

Definitions and Concepts for CAIE Physics GCSE

Topic 1: General Physics

*Definitions in **bold** are for extended students only*

1.1 Length and Time

Analogue device: A measuring device that requires the user to read from a scale to obtain the measurement.

Digital device: A measuring device that displays the measurement on a display, rather than requiring the user to read from a scale.

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

Micrometer screw gauge: A measuring implement used to accurately measure very small distances.

Pendulum: A pendulum is a weight suspended from a pivot so that it can swing freely.

Volume: The amount of space that a substance or object occupies.

1.2 Motion

Acceleration: The rate of change of velocity. It can be calculated from the gradient of a velocity-time graph. Denoted by non-zero gradient in a speed-time graph.

Air resistance: The resistance of an object's motion through air. It is a form of friction due to the air particles colliding with the object.

Average speed: The average speed is calculated by dividing the distance travelled by the time taken.

Deceleration: Negative acceleration.

Distance-time graph: A plot of how an object's distance changes over time. The gradient of the graph at any point, equals the object's speed at that point.

Free fall: Motion under the force of gravity alone.

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Linear motion: Motion for which the acceleration is not constant.

Speed: A scalar quantity that is a measure of the rate of change of distance.

Speed–time graph: A plot of how an object's speed changes over time. **The gradient of the graph at any point, equals the object's acceleration at that point.** The area under the graph represents the distance travelled.

Terminal velocity: Steady speed achieved by an object freely falling through a gas or liquid.

Gravitational field: A region where a mass will experience a non-contact gravitational force. All matter produces a gravitational field around it, and the greater its mass, the stronger the field.

Velocity: A vector quantity that is a measure of the rate of change of displacement. It is the speed in a given direction.

1.3 Mass and Weight

Balance: A piece of apparatus that can compare different weights to demonstrate which is greater. It can also be used to compare masses.

Mass: Mass is a measurement of how much matter is in an object. **It is also the resistance that a body offers to a change in its speed or position upon the application of a force.**

Weight: The force acting on an object due to gravity. **It is equal to the product of the object's mass and the gravitational field strength at its location.**

1.4 Density

Density: The mass per unit volume of an object.

Displacement: It is the object's overall change in position. Calculated by the difference between final and initial readings.

1.5 Forces

1.5.1 Effects of Forces

Air resistance: The resistance of an object's motion through air. It is a form of friction due to the air particles colliding with the object.

Extension–load graphs: A graph that shows how the extension of an object varies with the load applied. For a spring, this should initially form a straight line that passes through the origin.



Friction: A resistive contact force that acts to oppose the relative motion between two surfaces. Some energy of the object in contact is lost as heat in the process.

Hooke's law : The extension of a spring is directly proportional to the force applied to it, up to the limit of proportionality. The constant in this relationship is known as the spring constant.

Limit of proportionality: The point beyond which the extension of an elastic object is no longer directly proportional to the force applied to it.

Resultant force: The single force that can replace all the individual forces acting on an object, and have the same effect.

Spring constant: A measure of a spring's stiffness. The higher the spring constant, the smaller the extension is for a given force.

1.5.2 Turning Effect

Moment of a force: The turning effect of a force, equal to the product of the magnitude of the force and the perpendicular distance from the pivot to the line of action of the force.

Principle of moments: For an object in equilibrium, the sum of the clockwise moments about any point on the object must equal the anticlockwise moments about that same point.

1.5.3 Conditions for Equilibrium

Equilibrium: An object in equilibrium has a zero resultant force and a zero resultant moment.

Resultant force: The single force that can replace all the individual forces acting on an object, and have the same effect.

Turning effect: It is also known as the moment of the force.

1.5.4 Centre of Mass

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

Plane lamina: A body whose mass is concentrated in a single plane.

Stability: A measure of the likelihood of an object toppling. An object is unstable if the object's line of action of weight lies outside of its base.



1.5.5 Scalars and Vectors

Resultant vector: It is the sum of two or more vectors which has its own magnitude and direction

Scalars: Quantities that only have a magnitude, not a direction.

Vectors: Quantities that have both a magnitude and direction. They are represented by an arrow, with the length representing the magnitude and the arrowhead representing the direction.

1.6 Momentum

Conservation of momentum: The total momentum of a system before an event is always equal to the total momentum of the system after the event.

Impulse: The change of a system's momentum as a result of a force acting over a period of time

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

1.7 Energy, Work and Power

1.7.1 Energy

Chemical energy: A store of energy found in things such as batteries, fuels and food.

Elastic potential (strain) energy: The store of energy that stretched or compressed objects contain.

Electrical current: An electric current is a flow of electric charge in a circuit.

Gravitational potential energy: The store of energy that all raised matter has. It is directly proportional to the mass of the object, the distance that it is raised, and the gravitational field strength at that point.

Internal energy: It is defined as the energy associated with the random, disordered motion of molecules.

Kinetic energy: The store of energy that all moving matter has. It is directly proportional to the object's mass and to the square of its velocity.

Nuclear energy: Non-renewable energy that is generated from the energy stored in the nuclei of radioactive isotopes. It is released in processes known as nuclear fission and nuclear fusion.



Principle of conservation of energy: The law that energy can be transferred, stored or dissipated but never created or destroyed.

1.7.2 Energy Resources

Chemical energy: A store of energy found in things such as batteries, fuels and food.

Efficiency: The ratio of useful output energy transfer to total energy input. It can never exceed 1 (or 100%), due to the conservation of energy.

Geothermal energy: Renewable energy generated from the conversion of the thermal energy found below the Earth's surface into electrical energy.

Hydroelectric power: Renewable energy generated by water stored at a height, and released through a turbine. The turbine turns a generator which converts the kinetic energy into electrical energy.

Nuclear fission: It is a process where the nucleus of an atom is split into two or more smaller nuclei.

Nuclear fusion: It is the process of making a single heavy nucleus (part of an atom) from two lighter nuclei.

Renewable energy resource: An energy resource that can be replenished whilst it is being used.

Solar energy: Renewable energy generated by converting the energy of the sun into electrical energy, usually by using a solar panel.

Tidal energy: Renewable energy generated by trapping water when at high tide, and then releasing it through a turbine. The turbine turns a generator which converts the kinetic energy into electrical energy.

Wind energy: Refers to the process of creating electricity using the wind.

1.7.3 Work

Work done: Work is done on an object when a force causes it to move through a distance. It is equal to the product of the distance travelled and the magnitude of the force in the direction of motion.

1.7.4 Power

Power: The rate at which energy is transferred, or the rate at which work is done. It is calculated by dividing the work done by the time taken.



Work done: Work is done on an object when a force causes it to move through a distance. It is equal to the product of the distance travelled and the magnitude of the force in the direction of motion.

1.8 Pressure

Atmosphere: The thin layer of air surrounding the Earth, which gets less dense with increasing altitude. The pressure also decreases with increasing altitude.

Atmospheric pressure: It is the force exerted on a surface by the air above it as gravity pulls it to Earth

Manometer: A U-shaped tube of liquid that allows the pressure on a column of liquid to be measured.

Mercury barometer: A measuring device that measures changes in atmospheric pressure.

Pressure: The force acting perpendicular to a surface, per unit area.

