OCR A-Level Physics

3.1 Motion

Flashcards

Define speed, the equation used to calculate speed, and the respective SI units.

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Speed is defined as the rate of change of distance. The equation used is:

$$speed = distance / time$$

The SI units are ms^{-1}.

Define displacement.

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The displacement of an object is the distance it has travelled in a given direction, so it is a vector with both magnitude and direction.

Define velocity, the equation used to calculate velocity, and the respective SI units.

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The velocity of an object is defined as the rate of change of displacement, or speed in a given direction, making velocity a vector.

The equation used is velocity = change in displacement/time and the SI units are ms^{-1}.

Define acceleration, the equation used to calculate acceleration, and the respective SI units.

Define acceleration, the equation used to calculate acceleration, and the respective SI units.

Acceleration is defined as the rate of change of velocity, making it a vector.

The equation used is acceleration = change in velocity / time and the SI units are ms^{-2}.

What does a straight, horizontal line represent on a displacement-time graph?

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A stationary object.

What does a line with a constant, non-zero gradient represent on a displacement-time graph?

What does a line with a constant, non-zero gradient represent on a displacement-time graph?

An object moving with constant velocity.

What does a curved line represent on a displacement-time graph?

What does a curved line represent on a displacement-time graph?

Acceleration (if gradient is increasing) or deceleration (if gradient is decreasing).

What does a straight, horizontal line represent on a velocity-time graph?

What does a straight, horizontal line represent on a velocity-time graph?

An object moving with constant velocity.

What does a line with a constant, non-zero gradient represent on a velocity-time graph?

What does a line with a constant, non-zero gradient represent on a velocity-time graph?

An object that is accelerating (positive gradient) or decelerating (negative gradient).

What does the area under a velocity-time graph represent?

What does the area under a velocity-time graph represent?

Displacement.

What does the area under an acceleration-time graph represent?

What does the area under an acceleration-time graph represent?

Velocity.

Describe how the terminal velocity of an object can be determined using light gates.

Describe how the terminal velocity of an object can be determined using light gates.

- Set up the light gates vertically and measure the distance between them.
- Connect them to a data logger and then release an object from rest above them, measuring the time it takes for the object to travel between the two gates.
- Using the time and the known distance, you can calculate the velocity of the falling object.

Describe how light gates can also be used to investigate conservation of momentum.

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- Place two carts on a linear air track (to reduce friction) with repelling magnets so that they do not stick together.
- Attach card to the top of each cart so that they break the beams of the light gates when they pass.
- Keep one cart stationary and push the other towards it, measuring its velocity before the collision.
- Then measure the velocity of both carts after the collision and calculate the momentum before and after.

Define ‘g’.

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The acceleration of free fall, ‘g’, is the acceleration of an object in response to the gravitational attraction between the Earth and the object. $g = 9.81 m\ s^{-2}$.

Describe the experiment in which one can determine ‘g’ using an electromagnet.

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- An electromagnet holds a steel ball suspended a measured distance above a surface, then start the timer when the electromagnet is deactivated, and stop it when the surface is hit.
- As the ball was initially resting, u = 0.
- The distance and time are known, so we can use a SUVAT equation:

$$s = ut + \frac{1}{2} at^2 \; t$$

- Calculate ‘a’ which, in this case, is ‘g’.

A ball is projected off a castle at 6m s^{-1}. How does its horizontal velocity change from its launch until it hits the ground?

A ball if projected of a castle at 6m s^{-1}. How does its horizontal velocity change from its launch until it hits the ground?

The horizontal velocity remains the same as there is no acceleration in the horizontal direction.

In projectile motion, what is the vertical acceleration?

In projectile motion, what is the vertical acceleration?

The vertical acceleration is equal to gravitational field strength (g) downwards.