AQA Physics A-level

RP03 - Determination of g

Practical Flashcards

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What is ‘g’?

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What is ‘g’?

Gravitational Field Strength (in our case, on the surface of Earth)

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What is meant by free-fall?

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What is meant by free-fall?

An object is said to be in free-fall if the only force acting on it is gravity. This means that any resistive forces that are acting can be considered to be negligible.

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What graph can be plotted from experimental data to determine ‘g’?

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What graph can be plotted from experimental data to determine ‘g’?

A graph of 2h/t against t can be plotted. The value of ‘g’ is equal to the gradient of the line plotted.

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Demonstrate why ‘g’ is given by the gradient of a 2h/t against t graph.

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Demonstrate why ‘g’ is given by the gradient of a 2h/t against t graph.

$$h = ut + \frac{1}{2}gt^2$$

$$\frac{2h}{t} = gt + 2u$$

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Describe how an electromagnet system can be used to determine ‘g’.

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Describe how an electromagnet system can be used to determine ‘g’.

A magnetic ball bearing can be released by an electromagnet clamped at a known height. The timing system starts when the electromagnet is switched off, and the timer is stopped when the ball lands on the finish pad.

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When using a clamp stand in this experiment, what safety precaution should be taken?

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When using a clamp stand in this experiment, what safety precaution should be taken?

The clamp stand should have a counterweight or a G-clamp attached to its base to provide a moment so as to prevent the clamp stand from toppling over.

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What safety precaution should be taken when using an electromagnet?

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What safety precaution should be taken when using an electromagnet?

Electromagnets heat up over time. To reduce this heating effect, you should switch it off when not in use.

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Suggest how light-gates could be positioned to ensure that the ball falls directly through them.

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Suggest how light-gates could be positioned to ensure that the ball falls directly through them.

A plumb line could be used to demonstrate the expected path of the ball. This allows the light-gates to be positioned in appropriate places so that the ball will fall through them.

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Why is it advantageous to use a small ball-bearing over a larger ball?

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Why is it advantageous to use a small ball-bearing over a larger ball?

The smaller the ball, the smaller the effects of air resistance. In the case of a small ball-bearing these effects can be considered negligible.

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Why should there be a gap between the release position and the first light-gate?

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Why should there be a gap between the release position and the first light-gate?

There should be a gap to ensure that the time over which the ball is passing through the light gate is negligible (the ball is moving sufficiently quick enough).

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Explain why this experiment would not be valid if the air resistance acting on the ball wasn't negligible.

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Explain why this experiment would not be valid if the air resistance acting on the ball wasn't negligible.

The ball wouldn't be in free-fall since the acceleration would not be purely due to the force of gravity. The acceleration would also be variable since air resistance increases with speed, and so the uniform acceleration equations couldn't be used.

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Suggest why your obtained value of ‘g’ may not be the same as the accepted value.

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Suggest why your obtained value of ‘g’ may not be the same as the accepted value.

- Delays in the timing equipment (if using a stop clock, this will be human reaction time)
- Resistive forces may be significant
- Errors in height measurements, such as measuring from different positions on the ball each time

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Would you expect your value of ‘g’ to be greater or lower than the accepted value?

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Would you expect your value of ‘g’ to be greater or lower than the accepted value?

You will most likely obtain a value that is lower than the accepted value, due to air resistance reducing the downwards resultant force acting on the object.

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How could your results be improved?

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How could your results be improved?

You should take repeat readings at each height and then calculate the mean time taken. You should also ensure that height measurements are taken from the same position on the ball, each time.

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What is the advantage of using light-gates over a stop-clock in this experiment?

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What is the advantage of using light-gates over a stop-clock in this experiment?

Using light-gates should result in a lower uncertainty in your time measurements. A stop-clock will involve human reaction times and therefore an associated error.

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How can the percentage difference between your value of ‘g’ and the accepted value be calculated?

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How can the percentage difference between your value of ‘g’ and the accepted value be calculated?

$$[(\text{Your Value} - 9.81)/9.81] \times 100\%$$

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What is the minimum number of repeat readings you should take in this experiment?

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What is the minimum number of repeat readings you should take in this experiment?

You should take at least 3 repeat readings at each height. This allows for anomalous results to be more easily identified.

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