Paper 1 Naked-eye Astronomy Edexcel GCSE Astronomy Learning Plan
Summer 2020 (J.Thomas)

This is a personal suggestion for how to split up the learning points in the specification according to how successful a candidate might be in finding information from online or hardcopy sources and learning these without a teacher's help.

- The first column includes items where the candidate could expect to find and learn facts without assistance.
- Items in the second column might need some teacher assistance, so a candidate should make a note of questions to ask their teacher during self-study of these topics.
- Items in the third column are judged to be more challenging for a candidate to understand without assistance or they may require some practise with past paper questions to appreciate the level of understanding and application required.

This extract from the Edexcel GCSE Astronomy Specification should be read before starting any revision or self-study using this plan:

Content
*The specification points all begin with either **'know', 'understand' or 'be able to'**. These command words indicate the depth to which the content must be studied.*

*A '**know**' statement is limited to recalling the facts in the specification content.*
*An'**understand**' statement includes all aspects of 'know' and additional depth to reach an understanding of the content.*
*A '**be able to**' statement includes all aspects of 'know' and understand', as well as application of skills for the specification content.*

***For example** specification statement 1.4 states 'Be able to use the latitude and longitude co-ordinate system'. This means that students can be expected to use the longitude and latitude system in questions relating to positions on Earth. They could also be asked to explain how longitude and latitude are different to each other and also to recall a definition for longitude and latitude.*
(https://qualifications.pearson.com/en/qualifications/edexcel-gcses/astronomy-2017.html)

Paper 1: Naked-eye Astronomy

Items where the student can learn facts	Items where understanding is required (these may need teacher explanation)	Items where teaching and exam question practise is recommended
Topic 1 – Planet Earth		
1.1 Know that the shape of the Earth is an oblate spheroid	1.3 Understand the Earth's major internal divisions and their features: a crust b mantle c outer core d inner core	1.2 Be able to use information about the mean diameter of the Earth (13 000 km)
	1.6 Understand the effects of the Earth's atmosphere on astronomical observations, including sky colour, skyglow (light pollution) and 'twinkling' (seeing)	1.4 Be able to use the latitude and longitude co-ordinate system
		1.5 Be able to use the major divisions of the Earth's surface as astronomical reference points, including: a Equator b Tropic of Cancer c Tropic of Capricorn d Arctic Circle e Antarctic Circle f Prime Meridian

		g North Pole h South Pole
Topic 2 – The lunar disc		
2.1 Know the shape of the Moon	2.4 Understand the structure and origin of the principal naked-eye lunar surface formations, including: a craters b maria c terrae d mountains e valleys	2.2 Be able to use information about the mean diameter of the Moon (3500 km)
2.3 Be able to recognise the appearance of the principal naked-eye lunar surface formations, including: a craters b maria c terrae d mountains e valleys	2.7 Understand the synchronous nature of the Moon's orbit	2.6 Be able to use the rotation and revolution (orbital) periods of the Moon
2.5 Be able to identify the following features on the lunar disc: a Sea of Tranquility b Ocean of Storms c Sea of Crises d Tycho e Copernicus	2.8 Understand the causes of lunar libration and its effect on the visibility of the lunar disc	

f Kepler g Apennine mountain range		
Topic 3 – The Earth-Moon-Sun system		
	3.5 Understand the relative effects of the Sun and Moon in producing high and low, spring and neap tides	3.1 Be able to use the relative sizes of the Earth, Moon and Sun
	3.6 Understand how the gradual precession of the Earth's axis affects the appearance of the Sun, Moon and stars, when observed from Earth, and its use in archaeoastronomy	3.2 Be able to use the relative distances between the Earth, Moon and Sun
	3.8 Understand the appearance of the Sun during partial, total and annular solar eclipses, including the terms first, second, third and fourth umbral contact	3.3 Understand how Eratosthenes and Aristarchus used observations of the Moon and Sun to determine successively: a diameter of the Earth b diameter of the Moon c distance to the Moon d distance to the Sun e diameter of the Sun
	3.9 Understand the appearance of the Moon during partial and total lunar eclipses, including the terms first, second, third and	3.4 Be able to use information about the mean diameter of the Sun (1.4 × 106 km)

	fourth umbral contact	
	3.10 Understand the causes of solar and lunar eclipses	3.7 Be able to use data relating to the rate of precession of the Earth's axis
Topic 4 – Time and the Earth-Moon-Sun cycles		
4.9 Understand the lunar phase cycle	4.1 Understand the difference between sidereal and synodic (solar) days	4.4 Be able to use: the Equation of Time = Apparent Solar Time (AST) − Mean Solar Time (MST)
4.11 Understand the annual variation in times of sunrise and sunset	4.2 Understand the role of the Sun in determining Apparent Solar Time (AST)	4.17 Be able to use data related to time zones
4.12 Understand the astronomical significance of equinoxes and solstices	4.3 Understand the role of the Mean Sun in determining Mean Solar Time (MST) and Local Mean Time (LMT)	4.19 Be able to use shadow-stick data and the Equation of Time to determine longitude
4.15 Understand the difference in local time for observers at different longitudes	4.5 Understand the annual variation of the Equation of Time	4.20 Understand the principles of astronomical methods for the determination of longitude, including lunar distance method
4.16 Understand the use of time zones	4.6 Understand the causes of the annual variation of theEquation of Time	4.21 Understand the principle of the horological method for the determination of longitude (Harrison's marine chronometer) (knowledge of internal working of chronometers not required)
4.18 Know that mean time at any point along the Prime Meridian is defined as Greenwich	4.7 Understand how to determine the time of local noon using shadows, including use of a	

Mean Time (GMT), which is the same as Universal Time (UT)	shadow stick (Observing Task Alert)	
	4.8 Understand the structure and use of sundials	
	4.10 Understand the difference between sidereal and synodic (solar) months	
	4.13 Understand the variation in the Sun's apparent motion during the year, particularly at the equinoxes and solstices	
	4.14 Understand the relationship between sidereal and synodic (solar) time	
	4.15 Understand the difference in local time for observers at different longitudes	
Topic 5 – Solar System observation		
5.6 Understand the terms First Point of Aries and First Point of Libra	5.1 Understand how to use pinhole projection to observe the Sun safely	
5.8 Understand the terms: a conjunction (superior and inferior) b opposition c elongation d transit e occultation	5.2 Understand the observed motion of the Sun follows an annual path called the ecliptic	

	5.3 Understand the changing position of the planets in the night sky	
	5.4 Understand the observed motion of the planets takes place within a narrow Zodiacal Band	
	5.5 Understand the observed retrograde motion of planets	
	5.7 Understand the appearance and cause of meteors and meteor showers, including determination of the radiant (Observing task alert)	
Topic 6 – Celestial observation		
6.1 Be able to recognise the following astronomical phenomena visible to the naked eye, including: a Sun b Moon c stars (including double stars, constellations and asterisms) d star clusters e galaxies and nebulae f planets g comets h meteors i aurorae j supernovae	6.3 Understand the use of asterisms as pointers to locate specific objects in the night sky, including: a Arcturus and Polaris from the Plough b Sirius, Aldebaran and the Pleiades from Orion's Belt c Fomalhaut and the Andromeda galaxy from Square of Pegasus	6.10 Understand how the observer's latitude can be used to link the equatorial and horizon coordinates of an object for the observer's meridian

and artificial objects, including: k artificial satellites l aircraft		
6.2 Be able to recognise and draw the following constellations and asterisms, including their most prominent stars: a Cassiopeia b Cygnus c Orion d Plough e Southern Cross f Summer Triangle g Square of Pegasus	6.7 Understand the meaning of the terms: a celestial sphere b celestial poles c celestial equator	6.11 Understand how the observer's meridian defines local sidereal time and an object's hour angle
6.4 Understand why there is a range of constellation, asterism and star names among different cultures	6.8 Understand the use of the equatorial coordinate system (right ascension and declination)	6.12 Be able to use information on equatorial and horizon coordinates to determine: a the best time to observe a particular celestial object b the best object(s) to observe at a particular time
6.5 Be able to use information from star charts, planispheres, computer programs or 'apps' to identify objects in the night sky	6.9 Understand the use of the horizon coordinate system (altitude and azimuth)	6.15 Be able to use a star's declination to determine whether the star will be circumpolar from an observer's latitude
6.6 Understand the causes and effects of light pollution on observations of the night sky	6.16 Understand the apparent motion of circumpolar stars, including upper transit (culmination) and lower transit	6.17 Be able to use information about rising and setting times of stars to predict their approximate position in the sky

6.13 Understand, in relation to astronomical observations, the terms: a cardinal points b culmination c meridian d zenith e circumpolarity	6.18 Be able to find the latitude of an observer using Polaris	
6.14 Understand the diurnal motion of the sky due to the Earth's rotation		
6.19 Understand naked eye techniques such as dark adaptation and averted vision		
6.20 Understand the factors affecting visibility, including: a rising and setting b seeing conditions c weather conditions d landscape		
6.21 Understand the appearance of the Milky Way from Earth as seen with the naked eye		
Topic 7 – Early models of the Solar System		
7.3 Understand early geocentric models of the Solar System	7.1 Understand the use of detailed observations of solar and lunar cycles by ancient civilisations around the world for:	7.5 Be able to use information about the scale of the Solar System

	a agricultural systems b religious systems c time and calendar systems d alignments of ancient monuments	
	7.2 Understand that the current celestial alignment of ancient monuments differs from their original celestial alignment due to the precession of the Earth's axis	7.6 Be able to use the astronomical unit (1 AU = 1.5 × 10^8 km), light year (l.y.) and parsec (pc)
	7.4 Understand the advantage of the addition of epicycles, as described by Ptolemy	
Topic 8 – Planetary motion and gravity		
8.5 Understand the terms 'aphelion' and 'perihelion' (solar orbits), 'apogee' and 'perigee' (Earth orbits) for an elliptical orbit	8.1 Understand the contribution of the observational work of Tycho Brahe in the transition from a geocentric to a heliocentric model of the Solar System	8.4 Understand Kepler's laws of planetary motion
	8.2 Understand the contribution of the mathematical modelling of Copernicus and Kepler in the transition from a geocentric to a heliocentric model of the Solar System	8.6 Be able to use Kepler's third law in the form: T^2/r^3 = a constant where T is the orbital period of an orbiting body and r is the mean radius of its orbit
	8.3 Understand the role of gravity in creating stable elliptical orbits	8.7 Understand that the constant in Kepler's third law depends inversely on the mass of the central body
	8.9 Understand that the gravitational force	8.8 Know that Newton was able to explain

	between two bodies is proportional to the product of their masses and inversely proportional to the square of their separation (algebraic expression of Newton's law of universal gravitation not required)	Kepler's laws using his law of universal gravitation