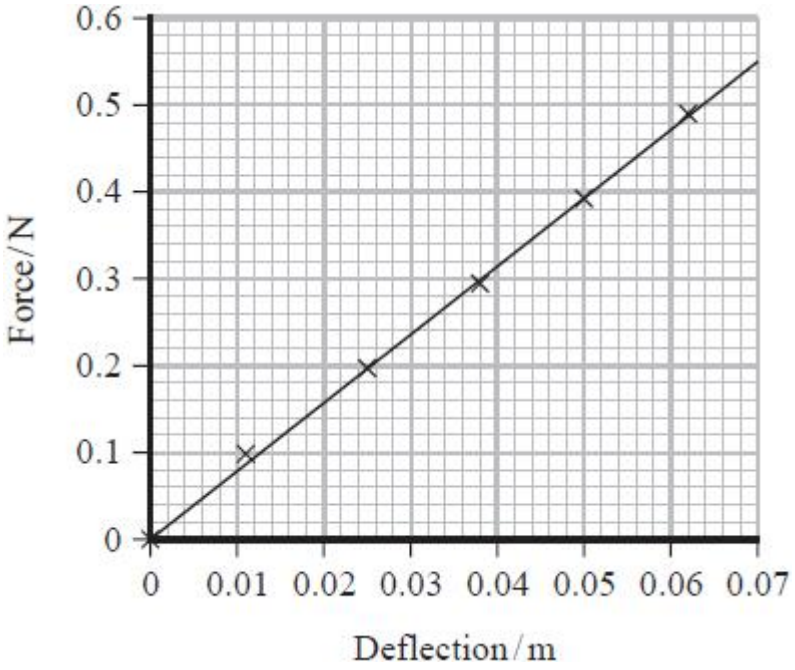

State why the mass will oscillate with simple harmonic motion when it is displaced slightly from its equilibrium position and released.

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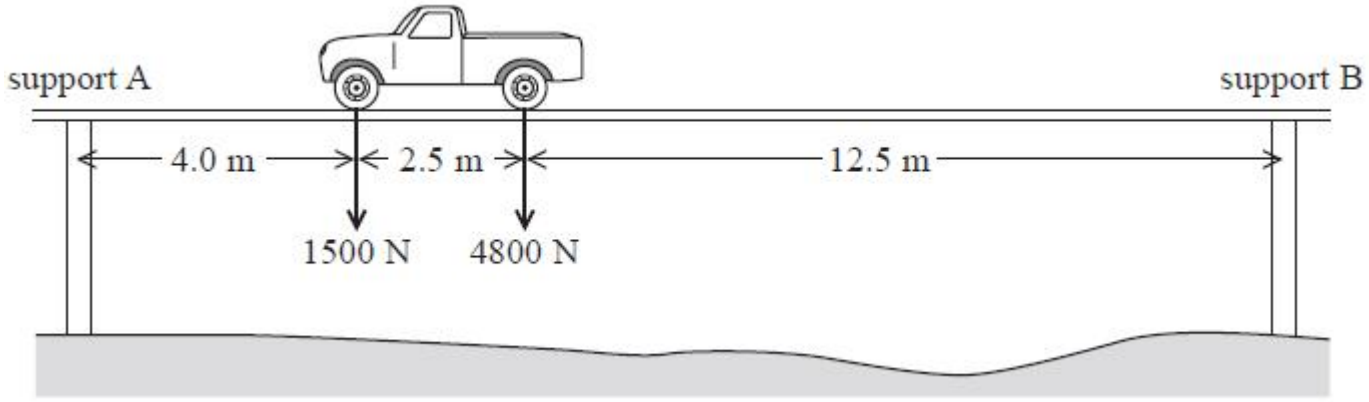
(Total for question = 2 marks)

Q2.

A beam bridge is a rigid structure that consists of one horizontal beam supported at each end.

The diagram shows a bridge with a uniform beam of mass 8 500 kg.

A small truck is crossing the beam bridge. The position of the truck and the forces of the truck on the bridge are shown, but are not drawn to scale.



(a) (i) State the conditions necessary for the bridge to be in equilibrium.

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(ii) Calculate the vertical forces at each of the bridge supports.

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Force at A = ...

Force at B = ...

The Volgograd Bridge is a concrete beam bridge across the River Volga in Russia.

In 2010 the bridge was closed to traffic due to windy conditions leading to resonance of the structure.

(i) Explain what is meant by resonance in this context.

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(ii) To suppress the oscillations of the bridge, dampers were installed.
Explain how damping resulted in the suppression of the oscillations of the bridge.

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(iii) Each damper contains an enclosure filled with a fluid. When this fluid is subjected to a magnetic field, the viscosity of the fluid greatly increases.

Describe how the behaviour of the fluid would change in a magnetic field and how this would be useful for the operation of the dampers.

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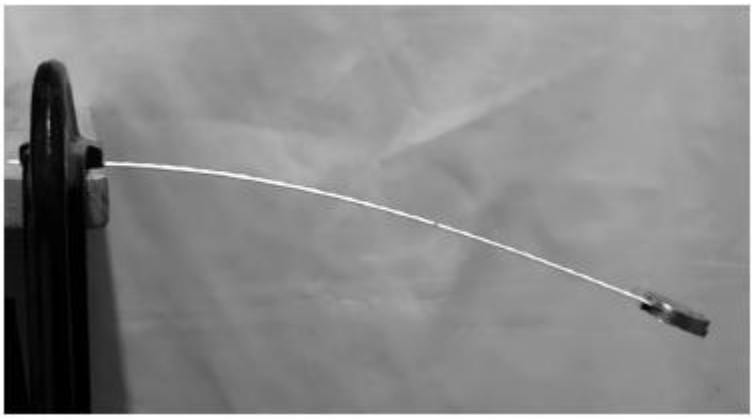
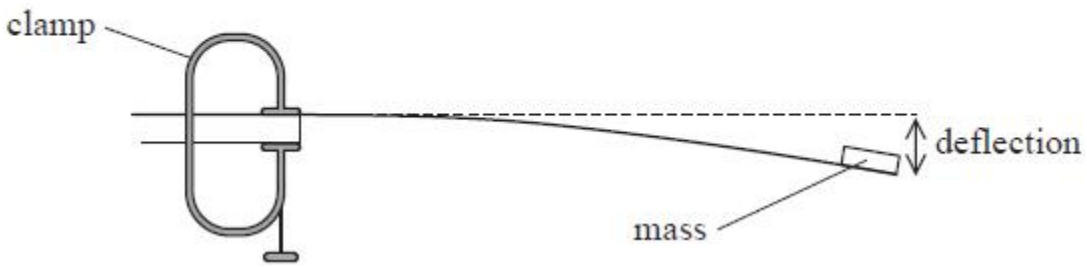
(Total for question = 14 marks)

Q3.

A student measured the deflection of a mass attached to the end of a thin strip of metal.

The strip was clamped to a bench at one end as shown.





The student varied the force on the end of the strip by changing the mass attached.

The deflection was measured each time when the mass was in its equilibrium position.

The student obtained the following graph of deflection against force.

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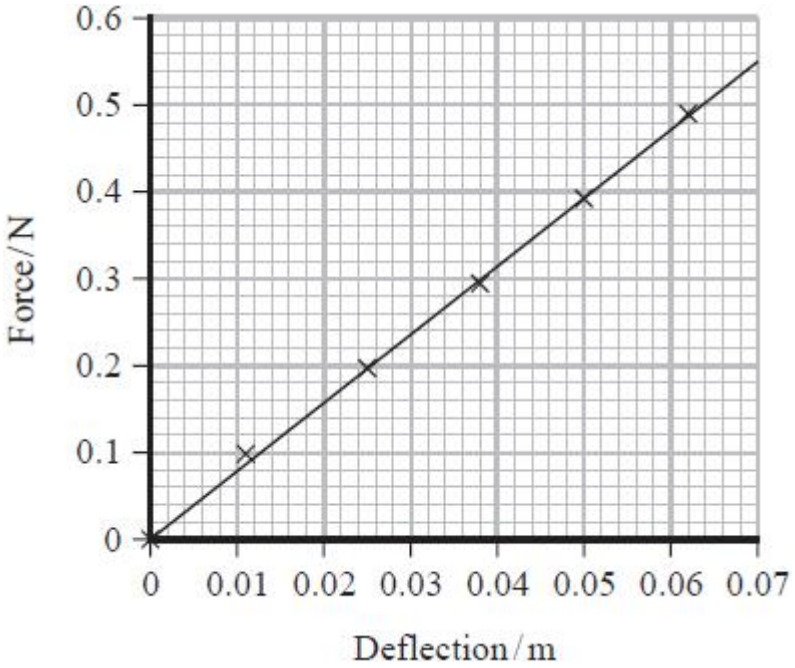

The student then investigated the oscillations of the mass on the metal strip. The student fixed different numbers of 10 g masses to the end of the metal strip.

The student noticed that the smaller the mass the higher the frequency of the oscillations. He estimated that the maximum number of oscillations he could count was two per second. He decided that the smallest mass he should use was 50 g.

Determine whether 50 g is the smallest mass he should use.

You may assume that the system acts in the same way as a mass on a spring.

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(Total for question = 5 marks)

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