GCSE Astronomy - Curriculum Plan

	Autumn 1	Autumn 2	Spring 1	Spring 2	Summer 1	Summer 2
Year 10 curriculum overview	• Paper 1 - Naked-eye Astronomy : Topic 1 - Planet Earth. • Paper 1 - Naked-eye Astronomy : Topic 2 - The lunar disc. • Introduce observation records and unaided observation planning.	• Paper 1 - Naked-eye Astronomy : Topic 3 - The Earth-Moon-Sun system. • Paper 1 - Naked-eye Astronomy : Topic 4 - Time and the Earth-Moon-Sun cycles. • Develop scale, cycles, eclipse, tide and time calculations.	• Paper 1 - Naked-eye Astronomy : Topic 5 - Solar System observation. • Paper 1 - Naked-eye Astronomy : Topic 6 - Celestial observation. • Develop naked-eye observing techniques and sky-coordinate work.	• Paper 1 - Naked-eye Astronomy : Topic 7 - Early models of the Solar System. • Paper 1 - Naked-eye Astronomy : Topic 8 - Planetary motion and gravity. • Complete Paper 1 content and begin synoptic Paper 1 consolidation.	• Paper 2 - Telescopic Astronomy : Topic 9 - Exploring the Moon. • Paper 2 - Telescopic Astronomy : Topic 10 - Solar astronomy. • Prepare aided observation work and safe solar-observation methods.	• Paper 2 - Telescopic Astronomy : Topic 11 - Exploring the Solar System. • Telescope foundations, Solar System bodies, space probes and crewed exploration. • End-of-year consolidation across Paper 1 and early Paper 2 content.
Key knowledge outcomes (students should know)	• Earth is an oblate spheroid with a mean diameter of 13 000 km. • Earth has major internal divisions: crust,	• The Earth, Moon and Sun can be compared using relative sizes, relative distances, ratios and	• The Sun can be observed safely using pinhole projection. • The Sun appears to follow an annual path called	• Ancient civilisations used solar and lunar cycles for agriculture, religion, time, calendars and monument alignment.	• The Moon has major internal divisions which can be compared with those of Earth. • The near side and far side of	• The Solar System contains planets, dwarf planets and Small Solar System Objects including asteroids,

	Autumn 1	Autumn 2	Spring 1	Spring 2	Summer 1	Summer 2
	mantle, outer core and inner core. • Latitude, longitude, Equator, tropics, polar circles, Prime Meridian and poles are used as astronomical reference points. • Earth's atmosphere affects astronomical observation through sky colour, skyglow/light pollution and twinkling/seeing. • The Moon is spherical, has a mean diameter of 3500 km and shows principal naked-eye formations: craters,	standard form. • Eratosthenes and Aristarchus used observations to estimate the diameter of Earth, Moon and Sun and distances to the Moon and Sun. • The Sun and Moon produce high and low tides, including spring and neap tides. • Precession of Earth's axis changes the apparent position of the Sun, Moon and stars and is relevant to archaeoastronomy.	the ecliptic. • Planets change position in the night sky, move within the Zodiacal Band and can show retrograde motion. • Students should know the First Point of Aries, First Point of Libra, meteors, meteor showers and the radiant. • Conjunction, opposition, elongation, transit and occultation describe key Solar System observing positions and events. • Naked-eye astronomical objects include the	• Ancient monument alignments may differ from their original alignments because of axial precession. • Early geocentric models attempted to explain observed planetary motion. • Ptolemy used epicycles to improve geocentric predictions. • The astronomical unit, light year and parsec are used to describe Solar System and stellar distances. • Brahe's observations and the mathematical models of Copernicu	the Moon have different appearances. • Information about the Moon's far side has been gathered through spacecraft observations. • A spacecraft travelling to the Moon must reach Earth's escape velocity, requiring rockets to provide sufficient energy. • The Giant Impact Hypothesis, Capture Theory and Co-accretion Theory are explanations for the	meteoroids and comets. • Comets have a nucleus, coma and tails and may originate in the Kuiper Belt or Oort Cloud. • The Kuiper Belt, Oort Cloud and heliosphere define important outer Solar System regions. • Planets can be compared by relative size, mass, temperature, atmosphere, satellites and ring systems. • Most Solar System bodies orbit the Sun in or

	Autumn 1	Autumn 2	Spring 1	Spring 2	Summer 1	Summer 2
	maria, terrae, mountains and valleys. • Major lunar features include Sea of Tranquility, Ocean of Storms, Sea of Crises, Tycho, Copernicus, Kepler and the Apennine mountain range. • The Moon has rotation and revolution periods which produce synchronous rotation. • Lunar libration changes how much of the lunar disc is visible from Earth.	• Solar eclipses may be partial, total or annular and use the terminology of first, second, third and fourth umbral contact. • Lunar eclipses may be partial or total and are caused by Earth, Moon and Sun alignment. • Sidereal and synodic days and months describe different astronomical cycles. • Apparent Solar Time, Mean Solar Time, Local Mean Time, the Equation	Sun, Moon, stars, double stars, constellations, asterisms, clusters, galaxies, nebulae, planets, comets, meteors, aurorae, supernovae, artificial satellites and aircraft. • Important constellations and asterisms include Cassiopeia, Cygnus, Orion, the Plough, Southern Cross, Summer Triangle and Square of Pegasus. • Asterisms can be used as pointers to locate Arcturus, Polaris,	s and Kepler supported the transition from geocentric to heliocentric models. • Gravity produces stable elliptical orbits. • Kepler's laws describe planetary motion, including the relationship between orbital period and mean orbital radius. • Aphelion, perihelion, apogee and perigee describe positions in elliptical orbits. • Newton explained Kepler's laws using universal gravitation.	Moon's origin. • The Sun can be observed safely using telescopic projection and H-alpha filters. • The Sun's internal divisions are the core, radiative zone, convective zone and photosphere. • The Sun produces energy by nuclear fusion through the proton-proton cycle. • The chromosphere and corona form part of the solar atmosphere. • Sunspots can be used to	close to the ecliptic plane. • Transits of Venus were used to estimate the astronomical unit and the absolute scale of the Solar System. • The human eye is limited by small aperture and low sensitivity in low light. • Objective lenses or mirrors collect and focus light, while eyepieces magnify the image. • Galilean, Keplerian, Newtonian and Cassegrain telescopes have different

	Autumn 1	Autumn 2	Spring 1	Spring 2	Summer 1	Summer 2
		of Time, local noon, sundials, time zones, GMT and UT are used to measure time. • Longitude can be determined using shadow-stick, lunar-distance and horological methods.	Sirius, Aldebaran, the Pleiades, Fomalhaut and the Andromeda Galaxy. • The celestial sphere, celestial poles, celestial equator, right ascension, declination, altitude, azimuth, meridian, zenith, culmination, circumpolarity and diurnal motion are used to describe sky positions. • Dark adaptation, averted vision, seeing conditions, weather, landscape and light pollution affect naked-eye	• Gravitational force increases with the product of the masses and decreases with the square of separation.	determine solar rotation and study the solar cycle. • The solar wind causes aurorae, cometary tails and geomagnetic storms and can affect satellites, aircraft and crewed missions. • Earth's magnetosphere includes the Van Allen Belts.	basic designs. • Aperture, light grasp, field of view, resolution and magnification determine telescope performance. • Galileo's telescopic observations supported the heliocentric model. • Reflecting telescopes have advantages over refracting telescopes, including reduced chromatic aberration and larger practical apertures. • Space probes include fly-by, orbiter, impactor and lander

	Autumn 1	Autumn 2	Spring 1	Spring 2	Summer 1	Summer 2
			observations.			missions, with examples such as New Horizons, Juno or Dawn, Deep Impact and Philae. • The Apollo programme demonstrated crewed lunar exploration.
Key skills (students should be able to)	• Use degrees, angular measure, latitude and longitude accurately. • Use standard form, ratios and scale information to compare Earth and Moon data. • Recognise	• Use ratios, standard form, angular measurements, degrees, minutes and seconds of arc. • Rearrange and substitute into simple equations such as the	• Use star charts, planispheres, computer programs or apps to identify objects in the night sky. • Draw and label key constellations and asterisms accurately. • Use asterisms as	• Use AU, light year and parsec in scale and distance problems. • Translate between graphical and numerical information about planetary motion. • Use Kepler's third law in the form T squared	• Compare the structure of Earth and Moon using scientific terminology. • Explain how spacecraft observations provide evidence about the Moon's far side. • Compare theories for the	• Use data tables to compare Solar System bodies by distance, temperature, diameter, mass, moons and rings. • Use specialist units including AU, light year and parsec.

	Autumn 1	Autumn 2	Spring 1	Spring 2	Summer 1	Summer 2
	lunar formations from drawings, photographs and observation records. • Record naked-eye observations with date, time, location and seeing conditions. • Begin an observation log using clear astronomical vocabulary. • Plan a feasible unaided observation by selecting target, site, date, time and method. • Identify basic hazards and safety requirements for observation work.	Equation of Time. • Interpret graphs and tables for shadows, tides, sunrise and sunset, precession and time variation. • Use shadow-stick data and Equation of Time data to estimate longitude. • Describe eclipse geometry using precise terminology. • Compare solar and lunar eclipses, spring and neap tides, sidereal and synodic cycles, and apparent and mean solar time.	pointers to locate named stars and deep-sky objects. • Use right ascension, declination, altitude and azimuth to decide when and where to observe objects. • Use an observer's latitude to link horizon and equatorial coordinates. • Use declination to decide whether a star is circumpolar. • Predict approximate star positions from rising and setting information. • Use Polaris to estimate	divided by r cubed equals a constant. • Rearrange and solve simple algebraic equations involving orbital period and orbital radius. • Use inverse square relationships to explain how gravitational force changes with separation. • Compare geocentric and heliocentric models using evidence. • Explain how scientific models change when observations and mathematical	Moon's origin using supporting evidence and limitations. • Apply strict safety rules for solar observation and explain why direct solar viewing is dangerous. • Use sunspot data to estimate the mean solar rotation period. • Interpret solar-cycle data from graphs and tables. • Explain the effects of the solar wind using examples. • Plan an aided observation by selecting	• Use ratios and inverse square relationships in telescope light-grasp and Solar System scale problems. • Use the telescope magnification formula and rearrange it when needed. • Compare refracting and reflecting telescopes in terms of design and performance. • Evaluate the advantages and disadvantages of fly-by, orbiter, impactor, lander and crewed missions. • Explain how telescope

	Autumn 1	Autumn 2	Spring 1	Spring 2	Summer 1	Summer 2
	• Distinguish direct observation from scientific explanation.	• Write extended explanations using evidence from data, diagrams and observations.	observer latitude. • Apply naked-eye observing methods including dark adaptation and averted vision. • Evaluate how light pollution, seeing, weather and landscape affect observation quality.	explanations improve. • Answer synoptic Paper 1 questions linking cycles, observation, coordinates, models and gravity.	appropriate target, equipment, time and safety controls. • Record aided observations with instrument details and seeing conditions.	design improves on the limitations of the human eye. • Use graphical and extended-answer skills to compare observation methods and exploration methods.
Year 11 curriculum overview	• Paper 2 - Telescopic Astronomy: complete Topic 11 - Exploring the Solar System. • Paper 2 - Telescopic Astronomy: Topic 12 - Formation of planetary systems. • Aided observation	• Paper 2 - Telescopic Astronomy: Topic 13 - Exploring starlight. • Magnitude, spectra, parallax, HR diagrams, variable stars and multi-wave length astronomy. • Digital image	• Paper 2 - Telescopic Astronomy: Topic 14 - Stellar evolution. • Paper 2 - Telescopic Astronomy: Topic 15 - Our place in the Galaxy. • Catalogues, star life cycles, Milky Way structure	• Paper 2 - Telescopic Astronomy: Topic 16 - Cosmology. • Completion of unaided and aided observation records. • Observation Statement preparation and	• Exam practice for Paper 1 - Naked-eye Astronomy. • Exam practice for Paper 2 - Telescopic Astronomy. • Mathematics, observation, data analysis	• N/A

	Autumn 1	Autumn 2	Spring 1	Spring 2	Summer 1	Summer 2
	programme refinement.	analysis and telescope comparison.	and galaxies.	synoptic consolidation.	and extended-response consolidation.	
Key knowledge outcomes (students should know)	• Telescope design, light grasp, field of view, resolution and magnification must be consolidated from Topic 11. • Space probes and crewed missions have different strengths, limitations and risks. • Gravitational attraction produces regular motion, including the orbits of planets and moons. • Tidal gravitation	• The astronomical magnitude scale describes apparent brightness as seen from Earth. • Absolute magnitude describes how bright a star would appear at a standard distance. • The distance modulus formula links apparent magnitude, absolute magnitude and distance in parsecs. • Stellar spectra provide evidence about chemical compositio	• The Messier and New General Catalogue are used to catalogue nebulae, clusters and galaxies. • The Bayer system names bright stars within constellations. • Main sequence stars are governed by the balance between radiation pressure and gravity. • Sun-like stars and high-mass stars follow different evolutiona	• Galaxies outside the Local Group show redshift because they are receding from us. • The redshift formula links observed wavelength, emitted wavelength, radial velocity and the speed of light. • Hubble's law links recession velocity, Hubble constant and distance. • Distance and redshift evidence support the discovery of the	• Paper 1 - Naked-eye Astronomy is 1 hour 45 minutes, 100 marks and 50 percent of the GCSE. • Paper 2 - Telescopic Astronomy is 1 hour 45 minutes, 100 marks and 50 percent of the GCSE. • Both papers include multiple-choice, short-answer, calculation, graphical and extended-open-response questions. • Both papers assess synoptic understan	• N/A

	Autumn 1	Autumn 2	Spring 1	Spring 2	Summer 1	Summer 2
	al forces produce effects such as ring systems, asteroid belts and internal heating. • Multiple-body gravitational interactions can produce gradual shifts in orbits, chaotic motion, resonances and Lagrangian Points. • Collisions can cause impact craters and changes to orbital motion or planetary orientation. • Solar wind affects comets, planetary atmospher	n, temperature and radial velocity. • Stars can be classified by spectral type, colour and surface temperature. • The Hertzsprung-Russell diagram shows main sequence stars, the Sun, red and blue giants, white dwarfs and supergiants. • A star's life cycle relates to its position on the Hertzsprung-Russell diagram. • Brightness and intensity follow an inverse square	ry pathways. • White dwarfs are supported by electron pressure and neutron stars by neutron pressure. • The Chandrasekhar Limit affects the final stages of stellar evolution. • Sun-like stars evolve through nebula, main sequence, red giant, planetary nebula, white dwarf and black dwarf stages. • High-mass stars evolve through nebula, main sequence,	expanding Universe. • The Hubble constant can be used to estimate the age and size of the Universe. • Expansion evidence can be discussed in relation to both Big Bang and Steady State theories. • Evidence supporting the Big Bang includes quasars, cosmic microwave background radiation and the Hubble Deep Field image. • Fluctuations in the CMB are significant for theories of the	ding across the qualification. • Equations and data are provided in the examination papers, but students must know how to use them accurately. • Key equations include Equation of Time, Kepler's third law, telescope magnification, distance modulus, redshift and Hubble's law. • Assessment objectives require knowledge and understanding, application, and	

	Autumn 1	Autumn 2	Spring 1	Spring 2	Summer 1	Summer 2
	es and the heliosphere. • The Roche Limit describes how tidal and elastic forces affect whether a body is broken apart. • Gravitational and elastic forces influence whether a body is spherical or irregular. • Gravitational and thermal factors influence whether a body can retain an atmosphere. • Exoplanets can be detected using transit, astrometry and radial	relationship with distance. • Heliocentric parallax can be used to determine astronomical distances. • Light curves show variability in eclipsing binaries, Cepheid variables, novae and supernovae. • Digital sensors convert light into electrical signals which can be processed and stored as data files. • Earth's atmosphere blocks most wavelengths except visible light and	red supergiant, supernova, neutron star or black hole stages. • Evidence for black holes is gathered indirectly from their effects on nearby matter and radiation. • The Milky Way appears different through binoculars or a small telescope compared with the naked eye. • The Milky Way is a barred spiral galaxy containing dust, star-forming regions and globular clusters. • 21 cm radio waves are	Universe's evolution, including evidence from WMAP and Planck. • Dark matter and dark energy are difficult to detect but are significant in current cosmological models. • Current models predict different possible future evolutionary paths for the Universe. • Students must complete at least one unaided and one aided observation. • Observation records must include	analysis/evaluation of observations, data and methods. • Command words include calculate, compare, describe, determine, evaluate, explain, justify, plot, predict, show that and sketch. • Full-course vocabulary must be secure across naked-eye astronomy, telescopic astronomy, observation, mathematics and data analysis.	

	Autumn 1	Autumn 2	Spring 1	Spring 2	Summer 1	Summer 2
	velocity methods. • Life elsewhere is considered through requirements for life, Titan, Europa, Enceladus, the Habitable Zone, the Drake equation and SETI.	radio waves. • Radio, infrared, ultraviolet, x-ray and gamma-ray astronomy reveal different astronomical objects and processes. • Space telescopes and orbital observing platforms overcome atmospheric limitations but have cost and maintenance disadvantages.	used to determine the structure and rotation of the Milky Way. • The Local Group includes the Milky Way, Andromeda Galaxy, Large and Small Magellanic Clouds and Triangulum Galaxy. • Galaxies are classified as spiral, barred spiral, elliptical or irregular using Hubble's system. • Active Galactic Nuclei are powered by matter falling onto super-massive black holes and include Seyfert	design, observations, analysis and evaluation. • The centre Observation Statement must confirm completion of observation work before the published deadline.		

	Autumn 1	Autumn 2	Spring 1	Spring 2	Summer 1	Summer 2
			galaxies, quasars and blazars. • Galaxies form clusters and superclusters and have different theories of formation and evolution.			
Key skills (students should be able to)	• Evaluate telescope and space-probe methods using evidence. • Compare direct observation, robotic exploration and crewed exploration. • Use Solar System data tables to compare bodies by size, distance, mass,	• Use base-10 logarithms in the distance modulus formula. • Rearrange equations and substitute values with correct units. • Use significant figures appropriately in astronomical calculations. • Interpret inverse	• Classify and compare stellar life cycles for Sun-like and high-mass stars. • Explain pressure-gravity balances using correct scientific vocabulary. • Use catalogues and naming systems to identify astronomical objects.	• Use the redshift equation to calculate wavelength shift or recession speed. • Use Hubble's law to calculate recession speed, distance or the Hubble constant. • Change the subject of cosmology equations. • Plot recession speed	• Answer recall, calculation, graph, data-interpretation and extended-open-response questions across the full GCSE. • Work synoptically across Paper 1 and Paper 2 topics. • Link cycles, coordinates, observation, telescopes, planetary	• N/A

	Autumn 1	Autumn 2	Spring 1	Spring 2	Summer 1	Summer 2
	temperature, moons and rings. • Use ratios, inverse square relationships, AU, light year and parsec. • Apply simple probability in the context of the Drake equation. • Explain exoplanet detection using transit light curves, radial velocity evidence and astrometry. • Evaluate claims about habitability using evidence and limitations. • Refine aided observation programmes using	square relationships in brightness and intensity questions. • Use degrees, arcminutes and arcseconds accurately. • Determine astronomical distances using heliocentric parallax. • Sketch and interpret Hertzsprung-Russell diagrams. • Interpret light curves and determine periods of eclipsing binaries or variable stars. • Use star-trail photographs to determine the	• Classify galaxies using Hubble's system. • Describe the structure of the Milky Way and the Local Group. • Explain why radio astronomy is used to study galactic structure. • Use evidence from spectra, images, catalogues and radio observations to draw conclusions about stars and galaxies. • Write extended responses linking stellar evolution, galactic structure and observational evidence.	against distance and determine the gradient as the Hubble constant. • Translate between graphical and numerical information in cosmology data. • Compare Big Bang and Steady State explanations using evidence. • Evaluate evidence from CMB radiation, quasars and deep-field observations. • Write reasoned conclusions about dark matter, dark energy and the future of	motion, stellar evolution and cosmology. • Use all provided formulae and data-sheet values accurately. • Evaluate observational procedures and identify uncertainty, random error and systematic error. • Justify improvements to observational methods. • Communicate conclusions using diagrams, graphs, calculations and precise astronomical vocabulary.	

	Autumn 1	Autumn 2	Spring 1	Spring 2	Summer 1	Summer 2
	target selection, equipment choice, timing, safety and data sufficiency. • Compare student observations with accepted sources and identify improvements.	sidereal day. • Compare optical, radio, infrared and space-based observing methods. • Evaluate digital astronomical images using brightness, dynamic range, false colour and artefacts such as diffraction spikes, cosmic rays and satellite trails.	• Evaluate observational evidence using accuracy, precision, repeatability, reproducibility, random error and systematic error.	the Universe. • Complete observation records covering design, observations, analysis and evaluation. • Suggest justified improvements to observation programmes using evidence from results.	• Apply command words accurately, especially calculate, determine, explain, evaluate, justify and show that.	