Solar System and beyond

1 (a) The Sun is at the centre of our Solar System.

(i) Complete the following sentence.

(1)

Our Solar System is near the edge of a galaxy called the .....

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

When the Sun nears the end of its life it will become a

(1)

☒ **A** black hole

☒ **B** neutron star

☒ **C** supernova

☒ **D** white dwarf

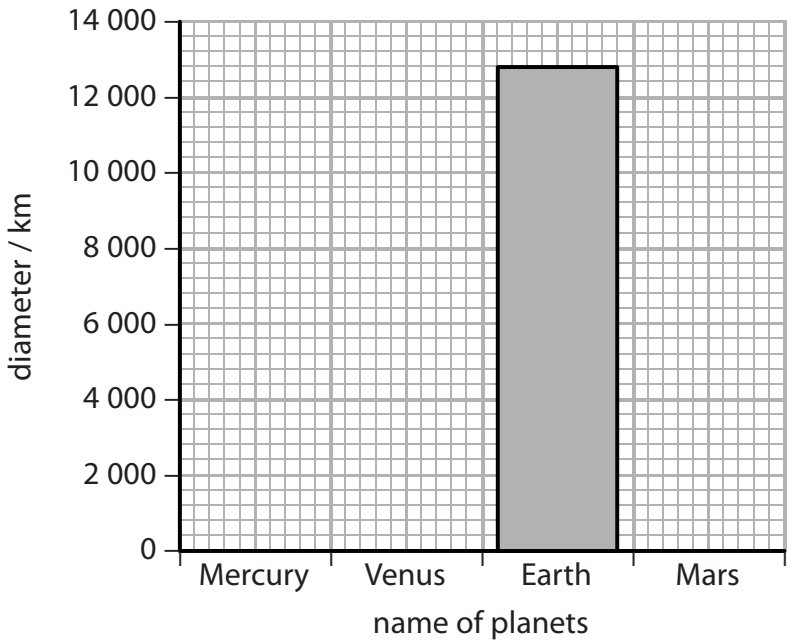
(b) The table gives information about the diameters and distances of the four planets closest to the Sun.

planet	distance from the Sun / AU	diameter of the planet / km
Mercury	0.39	4 900
Venus	0.72	12 100
Earth	1.00	12 800
Mars	1.52	6 800

(i) Put the information about the diameter of the planets on to the bar chart.

The diameter for Earth has been done for you.

(2)



(ii) The distance of the planets from the Sun has been given in Astronomical Units (AU).
1 AU is 150 000 000 km.
Calculate the distance of Mars from the Sun in kilometres.

(2)

distance of Mars from the Sun = ... km

*(c) For many years scientists have searched for evidence of intelligent life in our Solar System and in the rest of the Universe.

Describe the methods scientists have used to help with this search in both our Solar System and the rest of the Universe.

(6)

(Total for Question 6 = 12 marks)

Theories and observations

2 During the twentieth century red-shift and CMB radiation were discovered.

They have provided scientists with data to test theories of the origin of the Universe.

(a) (i) Complete the following sentence.

(1)

CMB is an abbreviation for .....

(ii) State which theory about the origin of the Universe is supported by the existence of CMB.

(1)

.....

(iii) There is a red-shift in the light received from some galaxies.
State what is meant by red-shift.

(1)

.....

.....

(iv) Some galaxies show greater red-shift than others.
Explain what this suggests about the Universe.

(2)

.....

.....

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.....

(b) Stars have different stages in their evolution.

(i) Which of these gives the next stages in the evolution of the Sun?

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

(1)

☒ **A** white dwarf then black hole

☒ **B** neutron star then white dwarf

☒ **C** red giant then supernova

☒ **D** red giant then white dwarf

(ii) Modern telescopes can provide us with more data than the telescopes used 100 years ago.
Explain what additional data can be collected and processed using modern telescopes.

(2)

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.....

.....

(Total for Question 1 = 8 marks)

Stars and galaxies

3 (a) The image shows the Andromeda galaxy.

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

Andromeda is just one of many millions of galaxies that form the

(1)

☒ **A** constellations

☒ **B** planets

☒ **C** stars

☒ **D** Universe

(ii) State the name of the galaxy that contains our Solar System.

(1)

(b) When astronomers study distant galaxies, they notice changes to the waves they observe.

(i) Describe the changes to the waves they observe.

(2)

.....

.....

.....

.....

(ii) State the evidence that astronomers have observed to support the Big Bang theory for the origin of the Universe.

(2)

.....

.....

.....

.....

*(c) By observing stars in distant galaxies, astronomers have been able to identify the different stages in the life of a star.

Describe the life cycle, from birth to death, of a star that is similar in mass to our Sun.
You may draw labelled diagrams to help with your answer.

(6)

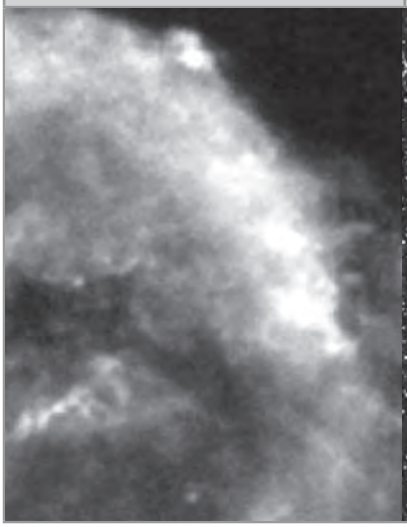
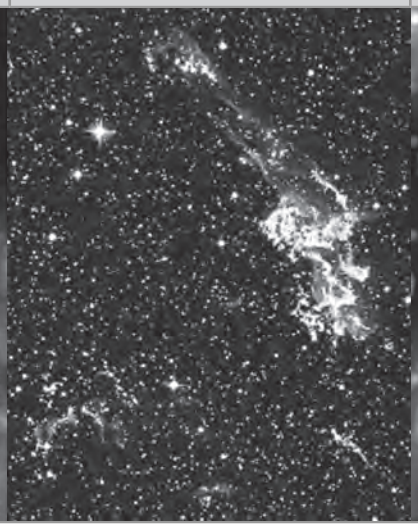
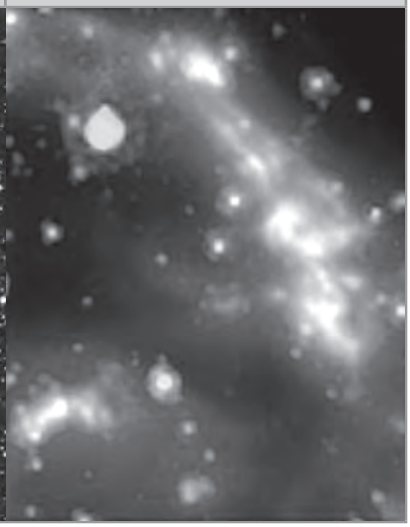
(Total for Question 6 = 12 marks)

Looking at our Universe

4 (a) Chandra, Hubble and Spitzer are space telescopes.

The photographs show exactly the same part of the Universe observed using the different telescopes.

The main object shown in each photograph is the same supernova.

Chandra's image using X-rays	Hubble's image using visible light	Spitzer's image using infrared
		

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

A supernova is

(1)

☒ **A** a star in its main sequence

☒ **B** the appearance of a new star

☒ **C** the explosion of a massive star

☒ **D** the explosion of a white dwarf

(ii) The waves th

X-rays

visible light

infrared

Complete the table by arranging these three waves in order of decreasing wavelength.

(1)

longest wavelength →		**shortest wavelength**
.....	.....	.....

(iii) Astronomers use different types of telescope, like Chandra, Hubble and Spitzer.

Explain how using these different telescopes gives a better understanding of the Universe.

(3)

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.....

(b) Most space telescopes orbit the Earth but the Spitzer telescope stays behind the Earth to hide from the Sun.

Suggest why this is necessary.

(2)

.....

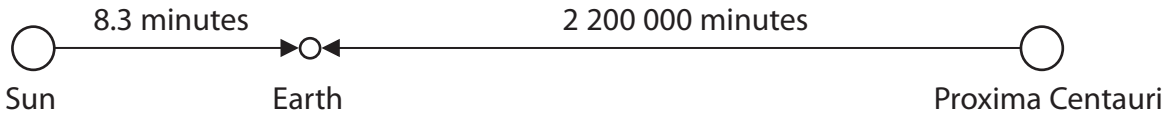
.....

.....

.....

(c) Outside our Solar System, the star closest to Earth is called Proxima Centauri.
Light from this star takes 2 200 000 minutes to reach the Earth.
Light from the Sun takes 8.3 minutes to reach the Earth.
The speed of light is 18 000 000 km/minute.

not to scale



(i) By calculation, compare the distance of Proxima Centauri from the Earth with the distance of the Sun from the Earth.

(2)

.....

.....

(ii) A light year is the distance that light travels in one year.

Astronomers usually give the distance from stars as a number of light years instead of a number of kilometres.

Suggest a reason for this.

(1)

.....

.....

(Total for Question 4 = 10 marks)