

## Definitions and Concepts for AQA Physics A Level

### Topic 12: Turning Points in Physics (Option Topic)

**Anode:** A positively charged electrode.

**Bertozzi's Experiment:** An experiment that investigated the velocity of electrons emitted with different kinetic energies. It showed that the speed of light was never exceeded and that as the kinetic energy continually increases, the velocity of the electrons continually approaches the speed of light.

**Black-Body:** A body that emits all wavelengths of radiation, dependent on its temperature.

**Cathode Rays:** Beams of electrons emitted from a cathode through thermionic emission.

**Cathode:** A negatively charged electrode.

**Condenser Lens:** The lens in a TEM that is responsible for deflecting the electrons into a wide beam, that is then incident of the sample.

**Constant-Current STM:** A form of scanning tunneling microscope in which the current of the probe remains constant, and the probe's height changes with changes in the sample's surface. The current that tunnels across varies depending on the height, allowing an image to be formed.

**Dipole Detector:** A pair of aligned metal rods placed at the centre of a concave reflector.

**Discharge Tube:** A sealed glass tube held at low pressure, with an anode at one end and a cathode at the other. When the electrodes are connected to a supply, the gas in the tube will glow and conduct electricity.

**Drag Force:** A force acting against the oil drop's motion in Millikan's Oil Drop experiment. All objects travelling through a fluid will experience drag.

**Electron Gun:** A pair electrodes that produce a thin and fast moving beam of electrons. Electrons are emitted from the cathode by thermionic emission and are then accelerated through a gap by the anode.

**Ether:** A substance that was believed to fill all space and be responsible for light propagation.



**Ether Drift:** A theory that the Earth's ether carried light along with it. This implied that light should travel faster when travelling in the direction of the ether, however this was later proved to be false.

**Fizeau's Determination of the Speed of Light:** An early method of determining the speed of light. It involved timing the length of time it took for a beam of light to travel to and back from a mirror, by passing it through a rotating cog wheel.

**Hertz's Discovery of Radio Waves:** Hertz discovered that radio waves are produced when sparks jump across a gap of air. They can be detected with a dipole detector or a wire loop with a gap in.

**Huygens' Wave Theory:** A theory stating that all wavefronts consist of a series of points from which secondary wavelets are emitted.

**Inertial Frame of Reference:** A frame of reference which is not accelerating (frames which travel at a constant velocity relative to each other).

**Invariance of Speed of Light:** The speed of light is identical for all observers, whatever the speed of the source is and whatever the observer's state of motion is.

**Length Contraction:** For an observer moving parallel to a rod, the r.

**Maxwell's Electromagnetic Theory:** Maxwell predicted that a type of wave, known as an electromagnetic wave, consisted of oscillating, perpendicular electric and magnetic fields. He then went onto produce an equation for their speed, which combined with experiments, proved his theory.

**Michelson-Morley Interferometer:** An experimental set-up involving a monochromatic light source, a semi-silvered glass block, a plane glass block, two mirrors and a viewing telescope. It proved that the speed of light is invariant.

**Negative Glow:** A glow found near the cathode in a cathode ray tube. It is caused by the recombination of positive ions with the electrons produced by ionisation. This recombination results in photons being emitted.

**Newton's Corpuscular Theory:** A theory that light existed as discrete packets, referred to as corpuscles, that travel in straight lines and have momentum.

**Objective Lens:** The second lens in a TEM microscope. It is responsible for magnifying and focussing the image of the sample.

**Paddle Wheel:** A wheel found in a discharge tube that demonstrates the presence of cathode rays.



**Photon:** A packet of energy. Light consists of photons.

**Projector Lens:** The final lens in a TEM that is responsible for focussing the image onto a fluorescent screen.

**Quantisation of Electric Charge:** Electric charge is quantised. This means it can only be found in packets of energy with a charge that is a multiple of the electron charge.

**Quantum Tunnelling:** For a sufficiently thin barrier, the amplitude of a matter wave passing through it will not become zero - this means the matter wave can 'tunnel' through the barrier.

**Relativistic Energy:** When an object approaches relativistic speeds, the mass will increase, resulting in an increase of energy known as relativistic energy.

**Scanning Tunnelling Microscope:** A microscope that uses a probe controlled by piezoelectric transducers to scan the surface of a sample. It uses electron tunnelling and has a resolution of around 0.001nm.

**Specific Charge:** The ratio of charge to mass.

**Stokes' Law:** A law that gives the drag force that acts on a spherical object, such as an oil droplet.

**Stopping Potential:** A value of potential difference at which photoelectric emission is stopped. This is because the electrons no longer have sufficient kinetic energy to cross the potential difference.

**Thermionic Emission:** The emission of electrons from a metal plate due to heating it.

**Threshold Frequency:** The minimum frequency of photons required for photoelectrons to be emitted from the surface of a metal plate through the photoelectric effect. It is equal to the metal's work function divided by Planck's constant.

**Time Dilation:** A consequence of the invariance of the speed of light, that means that time will appear to run slowly when you are moving.

**Transmission Electron Microscope:** A microscope that passes a beam of electrons through lenses and across a sample, to form an image on a fluorescent screen. The resolution is around 0.1nm.



**Ultraviolet Catastrophe:** The discrepancy between practical measurements and classical theoretical predictions of the energy intensities at different wavelengths, emitted from a black body.

**Work Function:** The minimum energy required to remove an electron from a metal's surface.

