AQA Physics GCSE

4.5.6 - Forces and Motion

Flashcards

Does a distance quantity require a specific direction? i.e. Is it a scalar or vector quantity?

Does a distance quantity require a specific direction? i.e. is it a scalar or vector quantity?

No specific direction is required so it is a scalar quantity.

If an object moves 3 metres to the left and then 3 metres back to its initial position, what is the object's total displacement?

If an object moves 3 metres to the left and then 3 metres back to its initial position, what is the object's total displacement?

- The object has zero displacement
- Displacement is a vector quantity so it also involves direction
- The object starts and ends at the same point

State a typical value for the speed of sound.

State a typical value for the speed of sound.

330 m/s

What is a typical value for human walking speed?

What is a typical value for human walking speed?

1.5 m/s

What is a typical value for human running speed?

What is a typical value for human running speed?

3 m/s

What is a typical value for human cycling speed?

What is a typical value for human cycling speed?

6 m/s

State the equation linking distance, speed and time. Give appropriate units.

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Distance = Speed x Time

Distance (m), Speed (m/s), Time (s)

Why can an object travelling at a constant speed in a circle not have a constant velocity? (Higher)

Why can an object travelling at a constant speed in a circle not have a constant velocity? (Higher)

- Speed is a scalar quantity
- Velocity is a vector quantity which means it can only be constant if the direction is constant
- In circular motion, the direction is continuously changing

How can speed be calculated from a distance-time graph?

How can speed be calculated from a distance-time graph?

The speed is equal to the gradient of the graph.

What must be done to calculate speed at a given time from a distance-time graph for an accelerating object? (Higher)

What must be done to calculate speed at a given time from a distance-time graph for an accelerating object? (Higher)

- Drawing a tangent to the curve at the required time
- Calculating the gradient of the tangent

State the equation for the average acceleration of an object. Give appropriate units.

State the equation for the average acceleration of an object. Give appropriate units.

Acceleration = (Change in Velocity)/(Time Taken)

Acceleration (m/s^2), Velocity (m/s), Time (s)

How can the distance travelled by an object be calculated from a velocity-time graph? (Higher)

How can the distance travelled by an object be calculated from a velocity-time graph? (Higher)

It is equal to the area under the graph.

Give an approximate value for the acceleration of an object in free fall under gravity near the Earth's surface.

Give an approximate value for the acceleration of an object in free fall under gravity near the Earth's surface.

$9.8\ m/s^2$

What can be said about the resultant force acting on an object when it is falling at terminal velocity?

What can be said about the resultant force acting on an object when it is falling at terminal velocity?

- The resultant force is zero
- When at terminal velocity, the object is moving at a constant speed and so isn't accelerating

State Newton's first law for a stationary object.

State Newton's first law for a stationary object.

If the resultant force on a stationary object is zero, the object will remain at rest.

State Newton's first law for a moving object.

State Newton's first law for a moving object.

If the resultant force on a moving object is zero, the object will remain at constant velocity (same speed in same direction).

What can be said about the braking forces and driving forces when a car is travelling at constant velocity?

What can be said about the braking forces and driving forces when a car is travelling at constant velocity?

The braking forces are equal to the driving forces.

If an object changes direction but remains at a constant speed, is there a resultant force?

If an object changes direction but remains at a constant speed, is there a resultant force?

Since there is a change in direction, there is a change in velocity and so there must be a resultant force.

What is inertia? (Higher)

What is inertia? (Higher)

The tendency of an object to continue in its state of rest or uniform motion.

State the defining equation for Newton's Second Law.

State the defining equation for Newton's Second Law.

Resultant force = Mass x Acceleration

$F = ma$

State Newton's Second Law in words.

State Newton's Second Law in words.

An object's acceleration is directly proportional to the resultant force acting on it and inversely proportional to its mass.

What is inertial mass? (Higher)

What is inertial mass? (Higher)

- A measure of how difficult it is to change a given object's velocity
- The ratio of force over acceleration

What is the symbol used to represent an approximate value?

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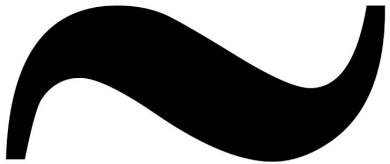

State Newton's Third Law.

State Newton's Third Law.

Whenever two objects interact, the forces that they exert on each other are always equal and opposite.

What is the stopping distance of a vehicle equal to?

What is the stopping distance of a vehicle equal to?

The sum of thinking distance and braking distance.

For a given braking distance, if the vehicle's speed is increased, what can be said about its stopping distance?

For a given braking distance, if the vehicle's speed is increased, what can be said about its stopping distance?

The stopping distance is increased with an increase in speed.

Give a typical range of values for human reaction time.

Give a typical range of values for human reaction time.

0.2 seconds - 0.9 seconds

Give three factors which can affect a driver's reaction time.

Give three factors which can affect a driver's reaction time.

1. Tiredness
2. Drugs
3. Alcohol

Give two factors which may affect braking distance.

Give two factors which may affect braking distance.

1. Adverse (wet/icy) road conditions
2. Poor tyre/brake conditions

Describe the energy transfers that take place when a car applies its brakes.

Describe the energy transfers that take place when a car applies its brakes.

- Work is done by the friction force between the brakes and wheel
- Kinetic energy of the wheel is converted to heat and is dissipated to the surroundings through the brake discs

To stop a car in a given distance, if its velocity is increased, what must happen to the braking force applied?

To stop a car in a given distance, if its velocity is increased, what must happen to the braking force applied?

The braking force must also be increased.

State two consequences of a vehicle undergoing very large decelerations.

State two consequences of a vehicle undergoing very large decelerations.

1. Kinetic energy converted to heat is very high causing brakes to overheat
2. Loss of control of the vehicle