Lloyd Williamson School Foundation
Edexcel GCSE (9-1) Astronomy
Scheme of work for Years 10 and 11

Syllabus Aims

The subject content sets out the knowledge, understanding and skills relevant to this qualification. Together with the assessment information, it provides the framework within which centres create their programmes of study.

Qualification Aims and Objectives

The aims and objectives of this qualification are to enable students to:

● understand the structures of the Earth, Moon and Sun; and how their interactions produce many of the astronomical cycles and phenomena of our natural world

● understand the Earth's place within the Solar System and universe; and the forces, which have shaped both our own, and other planetary systems

● understand the forces governing the life cycles of stars; and demonstrate a knowledge of how stars appear in the night sky

● understand how astronomers discovered the Earth's position within our galaxy and the Universe; and understand current theories for the evolution of the Universe

● understand the challenges inherent in making observations in astronomy; and the ways in which technology has aimed to overcome them

● apply observational, enquiry and problem-solving skills, through the use of information from aided and unaided astronomical observations; and use these skills to evaluate observations and methodologies

● develop an informed interest in current astronomical investigations, discoveries and space exploration

● acquire knowledge and understanding of astronomy theory and practice, and the skills needed to investigate a wide range of astronomical contexts

● understand that the study and practice of astronomy are interdependent and iterative activities, and appreciate the links between astronomy and other branches of science

● develop an awareness that the study and practice of astronomy are subject to limitations by e.g. economic, technical, ethical and cultural influences

● progress to further and higher education courses in the fields of astronomy or physics.

Mathematics

Maths skills will be assessed in the examinations. Those skills that can be assessed in relation to a specification point are referenced in the maths column, next to the specification point.

Equations

Students are not required to recall any equations. The equations that students are expected to be able to use are listed in the specification points and in *Appendix 2: Formulae and data sheet*. The formulae and data sheet for each examination are given in the examination paper.

Naked-eye Astronomy – Paper 1: Written examination: 1 hour and 45 minutes
Telescopic Astronomy – Paper 2: Written examination: 1 hour and 45 minutes

Term	Topic	Learning Objective/Outcome/Specification	Criteria/Resources
Yr10 – Autumn	***Naked-eye Astronomy*** Topic 1: Planet Earth	• Students will gain an understanding of the planet Earth and its internal structure. They will learn about the major divisions on Earth's surface and how its atmosphere affects observations.	***Use of mathematics*** ● *use angular measures in degrees (5a)* ● *use ideas of latitude and longitude (5d)*
	Naked-eye Astronomy Topic 6: Celestial Observation	• Students will gain an understanding of how to observe a variety of naked-eye astronomical phenomena. They will study how to plan their observations to be at the best time and location, taking into account effects such as weather and light pollution.	***Use of mathematics*** ● *use angular measures in degrees (5a)* ● *use ideas of latitude and longitude (5d)* ● *change the subject of an equation (3b)* ● *substitute numerical values into algebraic equations using appropriate physical quantities (3c)* ● *solve simple algebraic equations (3d)* ● *translate information between graphical and numeric form such as on the Hertzsprung-Russell diagram (4a)* ● *use angular measure in degrees when using the declination system (5a)* ● *use degrees, minutes and seconds of arc when working with the celestial and horizon coordinate systems (5b)* ● *use the concept of subtended angle when working with the celestial and horizon coordinate systems (5c)* ● *use concepts of 3D motion, rotation and coordinates on a sphere when working with the celestial and horizon coordinate systems (5d)*

Yr10 – Spring	***Naked-eye Astronomy*** Topic 2: Lunar Disc	• Students will gain an understanding of the Moon and its surface formations and be able to identify some of the main features on its surface. Students will study the rotation and revolution of the Moon and the effect of libration.	***Use of mathematics*** ● *use ratios to determine the relative sizes of the Moon, Earth and Sun (1c)* ● *translate information between graphical and numerical forms, for example when working with data on shadow lengths and directions from shadow sticks and sundials or on tides (4a)*
	Telescopic Astronomy Topic 9: Exploring the Moon	• Students will gain an understanding of the Moon, its internal structure, and features on the far side. They will study how the constant drive to improve the accuracy, detail and range of observations has provided a context for the exploration of the Moon.	
	Telescopic Astronomy Topic 11: Exploring the Solar System	• Students will investigate the main bodies in the Solar System and their characteristics. They will gain understanding that the constant drive to improve the accuracy, detail and range of observations has provided a context for the invention of the telescope, the development of the space telescope and probes to the outer reaches of our Solar System and has provided a context for the manned exploration of the Moon.	***Use of mathematics*** ● *use angular measures in degrees (5a)* ● *use specialist units: AU, l.y. and pc when considering the size of Solar System and the distances to other stars (2c)* ● *plot two variables from experimental or other data (4b)* ● *determine the slope of a linear graph such as when determining Hubble's constant (4c)* ● *change the subject of an equation such as when using the equation for telescopic magnification (3b)* ● *substitute numerical values into algebraic equations using appropriate physical quantities (3c)* ● *solve simple algebraic equations (3d)*

			● *translate information between graphical and numeric form (4a)* ● *use ratios and inverse square relationships such as when calculating telescopic magnification and light grasp (1c)* ● *use degrees, minutes and seconds of arc such as when considering telescopic resolution (5b)* ● *use the concept of subtended angle (5c)*
	Naked-eye Astronomy Topic 5: Solar System Observation	• Students will gain an understanding of how to observe the Sun and planets, including the locations of the planets in relation to the Earth and the Sun and safely observing the Sun.	***Use of mathematics*** ● *use specialist units such as the AU (2c)* ● *translate information between graphical and numeric form (4a)*
Yr10 – Summer	***Naked-eye Astronomy*** Topic 7: Early Models of the Solar System	• Students will gain an understanding of how ancient civilisations observed the Solar System. They will also study how early astronomers modelled the Solar System.	***Use of mathematics*** ● *use specialist units: AU, l.y. and pc when considering the size of Solar System and the distances to other stars (2c)* ● *translate information between graphical and numeric form (4a)*
	Naked-eye Astronomy Topic 8: Planetary Motion and Gravity	• Students will gain an understanding of the motion of the planets around the Sun and the role of gravity. They will study Kepler's laws of planetary motion and Newton's law of universal gravitation.	***Use of mathematics*** ● *use specialist units: AU, l.y. and pc when considering the size of Solar System and the distances to other stars* ● *use ratios and inverse square relationships when using Newton's law of universal gravitation (1c)* ● *solve algebraic equations such as Kepler's third law of planetary motion (3d)* ● *translate information between*

			graphical and numeric form (4a) ● *plot two variables from experimental or other data (4b)* ● *use a calculator to determine squares, square roots and cubes of positive numbers when using Kepler's third law of planetary motion (1e)*
	Telescopic Astronomy Topic 10: Solar Astronomy	• Students will gain an understanding of the structure of the Sun, its energy production process and the solar wind. Students will also use sunspot data to determine information about the Sun's rotation period and the solar cycle.	***Use of mathematics*** ● *use angular measures in degrees (5a)* ● *translate information between graphical and numerical forms, for example when working with data on shadow lengths and directions from shadow sticks and sundials or on tides* ● *solve simple algebraic equations (3d)*
	Naked-eye Astronomy Topic 3: The Earth-Moon-Sun System	• Students will gain an understanding of the relationship between the Earth, Moon and Sun and how they affect each other. They will also study tides, precession and eclipses.	***Use of mathematics*** ● *substitute numerical values into algebraic equations using appropriate physical quantities, for example in reproducing Eratosthenes' calculations or when using the Equation of Time* ● *use angular measures in degrees (5a)* ● *recognise and use expressions in standard form, for example when considering the actual size and relative scale of the Earth-Moon-Sun system (1b)* ● *use ratios to determine the relative sizes of the Moon, Earth and Sun (1c)* ● *use specialist units such as the AU (2c)* ● *use degrees, minutes and seconds of arc (5b)* ● *substitute numerical values into algebraic equations using appropriate physical quantities, for example in*

			reproducing Eratosthenes' calculations ● *change the subject of an equation (3b)* ● *substitute numerical values into algebraic equations using appropriate physical quantities (3c)* ● *solve simple algebraic equations (3d)* ● *use angular measure in degrees when using the declination system (5a)* ● *use degrees, minutes and seconds of arc when working with the celestial and horizon coordinate systems (5b)* ● *translate information between graphical and numerical forms, e.g. when working with data on shadow lengths and directions from shadow sticks and sundials or on tides (4a)*
SUMMER VACATIONS			
Yr11 – Autumn	***Naked-eye Astronomy*** Topic 4: Time and the Earth-Moon-Sun Cycles	• Students will gain an understanding of astronomical definitions and measurements of time. They will study synodic and sidereal time, solstices and equinoxes and the need for time zones.	***Use of mathematics*** ● *substitute numerical values into algebraic equations using appropriate physical quantities, for example in reproducing Eratosthenes' calculations or when using the Equation of Time (3c)* ● *use angular measures in degrees (5a)* ● *use ideas of latitude and longitude (5d)* ● *translate information between graphical and numerical forms, for example when working with data on shadow lengths and directions from shadow sticks and sundials or on tides* ● *change the subject of an equation, for example the Equation of Time (3b)* ● *solve simple algebraic equations (3d)* ● *convert between hours, minutes and*

			seconds, and decimal fractions of hours (5b)
	Telescopic Astronomy Topic 12: Formation of Planetary Systems	• Students will gain an understanding of how the interaction of gravitational and tidal forces led to the formation of our Solar System. They will use this information to study exoplanets and also the possibility of life existing elsewhere.	***Use of mathematics*** ● *solve simple problems using numerical probability (2e)* ● *understand the principles of calculations involving light years (2d)*
	Telescopic Astronomy Topic 13: Exploring Starlight	• Students will gain an understanding of how stars are observed and how we can obtain information about them from just observing the light they emit. They will study the evolution of stars and different types of stars. Students will also find out why we observe stars in different parts of the electromagnetic spectrum and where telescopes are located to enable better observations to be made.	***Use of mathematics*** ● *change the subject of an equation (3b)* ● *substitute numerical values into algebraic equations using appropriate physical quantities (3c)* ● *solve simple algebraic equations (3d)* ● *translate information between graphical and numeric form such as on the Hertzsprung-Russell diagram (4a)* ● *plot two variables from experimental or other data such as when using the right ascension (RA) and declination (dec) coordinate system or when plotting a stellar light curve or Hertzsprung-Russell diagram (4b)* ● *use specialist units such as l.y, pc and kpc when considering the distances to stars (2c)* ● *understand the principles of calculations involving light years (2d)* ● *use ratios and inverse square relationships such as when considering the decreasing apparent brightness of stars with increasing distance (1c)* ● *use degrees, minutes and seconds of arc when working with the celestial and horizon coordinate systems (5b)*

			● *understand and use logarithms (base 10) in equations and as scales and graphs such as when using the distance modulus formula (1d)*
Yr11 – Spring 1	***Telescopic Astronomy*** Topic 14: Stellar Evolution	• Students will gain an understanding of how and why stars evolve. They will study how stars form and how they end their life, depending on their size.	***Use of mathematics*** ● *change the subject of an equation such as Hubble's law (3b)* ● *substitute numerical values into algebraic equations, such as Hubble's law, using appropriate physical quantities (3c)* ● *solve simple algebraic equations such as Hubble's law (3d)* ● *translate information between graphical and numeric form such as when working with data on the distances and recessional speeds of distant galaxies (4a)* ● *plot two variables from experimental or other data such as when working with data on the distances and recessional speeds of distant galaxies (4b)* ● *determine the slope of a linear graph such as when determining Hubble's constant (4c)* ● *use specialist units such as l.y., pc and kpc when working with distances to objects within our Galaxy and (Mpc) when considering the distances to other galaxies (2c)* ● *understand the principles of calculations involving light years (2d)* ● *use ratios and inverse relationships such as when using Hubble's law (1c)*
	Telescopic Astronomy Topic 15: Our Place in the Galaxy	• Students will gain an understanding of the Milky Way, our place in it and how it fits into the Universe. They will study different types of galaxies and the main theories for their evolution.	
	Telescopic Astronomy *Topic 16: Cosmology*	• *Students will gain an understanding of redshift and Hubble's law for distant galaxies. They will also study the evidence and explanation for the expanding Universe. Students will explore dark matter and dark energy and the possible fate of the Universe.*	