

Centre No.						Paper Reference (complete below)	Surname	Initial(s)
Candidate No.							Signature	

Paper Reference

1626/04

Edexcel GCSE

Astronomy

Paper 4H

Higher Tier

Thursday 27 June 2002 – Morning

Time: 1 hour 30 minutes

Materials required for examination

Nil

Items included with question papers

Nil

Examiner's use only

--	--	--

Team Leader's use only

--	--	--

Question Number	Leave Blank
1	
2	
3	
4	
5	
6	
7	
8	
Total	

Instructions to Candidates

In the boxes above, write your centre number, candidate number, your surname and initials, the paper reference and your signature. The paper reference is shown above. Check that you have the booklet for the correct Tier. Answer ALL questions in the spaces provided in this question paper. Show all the steps in any calculations and state the units. Calculators may be used. Include diagrams in your answers where these are helpful.

Information for Candidates

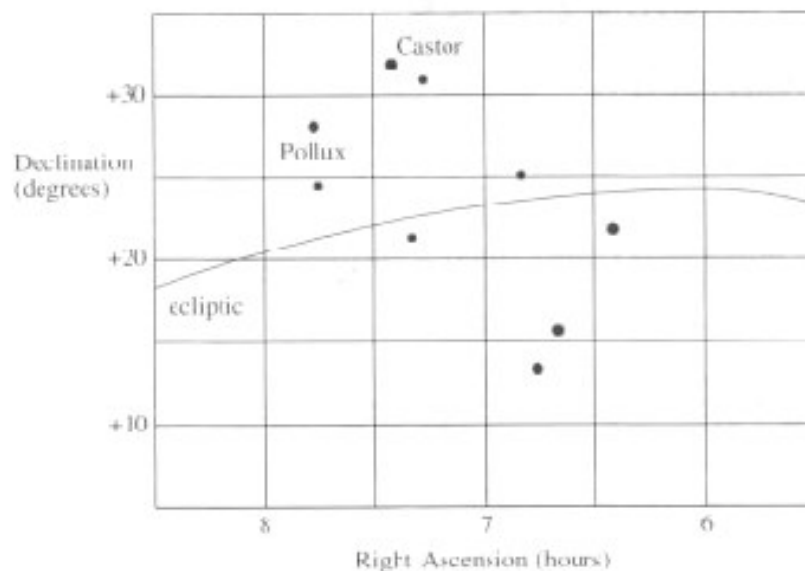
The marks for individual questions and the parts of questions are shown in round brackets: e.g. (2). There are eight questions in this question paper. There are three blank pages. The total mark for this paper is 80.

Advice to Candidates

Additional answer sheets may be used.

Answer ALL of the questions

1. The diagram shows the constellation of Gemini. Two of the brightest stars, Castor and Pollux, are labelled.



- (a) Give the approximate coordinates of **Pollux**

Right Ascension =

Declination =

(2)

- (b) From which approximate latitude on Earth could **Castor** be seen directly overhead?

.....

(1)

(c) The diagram shows the **ecliptic**. What is the astronomical significance of this on a star chart?

.....
.....

(1)

(d) On the diagram, show the boundaries of the **zodiacal band**.

(3)

(e) On the diagram, show with the letter **S** the position of the Sun on June 21st.

(1)

(f) Explain why Gemini would **not** be visible from the northern hemisphere during the summer.

.....
.....
.....

(2)

(Total 10 marks)

2. The photograph shows the observatory on Cerro Pachón in the Andes, South America. This houses one of the 8 metre telescopes of the Gemini project.



- (a) To what does the **8 metre** refer?

.....
.....

(1)

- (b) State **two** reasons why this value should be as large as possible.

1.
.....
2.
.....

(2)

- (c) Observing the sky from locations close to urban areas suffers from a form of light pollution called **skyglow**. Suggest **two** ways in which skyglow affects astronomical observations.

1.
.....
2.
.....

(2)

(d) Give **two** further reasons why telescopes are often built on high mountains.

1

.....

2

.....

(2)

(e) Draw a ray diagram for a Cassegrain reflecting telescope.



(3)

(Total 10 marks)

3. (a) Describe the appearance of a typical sunspot.

.....
.....
.....
.....

(2)

(b) Describe how (i) the number of sunspots, and (ii) the latitude of sunspots varies during the solar cycle.

(i) Number of sunspots

.....
.....

(ii) Latitude of sunspots

.....
.....

(2)

(c) State the approximate temperature at the Sun's:

(i) core

(ii) photosphere

(iii) corona

(3)

(d) Describe how energy is produced in the Sun's core.

.....
.....
.....
.....
.....
.....
.....

(3)

(Total 10 marks)

4. The table shows the times of the rising and setting of the Sun and the Moon for an observer in London during a month in the year 2001. All times are GMT.

Date of month	Sunrise	Sunset	Moonrise	Moonset
3rd	06:57	16:29	17:55	09:14
10th	07:09	16:18	00:19	14:49
17th	07:21	16:08	09:47	17:44
24th	07:35	16:00	14:02	23:59

- (a) (i) Suggest the month for which these times apply

.....

- (ii) Explain your answer.

.....

.....

.....

.....

(3)

- (b) In what phase was the Moon on 17th?

.....

(1)

- (c) (i) Sketch the appearance of the Moon on 17th.

- (ii) Explain your answer.

.....

.....

(3)

(d) (i) Suggest the date during this month on which the Moon was **new**.

.....

(ii) Explain your answer.

.....

.....

.....

.....

(3)

(Total 10 marks)

5. In the year 1543, Nicholas Copernicus published his heliocentric model of the Universe. This was later modified by Johannes Kepler.

(a) (i) State Kepler's main modification to Copernicus' model.

.....

.....

(ii) On what observational evidence was this based?

.....

.....

(2)

(b) Galileo Galilei made significant astronomical discoveries with the aid of the newly-invented telescope. State the **two** discoveries that gave firm support to the heliocentric model.

1

2

(2)

(c) Isaac Newton published his law of gravitation in 1687. State **two** other contributions made by Newton in the field of Astronomy.

1

2

(2)

- (d) Portia and Umbriel are two satellites of Uranus. Portia orbits the planet at a mean distance of 66 000 km. The orbit of Umbriel is four times greater than this. The orbital period of Portia is 0.51 days. Use Kepler's Third law to determine the orbital period of Umbriel.

Use the equation $\left(\frac{T_1}{T_2}\right)^2 = \left(\frac{a_1}{a_2}\right)^3$

.....

.....

.....

.....

.....

.....

.....

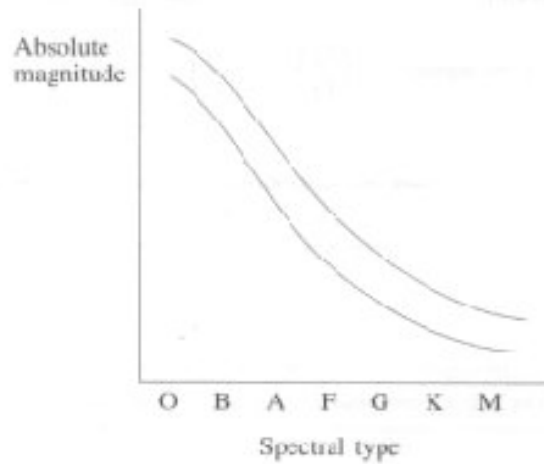
.....

.....

(4)

(Total 10 marks)

6. The diagram shows an incomplete Hertzsprung-Russell diagram. The main sequence is represented by the diagonal band.



- (a) On the diagram, indicate the position of:
- (i) the Sun (use S)
 - (ii) a typical Red Giant (use RG)
 - (iii) a typical White Dwarf (use WD)
- (3)
- (b) State **two** physical properties of a Red Giant.

1

.....

2

.....

(2)

- (c) State **two** physical properties of a White Dwarf.
- 1
-
- 2
-
- (2)

(d) Explain how astronomers determine the spectral type of a star.

.....

.....

.....

.....

.....

.....

.....

.....

(3)

(Total 10 marks)

7. (a) What is the **Oort Cloud**?

.....

.....

.....

.....

(2)

(b) With the aid of a diagram, describe how a comet's orbit may become modified to become 'trapped' in the inner part of the Solar System as a short period comet.



.....

.....

.....

.....

(3)

(c) The perihelion and aphelion distances of a short-period comet are 0.5 AU and 30AU respectively. Use the inverse square law to determine by how many times the force of gravity of the Sun acting on the comet is greater when the comet is at perihelion compared with when it is at aphelion.

.....

.....

.....

.....

(2)

(d) Why are comets most clearly visible from Earth when they are close to perihelion?

.....

.....

.....

.....

.....

.....

.....

(3)

(Total 10 marks)

8. (a) What is the **Doppler Principle**?

.....
.....
.....
.....

(2)

(b) An astronomer discovers that a line in the spectrum of a galaxy is at a wavelength of 485 nm. The true wavelength of the line is 440 nm. Determine the velocity with which this galaxy is receding.

Use the equation $\frac{\lambda - \lambda_0}{\lambda_0} = \frac{v}{c}$

where c is the speed of light = 300000km/s

.....
.....
.....
.....

(2)

(c) How do astronomers use observations of galaxies to deduce that the Universe is expanding?

.....
.....
.....
.....

(2)

(d) Suggest how the Doppler Principle can be used to show the differential rotation of the Sun

.....

.....

.....

.....

.....

.....

.....

.....

(4)

(Total 10 marks)
