CCEA GCSE Physics: Space Physics

Syllabus areas covered.

Module 1: The Solar System

Subject	Learning Outcomes from Syllabus	Content Taught
The Earth and Solar System	2.5.1 describe the main features of the Solar System, including the Sun, the rocky and gas planets, moons, asteroids and comets; 2.5.2 recall the order of the eight planets from the Sun outwards; 2.5.3 demonstrate understanding that gravity provides the force needed for the orbital motion of planets, comets, moons and artificial satellites; 2.5.4 explain the use of artificial satellites in the observation of the Earth, weather monitoring, astronomy and communications;	• Earth • Moon • Artificial Satellites: crowded space • The Sun • Planetary Orbits • Mars • Jupiter and its principal moons (Io, Europa, Ganymede, Callisto) • Saturn • Minor Planets – Pluto • Asteroids – Ceres • Comets – Halley

Approx. length 45 min.

Module2: The Sun and Stars

Subject	Learning Outcomes from Syllabus	Content Taught
The Sun as a Star		• The Sun – our local star • What is it made off?
Stars	2.5.5 explain that: - stars form when enough dust and gas from space is pulled together by gravitational attraction; and - smaller masses may also form and be attracted by a larger mass to become planets; 2.5.6 demonstrate understanding that studies of light from stars, including our Sun, show they are composed mainly of hydrogen and helium and that their energy is supplied by the fusion of hydrogen into helium; 2.5.7 recall that all the naturally occurring elements apart from hydrogen are formed by nuclear fusion in stars;	• Stars – constellations • Birth of stars

Life Cycle of Stars	2.5.8 recall the life cycle of a star with the mass of our Sun from protostar to main sequence to red giant to white dwarf to black dwarf.
	
	2.5.9 recall that a star is stable during the 'main sequence' period of its life cycle because the outward force of thermal expansion is balanced by the inward force of gravity.
		• Life cycles of stars
		  • Sun-like stars
		  • Massive stars
		• Gravity vs nuclear fusion
		• Death of Sun-like stars

Supernovae	2.5.10 demonstrate understanding that: - more massive stars have a very different life cycle after the main sequence period; - they become red supergiants followed by an explosion in which the outer layers of the star are ejected; - this is called a supernova and the star will shine for a relatively short time with the brightness of 10 billion suns; and after the supernova the remaining core of the star may collapse more, and some become neutron stars while very massive ones form black holes;	• Death of Massive stars • Supernovae and their remnants
Black Holes	2.5.11 demonstrate knowledge that there is such a strong gravitational field in a black hole that nothing can escape from it, including electromagnetic radiation such as light;	Black Holes

Approx length 45 min.

Module 3: Galaxies and the Universe

Subject	Learning Outcomes from Syllabus	Content Taught
The Universe	2.5.12 demonstrate knowledge that the Universe began as a Big Bang which, according to current measurements, occurred 14 billion years ago; and	• The Milky Way – our home galaxy • Andromeda Galaxy – our neighbour • Large Scale Structure • Laniakea – our local supercluster
Big Bang Model	2.5.13 describe the Big Bang model for the formation and evolution of the Universe, including: - the rapid expansion and cooling of the Universe; - the eventual formation of neutrons and protons; how further expansion and cooling allowed nuclei to form; - how eventually, after further expansion and cooling, the temperature had dropped sufficiently for electrons to combine with neutrons and protons to form atoms of hydrogen.	• The expanding Universe • Big Bang and the Cosmic Microwave Background
Redshift	2.5.14 describe and explain that evidence for the Big Bang includes that light from other galaxies is shifted to the red end of the spectrum, and that this can be explained by space expanding;	
CMBR	2.5.15 explain that the existence of cosmic microwave background radiation (CMBR) is further evidence of the Big Bang, and that the Big Bang is currently the only model that explains CMBR;	

Followed by the dome show "*We are Stars"* that brings all these concepts together.

Approx length 45 min.

Module 4: Space Travel and life on other planets: exo-planets

This portion of the syllabus is only lightly covered

Subject	Learning Outcomes	Content Taught
Space Travel and life on other planets	2.5.16 research, discuss and recall the evidence for other planets outside our Solar System; 2.5.17 demonstrate understanding of how the composition of the atmosphere of these planets can be determined by examination of the light passing through their atmospheres, in particular the search for oxygen, which would indicate the possibility of life on the planet; 2.5.18 consider the possibilities and limitations of space exploration in terms of distance and speed of travel; 2.5.19 recall that distances to stars and galaxies are so large that they are measured in light years and that a light year is the distance light travels in one year; and 2.5.20 carry out calculations involving light years and distance.	• Exoplanets • The Trappist exoplanetary system • Proxima B – our nearest neighbour

Approx length 15 min.