Questions

Q1.

(i) An astronomer observes light from a distant galaxy.

As the galaxy moves away from us, the spectrum of the light is

(1)

☒ **A** blue-shifted

☒ **B** green-shifted

☒ **C** red-shifted

☒ **D** violet-shifted

(ii) The shift in the spectrum of light from the distant galaxy provides evidence for the expansion of the

(1)

☒ **A** Earth

☒ **B** Milky Way Galaxy

☒ **C** Solar System

☒ **D** Universe

(Total for question = 2 marks)

Q2.

Two theories about the Universe are the Steady State Theory and The Big Bang Theory.

(i) The table shows some ideas about the Universe.

Which row of the table applies to the Steady State Theory?
Put a cross (☒) in the box next to your answer.

(1)

	the Universe.....	the Universe.....
☐ A	... is not expanding	... had a beginning
☐ B	... is expanding	... had a beginning
☐ C	... is not expanding	... did not have a beginning
☐ D	... is expanding	... did not have a beginning

(ii) State the name of the discovery that persuaded most scientists to prefer the Big Bang Theory to the Steady State Theory.

(1)

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Q3.

This simplified diagram compares spectra of light from the Sun and two galaxies.

The light from galaxy 1 and galaxy 2 both show redshift.

Explain what these redshifts predict about the position and movement of the two galaxies.

(3)

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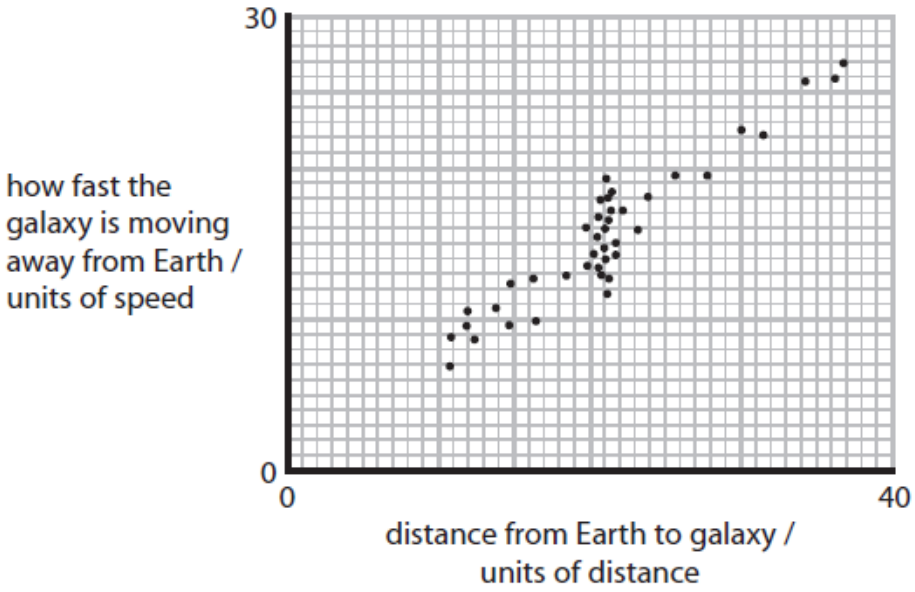
Q4.

(a) Hubble measured the distance of many galaxies from Earth.
He also measured the speed at which each galaxy moved away from Earth.

Hubble plotted his data on a graph like this.



(i) Plot the point: distance = 5 units, speed = 4 units

(1)

(ii) Draw the straight line of best fit.

(1)

(b) Hubble's work led to the theory of the Big Bang.

Describe what is meant by the Big Bang theory.

(2)

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Q5.

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.

(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)

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

(1)

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

(2)

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Q6.

* Describe how modern telescopes have contributed to our understanding of the Universe.

(6)

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Q7.

The Big Bang theory gives an explanation for the origin of the Universe.

Explain how evidence supports the ideas that

- the Universe is expanding
- the Universe began at a single point.

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(Total for question = 6 marks)

Q8.

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)

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

(1)

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(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 = 8 marks)

Q9.

Satellites are used to gather data about the origin of the Universe.

The Big Bang theory is a theory about the origin of the Universe.

Evidence for the Big Bang theory is provided by red-shift and CMB radiation.

(i) Describe what is meant by red-shift.

(2)

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(ii) Explain how red-shift provides evidence for the Big Bang theory.

(2)

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(iii) The Cosmic Background Explorer (COBE) satellite observed CMB radiation from 1989 to 1993.

State what the 'M' in CMB radiation stands for.

(1)

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(iv) State what is meant by 'cosmic background radiation'.

(1)

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(v) Explain how the presence of CMB radiation provides evidence for the Big Bang theory.

(2)

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(Total for question = 8 marks)

Q10.

(a) Which row of the table shows these objects in the correct order of size?

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

(1)

	smallest → biggest		
☒ **A**	Milky Way	Solar System	Universe
☒ **B**	Milky Way	Universe	Solar System
☒ **C**	Solar System	Universe	Milky Way
☒ **D**	Solar System	Milky Way	Universe

(b) Some visible light telescopes are located in space.

Other visible light telescopes are located on the Earth's surface.

Explain why the images produced by telescopes on Earth are less clear than the images produced by telescopes in space.

(2)

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(c) This simplified diagram compares spectra of light from the Sun and two galaxies.

The light from galaxy 1 and galaxy 2 both show redshift.

Explain what these redshifts predict about the position and movement of the two galaxies.

(3)

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(d) Scientists have studied stars to discover how stars evolve.

They know that stars form in a nebula when clouds of dust and gas are pulled together by gravity.

Describe how this process continues for stars much more massive than the Sun.

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(Total for Question is 10 marks)

Q11.

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

Which of these is the biggest?

(1)

☒ **A** the Solar System

☒ **B** a galaxy

☒ **C** a nebula

☒ **D** the Universe

(b) These are four stages in the evolution of a star similar to the Sun.

They are **not** in the correct order.

1. main sequence star
2. white dwarf
3. red giant
4. nebula

Write down the stages in the correct order.

(2)

The first stage has been done for you.

..... nebula .....

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(c) (i) The chart shows the electromagnetic (EM) spectrum.
Some parts of the spectrum have been labelled.

radio	**P**	**Q**	visible light	**R**	**S**	gamma rays

State the name of part **Q**.

(1)

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(ii) Three telescopes using different parts of the spectrum have been added to the chart.

radio	**P**	**Q**	visible light	**R**	**S**	gamma rays
Jodrell Bank			Hubble			Compton

Jodrell Bank is located near Manchester, whereas Hubble and Compton are in space.

Explain why some telescopes are located outside the Earth's atmosphere.

(2)

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*(d) Describe how modern telescopes have contributed to our understanding of the Universe.

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(Total for Question is 12 marks)

Q12.

A long time ago scientists thought that the Universe never changed.

Now there is evidence to show that stars progress through various stages and that the Universe is expanding.

(a) Our Sun is in its main sequence stage.

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

A star of much greater mass than the Sun will eventually become

(1)

☒ **A** a black hole

☒ **B** a protostar

☒ **C** a red dwarf

☒ **D** a white dwarf

(ii) Describe how the Sun reached its main sequence stage.

(3)

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(iii) Scientists can estimate the age of a star. They want to find the age of the oldest star.

Suggest why knowing the age of the oldest star is not enough to tell scientists the age of the Universe.

(2)

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*(b) Edwin Hubble discovered that the Universe was expanding.
He did this by using observations of red-shift.
Explain what red-shift is and how it provides evidence that the Universe is expanding.

(6)

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(Total for Question = 12 marks)