

Name of the Student: _____

Max. Marks : 17 Marks

Time : 17 Minutes

Q1.

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 (☒).

The Big Bang and Steady State are two theories of the origin of the Universe.

Red shift and cosmic microwave background (CMB) radiation have been discovered by observing the Universe.

Which line of the table links the evidence to the theory it supports?

(1)

		evidence		
		theory	red shift	CMB
☐	A	Big Bang	Yes	No
☐	B	Steady State	Yes	Yes
☐	C	Big Bang	Yes	Yes
☐	D	Steady State	No	Yes

(Total for question = 1 mark)

Q2.

The Big Bang theory and the Steady State theory are two theories about the origin of the universe.

The discovery of CMB led scientists to accept only one of the theories.

Explain why red shift supports both theories but CMB supports only one of them.

(3)

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(Total for question = 3 marks)

Q3.

The Big Bang theory is one theory for the origin of the Universe.

The Big Bang theory suggests:

- the Universe had a beginning
- the Universe is still expanding.

The Steady State theory is also a theory about the origin of the Universe.

Give **one** similarity and **one** difference when comparing the Big Bang theory with the Steady State theory.

(2)

similarity

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difference

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(Total for question = 2 marks)

Q4.

Describe the significance of microwave radiation in the development of a theory of the origin of the universe.

(2)

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(Total for question = 2 marks)

Q5.

Stars may originate as a nebula.

(i) Describe the process that then occurs to produce the conditions necessary for nuclear fusion in a new star.

(3)

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(ii) The energy, E , released in nuclear fusion is equivalent to loss in mass, m , according to the equation.

$$E = mc^2$$

where c is the velocity of light.

$$c = 3.00 \times 10^8 \text{ m/s}$$

In 1 second, the energy radiated by the Sun is $3.86 \times 10^{26} \text{ J}$.

Calculate the loss in mass of the Sun in 1 second.

(2)

loss in mass = kg

(Total for question = 5 marks)

Q6.

The Sun reaches its highest point in the sky on Midsummer's day.

Describe how you could use this fact to measure the time it takes for the Earth to orbit the Sun once.

(2)

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(Total for question = 2 marks)

Q7.

A scientist records the sounds made by a dolphin as it swims towards him.

The dolphin stops swimming but continues to emit the sounds.

Describe what happens to the frequency and wavelength of the sounds when the dolphin stops swimming.

(2)

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(Total for question = 2 marks)