

Edexcel IAL Physics A-Level

Topic 4.1 - Further Mechanics

Flashcards



What is the rule for resolving momentum
in components?



What is the rule for resolving momentum in components?

The momentum is only transferred parallel to the line of impact and is conserved.



Write down the equation for impulse.



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$$F\Delta t = \Delta(mv) = mv - mu$$

Impulse = change in momentum



What are the two 'dimensions' you can use to resolve momentum?



What are the two 'dimensions' you can use to resolve momentum?

Resolve horizontally and vertically or resolve parallel and perpendicular to the line of impact.



What is the difference between an elastic and inelastic collision?



What is the difference between an elastic and inelastic collision?

In an elastic collision, momentum and kinetic energy are conserved. In an inelastic collision, kinetic energy is not conserved.



Derive the equation linking kinetic energy, momentum and mass.



Derive the equation linking kinetic energy, momentum and mass.

- First we start with $E_k = \frac{1}{2}mv^2$ and $p=mv$.
- If we substitute $m=p/v$ into E_k we get
- $E_k = pv/2$ then we substitute $v=p/m$
- into E_k we get $E_k = p^2/2m$



Define angular displacement and give its unit.



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Angular displacement is the angle through which a point has been rotated in a given direction. It is measured in radians (θ), 1 radian is equal to the arc length of a sector over its radius.



Define angular velocity.



Define angular velocity.

Angular velocity (ω) = angular displacement/time

$\omega = \theta / t$. To convert linear speed to angular velocity: $v = \omega r$ where r is the radius of the circular path / m.



Define frequency and period in this context and state the equations in terms of ω .



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Frequency: number of complete revolutions per second [$\omega = 2\pi f$].

Period: Time taken for a complete revolution (rev s^{-1}) [$T = 2\pi/\omega$].



What kind of force is required to keep an object moving in a circle at constant speed?



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A constant centripetal force (A force applied always towards the centre of that circle).



How is centripetal acceleration produced?



How is centripetal acceleration produced?

It is produced by a centripetal force.

Since $F = ma$, the centripetal force must be $F = mv^2 / r$ and $F = mr\omega^2$.

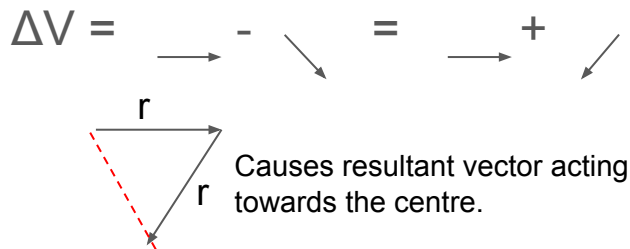
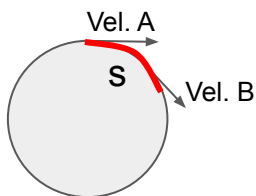


Explain the derivation for centripetal acceleration.



Explain the derivation for centripetal acceleration

If a ball is moving at a constant speed in a circle, it is changing direction constantly so also accelerating, meaning its linear speed is the same but its linear velocity is changing.



As this forms an isosceles triangle:

$$s/r = \Delta v_A/v_A = \Delta v/v$$

$$\text{As } s = v\Delta t, v\Delta t/r = \Delta v/v$$

Rearranging this:

$$\Delta v/t = v^2/r$$

$\Delta v/t =$ acceleration therefore

$$\text{Centripetal acceleration} = v^2/r = r\omega^2$$



Write down all the different equations for force involving angular velocity/radius etc.



Write down all the different equations for force involving angular velocity/radius etc.

$$F = ma = mv^2 / r = mr\omega^2$$

