

Name:

Date:

P8 - Test 4  
SPACE PHYSICS  
Intermediate

**GCSE**

PHYSICS

AQA - Triple Science

Mark

Grade

---

### Materials

For this paper you must have:

- Ruler
- Pencil and Rubber
- Scientific calculator, which you are expected to use when appropriate

### Instructions

- Answer all questions
- Answer questions in the space provided
- All working must be shown

### Information

- The marks for the questions are shown in brackets

1.

(a) Brown dwarf stars are thought to have been formed in the same way as other stars. They are too small for nuclear fusion reactions to take place in them. Brown dwarf stars emit infrared radiation but are not hot enough to emit visible light.

(i) Describe how a star is formed.

---

---

---

---

(2)

(ii) Describe the process of nuclear fusion.

---

---

---

(1)

(iii) Scientists predicted that brown dwarf stars existed before the first one was discovered in 1995.

Suggest **one** reason why scientists are now able to observe and identify brown dwarf stars.

---

---

---

(1)

(b) In the 18th century some scientists suggested a theory about how the planets formed in the Solar System. The theory was that after the Sun formed, there were cool discs of matter rotating around the Sun. These cool discs of matter formed the planets. The scientists thought this must have happened around other stars too.

(i) Thinking about this theory, what would the scientists have predicted to have been formed in other parts of the Universe?

---

---

(1)

- (ii) Since the 1980s scientists studying young stars have shown the stars to be surrounded by cool discs of rotating matter.

What was the importance of these observations to the theory the scientists suggested in the 18th century?

---

---

(1)

- (c) The Earth contains elements heavier than iron.

Why is the presence of elements heavier than iron in the Earth evidence that the Solar System was formed from material produced after a massive star exploded?

---

---

(1)

(Total 7 marks)

2.

Read this statement from a website.

Immediately after the 'big bang', at the start of the Universe, there were only atoms of the element hydrogen (H).

Now there are over one hundred elements. Scientists think that all the elements on Earth are also present throughout the Universe.

- (a) Explain how atoms of the element (He) are formed in a star.

---

---

---

---

(2)

- (b) Explain how atoms of very heavy elements, such as gold (Au), were formed.

---

---

---

---

(2)

(c) Scientists have only examined a tiny fraction of the Universe.

What is the basis for scientists thinking that the elements found on Earth are present throughout the Universe?

---

---

(1)

(Total 5 marks)

**3.**

Studies of light from distant galaxies have provided evidence for the theory that the Universe started from one place and is expanding. Explain how.

---

---

---

---

---

(Total 3 marks)

**4.**

Astronomers believe that the Universe is expanding.

(i) How might the Universe have started?

---

---

(1)

(ii) State and explain briefly, **one** piece of scientific evidence which may be used to support this belief.

---

---

---

---

(2)

(Total 3 marks)

**5.**

Our Sun is just one of many millions of stars in a galaxy called the Milky Way.

Our Sun is in the main stable period of a star's lifetime. The massive force of gravity draws its matter together. This force is balanced by the very high temperatures, from the fusion of hydrogen atoms, which tend to make the Sun expand. Describe and explain what will happen to the Sun as the hydrogen is eventually used up.

---

---

---

---

---

---

---

**(Total 3 marks)**

**6.**

(a) As part of its life cycle, a star changes from being a protostar to a main sequence star.

Explain the difference between a protostar and a main sequence star.

---

---

---

---

**(2)**

(b) The early Universe contained only atoms of hydrogen. The Universe now contains atoms of over one hundred different elements.

Explain how the different elements now contained in the Universe were formed.

---

---

---

---

---

---

---

**(3)**

**(Total 5 marks)**

7.

Stars are formed from massive clouds of dust and gases in space.

(a) What force pulls the clouds of dust and gas together to form stars?

\_\_\_\_\_

(1)

(b) Once formed a star can have a stable life for billions of years. Describe the **two** main forces at work in the star during this period of stability.

\_\_\_\_\_

\_\_\_\_\_

(2)

(c) What happens to this star once this stable period is over?

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

(4)

(d) Suggest what might then happen to a planet close to this star.

\_\_\_\_\_

\_\_\_\_\_

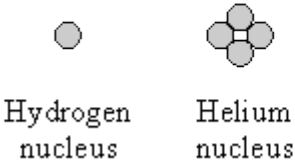
(1)

(Total 8 marks)

8.

At the very high temperatures in the sun, hydrogen is converted into helium. It takes four hydrogen nuclei to produce one helium nucleus.

The table shows the relative masses of hydrogen and helium nuclei.



Nucleus	Relative Mass
hydrogen	1.007825
helium	4.0037

- (a) Use these figures to calculate what happens to the mass of the sun as hydrogen is converted to helium.

---

---

---

---

**(3)**

- (b) Use your answer to part (a) to explain how the sun has been able to radiate huge amounts of energy for billions of years.

---

---

---

**(2)**

**(Total 5 marks)**

**9.**

Nuclear fusion in the Sun releases large amounts of energy.

- (i) Explain what is meant by nuclear fusion.

---

---

---

---

---

**(3)**

- (ii) Why is energy released by such nuclear fusion reactions?

---

---

---

---

**(2)**

**(Total 5 marks)**

**10.**

Studying stars gives scientists evidence about the evolution of the Universe.

(a) (i) In astronomy, what is meant by a black hole?

---

---

---

---

**(2)**

(ii) How is it possible to detect a black hole?

---

---

---

---

**(2)**

(b) The changes which happen in stars result in new elements being formed.

Nuclei of the heaviest elements are found in the Sun.

Describe how these nuclei are formed.

---

---

---

---

**(2)**

**(Total 6 marks)**

**11.**

(i) Explain how stars like the Sun were formed.

---

---

---

**(2)**



- (ii) The Sun is made mostly of hydrogen. Eventually the hydrogen will be used up and the Sun will “die”.

Describe what will happen to the Sun from the time the hydrogen is used up until the Sun “dies”.

---

---

---

---

---

(3)

(Total 5 marks)

12.

Every star goes through a ‘life cycle’.

- (a) Describe how a star forms.

---

---

---

---

---

(2)

- (b) During a long period of its life, a star remains in a stable state.

Explain why a star remains stable.

---

---

---

---

---

(2)

(c) Some stars are much more massive than the Sun.

Describe what will happen to a star, originally much more massive than the Sun, after it reaches its red giant stage.

---

---

---

---

---

(2)

(Total 6 marks)

**13.**

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

(a) (i) Explain what is meant by the 'Big Bang' theory.

---

---

---

---

(2)

(ii) The light arriving from distant galaxies provides scientists with evidence to support the 'Big Bang' theory.

Explain how.

---

---

---

---

(2)

- (b) At a meeting held in 2005, a group of scientists claimed that new data had been collected that showed the 'Big Bang' theory to be wrong. Other scientists said that there was no reason to doubt the 'Big Bang' theory.

What should scientists do when a theory does **not** appear to be supported by new data?

---

---

---

---

(2)

- (c) Scientists can answer many questions about the Universe, but not the question:

*Why was the Universe created?*

Suggest a reason why this question **cannot** be answered by scientists.

---

---

(1)

(Total 7 marks)