



GCE PHYSICS

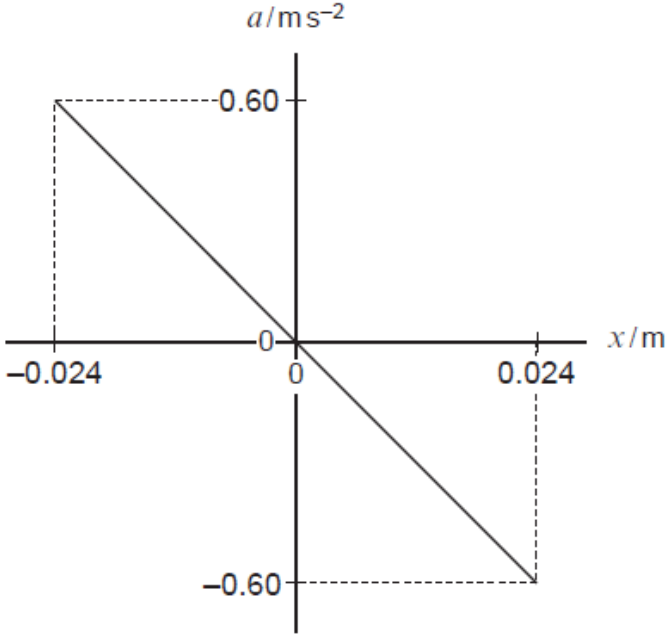
S21-A420QS

Assessment Resource number 8

Newtonian Physics Resource H

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(a) The acceleration, a , of a body is plotted against its displacement, x , from a fixed point.



(i) State the features of the **graph** that show the body is performing *simple harmonic motion*. [2]

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(ii) Determine the *amplitude* of the motion. [1]

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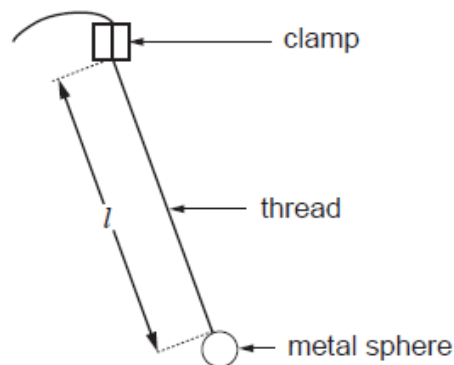
(iii) Calculate the *periodic time* of the motion. [3]

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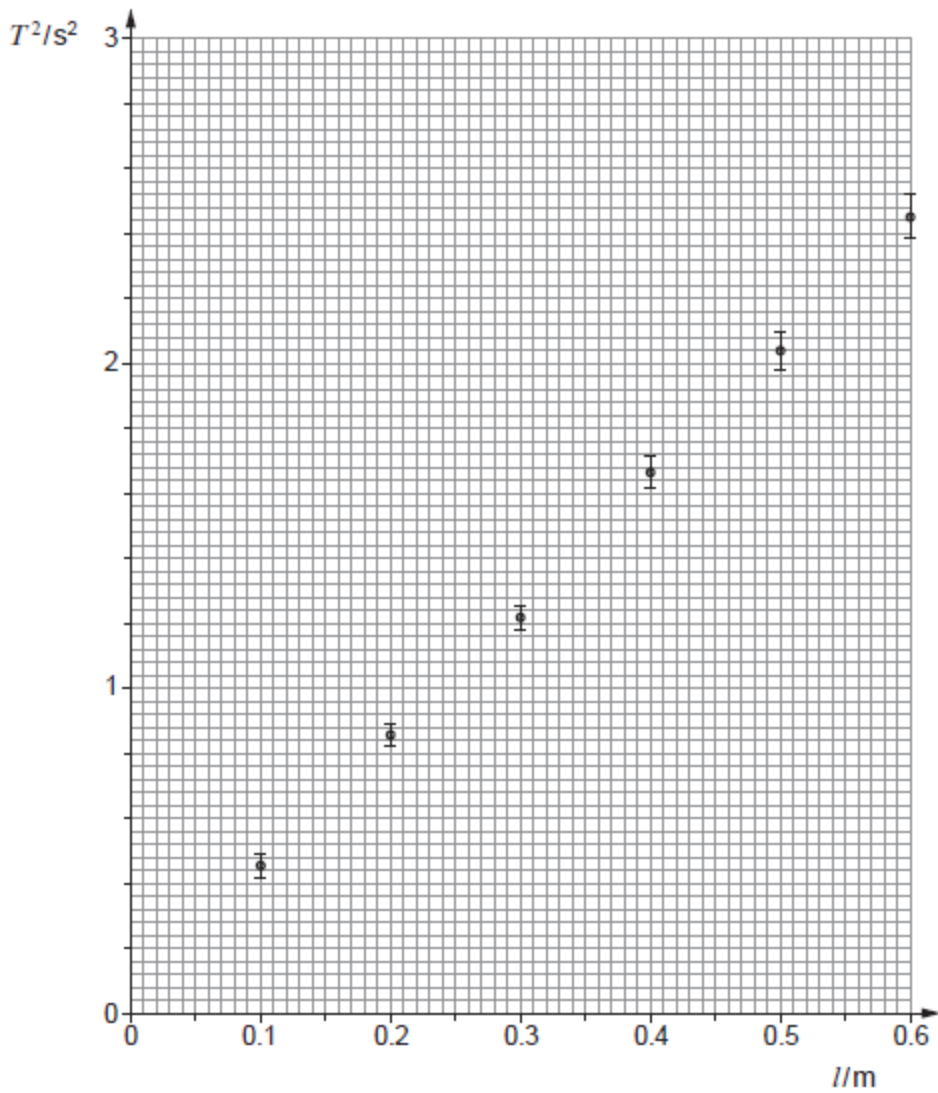
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(b) Charlotte performed an experiment to determine the acceleration due to gravity, g , using a simple pendulum.



Using a metre ruler she measured the length, l , shown in the diagram. She then recorded the time for 10 small amplitude oscillations, repeated the timing and calculated values for the mean periodic time, T , and its uncertainty. She repeated the procedure for another five values of l . She plotted her values of T^2 against l on the following grid.



(i) State why you would not expect the line of best fit to pass exactly through the origin. [1]

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(ii) Determine a value for the acceleration due to gravity, g , together with its percentage uncertainty. Give your reasoning clearly. [6]

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(c) A tennis ball attached by a **spring** to a fixed point is displaced vertically from its equilibrium position and released. It performs *damped oscillations*.

(i) What observed feature of the oscillations shows them to be damped? [1]

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(ii) Explain in terms of *forces* how the damping comes about. [2]

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(d) Explain what is meant by *critical damping*, and state one application of critical damping (or of damping that is close to critical). [3]

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(a) (i) A cylinder of gas fitted with a pressure gauge is surrounded by melting ice. The gas pressure stabilises at 96 kPa. The cylinder is then surrounded instead by boiling water. The pressure stabilises at 131 kPa. Show that this is consistent with a value of -273°C for the absolute zero of temperature. [3]

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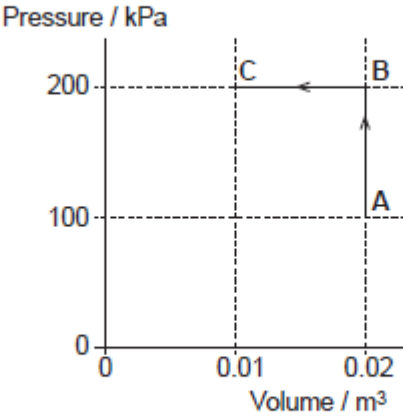
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(ii) State the significance, in terms of molecules, of the absolute zero of temperature. [1]

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(b) A cylinder with a moveable, leak-proof piston contains 0.850 mole of an ideal gas. The gas is taken along the path ABC shown on the p - V grid.



- (i) Show clearly that the gas is at the same temperature at A and C, and determine this temperature. [3]

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- (ii) Calculate the work done on the gas over ABC. [2]

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- (iii) Determine the net heat flow over ABC, stating whether it is in or out of the system, and justifying your answer clearly in terms of the *1st law of thermodynamics*. [3]

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