CAIE Physics A-level

4 - Forces, Density and Pressure

Flashcards

Draw a diagram showing the forces on a mass in a gravitational field.

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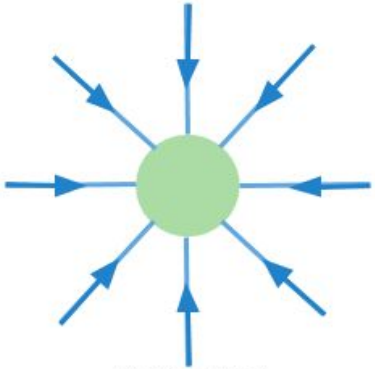

Radial field

Draw a diagram showing the path of a positive charge in a uniform electric field.

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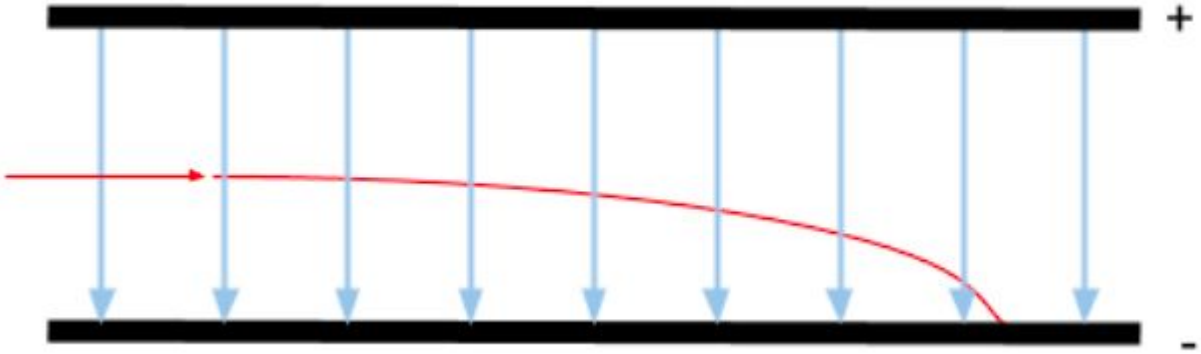

Describe what happens when a resultant force F acts on a body with mass m.

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The body will accelerate in the direction of the resultant force. The resultant force is related to mass and acceleration by the formula F = ma.

Give 3 examples of common forces and explain briefly what they do.

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Any 3 of the following:

- Weight – the gravitational force acting on an object, through its centre of mass.
- Friction – the force that arises when two surfaces rub against each other.
- Drag – the resistive force on an object travelling through a fluid (e.g. water or air).
- Tension – the force within a stretched cable or rope.
- Upthrust – the upward buoyancy force acting on an object when it is in a fluid.
- Normal Contact Force – the force arising when an object rests against another object. It acts perpendicular to the plane of contact.

What is meant by drag?

What is meant by drag?

An object moving through a fluid experiences a drag force acting on it. Drag is a frictional force that opposes motion. In air this is air resistance.

What is the centre of gravity of an object?

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The centre of gravity of a mass-possessing object is the point at which all the mass of the object can be considered to act through.

What is the principle of moments?

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For an object in equilibrium, the sum of the clockwise moments is equal to the sum of the anticlockwise moments.

What is a moment?

What is a moment?

A turning force: force x 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 that have equal magnitude and opposite direction, applied to a body in parallel with each other but not along the same line. For example:

Such forces can cause rotation of the object.

When a lever is in equilibrium, what condition must be met?

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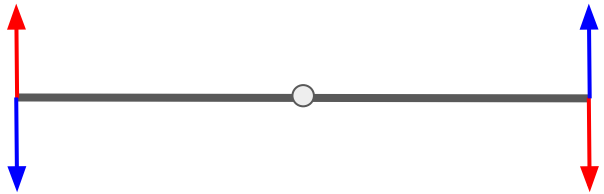
The clockwise moments must equal the anti-clockwise moments.



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

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At the geometric centre of the object.

Describe what is meant by density.

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The mass per unit volume of a substance. The unit is kg m^{-3}.

Describe what is meant by pressure.

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The pressure is the normal force exerted on a surface per unit area. It is measured in Pascals (Pa), where 1 Pa = 1 Nm^{-2}.

What is the force that an object submerged in a fluid experiences?

What is the force that an object submerged in a fluid experiences?

It experiences an upwards force called upthrust. This is because the pressure at the bottom surface of the object is greater than at its top surface.

Hydrostatic pressure > atmospheric pressure

Derive the following equation:

$$\Delta p = \rho g \Delta h$$

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The equation for Pressure is given by $P=F/A$

$= mg/A = \rho Vg/A = \rho A \Delta h g/A = \rho \Delta h g$

Where $\rho = m/V$ so $m = \rho V$ and $V = A\Delta h$

State Archimedes' principle for upthrust in a fluid.

State Archimedes' principle for upthrust in a fluid.

$$F = \rho g V$$

Where 'F' is the upthrust, 'ρ' and 'V' are the densities and the volumes of the object respectively.