Exploring space

1 (a) The photograph shows an Apollo 12 astronaut walking on the Moon.



Complete the sentence by putting a cross (☒) in the box next to your answer.

Manned space crafts have landed on the Moon but have not yet landed on Mars.

One of the reasons is because

(1)

- ☒ **A** the Moon is closer to Earth than Mars
- ☒ **B** the Moon is closer to the Sun than Mars
- ☒ **C** Mars is closer to the Earth than the Moon
- ☒ **D** Mars is closer to the Sun than the Moon

(b) A scientist compares the sizes of some objects in space.

Which of these is the smallest?

Put a cross (☒) in the box next to your answer.

(1)

- ☒ **A** Jupiter
- ☒ **B** the Milky Way galaxy
- ☒ **C** the Moon
- ☒ **D** the Sun

(c) Some scientists look for signs of water on other planets.

Suggest why they do this.

(1)

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(d) The Earth is 150 000 000 km from the Sun.
It takes light 500 s to reach the Earth from the Sun.

Calculate the speed of light in km/s.

(3)

speed = ... km/s

(e) The photograph was taken using a powerful telescope on Earth.
It shows a nebula and many stars.



(i) Explain why photographs from telescopes in space show the nebula more clearly.

(2)

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(ii) A nebula is a cloud of gas and dust where stars are formed.
A hot object forms when gas and dust in a nebula come together.

Explain why the gas and dust come together and form a hot object.

(2)

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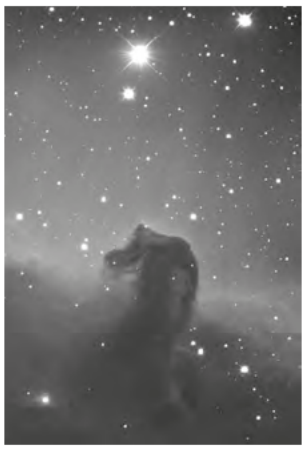
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(Total for Question 3 = 10 marks)

2 (a) The photograph shows a nebula and many stars.



(i) A nebula is a cloud of gas and dust from which stars are formed.

Describe the energy changes involved when a main sequence star forms from gas and dust.

(3)

(ii) Describe how the mass of a main sequence star will affect what the star finally becomes.

(3)

*(b) While the orig bout the origin of the Universe.
Two major theories about the origin of the Universe are the Big Bang and the Steady State theories.

Some evidence supports both theories.
Other evidence supports only one theory.

By considering the evidence, discuss why one of these theories is preferred by most scientists.

(6)

(Total for Question 5 = 12 marks)

The Solar System

3 The diagram shows four moons which orbit Jupiter.



(a) (i) Complete the sentence by putting a cross (☒) in the box next to your answer.

Jupiter is

(1)

- ☐ **A** a comet
- ☐ **B** a galaxy
- ☐ **C** a planet
- ☐ **D** a universe

(ii) Galileo used a new invention to observe these moons.

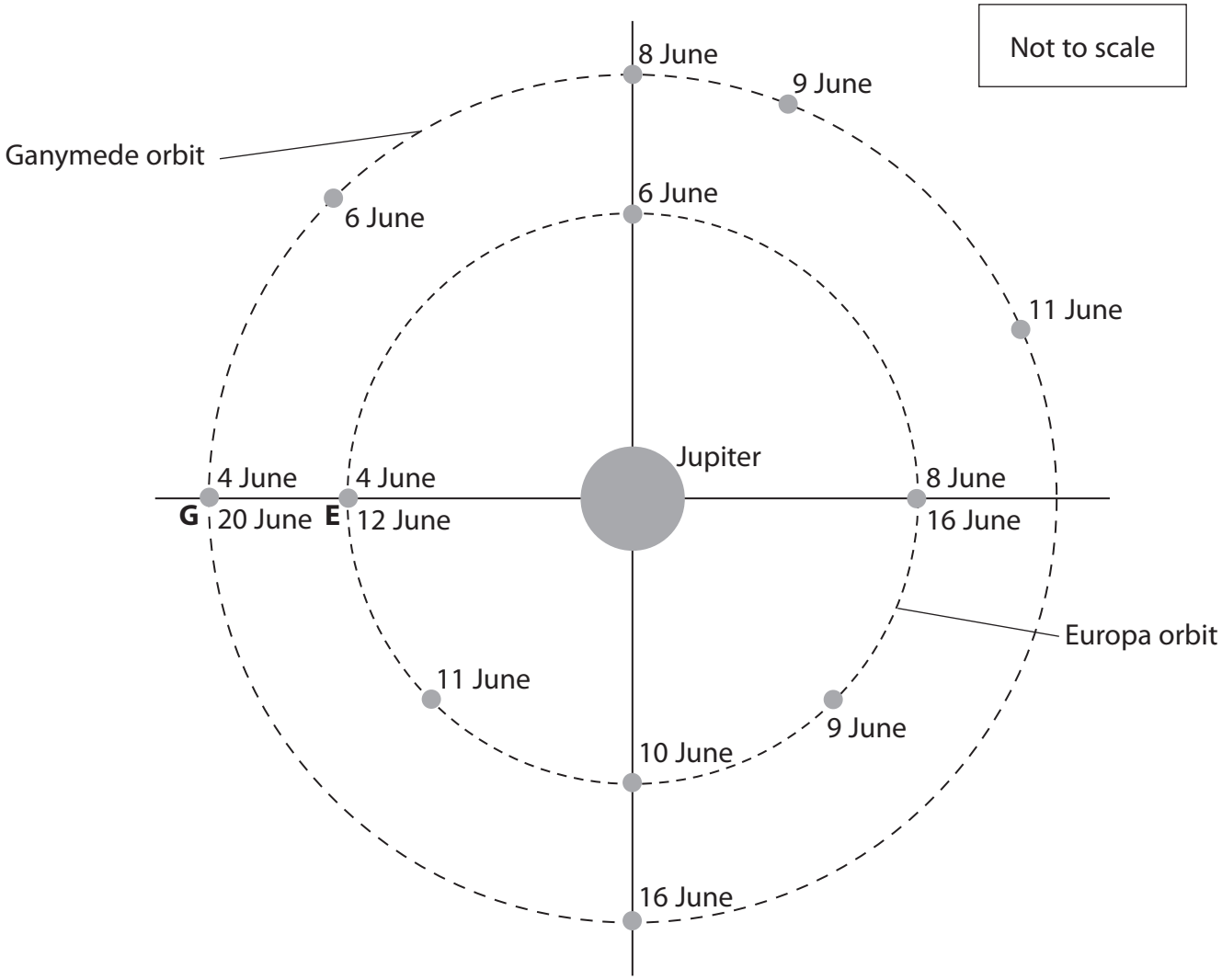
The invention he used was called a .....

(1)

(b) The diagram sho d
Jupiter.

The radius of Europa's orbit is 671 000 km.

The radius of Ganymede's orbit is 1 070 000 km.



The positions of the moons on some dates are marked.

(i) On which one of the marked dates were the moons closest together?

(1)

.....

(ii) Use information from the diagram to calculate the time for Ganymede to complete one orbit of Jupiter.

(1)

time for one orbit = ... days

(iii) Calculate the distance from Europa to Ganymede on 12 June.

(2)

distance apart = ... km

*(iv) Describe how the distance between Europa and Ganymede changes during three orbits of Europa.

(6)

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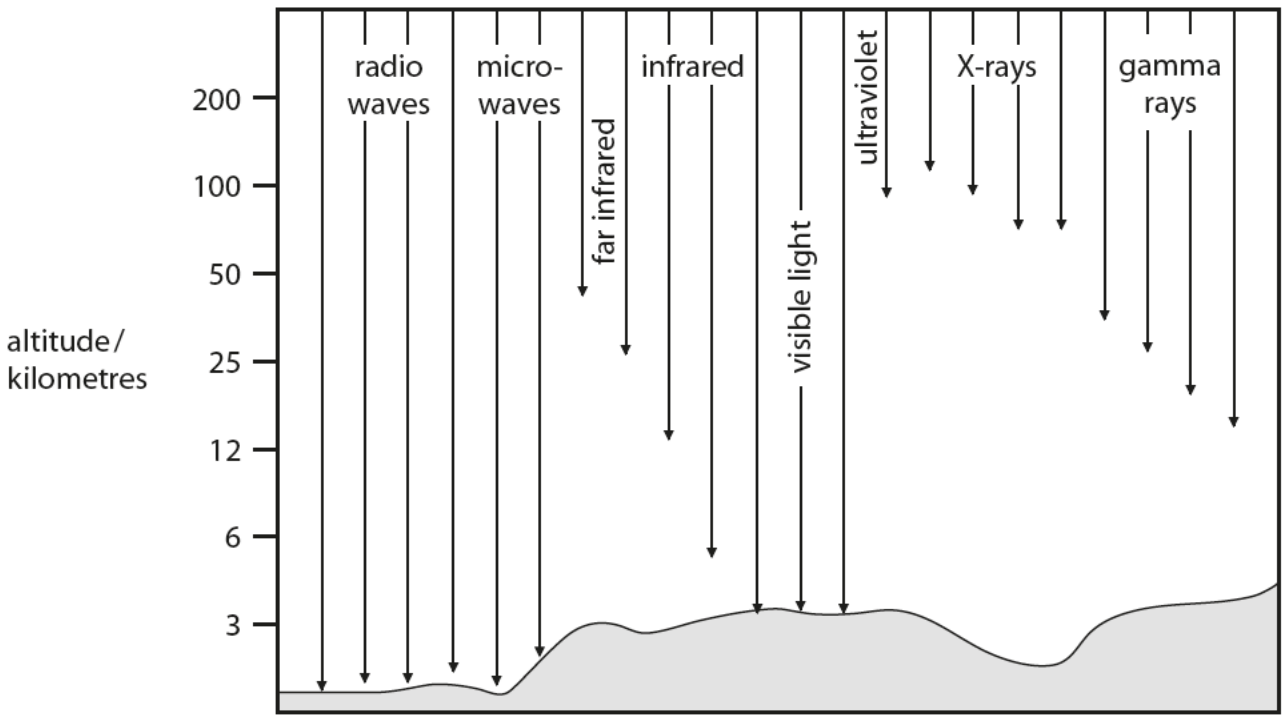
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(Total for Question 6 = 12 marks)

The Solar System

4 Not all electromagnetic radiation coming from space reaches the Earth's surface.

The diagram shows how far radiation from each part of the electromagnetic spectrum travels down through the atmosphere.



(a) (i) Name **one** type of radiation that can reach the surface of the Earth from stars.

(1)

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(ii) Name **one** type of radiation from stars that cannot be detected at the Earth's surface but can be detected using satellites.

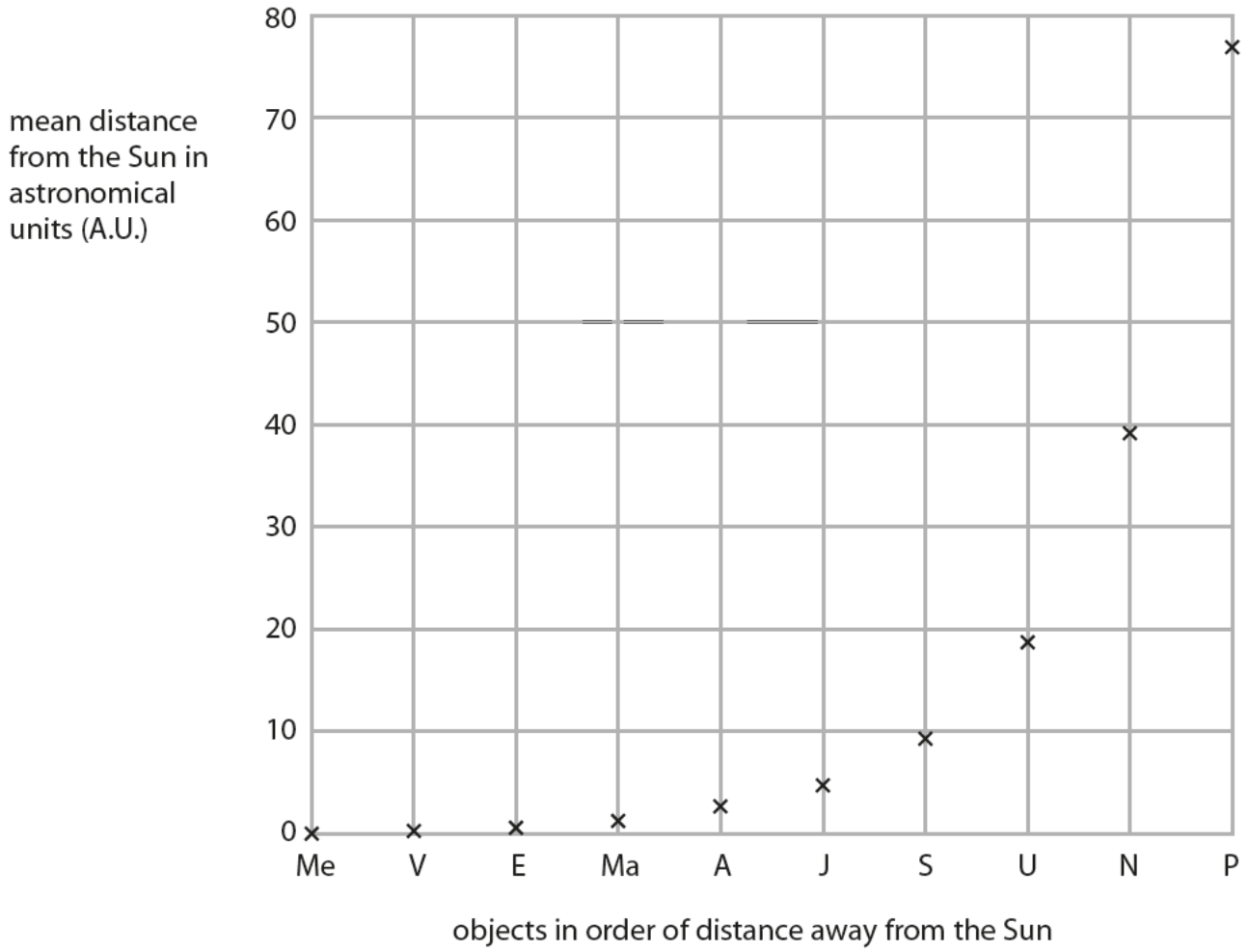
(1)

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(b) Bode, a scientist, found a rule predicting the distance of objects from the Sun.

The chart shows the mean distances from the Sun predicted by Bode's rule.



[Me – Mercury; V – Venus; E – Earth; Ma – Mars; A – Asteroid Belt; J – Jupiter; S – Saturn; U – Uranus; N – Neptune; P – Pluto]

(i) Read, from the chart, the predicted values for the distance from the Sun to Neptune and from the Sun to Pluto.

(2)

Sun to Neptune.....

Sun to Pluto.....

(ii) Bode's rule works well for all objects between Mercury and Uranus.
From scientific measurements, however, the actual mean distance from the Sun to Neptune is 30 A.U.
Some scientists think that Neptune was not part of the original Solar System.

Explain how the predicted value for Neptune supports the view of these scientists.

(2)

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*(c) Scientists are using a variety of methods to search for life beyond Earth.

Discuss the problems involved in using these methods.

(6)

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(Total for Question 6 = 12 marks)