

Edexcel Physics A-level

CP09 - Investigating Change in Momentum

Practical Flashcards

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Why should the runway be tilted when carrying out this experiment?



Why should the runway be tilted when carrying out this experiment?

As the trolley travels along the runway, friction will act. To compensate for this, the runway should be tilted.



How would friction affect your results?



How would friction affect your results?
Friction reduces the resultant force acting on the trolley. This will cause the velocity of the trolley as it passes through the light gate to be smaller, and result in a shallower gradient to your graph.



Suggest how friction could further be reduced when carrying out this experiment.



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An air track could be used to reduce the contact and therefore friction.



Describe how the start position of the trolley is determined.



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The trolley should be pulled up the runway until the mass hanger is just touching the pulley.



How should the light-gate be positioned
in this experiment?



How should the light-gate be positioned in this experiment?

The trolley should be pulled up the runway until the mass hanger is just touching the floor, but the string is still taught. The light-gate should then be positioned so it is in the centre of the trolley's interrupt card.



What components should be included when measuring the mass of the whole system?



What components should be included when measuring the mass of the whole system?

The mass of the whole system (M) is equal to the sum of masses of the trolley, slotted masses, mass hanger and string.



Suggest two ways that the distance travelled by the trolley could be measured.



Suggest two ways that the distance travelled by the trolley could be measured.

The distance (d) can be given by the length travelled along the runaway or by the length that the mass hanger falls.



How is the time over which the force acts on the trolley measured?



How is the time over which the force acts on the trolley measured?

A stop-clock should be used to measure the time (T) between the trolley being released and the masses striking the ground.



How is the force acting on the trolley determined?



How is the force acting on the trolley determined?

The force is equal to the weight of the masses and mass hanger:

$$F = mg$$



What is the momentum of the trolley equal to when it reaches the light gate?



What is the momentum of the trolley equal to when it reaches the light gate?

Momentum = Mass of System x Velocity

$$p = Mv$$



How do you calculate the trolley's velocity as it passes through the light-gate?



How do you calculate the trolley's velocity as it passes through the light-gate?

The distance travelled through the light-gate will equal the length of the interrupt card (L).

This can be combined with the time it takes to pass through the light-gate (t) to give:

$$v=L/t$$



What is the change of momentum that the system undergoes?



What is the change of momentum that the system undergoes?

The initial momentum of the system is zero since it is initially at rest. This means the change of momentum is equal to the final momentum (Mv).



What equation is obtained when equating the impulse to the system's change of momentum?



What equation is obtained when equating the impulse to the system's change of momentum?

$$Ft = \Delta mv$$

$$mgT = Mv$$



How can the uncertainties in your time readings (t and T) be obtained?



How can the uncertainties in your time readings (t and T) be obtained?

The uncertainties in t and T are given by halving the range of the repeat readings for each of them.



Explain what graph can be plotted to compare your experimental value of M/g to the theoretical value.



Explain what graph can be plotted to compare your experimental value of M/g to the theoretical value.

A graph of mT against v can be plotted.

The gradient of this graph will be mT/v and can be compared with the theoretical value for M/g .



What safety precautions should be taken when carrying out this experiment?



What safety precautions should be taken when carrying out this experiment?

The masses travelling with the trolley should be attached to it securely to avoid them falling off during motion. You should also avoid standing with your feet near the mass hanger.



Explain how the conservation of energy could be applied in this experiment.



Explain how the conservation of energy could be applied in this experiment.

The system starts at rest, with gravitational potential energy. As the masses fall, this GPE is converted into kinetic energy. Note that work will also be done against resistive forces.



How could multiple light-gates be implemented to improve this experiment?



How could multiple light-gates be implemented to improve this experiment?

A light-gate could also be added to the start. This will remove the need to measure the time T using a stop-clock, and so will reduce the uncertainty due to human reaction time.



How can the uncertainty in your gradient value be calculated?



How can the uncertainty in your gradient value be calculated?

The difference in gradients between the lines of best and worst fit can be divided by the gradient of your line of best fit. This value can then be multiplied by 100% to produce the percentage uncertainty.

