

Centre No.						Paper Reference					Surname	Initial(s)		
Candidate No.						1	6	2	7	/	0	1	Signature	

Paper Reference(s)

**1627/01**

# Edexcel GCSE

## Astronomy

### Paper 01

Friday 15 May 2009 – Morning

Time: 2 hours

Examiner's use only

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Team Leader's use only

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**Materials required for examination**

Calculator

**Items included with question papers**

Nil

Question Number	Leave Blank
1	
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19	
20	
Total	

**Instructions to Candidates**

In the boxes above, write your centre number, candidate number, your surname and initial(s) and your signature.

Answer ALL questions in the spaces provided in this book. Do not use pencil. Use blue or black ink. Show all stages in any calculations and state the units. Calculators may be used.

Include diagrams in your answers where these are helpful.

Some questions must be answered with a cross in a box (☒). If you change your mind about an answer, put a line through the box (☒) and then mark your new answer with a cross (☒).

**Information for Candidates**

The marks for the various parts of questions are shown in round brackets: e.g. (2).

There are 20 questions in this question paper. The total mark for this paper is 120.

There are 24 pages in this question paper. Any blank pages are indicated.

**Advice to Candidates**



This symbol shows where the quality of your written answer will also be assessed.

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1. (a) Which of the following is the largest? Put a cross (☒) in the correct box.

Earth

Moon

Sun

(1)

(b) What is the average distance from the Earth to the Sun? Put a cross (☒) in the correct box.

1 Astronomical Unit

1 light year

1 parsec

(1)

(c) What is the approximate diameter of the Moon? Put a cross (☒) in the correct box.

2000 km

3500 km

5000 km

10 000 km

(1)

(d) What is the shape of the Earth's orbit around the Sun? Put a cross (☒) in the correct box.

a circle

an ellipse

a parabola

a zodiacal band

(1)

Q1

(Total 4 marks)



Leave  
blank

2. Five planets are listed below:

Mercury

Venus

Mars

Jupiter

Saturn

Name the planet that is being described in each statement (a) to (d) below.

(a) The surface is generally grey in colour and so highly cratered that it resembles the Moon.

.....

(b) The surface is generally red and its thin atmosphere contains traces of methane.

.....

(c) It is usually only visible at dawn or dusk and its dense atmosphere is highly reflective.

.....

(d) Through a small telescope, up to four satellites of this gas giant can be seen.

.....

(Total 4 marks)

Q2



Leave blank

3. (a) Which space mission mapped the surface of Venus using radar? Put a cross (☒) in the correct box.

Apollo 11

Giotto

Magellan

Voyager 1

(1)

(b) Which space mission studied Halley's Comet? Put a cross (☒) in the correct box.

Cassini

Galileo

Giotto

Magellan

(1)

(c) Describe briefly **two** of the problems that humans might experience in travelling to a planet.

1 .....

.....

2 .....

.....

(2)

Q3

(Total 4 marks)



Leave blank

4. (a) What is the phase of the Moon during a lunar eclipse? Put a cross (☒) in the correct box.

crescent

full

gibbous

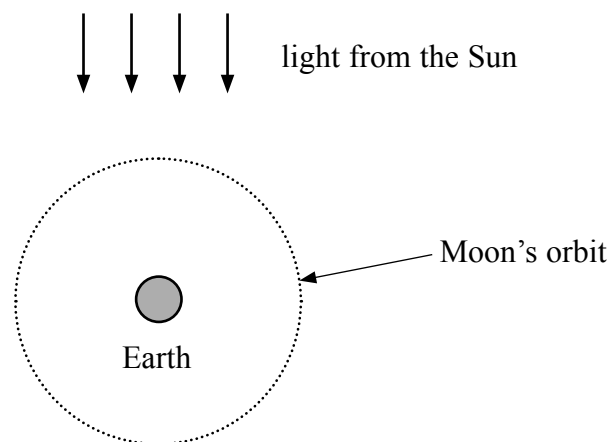
new

(1)

(b) State the phase of the Moon during a neap tide.

.....  
(1)

(c) The diagram (not to scale) shows the orbit of the Moon around the Earth and rays of light from the Sun.



On the diagram, indicate the position of the Moon:

(i) during a solar eclipse (use the letter **S**);

(ii) when the Moon would appear as a thin crescent from the Earth (use the letter **C**).

(2)

(d) As it orbits the Earth, the same side of the Moon always faces the Earth. State the reason for this.

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

(2)

Q4

(Total 6 marks)



Leave blank

5. (a) Who was credited with suggesting that planets orbit the Sun rather than the Earth? Put a cross (☒) in the correct box.

Copernicus

Galileo

Kepler

Newton

(1)

(b) Who used mathematics to explain the laws of planetary motion? Put a cross (☒) in the correct box.

Copernicus

Galileo

Kepler

Newton

(1)

(c) In 1801 Ceres was the first asteroid to be discovered. In 1930 Pluto was discovered.

(i) State **two** similarities between Ceres and Pluto.

1 .....

2 .....

(2)

(ii) State **two** differences between Ceres and Pluto.

1 .....

2 .....

(2)

(Total 6 marks)

Q5



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blank

6. Just before sunrise a group of students were observing the sky. They noticed that Venus and a thin decrescent Moon were close to each other.

(a) In which direction were the students looking?

.....  
(1)

(b) Deduce the phase of Venus at this time.

.....  
(1)

(c) One student noticed a faint band of light stretching across the sky.

(i) What is the name of this faint band? Put a cross (☒) in the correct box.

Ecliptic           ☒

Kuiper Belt       ☒

Milky Way        ☒

Zodiacal Band   ☒

(1)

(ii) Who was the first person to explain the nature of this faint band?

.....  
(1)

(d) The students observed the constellation Cassiopeia. Draw a sketch of this constellation.

(1)

Q6

(Total 5 marks)

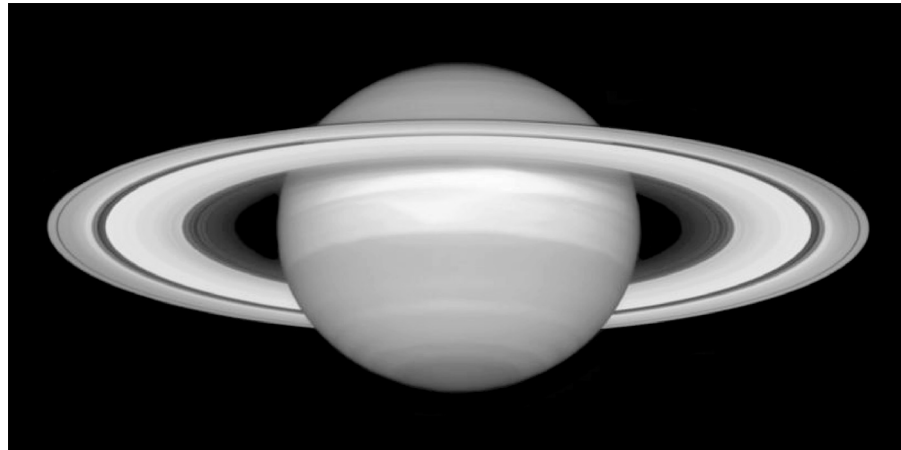
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7. The photograph shows Saturn and its rings.



*Image courtesy of NASA*

(a) Describe the physical nature and composition of Saturn's rings.

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

(2)

(b) (i) At which point in its orbit is Saturn best observed from Earth? Put a cross (☒) in the correct box.

- conjunction
- occultation
- opposition
- transit

(1)

(ii) Give **three** reasons why Saturn is best observed at this point.

1 .....

2 .....

3 .....

(3)

Q7

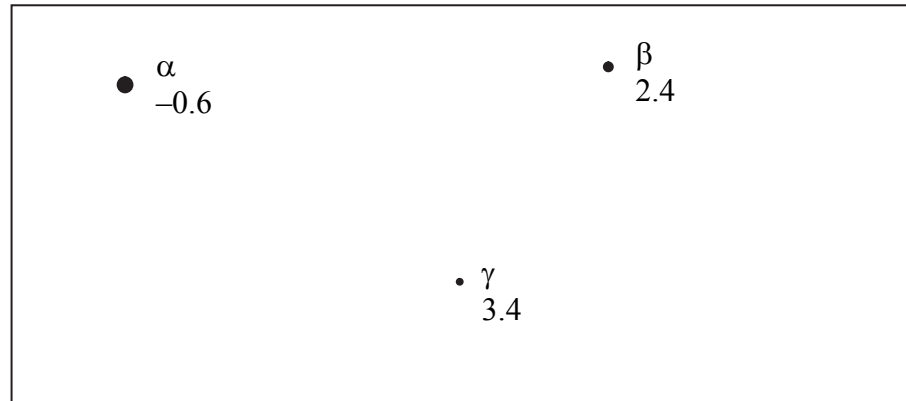
(Total 6 marks)





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8. The diagram shows the three brightest stars in a constellation with their apparent magnitudes.



(a) (i) By how many times is  $\beta$  brighter than  $\gamma$ ?

..... (1)

(ii) By how many times is  $\alpha$  brighter than  $\beta$ ?

..... (1)

(b) The two stars  $\beta$  and  $\gamma$  have the same absolute magnitude. State which star is further away from the Earth. Give a reason for your answer.

Star.....

Reason.....

..... (2)

(c) A fourth star  $\eta$  (not shown), is 250 times fainter than  $\alpha$ . What is its magnitude?

..... (1)

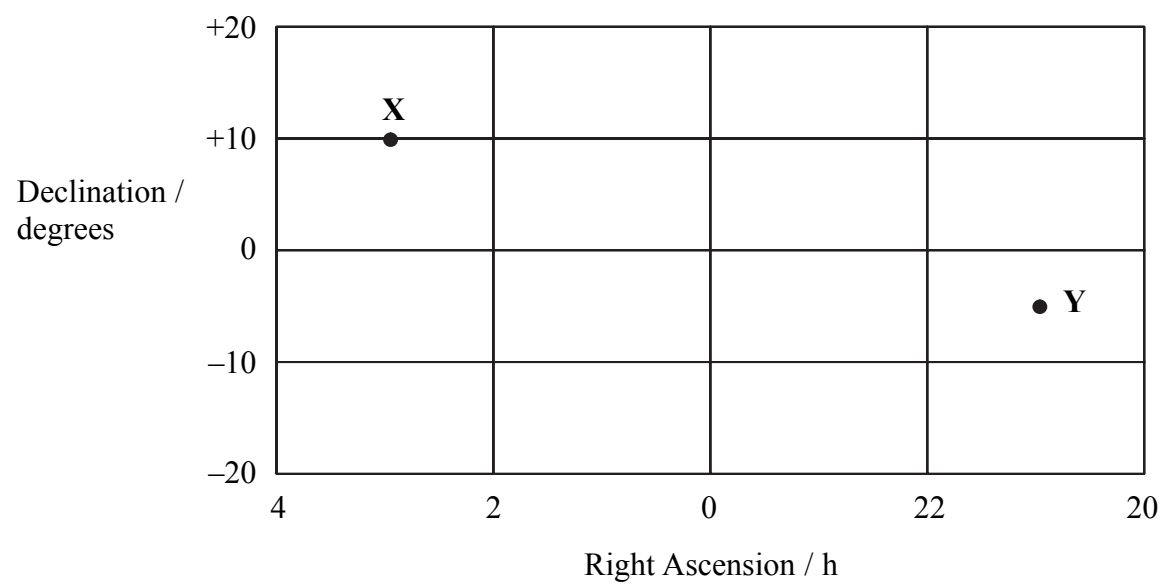
(Total 5 marks)

Q8



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9. The diagram shows part of the celestial sphere. Two stars, X and Y, are shown.



(a) State the Right Ascension of star X.

..... (1)

(b) On the grid:

(i) indicate the position of the Sun on 21 March (use S);

(ii) draw the ecliptic.

(3)

(c) What is the name of the Sun's position on 21 March?

..... (1)

(d) From what approximate latitude could you see star Y directly overhead?

..... (1)

(Total 6 marks)

Q9



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blank

10. (a) Explain why the Moon appears to be red/copper in colour during a total lunar eclipse.

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

(2)

(b) Explain why the Sun appears yellow in colour.

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

(2)

(c) On the Moon the sky always appears black. Explain why.

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

(2)

Q10

(Total 6 marks)



Leave blank

11. (a) Explain why it is dangerous to observe the Sun directly.

.....  
.....  
(2)

(b) (i) Describe **one** safe method of observing the Sun.

.....  
.....  
.....  
.....  
(2)

(ii) Name **two** features of the Sun which could be observed by this method.

1 .....  
2 .....  
(2)

(c) (i) What additional feature can be observed during a total solar eclipse?

.....  
(1)

(ii) In which other part of the electromagnetic spectrum is this feature easily observed?

.....  
(1)

Q11

(Total 8 marks)



Leave blank

12. The Hubble Space Telescope was launched into Earth-orbit in 1990.

(a) Discuss some of the problems and advantages of the Hubble Space Telescope over terrestrial telescopes.



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

(3)

(b) The Hubble Space Telescope is a reflector. Describe **two** differences between reflecting and refracting telescopes.

1 .....

2 .....

(2)

(c) Two reflectors have prime mirrors with diameters 1.5 m and 4.5 m.

(i) How much more light gathering power has the second telescope compared with the first?

.....

(1)

(ii) State **one** further advantage of using a telescope with a large diameter.

.....

(1)

(Total 7 marks)

Q12



Leave blank

13. (a) Where are most asteroids located within our Solar System?

.....  
(1)

(b) Asteroids are too faint to observe with the naked eye. Give **two** reasons why asteroids are faint.

1 .....

2 .....

(2)

(c) There is an increasing concern that an asteroid will collide with the Earth at some point in the future. Describe **two** pieces of astronomical evidence to support this view.

1 .....

.....

2 .....

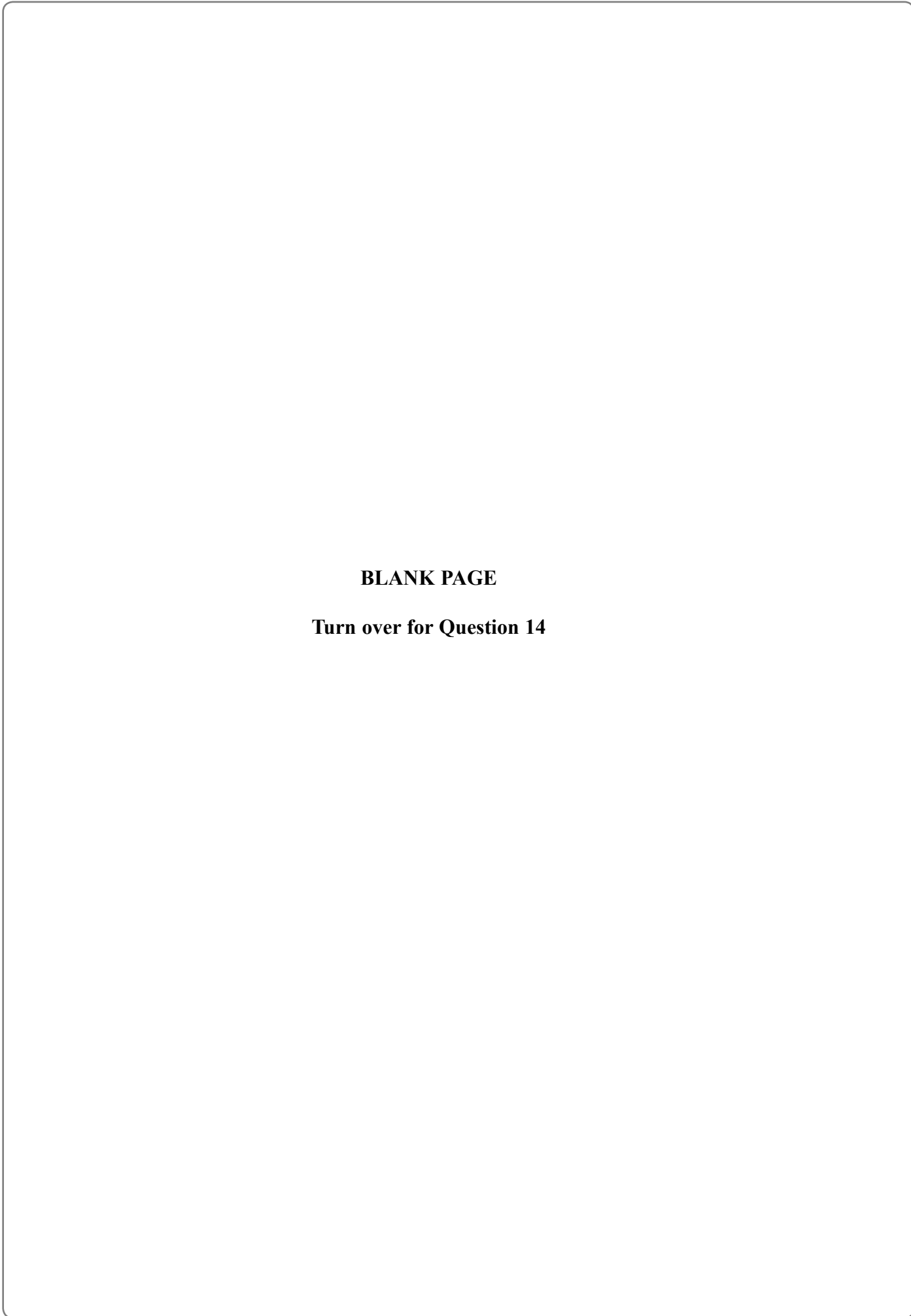
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(2)

Q13

(Total 5 marks)





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N 3 3 8 0 0 A 0 1 5 2 4



14. (a) Describe the location and nature of the Kuiper Belt.

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

(2)

(b) On the diagram below:

- (i) draw the complete orbit of a typical short-period comet;
- (ii) indicate the position of the comet when it is at perihelion (use the letter **P**).



(3)

(c) A short-period comet is 2.5 AU from the Sun at its closest point. The comet is 12.5 AU from the Sun at its furthest point. By how many times is the Sun's pull of gravity on the comet greater when at its closest point than at its furthest point? Put a cross (☒) in the correct box.

- 1 / 25
- 1 / 5
- 5
- 25

(1)

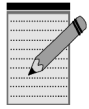




(d) In which direction do the tails of comets generally point?

..... (1)

(e) Explain the connection between short-period comets and meteor showers.



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

(3)

(Total 10 marks)

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Q14



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15. The photograph shows the Helix Nebula, a typical planetary nebula.



Image courtesy of NASA

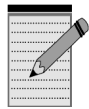
(a) What stage in the evolution of a star does a planetary nebula represent?

..... (1)

(b) What type of star is at the centre of a planetary nebula?

..... (1)

(c) The shell of gas in the planetary nebula is expanding. Describe how an astronomer might demonstrate that the shell is expanding.



.....  
.....  
.....  
..... (3)

(d) Sketch the light curve of a supernova.

(2)

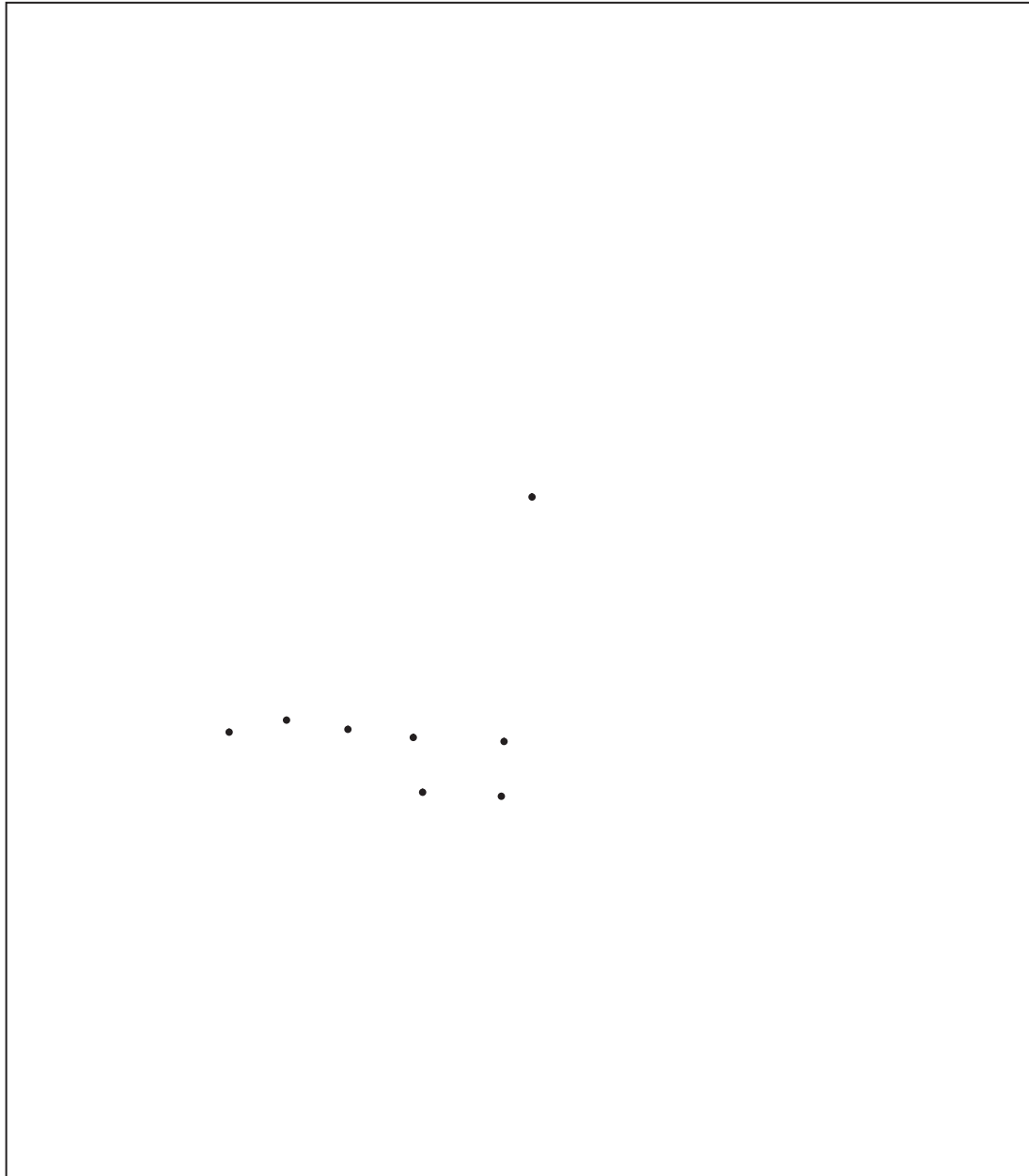
Q15

(Total 7 marks)



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16. A student observed part of the sky at midnight in December from a latitude of  $55^{\circ}\text{N}$ . She sketched what she saw.



(a) One of the stars is Polaris.

(i) Indicate this star on the diagram (use the letter **P**).

(ii) What is the name of the group of stars shown?

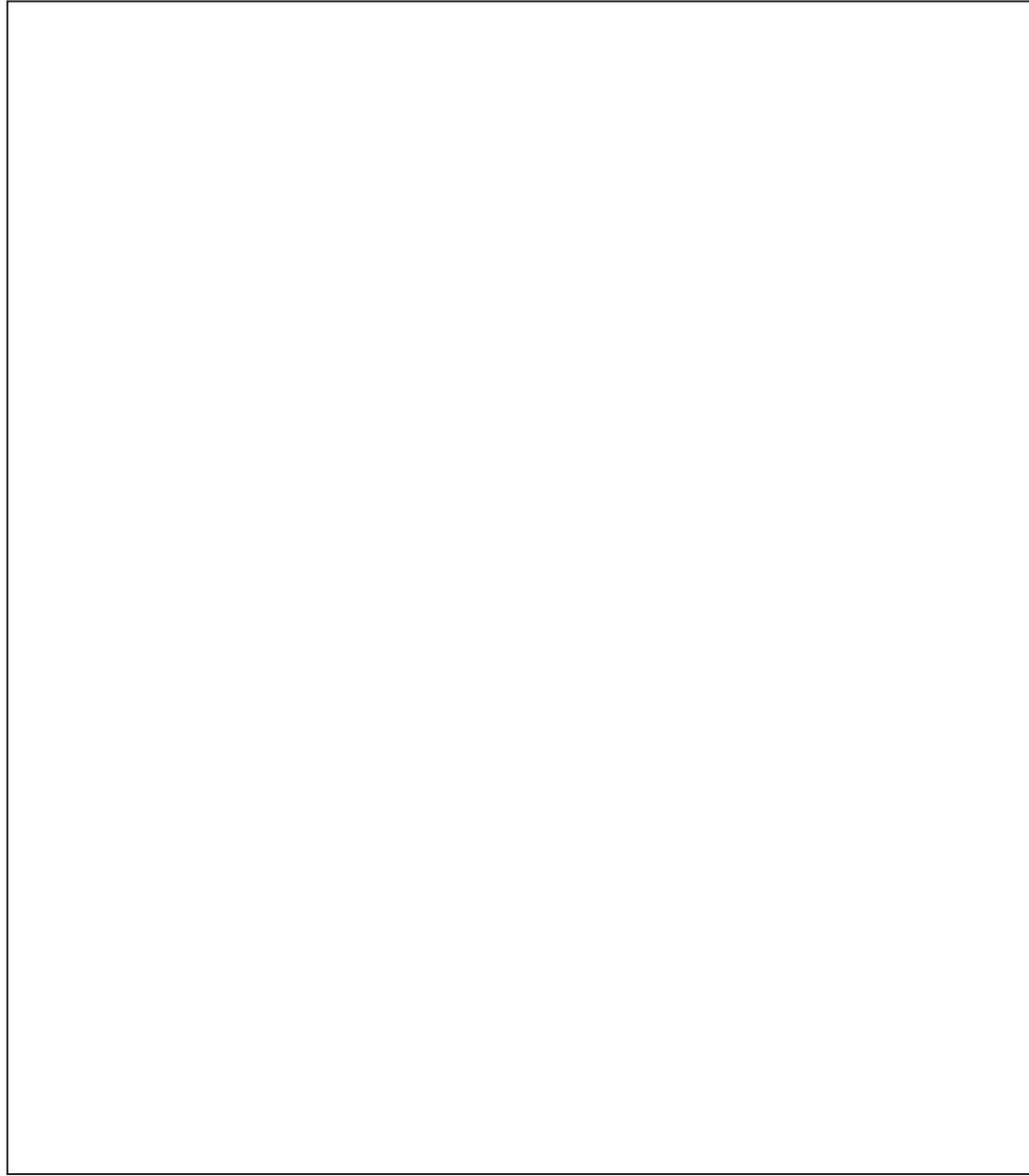
.....

(iii) Draw, on the diagram, how this group of stars would appear 6 hours later.

**(3)**



(b) If the student observed the same part of the sky at midnight in June, sketch what she would see.



(1)

Leave  
blank



<p>(c) Explain why the student would never be able to observe a planet in this part of the sky.</p> <p>.....</p> <p>.....</p> <p style="text-align: right;"><b>(2)</b></p> <p>(d) Explain why the student could not observe Orion in June.</p> <p>.....</p> <p>.....</p> <p style="text-align: right;"><b>(2)</b></p> <p style="text-align: right;"><b>(Total 8 marks)</b></p>	<p>Leave blank</p> <p><b>Q16</b></p> <input style="width: 20px; height: 20px;" type="text"/>
<p><b>17. (a)</b> On 26 December, a student at Greenwich observed that the star Betelgeuse crossed his meridian at 16:48 GMT.</p> <p>(i) In which direction was the student looking?</p> <p>.....</p> <p style="text-align: right;"><b>(1)</b></p> <p>(ii) How many days later would Betelgeuse cross the student's meridian at 16:36 GMT?</p> <p>.....</p> <p style="text-align: right;"><b>(1)</b></p> <p>(iii) A second student observed Betelgeuse on 26 December from a longitude of 2.0°W. At what time (GMT) would this student observe Betelgeuse crossing his meridian?</p> <p>.....</p> <p style="text-align: right;"><b>(2)</b></p> <p>(b) Explain the need for time zones.</p> <p>.....</p> <p>.....</p> <p>.....</p> <p>.....</p> <p style="text-align: right;"><b>(2)</b></p> <p style="text-align: right;"><b>(Total 6 marks)</b></p>	<p><b>Q17</b></p> <input style="width: 20px; height: 20px;" type="text"/>

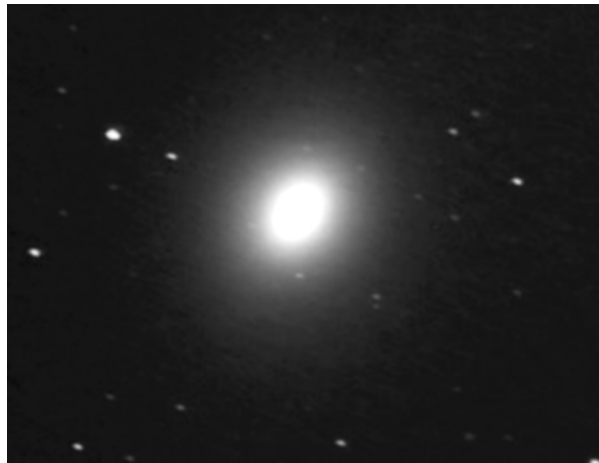


<p><b>18. (a) State <b>three</b> key facts about cosmic background radiation.</b></p> <p>1 .....</p> <p>2 .....</p> <p>3 ..... <b>(3)</b></p> <p><b>(b) State <b>three</b> major astronomical discoveries using radio telescopes.</b></p> <p>1 .....</p> <p>2 .....</p> <p>3 ..... <b>(3)</b></p> <p style="text-align: right;"><b>(Total 6 marks)</b></p>	Leave blank
	Q18 <input type="text"/>



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19. The image shows M82, a giant elliptical galaxy.



(a) Name **three** other types of galaxy.

1 .....

2 .....

3 .....

(3)

(b) Another elliptical galaxy is 10 Mpc from the Earth and has an absolute magnitude of  $-20.4$ .

1 Mpc = 1 000 000 pc. Calculate the apparent magnitude of this galaxy.

Use the formula  $M = m + 5 - 5 \lg d$

.....

.....

.....

(3)

Q19

(Total 6 marks)



Leave blank

20. Two units of distance used by astronomers are listed below with their values in km.

$$1 \text{ light-year} = 9.46 \times 10^{12} \text{ km}$$

$$1 \text{ parsec} = 3.09 \times 10^{13} \text{ km}$$

- (a) Light from the Sun takes 8.3 min to reach Earth, but 34 years to reach us from one of the nearest stars, Arcturus. How many times further away from us is Arcturus compared with the Sun? (1 year =  $5.26 \times 10^5$  min)

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

(2)

- (b) The Orion Nebula is 460 parsecs from Earth. Calculate how long it takes light from this nebula to reach us in years.

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

(3)

Q20

(Total 5 marks)

**TOTAL FOR PAPER: 120 MARKS**

**END**

