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

Tuesday 12 June 2007 – Morning

Time: 2 hours

Examiner's use only

Team Leader's use only

Question Number	Leave Blank
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20	
Total	

Materials required for examination
Nil

Items included with question papers
Nil

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.
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.

Additional answer sheets may also be used.

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Leave blank

1. An astronomy student wrote down descriptions of planets. For each of the descriptions (i)–(iv) below, write down the name of the most appropriate planet. Choose from the following planets:

Mercury Venus Earth Mars Saturn

(i) A planet known to support life.

.....

(ii) A gas giant with a prominent ring system.

.....

(iii) The Earth's 'twin' planet with a dense atmosphere of carbon dioxide.

.....

(iv) A heavily-cratered planet that closely resembles the Moon.

..... **Q1**

(Total 4 marks)

Leave blank

2. The image shows the launch of a *Saturn V* rocket. This was used to launch the *Apollo 11* spacecraft into an orbit around the Earth before it went to the Moon.

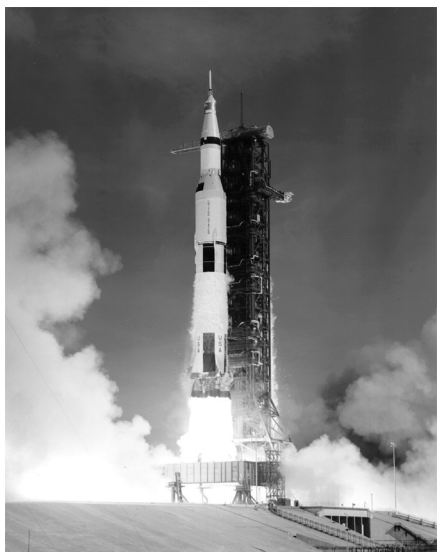


Image courtesy of NASA

(a) What is the difference between a rocket and a spacecraft?

.....

.....

.....

(2)

(b) What was the main purpose of the *Apollo* space programme?

.....

.....

(2)

(c) Until now, the manned exploration of space has been confined to the immediate Earth vicinity. Suggest one reason why this is so.

.....

.....

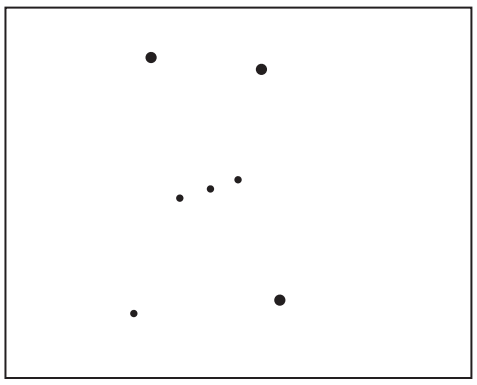
(1)

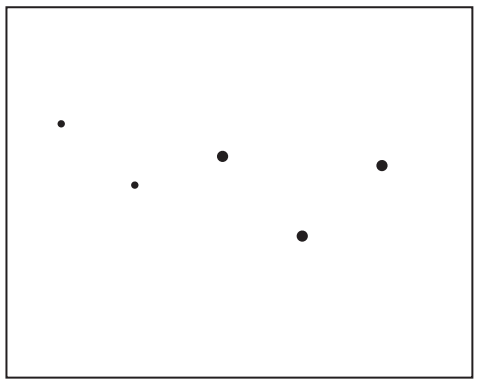
Q2

(Total 5 marks)

Leave blank

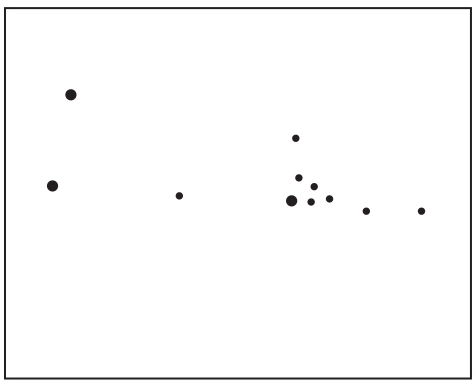
3. (a) The diagrams show four prominent constellations in the northern hemisphere. In the space under each diagram, write down the name of the constellation.

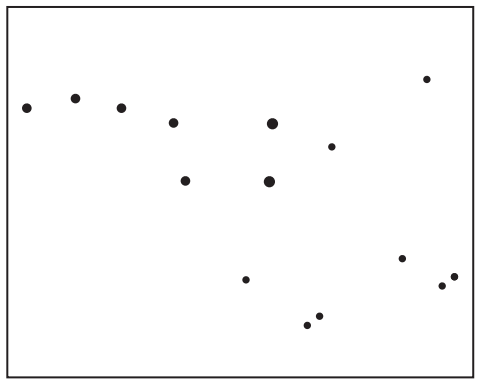




(i) .....

(ii) .....





(iii) .....

(iv) .....

(4)

(b) Which constellation

(i) contains three stars that point to Sirius

.....

(ii) contains two stars that point to Polaris?

.....

(2)

Q3

(Total 6 marks)

Leave blank

4. Four properties of light and all other forms of electromagnetic radiation are listed below:

interference

reflection

refraction

scattering

Which of these

(i) is responsible for the Earth's blue sky during the day

.....

(ii) causes the stars to appear higher in the sky than they should

.....

(iii) allows the radar technique to determine distances to nearby objects

.....

.....

(iv) makes the planets visible?

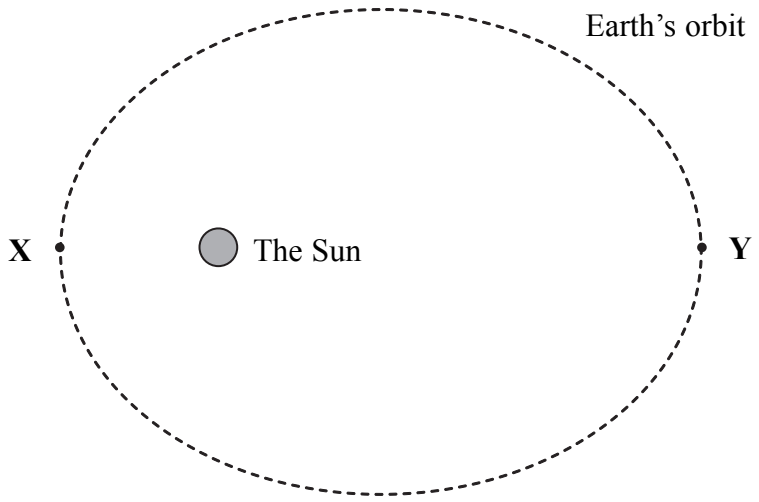
.....

Q4

(Total 4 marks)

Leave blank

5. The diagram shows the Earth's orbit around the Sun (not to scale).



(a) Mark with a cross (☒) the word that describes the shape of the Earth's orbit.

A circle ☒ **B** ellipse ☒ **C** square ☒ **D** parabola ☒

(1)

(b) What is the name of point **X**?

.....

(1)

(c) What is the approximate distance between **X** and **Y**? Give your answer in kilometres.

.....

(2)

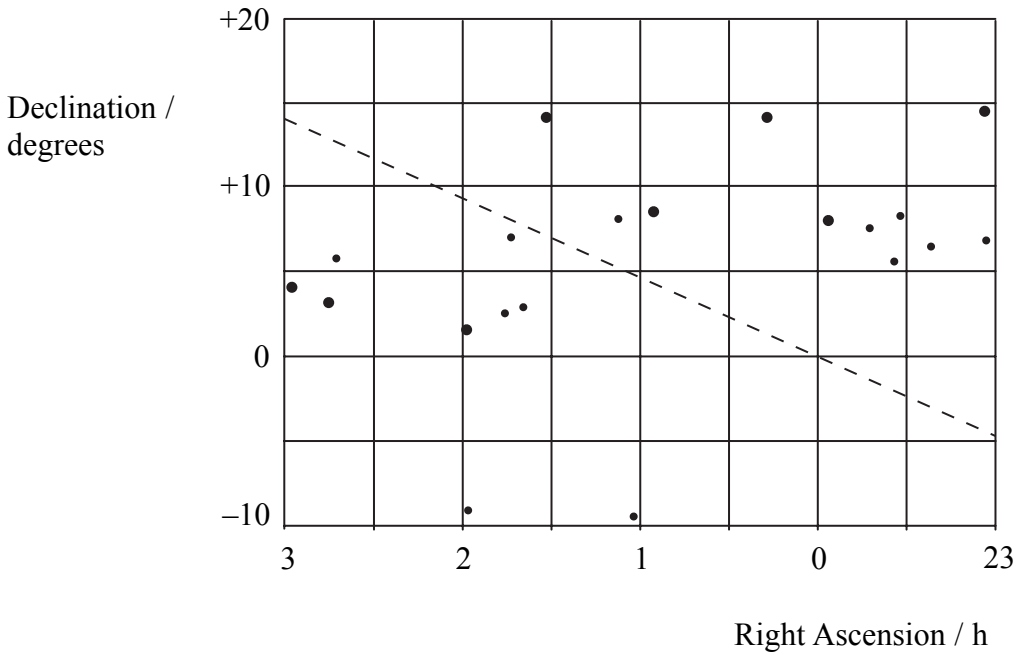
(d) Indicate with **S** on the diagram the point at which the Earth is moving slowest.

(1) **Q5**

(Total 5 marks)

Leave blank

6. The star chart shows part of the celestial sphere. The ecliptic is shown by the dashed line.



(a) On the star chart:

(i) mark with **S** the position of the Sun on March 21st,

(ii) indicate with an arrow the direction in which the Sun moves over a period of several weeks.

(2)

(b) On November 19th, the co-ordinates of Mars were:

Right Ascension = 2 h 40 min declination = +15°

On the star chart, mark with **M** the position of Mars on November 19th.

(1)

(c) On the star chart, show the region known as the zodiacal band.

(1)

(d) What is the astronomical significance of the zodiacal band?

.....

.....

(1) **Q6**

(Total 5 marks)

Leave blank

7. A student took a photograph of the full Moon during a total lunar eclipse.

Image courtesy of Richard O'Shea

(a) Draw a labelled diagram to show the relative positions of the Sun, Moon and Earth during a lunar eclipse.

(1)

(b) Sketch what the Moon would look like if the student photographed it four days later.

(2)

(c) Why do lunar eclipses not occur every full Moon?

.....

.....

.....

(2)

Q7

(Total 5 marks)

Leave blank

8. (a) What are **sunspots**?

.....

.....

.....

(2)

(b) State the approximate value in years for the solar cycle.

.....

(1)

(c) During one solar cycle, state how:

(i) the number of sunspots changes,

.....

.....

(ii) the latitude of most sunspots changes.

.....

.....

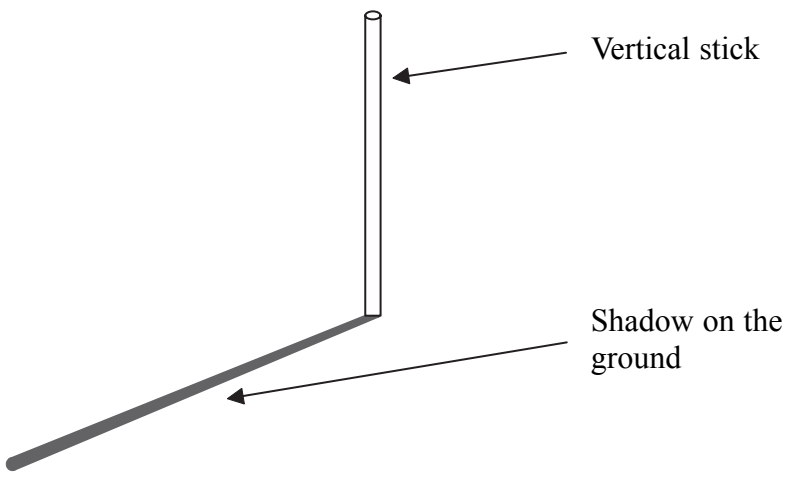
(2)

Q8

(Total 5 marks)

Leave blank

9. An astronomer made some observations with a shadow stick at Greenwich (longitude 0°) one day in September. She placed a straight stick vertically into the ground and measured the length of the shadow every five minutes.



Some of the astronomer's results are shown in the table.

time	length of shadow / mm
11:45	778
11:50	770
11:55	764
12:00	761
12:05	759
12:10	761
12:15	765
12:20	770
12:25	777

(a) At what time was the Sun highest in the sky?

.....

(1)

(b) What was the value of the Equation of Time on the day that the astronomer carried out her observations? Use the equation

mean solar time = apparent solar time – Equation of Time

.....

.....

.....

(2)

Leave blank

(c) At what time on this day did an astronomer in Swansea (longitude 4°W) observe the shortest shadow?

.....

.....

(2)

(d) The astronomer at Greenwich repeated the experiment in January. Explain whether the shadows were longer or shorter than in September.

.....

.....

.....

(2)

Q9

(Total 7 marks)

Leave blank

10. The picture shows the asteroid Gaspra and the two moons of Mars, Deimos and Phobos, to the same scale.

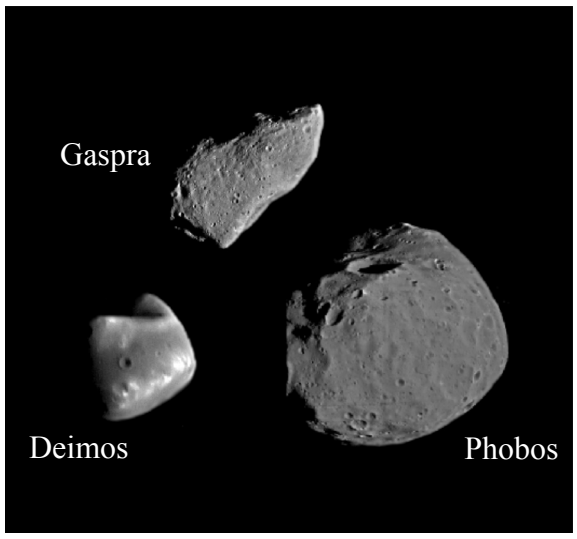


Image courtesy of NASA

(a) Many astronomers believe that Mars's two moons are captured asteroids. What evidence is there in the picture to support this?

.....

.....

(2)

(b) Between which two planets are most of the asteroids located?

.....

(1)

(c) Describe how asteroids may have been formed.

.....

.....

.....

.....

(3)

(d) Give two reasons why most asteroids are not bright enough to be seen with the naked eye.

1 .....

2 .....

(2) **Q10**

(Total 8 marks)

Leave blank

11. In a constellation, star α has an apparent magnitude of –0.2 and star β has an apparent magnitude of 0.8.

(a) How many times is star α brighter than star β?

.....

(1)

(b) Star ε appears 40 times fainter than star β. What is the magnitude of ε?

.....

.....

(2)

(c) Star σ can ***just*** be seen with the naked eye on a very clear night by an observer who is well away from sources of light pollution. Mark with a cross (☒) the approximate magnitude of σ.

A 4 ☒ **B** 6 ☒ **C** 8 ☒ **D** 10 ☒

(1)

Q11

(Total 4 marks)

Leave blank

12. Desmond and Molly each make a simple refracting telescope. Desmond's telescope has the following specification:

diameter of objective lens = 40 mm

focal length of objective lens = 50 cm

focal length of eyepiece = 20 mm

(a) Calculate the magnification of Desmond's telescope. Use the equation

$$\text{magnification} = \frac{\text{focal length of objective}}{\text{focal length of eyepiece}}$$

.....

.....

(2)

(b) Molly's telescope lets in four times more light than Desmond's. What is the diameter of her telescope's objective lens?

.....

.....

(2)

(c) The magnification of Desmond's telescope is three times more than that of Molly's. Explain whose telescope would be better suited to observe details of faint objects such as the Orion Nebula.

.....

.....

.....

.....

(3) **Q12**

(Total 7 marks)

Leave blank

13. The image shows a comet, Ikeya-Zhang. The dust tail and the ion tail are clearly visible.

Image courtesy of NASA

(a) Mark with a cross (☒) the two other features of comets.

A coma ☒ **B** corona ☒ **C** meteor ☒ **D** nebula ☒ **E** nucleus ☒

(1)

(b) A number of space probes have visited comets. Mark with a cross (☒) the probe that undertook close-up studies of Halley's Comet in 1986.

A Galileo ☒ **B** Giotto ☒ **C** Magellan ☒ **D** Voyager ☒

(1)

(c) (i) What causes the dust tail to be visible?

.....

.....

(ii) Why does the dust tail point away from the Sun?

.....

(iii) What causes the ion tail to be visible?

.....

(iv) Why does the ion tail point away from the Sun?

.....

(v) Which of a comet's tails appears straight?

.....

(5) **Q13**

(Total 7 marks)

Leave blank

14. (a) What are **circumpolar** stars?

.....

.....

(1)

(b) (i) What is meant by a **sidereal** day?

.....

.....

(ii) Mark with a cross (☒) the length of a sidereal day.

A 12 h 4 min ☒ **B** 23 h 56 min ☒ **C** 24 h 0 min ☒ **D** 24 h 4 min ☒

(2)

(c) An astronomer observes Polaris from a latitude of 58°N. The declination of Polaris is +90°.

(i) What is the angular distance of Polaris above the northern horizon?

.....

(ii) What is the angular distance of Polaris from the astronomer's zenith?

.....

(iii) Would a star of declination +40° be circumpolar from this latitude? Explain your answer.

.....

.....

.....

(4) **Q14**

(Total 7 marks)

Leave blank

15. (a) What is the **solar wind**?

.....

.....

(2)

(b) Mark with a cross (☒) the part of the Sun that has the highest temperature.

A chromosphere ☒ **B** core ☒ **C** corona ☒ **D** photosphere ☒

(1)

(c) (i) What are **aurorae**?

.....

.....

(ii) From where on Earth are aurorae mainly observed?

.....

(2)

(d) Describe the link between the solar wind and the aurorae.

.....

.....

.....

.....

(2) **Q15**

(Total 7 marks)

Leave blank

16. The image shows the Dumbell Nebula, a planetary nebula.

Image courtesy of NASA

(a) Mark with a cross (☒) the type of star that is at the centre of a planetary nebula.

A neutron star ☒ **B** pulsar ☒ **C** red giant ☒ **D** white dwarf ☒

(1)

(b) A planetary nebula represents the final stages of a star with a mass approximately equal to that of the Sun. Briefly describe the final stages of a star that has a **much greater** mass.

.....

.....

.....

.....

.....

(4)

(c) Describe the observational evidence for black holes.

.....

.....

.....

.....

(2)

Q16

(Total 7 marks)

Leave blank

17. (a) Outline the discovery of Neptune.

.....

.....

.....

.....

(2)

(b) The term 'planet' was recently defined by astronomers. This resulted in Pluto being relegated from its full planetary status.

(i) Give two astronomical reasons why Pluto should be regarded as a planet.

.....

.....

.....

(ii) Give two astronomical reasons why Pluto should **not** be regarded as a planet.

.....

.....

(4) **Q17**

(Total 6 marks)

Leave blank

18. The image shows the Lovell Radio Telescope at Jodrell Bank in Cheshire.

Image courtesy of Chris Cartwright, Adventure Images

(a) Describe how the Lovell Telescope extracts information that can be used from the incident waves.

.....

.....

.....

.....

.....

(3)

(b) At the entrance to the Jodrell Bank Observatory there is a sign requesting visitors to turn off mobile phones. Why is this?

.....

.....

(1)

(c) The first quasar discovered by astronomers was found using a radio telescope. Give three key facts about quasars.

.....

.....

.....

.....

(3) **Q18**

(Total 7 marks)

Leave blank

19. (a) Describe the Hubble classification of galaxies. You may find it helpful to draw the "Tuning Fork" diagram.

(4)

(b) Most astronomers believe that the Universe began about 15 billion years ago and that it has been evolving ever since. Describe some of the evidence for the 'Big Bang' theory of the origin of the Universe.

.....

.....

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.....

.....

.....

(4) **Q19**

(Total 8 marks)

Leave blank

20. (a) Define the term absolute magnitude.

.....

.....

(1)

(b) A star has an apparent magnitude of 2.8 and is 1000 pc away from us. Calculate the star's absolute magnitude. Use the equation

$$M = m + 5 - 5 \lg d$$

.....

.....

.....

(2)

(c) What would be the apparent magnitude of a star with the same absolute magnitude as this star, but which was 4000 pc away from us?

.....

.....

.....

.....

(3) **Q20**

(Total 6 marks)

TOTAL FOR PAPER: 120 MARKS

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