GCSE Physics Unit 2 - Forces, Space and Radioactivity

Item	Definition
Newton's 1st law HT	That an object will remain at rest or in uniform motion in a straight line unless acted upon by an external resultant force.
Newton's 2nd law HT	resultant force = mass × acceleration; F = ma
Newton's 3rd law HT	If a body A exerts a force on body B then body B exerts an equal and opposite force on body A.
Energy efficiency of vehicles	**Aerodynamic losses** reduced by more streamlined designs. **Rolling resistance** is reduced by having correctly inflated tyres and using materials which don't heat up as much as they are squashed. **Stop – start systems** reduce idling losses. **Inertial losses** are reduced by having lighter cars.
Safety features	In terms of **work done**: i.e. an air bag and a crumple zone increase the distance over which the energy is transferred, so reducing the force. In terms of **momentum**: i.e. the same change in momentum happens over a longer time so there is decreased deceleration so the force decreases.
Conservation of momentum	The momentum before (an interaction) = momentum after (interaction) provided no external forces act.
Principle of moments	For a body in equilibrium the sum of the clockwise moments = the sum of the anticlockwise moments about the same point.
Features of the solar system	Order of the planets: Mercury › Venus › Earth › Mars › Jupiter › Saturn › Uranus › Neptune Asteroid belt located between Mars and Jupiter. Mercury › Venus › Earth › Mars are the rocky planets (the inner planets). The remaining planets (the outer planets) are made from gas.
AU and light years	1 A.U. is the mean distance from the Sun to the Earth. 1 light year is the distance that light will travel in 1 year.
Life cycle of a star	**Stars of a similar mass to the Sun** Protostar › main sequence star › red giant › white dwarf **High mass star** Protostar › main sequence star › supergiant › supernova › neutron star or black hole
Stability of stars	In the main sequence the forces acting on a star are balanced. Gravitational inward forces match the outwards combination of gas and radiation pressure forces. When the hydrogen reduces the star will begin to fuse helium and then other increasingly heavier elements to maintain fusion. (cont.)

Stability of stars	The star will begin to swell as the combination of gas and radiation pressure exceeds the gravitational force and the forces become unbalanced. Eventually the gravitational force exceeds the combination of gas and radiation pressure and the star shrinks.
Return of heavy material	Heavy elements which are created in fusion in large stars are ejected during supernovae.
Origin of the solar system	Gravitational forces cause the matter to get closer together creating the Sun and the planets. During formation rocks tended to gather close to the Sun and formed the rocky planets whilst gaseous substances gathered together at distances further away and formed the gas planets.
Absorption spectra	Absorption lines arise from gas atoms in a star's atmosphere absorbing specific wavelengths of visible light. The wavelengths absorbed are specific to the elements present in the star.
Cosmological red shift	Wavelengths of the absorption lines are increased and this effect increases with distance. The light from further galaxies shows the most red shift due to it having travelled for a greater amount of time through an expanding universe. Therefore increasing the wavelength.
CMBR and the Big Bang	The wavelength of the early radiation in the form of short wavelength radiation (gamma rays) has become longer wavelength (microwave) radiation. This change (increase) in wavelength is believed to be due to the expansion of space since the Big Bang.
Isotope	Isotopes of the same element have equal numbers of protons but differing numbers of neutrons in their nuclei.
Unstable nuclei	Radioactive emissions occur from unstable atomic nuclei due to an imbalance between the numbers of protons and neutrons in the nucleus.
Radioactive decay	This is a random process.
Types of radiation	alpha radiation = helium nucleus: ${}^{4}_{2}He^{2+}$ or ${}^{4}_{2}\alpha$ beta radiation = high energy electron: ${}^{0}_{-1}\beta$ or ${}^{0}_{-1}e$ gamma radiation = electromagnetic wave: γ
Half-life	It is the time taken to halve the number of radioactive atoms / nuclei.
Moderator and control rods	**Control rods** are arranged to absorb neutrons so that for every two or three neutrons that are released from a fission reaction, only one (on average) goes on to produce further fission. The **moderator** slows down fast moving neutrons to enable absorption by U-235 nuclei to occur.
Nuclear fusion	Requires very high temperatures and pressures.