

AQA A-Level Physics

Topic 4.1 Mechanics

Flashcards

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What is meant by a scalar quantity?



What is meant by a scalar quantity?

A quantity that has only magnitude.



What is a vector quantity?



What is a vector quantity?

A quantity that has magnitude as well as direction.



Is acceleration a vector or scalar quantity?



Is acceleration a vector or scalar quantity?

Vector.



Is mass a scalar or vector quantity?



Is mass a scalar or vector quantity?

Scalar.



What is the difference between mass
and weight?



What is the difference between mass and weight?

Mass is scalar and is not dependent on the gravity acting upon it. Weight is a vector and depends on the gravitational field strength.

$$W = mg$$



If an object is in equilibrium the sum of the anti clockwise moments would be

.....



If an object is in equilibrium the sum of the anti clockwise moments would be

Equal to the sum of the clockwise moments (principle of moments).



If an object is in equilibrium it means the
object is ...



If an object is in equilibrium it means the object is ...

Not accelerating, so is either:

- Stationary, or
- Moving at a constant velocity



How can the forces acting on a object be shown to be in equilibrium?



How can the forces acting on a object be shown to be in equilibrium?

- Adding the horizontal and vertical components of the forces acting on it, showing they equal zero.
- Or if there are 3 forces acting on the object you can draw a scale diagram, if the scale diagram forms a closed triangle, then the object is in equilibrium.



What is a moment?



What is a moment?

A turning force: force multiplied by the perpendicular distance from the point to the line of action of the force.



What is meant by a couple?



What is meant by a couple

A pair of equal and opposite coplanar forces.



What is meant by the centre of mass?



What is meant by the centre of mass?

The point through which all the mass of an object acts, for a uniform object the centre of mass is the centre of the object



If you have a uniform object, where would its centre of mass be?



If you have a uniform object, where would its centre of mass be?

At the centre of the solid.



What can be described as ‘the change in displacement per unit of time’?



What can be described as ‘the change in displacement per unit of time’?

Velocity, instantaneous velocity can be found by measuring the gradient of a tangent to a displacement-time graph



What is the area under a velocity-time
and acceleration-time graph?



What is the area under a velocity-time and acceleration-time graph?

The displacement travelled and the velocity respectively.



As speed increases, air resistance



As speed increases, so air resistance

Increases (proportional to the square of the speed).



A ball is projected off a castle at 6m/s ,
how does its horizontal velocity change
from its launch until it hits the ground?



A ball is projected from a castle at 6m/s , 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 that direction.



How do the SUVAT equations reflect that
that all objects fall at the same rate?



How do the SUVAT equations reflect that all objects fall at the same rate?

Mass is not included in the SUVAT equations, showing that the mass of an object does not affect its speed or acceleration.



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).



What is meant by terminal velocity?



What is meant by terminal velocity?

When the forces acting on the falling object become balanced, the acceleration becomes zero and the object is moving at maximum velocity.



What is meant by friction?



What is meant by friction?

A resistance to motion between an object and a surface or an object moving through a fluid. Friction is a force that acts in the opposite direction to the movement.



Which of Newton's Laws state 'every action force has an equal and opposite reaction force'?



Which of Newton's Laws state 'every action force has an equal and opposite reaction force'

Newton's third law?



What is Newton's second law?



What is Newton's second law?

$$F = ma$$

Where mass (m) is constant, F is the force applied and a is the acceleration.



What is Newton's first law?



What is Newton's first law?

An object stays moving at a constant velocity until a force acts upon it.



What is the difference between elastic and inelastic collisions?



What is the difference between elastic and inelastic collisions?

In an elastic collision the kinetic energy before is equal to the kinetic energy afterwards.

In an inelastic collision the kinetic energy at the end is not equal to the kinetic energy at the start.



Give an equation that can be used to calculate momentum.



Give an equation that can be used to calculate momentum.

$$\textit{momentum} = \textit{mass} \times \textit{velocity}$$



True or false: 'Linear momentum is only conserved in elastic collisions.'



True or false: 'linear momentum is only conserved in elastic collisions'.

False, linear momentum is always conserved.



The rate of change of momentum can also be described as...



The rate of change of momentum can also be described as...

Force.



What is impulse?



What is impulse?

The change in momentum.

$$F\Delta t = \Delta mv$$



What does the area underneath a force
time graph represent?



What does the area underneath a force time graph represent?

Impulse, the change in momentum.



$$F \cos(\theta) = ?$$



$$F_s \cos(\theta) = ?$$

The work done / the energy transferred



What's the rate of work done is equal to?



What's the rate of work done equal to?

The power.



What is efficiency?



What is efficiency?

*Efficiency = The useful output power /
input power*



What is meant by the principle of conservation of energy?



What is meant by the principle of conservation of energy?

Energy cannot be created or destroyed, only transferred into other forms of energy.

Therefore the total energy in a closed system will always remain the same.



A river flowing to the right acts on a crossing boat with force 19N , the boat provides a perpendicular thrust of 45N , what is the resultant force on the boat?



A river flowing to the right acts on a crossing boat with force 19N, the boat provides a perpendicular thrust of 45N, what is the resultant force on the boat?

Forces are perpendicular so use pythagoras's theorem.

$$\text{Resultant force}^2 = 19^2 + 45^2$$

$$\text{Resultant force} = 48.84669897 \text{ N}$$

$$\text{Resultant force} = 49\text{N (2sf)}$$

$$\text{Direction, } \tan\theta = 45/19$$

$$\theta = \tan^{-1}(45/19)$$

$$\theta = 67^\circ \text{ above the horizontal}$$



A ball is fired at a velocity of 10 m/s , at an angle of 30° from the horizontal, find the vertical and horizontal components of velocity.



A ball is fired at a velocity of 10 m/s, at an angle of 30° from the horizontal, find the vertical and horizontal components of velocity.

$$\begin{aligned}x &= 10 \cos 30^\circ \\ &= 8.7 \text{ m/s}\end{aligned}$$

$$\begin{aligned}y &= 10 \sin 30^\circ \\ &= 5 \text{ m/s}\end{aligned}$$



What is lift?



What is lift?

An upward force which acts on objects travelling in a fluid, it is caused by the object creating a change in direction of fluid flow and acts perpendicular to the direction of fluid flow.

