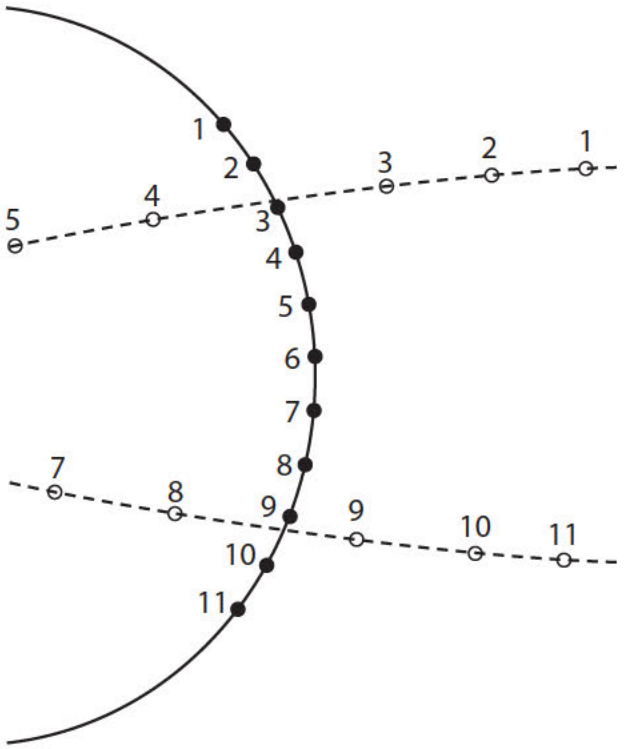
1 A comet passes close to the Earth.

An astronomer observes the position of the comet and the Earth on the same day each week for several weeks.

(a) The diagram shows her observations for weeks 1 to 11.



Path of Earth	———
Path of comet	- - - - - - - - -
Position of Earth week 1	1●
Position of comet week 1	1○

(i) Complete the path for the comet between week 5 and week 7.

(1)

(ii) Mark an X on the diagram to show the position of the Sun.

(1)

(iii) Suggest why the astronomer did not observe the comet during week 6.

(1)

.....

.....

(iv) The observation showing the comet nearest to the Earth was made during

(1)

- ☒ **A** week 7
- ☒ **B** week 8
- ☒ **C** week 9
- ☒ **D** week 10

(v) Explain how the diagram shows that the speed of the comet changes as it moves from position 1 to position 5.

(2)

.....

.....

.....

.....

(vi) Suggest why the speed of the comet changes.

(1)

.....

.....

(b) The Earth orbits the Sun once in 365 days.

The radius of the Earth's orbit is 150 000 000 km.

Calculate the orbital speed of the Earth in kilometres per hour.

(3)

orbital speed = ... kilometres per hour

(Total for Question 1 = 10 marks)

2 (a) These sentences are about astronomy.

Complete the sentences by writing words in the blank spaces.

(4)

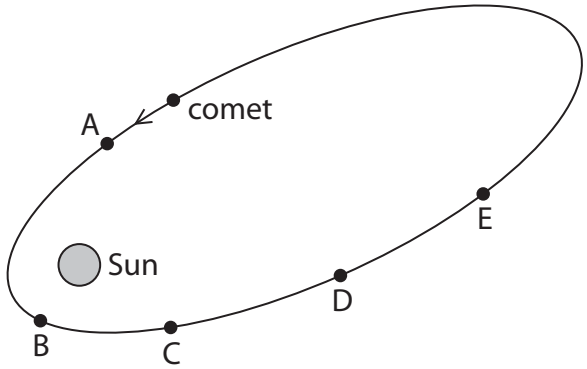
The Earth is an astronomical object.

One astronomical object smaller than the Earth is ..... .

Two astronomical objects larger than the Earth are ..... and ..... .

The Milky Way is the name given to our..... .

(b) The diagram shows the path followed by a comet as it moves around the Sun.
A, B, C, D and E are points on the comet's orbit.



(i) State the name of the force that causes the comet to orbit the Sun.

(1)

.....

(ii) At which of the points shown is the force on the comet greatest?

(1)

.....

(iii) Draw an arrow at point D to show the direction of the force acting on the comet.

(1)

(iv) At which of the points shown does the comet have the greatest kinetic energy?

(1)

.....

(Total for Question 2 = 8 marks)

3 (a) Which list gives the astronomical objects in order of size, starting with the largest?

(1)

- ☒ **A** galaxy – Solar System – planet – Sun
- ☒ **B** galaxy – Solar System – Sun – planet
- ☒ **C** planet – galaxy – Solar System – Sun
- ☒ **D** planet – Solar System – Sun – galaxy

(b) The Earth and Mars are planets in our Solar System.

(i) State two ways in which the orbits of Earth and Mars are similar.

(2)

1 .....

.....

2 .....

.....

(ii) State one way in which the orbits of Earth and Mars are different.

(1)

.....

.....

(c) Deimos is a moon that orbits the planet Mars.

The radius of its orbit is 23 500 km and its time period is 1.26 days.

Calculate the orbital speed of Deimos.

Give your answer to 2 significant figures.

(3)

orbital speed = ... km / day

(d) Enceladus is a moon that orbits the planet Saturn.

Enceladus has a similar orbital period to that of Deimos, but its orbital speed is about 10 times larger.

Explain how this is possible.

(2)

.....

.....

.....

.....

.....

.....

(Total for Question 3 = 9 marks)

4 The table shows some data about planets in our Solar System.

Planet	Diameter in km	Distance from Sun in 10^6 km	Time of orbit in Earth days or Earth years	Mass of planet in 10^{24} kg
Mercury	4 880	58	88 d	0.33
Venus	12 100	108	224 d	4.9
Earth	12 800	150	365 d	6.0
Mars	6 790	228	687 d	0.64
Jupiter	143 000	778	11.9 y	1 900
Saturn	121 000	1 427	29.5 y	570
Uranus	51 000	2 870	84 y	87
Neptune	50 000	4 497	165 y	100

Use data from the table to answer these questions.

(a) Which planet has about the same diameter as the Earth?

(1)

.....

(b) Jupiter has the largest gravitational field strength.

Suggest a reason for this.

(1)

.....

.....

(c) (i) State the equation linking density, mass and volume.

(1)

(ii) Calculate the density of Neptune in kg/km^3.

You may assume that Neptune is a sphere and that its volume is given by

$$\text{volume} = \frac{4\pi r^3}{3}$$

(3)

density = ... kg/km^3

(d) Calculate the orbital speed of Earth in km/s.

(3)

orbital speed = ...km/s

(e) A student says

'The smaller the planet, the shorter its period of orbit.'

Use data from the table to evaluate this statement.

(3)

(Total for Question 4 = 12 marks)