Edexcel IAL Physics A-Level

Topic 1.1 - Mechanics

Flashcards

State the 4 SUVAT equations

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$$s = \frac{(u + v)t}{2}$$

$$v = u + at$$

$$s = ut + \tfrac{1}{2}at^2$$

$$v^2 = u^2 + 2as$$

What does a horizontal line represent on a graph of displacement (y axis) against time (x axis)?

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A stationary object.

What does a line with a constant gradient represent on a graph of displacement (y axis) against time (x axis)?

What does a line with a constant gradient represent on a graph of displacement (y axis) against time (x axis)?

An object with constant velocity.

What does a curved line represent on a graph of displacement (y axis) against time (x axis)?

What does a curved line represent on a graph of displacement (y axis) against time (x axis)?

Acceleration or deceleration.

What does a horizontal line represent on a graph of velocity (y axis) against time (x axis)?

What does a horizontal line represent on a graph of displacement (y axis) against time (x axis)?

An object with a constant velocity.

What does a line with a constant gradient represent on a graph of velocity (y axis) against time (x axis)?

What does a line with a constant gradient represent on a graph of displacement (y axis) against time (x axis)?

The constant acceleration of the object for a positive gradient or constant deceleration for negative gradient.

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

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

The displacement of the object and the change in velocity respectively.

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.

- The light gates are connected to a timer or data logger.
- The time when each of the two beams are broken by the object and the time difference (with a number of repeats done to improve the accuracy) combined with the known distance between the light gates are used to find the velocity.
- velocity = distance / time

What is meant by a scalar quantity?

What is meant by a scalar quantity?

A quantity that only has magnitude not direction.

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?

Mass is scalar.

The diagram shows a force F at an angle of 30° to the horizontal direction. The horizontal component of the force F is 7.0 N. Calculate the magnitude of the force F.

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$$F_x = F \cos \theta$$
$$7.0 = F \times \cos 30$$
$$F = 8.1 \text{ (N) or } 8.08 \text{ (N)}$$

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

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Newton's third law.

What is Newton's second law?

What is Newton's second law?

$$F = ma$$

Where mass is constant.

What is Newton's first law?

What is Newton's first law?

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

Describe with diagrams the forces acting on a free-falling skydiver.

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1. During acceleration, weight > air resistance, as speed increases so does air resistance.

2. Terminal velocity is reached, weight = air resistance.

3. Parachute is opened causing deceleration as weight < air resistance.

4. New, slower terminal velocity is reached, weight = air resistance.
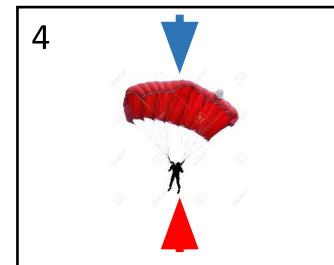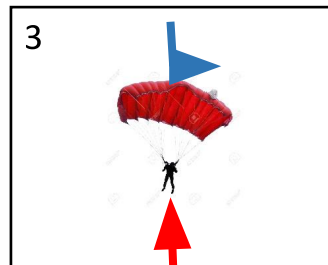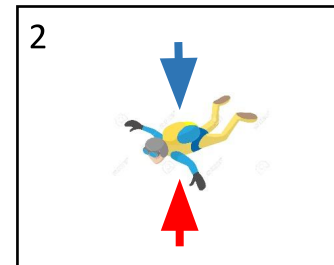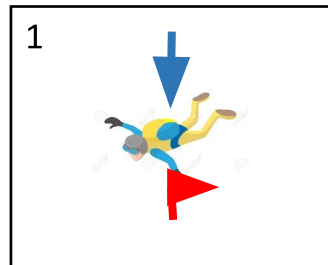
▼ = Weight   ▲ = Air Resistance

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.

However 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.

momentum = mass × 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 stand for?

What does the area underneath a force time graph stand for?

Impulse, the change in momentum.

Define the 'work done'.

Define the 'work done'.

$$\Delta W = F\Delta s$$

The work done is defined as the product of the magnitude of the force and distance moved by the object in the direction of the force. It is a measurement of energy and its units are joules with SI base unit kg m^2 s^-2.

What is the rate of work done equal to?

What is the rate of work done equal to?

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.

Define Kinetic Energy and give its SI base unit.

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The energy associated with the motion of an object with mass. The SI base unit is kg m^2 s^-2.

Define Gravitational Potential Energy.

Define Gravitational Potential Energy.

The energy stored by an object at a point in a gravitational field.

Define Elastic Potential Energy.

Define Elastic Potential Energy

The energy stored by an object as a result of a reversible change in an object's shape.

By considering a closed system where an object is moving up and down, derive a formula for the velocity of an object in a gravitational field.

By considering a closed system where an object is moving up and down, derive a formula for the velocity of an object in a gravitational field.

All initial GPE is converted to KE as the object falls, and this KE is converted back to GPE as it rises.

$mgh = \frac{1}{2}mv^2$ rearranging this in terms of v^2 gives:

$v^2 = 2gh$ hence $v = \text{sqrt}(2gh)$

mass has no bearing on the final speed, the acceleration of free fall is the same for all objects.

What is the relationship between power, time and work done (energy transferred)?

What is the relationship between power, time and work done (energy transferred)?

Power = Energy Transferred / Time

Power = Work Done / Time

What is efficiency?

What is efficiency?

Efficiency (%) = (The useful output power ÷ input power) x 100

or

Efficiency (%) = (The useful energy output ÷ input energy) x 100

Is the horizontal or vertical component of velocity constant in projectile motion?

Is the horizontal or vertical component of velocity constant in projectile motion?

Horizontal.

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 a moment? State the principle of moments.

What is a moment? State the principle of moments.

A turning force.

Moment = force x perpendicular distance from the object

For an object in equilibrium the sum of the clockwise moments will equal the sum of the anticlockwise moments.

Where is the 'centre of gravity' on a uniform object?

Where is the 'centre of gravity' on a uniform object?

At its geometrical centre.

State the equations for determining gravitational field strength and weight.

State the equations for determining gravitational field strength and weight.

$$G = F / m$$

where F is the force on a body in a gravitational field/N and m is the mass of the body/kg.

$$W = mg$$

where m is the mass of the body/kg and g the gravitational field strength/ ms^{-2}.