A LEVEL PHYSICS 9702 · EXAM SPECIAL · AS & A LEVEL · EVERY TOPIC · ~8 MIN READ

A Level Physics 9702: Definitions You Must Know

Every definition 9702 asks for, AS and A Level, in one place: worded precisely enough to earn the mark, with the key words examiners look for and the near-misses that score zero.

Measurement | Kinematics & dynamics | Forces & materials | Waves & superposition | Electricity | Particle physics | Fields | Thermal physics

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Paper tag = **where it is examined** DATA & FORMULAE given in the exam C1 A1 B1 how marks are awarded

highlight = comes up again and again HANDY worth memorising Test yourself at the end

IN 30 SECONDS

- **Definitions are easy marks, often 1 or 2 each,** on Papers 2 and 4. They are marked strictly: the key word must be there.
- **Ratio definitions:** "X per unit Y" is the safest form. "Force per unit positive charge" scores; "force on a charge" doesn't.
- **Watch three little words:** "per unit", "positive" (test charge), and "from infinity" (potential).
- **Learn the formula and the words together.** A formula alone usually scores if every symbol is defined, but words are safer.

BY THE END YOU CAN

- Recall precise definitions for every 9702 topic.
- Include the key words the mark scheme requires.
- Avoid the common near-miss wordings.

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1 AS Level (Topics 1–11)

Measurement, motion and forces

Term	Definition
Systematic error	an error that makes every reading differ from the true value by the same amount or fraction; reduced by calibration, not by repeating
Random error	scatter of readings about the true value; reduced by repeating and averaging
Accuracy	how close a value is to the true value
Precision	how close repeated readings are to each other
Displacement	distance in a stated direction from a fixed point
Velocity	rate of change of displacement
Acceleration	rate of change of velocity
Momentum	product of mass and velocity
Newton's second law	the resultant force is proportional to the rate of change of momentum ($F = \Delta p/\Delta t$)
Newton's first law	a body stays at rest or at constant velocity unless a resultant force acts on it
Principle of conservation of momentum	the total momentum of a system remains constant provided no resultant external force acts
Moment	force × perpendicular distance from the pivot to the line of action of the force
Couple	a pair of equal and opposite forces whose lines of action do not coincide; torque = one force × perpendicular distance between them
Principle of moments	for equilibrium, the sum of clockwise moments about any point equals the sum of anticlockwise moments about that point
Centre of gravity	the point at which the whole weight of a body may be considered to act
Density	mass per unit volume
Pressure	normal force per unit area
Work done	force × distance moved in the direction of the force
Power	work done per unit time
Efficiency	useful energy output ÷ total energy input

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Materials, waves and electricity

Term	Definition
Stress	force per unit cross-sectional area
Strain	extension per unit original length
Young modulus	stress ÷ strain (in the limit of proportionality)
Elastic deformation	the object returns to its original shape when the load is removed
Plastic deformation	the object does not return to its original shape when the load is removed
Wavelength	the distance between adjacent points on a wave that are in phase
Intensity	power per unit area (perpendicular to the direction of travel)
Coherent	having a constant phase difference
Principle of superposition	when two waves meet, the resultant displacement is the sum of the individual displacements
Diffraction	the spreading of a wave as it passes through a gap or around an edge
Electric current	the rate of flow of charge
Coulomb	the charge passing a point when a current of 1 A flows for 1 s
Potential difference	energy transferred from electrical to other forms per unit charge
E.m.f.	energy transferred from other forms to electrical per unit charge
Resistance	potential difference ÷ current
Resistivity	resistance × cross-sectional area ÷ length ($\rho = RA/L$)
Kirchhoff's first law	the sum of currents into a junction equals the sum out (conservation of charge)
Kirchhoff's second law	in a closed loop, the sum of e.m.f.s equals the sum of p.d.s (conservation of energy)

COMMON MISTAKE

"Voltage per unit charge" or "energy per charge" without "per unit". And e.m.f. vs p.d.: the direction of energy transfer is the difference.

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2 A Level (Topics 12–25)

Fields

Term	Definition
Radian	the angle subtended at the centre of a circle by an arc equal in length to the radius
Angular speed	rate of change of angular displacement
Gravitational field strength	gravitational force per unit mass
Gravitational potential	work done per unit mass in bringing a small test mass from infinity to the point
Electric field strength	force per unit positive charge (on a stationary charge)
Electric potential	work done per unit positive charge in bringing a small test charge from infinity to the point
Capacitance	charge stored per unit potential difference
Time constant	the time for the charge (or p.d., or current) to fall to 1/e of its initial value during discharge; $\tau = RC$
Magnetic flux density	force per unit current per unit length on a straight conductor at right angles to the field
Magnetic flux	flux density × area perpendicular to the field
Faraday's law	the induced e.m.f. is proportional to the rate of change of magnetic flux linkage
Lenz's law	the induced e.m.f. acts in a direction to oppose the change that produces it
r.m.s. value	the steady direct current (or p.d.) that dissipates the same mean power in a resistor

Thermal physics and oscillations

Term	Definition
Thermal equilibrium	no net transfer of thermal energy between bodies (same temperature)
Absolute zero	the temperature at which a substance has minimum internal energy
Specific heat capacity	energy per unit mass to raise the temperature by one degree
Specific latent heat	energy per unit mass to change state with no change in temperature
Internal energy	sum of the random kinetic and potential energies of the molecules
Ideal gas	a gas obeying $pV \propto T$ (T in kelvin) at all pressures, volumes and temperatures
Avogadro constant	the number of particles in one mole
Simple harmonic motion	acceleration proportional to displacement from a fixed point and directed towards that point
Resonance	maximum amplitude of a forced oscillation, when the driving frequency equals the natural frequency

Quantum, nuclear, medical and astronomy

Term	Definition
Photon	a quantum (discrete packet) of electromagnetic energy
Work function	the minimum energy needed to remove an electron from the surface of a metal
Threshold frequency	the minimum frequency of radiation that causes photoelectric emission
Electronvolt	the energy gained by an electron accelerated through a p.d. of 1 V
Mass defect	the difference between the total mass of the separate nucleons and the mass of the nucleus
Binding energy	the minimum energy needed to separate a nucleus into its individual nucleons
Activity	the number of nuclei decaying per unit time
Decay constant	the probability per unit time that a nucleus will decay
Half-life	the time for the number of undecayed nuclei (or activity) to halve
Acoustic impedance	density × speed of sound in the medium
Luminosity	the total radiant power emitted by a star
Radiant flux intensity	radiant power passing normally through unit area
Standard candle	an astronomical object of known luminosity

COMMON MISTAKE

"Binding energy is the energy released when a nucleus forms" is acceptable, but "energy stored in the nucleus" isn't. And activity is "number of decays per unit time", not "rate of radiation".

LINKING QUESTION

Every definition is used in the topic notes from Physical quantities and units to Astronomy and cosmology.

Test yourself — cover the answers first

QUICK CHECK

1. Define the radian.
2. Define electric potential.
3. Distinguish e.m.f. and p.d.
4. Define the decay constant.
5. Define coherent.

Show answers

1. the angle subtended at the centre by an arc equal in length to the radius
2. work done per unit positive charge bringing it from infinity
3. e.m.f.: other forms → electrical per unit charge; p.d.: electrical → other forms per unit charge
4. probability per unit time that a nucleus decays
5. constant phase difference

Stuck on a question?

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