Laws:

Newton's first law of motion: an object will continue in a state of rest or uniform motion in a straight line unless an eternal force acts upon it.
Newton's second law of motion: the rate of change of momentum of an object is directly proportional to the force acting, and takes place in the direction in which the force acts.
Newton's third law of motion: To every action there is an equal but opposite reaction.
Law of conservation of momentum: When two or more objects act on each other, their total momentum remains constant, provided no external forces are acting.
Law of conservation of energy: energy cannot be made or destroyed, but it can be changed from one form into another.
Kinetic Theory of matter: all matter is made up of tiny particles called molecules, which are constantly in motion, attract each other strongly when close together.
Pressure Law: the pressure of a mass of gas is directly proportional to its absolute temperature, provided the volume of the gas is kept constant. (p/T = constant)
Charles' Law: the volume of a fixed mass of gas is directly proportional to its absolute temperature provided the pressure of the gas is kept constant. (V/T = constant)
Boyle's Law: the pressure of a fixed mass of gas is inversely proportional to its volume provided the temperature of the gas is kept constant. (pV = constant)
Combined Gas equation: for a fixed mass of gas: pV/T = constant.
Ohm's Law: the current flowing through a metal conductor is directly proportional to the p.d. across its ends provided the temperature and other physical conditions remain constant.
Maxwell's Screw Rule: the direction of the turning of the screw gives the direction of the field.
Right-hand Grip Rule: thumb points to N pole / RIGHT hand around solenoid / fingers indicate conventional current.
Fleming's LEFT Hand Rule: to find the *direction of the force*: Thumb = force / First Finger = Field / seCond Finger = Current
Fleming's RIGHT Hand Rule: to find the direction of the induced current.
Faraday's Law: the e.m.f. induced in a conductor is directly proportional to the rate at which the conductor cuts through the magnetic field lines.

Further Notes:

Formulas:

Power = W/t = E/t

Pressure = F/A = ρgh (ρ = density / h = height) for pressure in a liquid)

Refraction: light passing into an optically more dense medium is bent towards the normal; light passing into an optically less dense medium is bent away from the normal.

Young's Experiment: $\lambda = sw/D$ (s = distance btw centers of parallel slits / D = distance from slits to eyepiece scale / w = distance btw centers of two neighboring fringes)

Frequency: $f \propto 1/\text{length}$ / $f \propto \sqrt{tension}$ $/f \propto 1/\sqrt{mass of string per unit length}$

$\sqrt{T/m}$

Therefore: **f= 1/2(length)**

Note: halving the length *doubles* the frequency.

Fundamental Wavelength:With 2 closed boundaries, fundamental wavelength will be 2xlength, with 1 open, 1 closed, 4xlength, and with 2 open, 2xlength.

Potential Difference: electrons always flow from lower to higher potential (i.e.: towards the more positive potential)

Volts: there is a p.d. of 1 volt across a battery if each coulomb of charge is given 1 joule of potential energy.

Coulomb: 1 coulomb of charge passes any point in a circuit when a steady current of 1 ampere flows for 1 second.

Ampere: the current which, flowing through two infinitely long, parallel, straight, this wires placed one meter apart in a vacuum, produces a force of $2x10^{-7}$ newton on each meter length of wire.

Perfect Ammeter: **0 R**

Perfect Voltmeter: R

Resistance: R α length / R α $1/r^2$

Therefore: a long wire has more resistance than a short one, and a thin wire has more resistance than a thick one.

Series: current is the same at all points round the circuit / sum of the p.d.s across the resistors is the same as the p.d. across the battery.

Parallel: same p.d. across each resistor / current through different branches adds up to equal the current in the main circuit.

Magnetism:

- *Permanent magnet*: i.e.: steel/alcomax (hard magnetic materials)
- *Temporary magnet*: i.e.: iron/mumetal (soft magnetic materials)

Thermionic Emission: electrons in white hot metal gather enough energy to break free from the metal surface and escape into the space surrounding it.

Radiation:

	Nature / Charge	Approximate Mass	Ionizing effect	Absorbed by	Deflection in electric / magnetic field
Alpha α	2 protons 2 neutrons Helium nucleus	4 proton masses	Strong	Sheet of writing paper.	Very small
Beta β	Electron	1/8000 proton mass	Weak	About 5mm of Aluminum	Large
Gamma γ	No charge High energy photon	–	Very weak	Never fully absorbed (lead reduces intensity)	Zero

Mass	4	0	0
Particle:	α /	β /	γ
Charge	2	-1	0

Electromagnetic spectrum:

Long----------WAVELENGTH----------SHORT

Radio Waves	Microwaves	Infrared	roygbiv	Ultraviolet	X-rays	Gamma

Low----------FREQUENCY----------HIGH