OCR (B) Physics A-level

PAG 01.3 - Investigating Initial Speed and Stopping Distance

Practical Flashcards

What is an interrupt card?

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An interrupt card is a length of card of a known length. It is attached to a moving object at the height of the light-gates, and cuts the light-beam as it passes through them.

How can the initial velocity be calculated from the data recorded by the light-gate?

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The light-gate will record the time taken for the interrupt card to pass through. The length of the interrupt card can be divided by the time to obtain the velocity.

Where should the light-gate be set-up in this experiment and what does it record?

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The light-gate should be positioned at the start of the metre ruler, so that it can measure the initial speed of the block.

When pushing the block, why must you release it before it passes through the light-gate?

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If you are still applying a force as it passes through the light-gate, it will cause the block to accelerate. This will result in an inaccurate initial speed measurement.

Why does the block eventually come to a stop?

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The block comes to a stop due to the frictional force acting between the block and the surface.

Describe the energy transfer that takes place in this experiment.

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The kinetic energy of the block is converted into thermal energy as work is done against friction.

Write an energy balance equation for this experiment.

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$$\frac{1}{2}mv^2 = Fd$$

Kinetic Energy = Work Done against Friction

What assumption about friction do we make in this experiment?

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We assume that the frictional force is constant across the distance travelled. This is a fair assumption due to the relatively low speeds.

What is the relationship between stopping distance and initial velocity?

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$$v^2 \propto d$$

Predict how the stopping distance of the block will change when its initial velocity is doubled.

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$$v^2 \propto d$$

This relationship suggests that when the initial velocity is doubled, the stopping distance will quadruple.

Why is it important that the material of the block, and the surface along which it slides, is the same throughout the experiment?

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The two surfaces must remain the same so that the frictional force doesn't change throughout the experiment.

What graph should be plotted with the data obtained from this experiment?

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A graph of stopping distance against velocity squared should be plotted. Since the two quantities are directly proportional, this should form a straight line that passes through the origin.

Why can repeat readings not be taken when carrying out this experiment?

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Repeat readings cannot be taken since it will be difficult to achieve the same exact initial velocity each time.

Why may it be advantageous to the plot the data points as you carry out the experiment?

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By plotting as you carry out the experiment, you can quickly spot an anomalous result, and take another recording around the same velocity to replace it.