4.1: Charge and Current

Conductors: A material that allows the flow of electrical charge. Good conductors have a larger amount of free charge carriers to carry a current.

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

Conventional Current: The flow from positive to negative, used to describe the direction of current in a circuit.

Coulomb: The unit of charge.

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

Electrolytes: Substances that contain ions that when dissolved in a solution, act as charge carriers and allow current to flow.

Electron Flow: The opposite direction to conventional current flow. Electrons flow from negative to positive.

Elementary Charge: The smallest possible charge, equal to the charge of an electron.

Insulators: A material that has no free charge carriers and so doesn't allow the flow of electrical charge.

Kirchhoff's First Law: A consequence of the conservation of charge. The total current entering a junction must equal the total current leaving it.

Mean Drift Velocity: The average velocity of an electron passing through an object. It is proportional to the current, and inversely proportional to the number of charge carriers and the cross-sectional area of the object.

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

Semiconductors: A material that has the ability to change its number of charge carriers, and so its ability to conduct electricity. Light dependent resistors and thermistors are both examples.

4.4: Waves

Amplitude: A wave's maximum displacement from its equilibrium position.

Antinodes: A position of maximum displacement in a stationary wave

Coherence: Waves with the same frequency and constant phase difference

Constructive Interference: The type of interference that occurs when two waves meet in phase. The wave amplitudes are superposed.

4.4: Waves (cont)

Critical Angle: The angle of incidence that results in an angle of refraction of exactly 90o . It is when the refracted ray travels along the boundary line.

Destructive Interference: The type of interference that occurs when the two waves are in antiphase. When one wave is at a peak and one is at a trough their addition results in a minimum point.

Diffraction: The spreading of waves as they pass through a gap of a similar magnitude to their wavelength.

Displacement: The distance that a point on a wave is from its equilibrium position.

Electromagnetic Spectrum: The spectrum of electromagnetic waves, consisting of Gamma Rays, X-Rays, Ultraviolet, Visible Light, Infrared, Microwaves and Radiowaves.

Electromagnetic Waves: Waves that consist of perpendicular electric and magnetic oscillations. All electromagnetic waves travel at the speed of light in a vacuum.

Frequency: The number of waves that pass a point in a unit time period. It is the inverse of the time period.

Fundamental Mode of Vibration: The oscillation of a wave at its natural frequency.

Intensity: The power transferred per unit area. It is proportional to the square of a wave's amplitude.

Interference: The superposition of the amplitudes of waves when they meet.

Longitudinal Waves: A wave with oscillations that are parallel to the direction of energy propagation. Sound waves are an example of a longitudinal wave. They cannot travel through a vacuum.

Nodes: A position of minimum displacement in a stationary wave.

Oscilloscope: A device used to display and analyse waveforms.

Path Difference: A measure of how far ahead a wave is compared to another wave, usually expressed in terms of the wavelength.

Period: The time taken for a wave to complete one full cycle

Phase Difference: The difference in phase between two points on a wave. It is usually expressed in radians

Polarisation: The restriction of a wave so that it can only oscillate in a single plane. This can only occur for transverse waves.

4.4: Waves (cont)

Progressive Waves: Waves that transfer energy from one point to another without a transfer of matter.

Reflection: The bouncing of a wave at a boundary. The angle of incidence will equal to the angle of reflection.

Refraction: The changing of speed of a wave as it passes into a new medium. If it passes into an optically denser medium, it will slow down

Refractive Index: A material property that is equal to the ratio between the speed of light in a vacuum, and the speed of light in a given material.

Stationary Wave: A wave that stores, but does not transfer, energy.

Superposition: When two waves meet at the same point in space their displacements combine and the total displacement at that point becomes the sum of the individual displacements at that point

Total Internal Reflection: An effect that occurs in optical fibres, where full reflection occurs at the inside boundary of the fibre, meaning no radiation passes out. The angle of incidence must be greater than the critical angle for this to occur.

Transverse Waves: A wave with oscillations that are perpendicular to the direction of energy propagation. Electromagnetic waves are examples of transverse waves

Wave Speed: The product of a wave's frequency and wavelength

Wavelength: The distance between two identical positions on two adjacent waves. It is commonly measured from peak to peak or trough to trough.

Young Double-Slit Experiment: An experiment that demonstrates the diffraction of light by passing monochromatic light across two narrow slits and observing the resulting pattern of bright and dark fringes.

4.2: Energy, Power and Resistance

Diode: A component that allows current through in one direction only. In the correct direction, diodes have a threshold voltage (typically 0.6 V) above which current can flow

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

4.2: Energy, Power and Resistance (cont)

Filament Lamp: A bulb consisting of a metal filament, that heats up and glows to produce light. As the filament increases in temperature, its resistance increases since the metal ions vibrate more and make it harder for the charge carriers to pass through.

I-V Characteristics: Plots of current against voltage, that show how different components behave.

Kilowatt-Hour: A unit of electrical energy. It is usually used to measure domestic power consumption.

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

Ohm: The unit of resistance.

Ohmic Conductor: A conductor for which the current flow is directly proportional to the potential difference across it, when under constant physical conditions.

Ohm's Law: The current and potential difference through an ohmic conductor held under constant physical conditions are directly proportional, with the constant of proportionality being resistance.

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

Resistor: A device that has a fixed resistance and follows Ohm's law

Volt: The unit of potential difference.

4.3: Electrical Circuits

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

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

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

Lost Volts: The difference between a source's emf and the terminal voltage. It is equal to the potential difference across the source's internal resistance.

Parallel Circuit: Components are said to be connected in parallel when they are connected across each other (separate loops).

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

Resistors in Parallel: The potential difference across resistors connected in parallel is identical for each resistor. The current is split between the resistors. The total resistance is equal to the inverse of the sum of the inverses of the resistances of the resistors

Resistors in Series: The current through resistors connected in series is identical for each resistor. The potential difference is split in the ratio of their resistances. The total resistance is equal to the sum of the resistances of the resistors.

Sensor Circuits: A circuit that reacts to external conditions. They commonly involve a semiconductor connected in a potential divider arrangement.

Series Circuit: Components are said to be connected in series when they are connected end to end (in one loop).

Terminal PD: The potential difference across the terminals of a power source. It is equal to the source's emf minus any voltage drop over the source's internal resistance.