

Physics 2 is graded on explanation. A point is earned by naming the principle and applying it to the specific system – which charge, which field, which surface. Write each definition below, then practise attaching “in this case ...” to it.

Fluids and thermodynamics

Pressure – force per unit area exerted perpendicular to a surface

Buoyant force – the upward force on a submerged or floating object, equal to the weight of the fluid displaced

Continuity equation – for an incompressible fluid, the volume flow rate Av is constant, so a narrower pipe means faster flow

Bernoulli’s principle – along a streamline, the sum of pressure, kinetic energy density and potential energy density is constant, so faster flow accompanies lower pressure

Ideal gas law – $PV = nRT$, treating molecules as point particles with no intermolecular forces

Internal energy – the total kinetic energy of a gas’s molecules; for an ideal gas it depends only on temperature

First law of thermodynamics – the change in internal energy equals the heat added to the system plus the work done on it

Second law of thermodynamics – the total entropy of an isolated system never decreases, so heat flows spontaneously from hot to cold

Electrostatics and circuits

Electric field – the force per unit positive charge at a point, a vector pointing away from positive and toward negative charge

Electric potential – the electric potential energy per unit charge at a point, a scalar

Potential difference – the work per unit charge required to move a charge between two points

Equipotential surface – a surface on which the potential is constant, always perpendicular to the field lines; no work is done moving along it

Capacitance – the charge stored per unit potential difference across a capacitor

Kirchhoff’s junction rule – the total current into a junction equals the total current out, a statement of charge conservation

Kirchhoff’s loop rule – the sum of potential changes around any closed loop is zero, a statement of energy conservation

Magnetism and induction

Magnetic field – the field that exerts a force on a moving charge, of magnitude $qvB \sin \theta$ and direction given by the right-hand rule

Magnetic flux – the product of the magnetic field component perpendicular to a surface and that surface's area

Faraday's law – an induced emf equals the negative rate of change of magnetic flux through a circuit

Lenz's law – the induced current flows in the direction whose magnetic field opposes the CHANGE in flux that produced it

Optics and modern physics

Index of refraction – the ratio of the speed of light in vacuum to its speed in a medium

Total internal reflection – reflection of all light at a boundary when it travels from a denser to a less dense medium at an angle beyond the critical angle

Photoelectric effect – the emission of electrons from a surface struck by light of sufficient FREQUENCY, evidence that light energy arrives in quanta

Work function – the minimum energy needed to remove an electron from a metal surface

Mass-energy equivalence – $E = mc^2$; the mass defect of a nucleus corresponds to its binding energy