AS physics EOS definition 汇总

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Physical Quantities and Units

Accuracy: How close a measurement is to its true value, influenced by the systematic and random errors of that measurement.

Absolute Uncertainties: The interval that a value is said to lie within, with a given level of confidence.

Base Units: The set of seven basic measures from which all other SI units can be derived.

Precision: A measure of how close a measurement is to the mean value. It only gives an indication of the magnitude of random errors, not how close data is to the true value.

Random Error: The unpredictable variation in a measurement. These can be reduced by taking many repeated measurements and calculating their mean.

Resolution: The smallest interval that a given measuring device can measure.

Scalar Quantity: A quantity that only has a magnitude.

Systematic Error: A consistent shift in readings causing a deviation from the true value. This shift is due to the equipment or method being used and cannot be reduced by repeated measurements.

Quantity: A characteristic that can be measured. Quantities always have a size and unit

Vector Quantity: A quantity that has a magnitude and a direction.

Zero Errors: A form of systematic error, caused when a measuring instrument doesn't read zero at a value of zero. This results in all measurements being offset by a fixed amount.

Kinematics

Acceleration: The rate of change of velocity. It is a vector quantity and so has both a direction and a magnitude.

Displacement: The direct distance between an object's starting and ending positions. It is a vector quantity and so has both a direction and a magnitude.

Displacement-Time Graphs: Plots showing how displacement changes over a period of time. The gradient gives the velocity. Curved lines represent an acceleration.

Distance: A measure of how far an object moves. It doesn't depend on direction and is therefore a scalar quantity.

Projectile Motion: The motion of an object that is fired from a point and then upon which only gravity acts. When solving projectile motion problems, it is useful to split the motion into horizontal and vertical components.

Speed: A scalar quantity that is a measure of the rate of change of distance. The average speed is calculated by dividing the distance travelled by the speed taken.

Velocity: The rate of change of displacement. It is a vector quantity and so has both a direction and a magnitude.

Velocity-Time Graphs: Plots showing how velocity changes over a period of time. The gradient gives acceleration. Area under line gives displacement. Curved lines represent changing acceleration.

Dynamics

Conservation of Momentum: In a closed system with no external forces the momentum of the system before an event is equal to the momentum of the system after the event.

Elastic Collision: When the kinetic energy of a system before an event is equal to the kinetic energy of the system after the event.

Force: The rate of change of momentum of an object. The product of the object's mass with its acceleration.

Inelastic Collision: When the kinetic energy of a system before an event is not equal to the kinetic energy of the system after the event. The kinetic energy has been transferred to other forms.

Momentum: The product of an object's mass and its velocity.

Newton's First Law: An object at a constant velocity will remain at a constant velocity unless acted on by a resultant force. (If this constant velocity is zero the object is at rest).

Newton's Second Law: If an object is acted upon by a resultant force it will accelerate. The acceleration is inversely proportional to the mass of the object and directly proportional to the force acting upon it.

Newton's Third Law: Every action has an equal and opposite reaction. If an object exerts a force on another object, then the other object must exert a force back, that is opposite in direction and equal in magnitude.

Terminal Velocity: The maximum velocity an object can achieve. It is the point at which frictional forces and driving forces are balanced and so no acceleration occurs and the resultant force on the object is 0 N.

Upthrust: The upwards force that a fluid applies on an object.

Weight: The force of gravity on an object, the product of the object's mass and the acceleration due to gravity.

Forces, Density and Pressure

Centre of Gravity: The single point through which the object's weight can be said to act.

Centre of Mass: The single point through which all the mass of an object can be said to act.

Couple: Two equal and opposite parallel forces that act on an object through different lines of action. It has the effect of causing a rotation without translation.

Density: The mass per unit volume of a material.

Equilibrium: For an object to be equilibrium, both the resultant force and resultant moment acting on the object must be equal to zero.

Hydrostatic Pressure: $\Delta p = \rho g \Delta h$

Moment of Force: The product of a force and the perpendicular distance from the line of action of the force to the pivot.

Principle of Moments: For an object to be in equilibrium, the sum of the clockwise moments acting about a point must be equal to the sum of the anticlockwise moments acting about the point.

Pressure: The force that a surface experiences per unit area. It is measured in Pascals (Pa).

Triangle of Forces: A method of determining the resultant force of two forces. The two forces are joined tip to tail and the resultant force is given by the force that would complete the triangle.

Upthrust: The upwards force that a fluid applies on an object.

Work, Energy and Power

Conservation of Energy: In a closed system with no external forces the energy of the system before an event is equal to the energy of the system after the event. The energy does not need to be in the same form after the event as it was before the event.

Efficiency: The ratio of useful energy output to total energy input for a given system.

Gravitational Potential Energy: The energy gained by an object when it is raised by a height in a gravitational field.

Kinetic Energy: A form of energy that all moving objects possess. It is directly proportional to the mass of the object, and to the square of its velocity.

Power: The rate of transfer of energy.

Work Done: The energy transferred by a force moving over a distance. It is equal to the product of the magnitudes of the force and distance.

Deformation of Solids

Compression: The result of two coplanar forces acting into an object. Compression usually results in a reduction in the length of the object.

Compressive Deformation: The changing of an object's shape due to compressive forces.

Elastic Deformation: If a material deforms with elastic behaviour, it will return to its original shape when the deforming forces are removed. The object will not be permanently deformed.

Elastic Limit: The force beyond which an object will no longer deform elastically, and instead deform plastically. Beyond the elastic limit, when the deforming forces are removed, the object will not return to its original shape.

Elastic Potential Energy: The energy stored in an object when it is stretched. It is equal to the work done to stretch the object and can be determined from the area under a force-extension graph.

Extension: The increase of an object's length.

Force-Extension Graph: A plot showing how an object extends as the force applied increases. For an elastic object, the gradient should be linear up to the limit of proportionality. The gradient gives the spring constant.

Hooke's Law: The extension of an elastic object will be directly proportional to the force applied to it up to the object's limit of proportionality.

Limit of Proportionality: The point at which the stress on an object is so great that Hooke's law no longer applies to an object.

Plastic Deformation: If a material deforms with plastic behaviour, it will not return to its original shape when the deforming forces are removed. The object will be permanently deformed.

Spring Constant: The constant of proportionality for the extension of a spring under a force. The higher the spring constant, the greater the force needed to achieve a given extension.

Strain: The ratio of an object's extension to its original length. It is a ratio of two lengths and so has no unit.

Electricity

Charge: A property of matter that causes it to experience force when placed in an electromagnetic field. It can be positive or negative.

Current: The rate of flow of charge in a circuit.

Light-Dependent Resistor (LDR): A light sensitive semiconductor whose resistance increases when light intensity decreases.

Ohmic Conductor: A conductor following Ohm's law where current flowing through it is directly proportional to the potential difference between each end of the conductor. This only holds if the conductor is kept at a constant temperature.

Potential Difference: The difference in electrical potential between two points in a circuit. It is also the work done per coulomb to move a charge from the lower potential point to the higher potential point. It is measured in Volts.

Power: The rate of energy transfer in a circuit. It can be calculated as the product of the current and the potential difference between two points. It is measured in Watts.

Resistance: A measure of how difficult it is for current to flow through a material.

Resistivity: A measure of how difficult it is for charge to travel through a material. It is proportional to the object's resistance and cross-sectional area, and inversely proportional to the object's length. It is measured in Ohm metres.

Quantisation of Charge: The idea that charge can only exist in discrete packets of multiples of the elementary charge.

Thermistor: A temperature sensitive semiconductor whose resistance increases when temperature decreases.

Volt: The unit of potential difference.

DC Circuits

Conservation of Charge: The total charge in a system cannot change.

Conservation of Energy: Energy cannot be created or destroyed - it can only be transferred into different forms.

Electromotive Force: The energy supplied by a source per unit charge passing through the source, measured in volts.

Internal Resistance: The resistance to the flow of charge within a source. Internal resistance results in energy being dissipated within the source.

Kirchoff's First Law: The total current entering a junction is equal to the total current leaving it.

Kirchhoff's Second Law: A consequence of the conservation of energy. The sum of the voltages in any closed loop must equal zero.

Parallel Connection: When two electrical components are on separate loops to one another in a circuit. Potential difference over each loop is the same, current is split between branches.

Potential Divider: A method of splitting a potential difference, by connecting resistors in series. The total potential difference is split in the ratio of their resistances.

Series Connection: When two electrical components are on the same loop to one another in a circuit. Potential difference is split between components depending on their resistance, current is the same across all components.

Variable Resistors: A resistor that can have its resistance changed. Typically, these are used with power supplies to change the voltage of a circuit without using a transformer.