AS Physics - Experiment Questions for Unit 1

1. Draw a labelled diagram of the apparatus you would use to measure the acceleration of a body in free fall.

(3)

List the measurements you would make and show how you would use them to calculate the acceleration.

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(5)
(Total 8 marks)

2. State Newton's second law of motion.

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(2)

You are asked to test the relation between force and acceleration.

Draw and label a diagram of the apparatus you would use.

State clearly how you would use the apparatus and what measurements you would make.

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(6)

Explain how you would use your measurements to test the relationship between force and acceleration.

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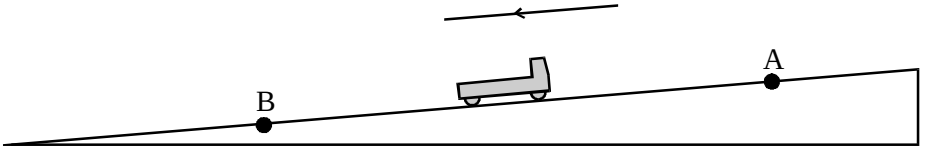
(3)

(Total 11 marks)

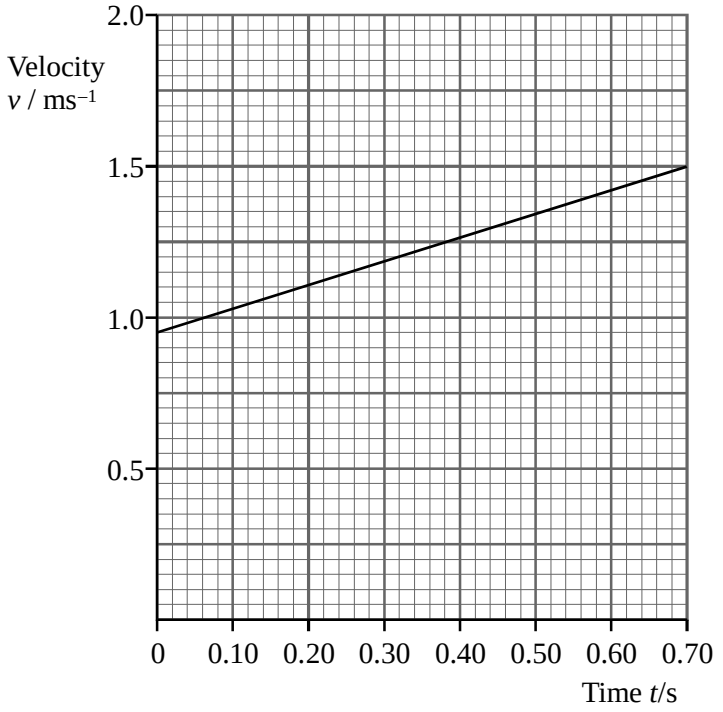
3. The diagram below shows a trolley running down a slope.



Complete the diagram to show an experimental arrangement you could use to determine how the trolley's position varies with time.

(2)

The data is used to produce a velocity-time graph for the trolley. Below is the graph for the motion from point A to point B. Time is taken to be zero as the trolley passes A, and the trolley passes B 0.70 s later.



The motion shown on the graph can be described by the equation $\upsilon = u + at$. Use information from the graph to determine values for u and a.

u = ...

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a = ...

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(3)

Determine the distance AB.

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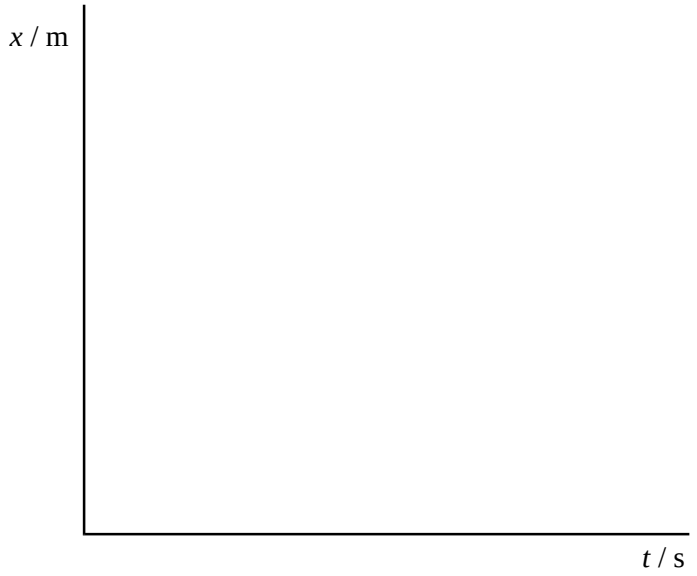
AB = ...

(3)

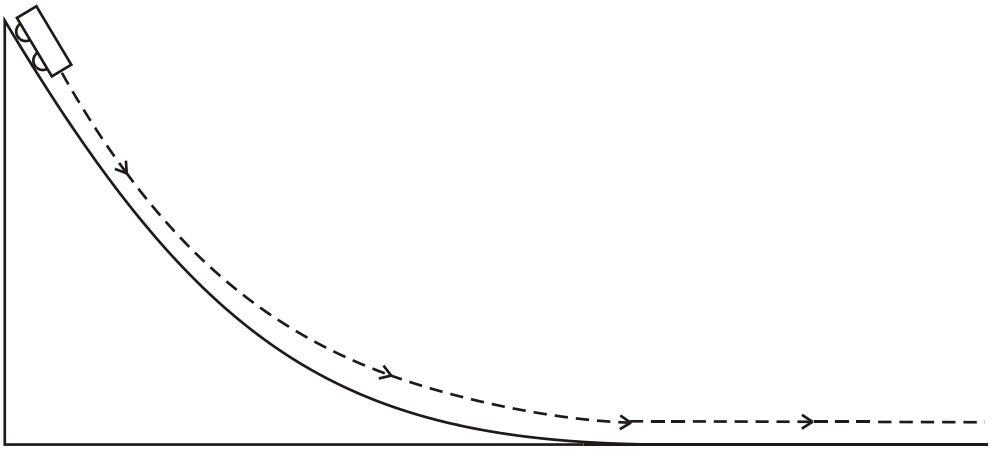
On the axes below sketch a graph to show how the displacement x of the trolley from point A varies with time t. Add a scale to each axis.



(3)

(Total 11 marks)

4. A Physics teacher is demonstrating conservation of energy. She sets up a curved runway and releases an initially stationary trolley from the top.



She tells the class that, as the trolley runs down the slope, its gravitational potential energy is converted into kinetic energy. Explain why this is only approximately true.

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(1)

Describe an experiment she could perform to find out what percentage of the gravitational potential energy lost is actually converted to kinetic energy. Your answer should include:

(i) any additional apparatus required (add this to the diagram opposite),

(ii) how the apparatus is used,

(iii) how the results are analysed.

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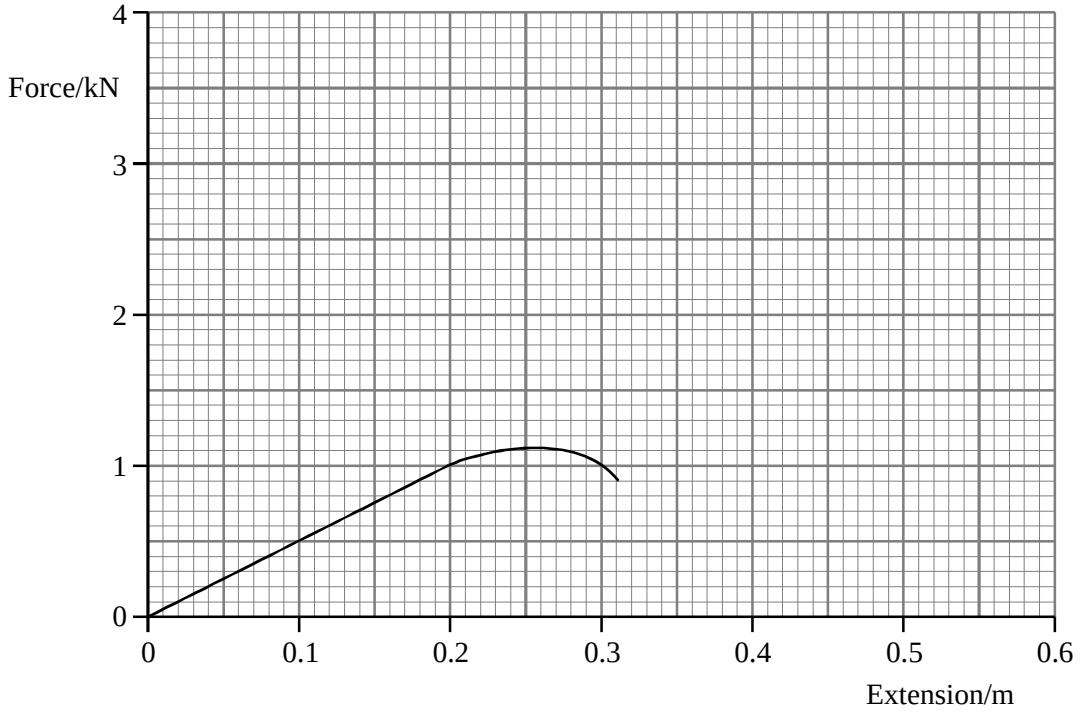
(6)
(Total 7 marks)

5. A nylon tow rope used for towing a car has the force-extension graph shown below.



Mark the graph with two crosses labelled:

P at the limit of proportionality,

Y at the yield point.

(2)

The 4.0 m long rope has an effective cross-sectional area of 3.0×10^{-5} m^2. Calculate the Young modulus of the nylon.

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Young modulus = ...

(3)

On the graph grid, draw lines to show how force would vary with extension if the nylon rope had

(i) twice the length (label this graph L),

(ii) three times the cross-sectional area (label this graph A).

Explain your reasoning in each case.

(i) .....

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(ii) .....

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(4)

In use the original rope stretches by 0.20 m. Calculate the energy stored in the rope.

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Energy stored = ...

(2)

Explain why a longer rope would be less likely to break when used for towing.

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(1)

(Total 12 marks)