Advanced Higher Physics
Astrophysics
Key Definitions

Word/Term	Definition
Astronomical Unit	The distance from the Earth to the Sun. It is equivalent to 1.5×10^{11} m.
Light Year	The distance that light travels in one year. It is equivalent to 9.46×10^{15} m.
Gravitational Field Strength	The gravitational force per unit mass.
Gravitational Field	A region around a mass where another mass will experience a gravitational force.
Conservative Field	A field in which the work done by a force (e.g. the force of gravity) on a particle that moves through any round trip in the field is zero i.e. energy is conserved.
Newton's Law of Universal Gravitation	Every object in the universe with a mass attracts every other object with a mass. It gives a measure of the gravitational force of attraction between any two objects and is an inverse square law.
Gravitational Potential	At a point in a gravitational field, it is the work done by external forces in moving unit mass from infinity to that point.
Gravitational Potential Energy	The energy that a mass has when it is a certain height above the Earth's surface.
Escape Velocity	The minimum velocity required by a mass, m, to just escape from a planet's gravitational field and reach infinity with zero velocity or zero kinetic energy.
Inertial Frame of Reference	A frame of reference in which an observer **is not accelerating** with respect to another. That is, an observer will move at a constant speed with respect to another.
Non-Inertial Frame of Reference	A frame of reference in which an observer **is accelerating** with respect to another. That is, an observer will not move at a constant speed with respect to another.
Equivalence Principle	Gravity pulling in one direction is equivalent to acceleration in the other. That is, there is no way to distinguish between the effects on an observer of a uniform gravitational field and of a constant acceleration.
Spacetime	The combination of space and time.
Gravitational Time Dilation	Where the force of gravity is weaker, time passes more quickly
Gravitational Lensing	If an object has sufficient mass it can cause light which is travelling in a straight line to bend.

Word/Term	Definition
World Line/Geodesic	A curve in spacetime joining the positions of a particle throughout its existence. It defines the position of an object in 3 dimensions (x, y and z) as well as the fourth dimension of time (t).
Geodesic Path	The shortest distance between two points in spacetime.
Black Hole	A region in space where the pull of gravity is so great that nothing, not even light, can escape its pull. It is also the last stage in the life cycle of a very high mass star.
Event Horizon	The radius of a black hole below which nothing, not even light, can escape from its gravitational pull. From the perspective of a distant observer, time appears to be frozen at this point.
Singularity	The centre point of a black hole.
Schwarzschild Radius	The distance from the centre of a black hole to its event horizon.
Stefan-Boltzmann Law	Gives a measure of the total energy being emitted at all wavelengths by a black body.
Black Body	A body that absorbs all the electromagnetic radiation incident on it and also emits all wavelengths of electromagnetic radiation.
Luminosity	A measure of how bright a star actually is (i.e. the total power it emits), not how bright it appears to us on Earth. It is dependent on the star's radius and surface temperature.
Apparent Brightness	A measure of how bright a star appears on Earth. It is dependent on the star's luminosity and distance from the Earth.
Charge-Coupled Device (CCD)	A chip found behind the lens in a digital camera that stores images.
Hydrostatic Equilibrium	When the thermal pressure outwards from a star balances the gravitational force inwards.
'Proton-Proton' Chain	A three stage process in which stars produce energy by converting hydrogen into helium through nuclear fusion.
Hertzsprung-Russell (H-R) Diagram	Relates a star's luminosity to its temperature. Stars are plotted on the diagram according to their size and luminosity and they are found to fall into groups: main sequence, giants, supergiants and white dwarfs.
White Dwarf	The last stage in the life cycle of a low mass (Sun like) star.
Neutron Star	The last stage in the life cycle of a high mass star.