AQA GCSE Physics | 8463

SPECIFICATION POINT 4.8.1.2

The life cycle of a star

Past-paper questions

Tier	**Higher**
Question groups	**25**
Available paper years	**2003–2025**

Using this booklet

1. Answer the questions in order and show your working.
2. Original question numbers and marks are retained.
3. Print at actual size (100%) for measuring questions.
4. Use the companion answer booklet to check your work.

Name: _____ **Date:** _____

Whole questions are retained for context, so some parts assess other specification points. Current and legacy sources are labelled. Continue on extra paper if needed.

4.8.1.2 The life cycle of a star

Question 01

June 2003 | 3451H | Original Q1 | Legacy

1 (a) Some scientists are involved in the search for *extra-terrestrial* intelligence (SETI).

(i) What does *extra-terrestrial* mean?

.....

(1 mark)

(ii) What equipment is used to carry out this search?

.....

(1 mark)

(b) In 1967, radio pulses, one every 1.337 seconds, were discovered coming from a point in space. Some scientists thought the pulses were being produced by intelligent life elsewhere in the *Universe*. Later, it was discovered that the pulses were emitted by a *neutron star*.

(i) Complete this sentence.

The *Universe* is made up of at least a billion .....

(1 mark)

(ii) Suggest **one** reason why scientists might have thought that the pulses were produced by intelligent life.

.....

.....

(1 mark)

(iii) What is the link between a *neutron star* and a *super nova*?

.....

.....

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(2 marks)

4.8.1.2 The life cycle of a star

Question 01 · continued

MARGIN BLANK

(c) In 2001, equipment was carried by balloons to a height of 41 km above the Earth's surface. The equipment detected the presence of bacteria.

(i) The natural movement of air in the Earth's atmosphere may have carried the bacteria up **or** the bacteria may have come from outer space.

Suggest **one** other explanation.

.....

.....

(1 mark)

(ii) Suggest **one** way in which bacteria may have travelled through space to reach the edge of our atmosphere.

.....

.....

(1 mark)

8

4.8.1.2 The life cycle of a star

Question 02

June 2003 | 3462H3 | Original Q1 | Legacy

1 (a) Some scientists are involved in the search for *extra-terrestrial* intelligence (SETI).

(i) What does *extra-terrestrial* mean?

.....

(1 mark)

(ii) What equipment is used to carry out this search?

.....

(1 mark)

(b) In 1967, radio pulses, one every 1.337 seconds, were discovered coming from a point in space. Some scientists thought the pulses were being produced by intelligent life elsewhere in the *Universe*. Later, it was discovered that the pulses were emitted by a *neutron star*.

(i) Complete this sentence.

The *Universe* is made up of at least a billion .....

(1 mark)

(ii) Suggest **one** reason why scientists might have thought that the pulses were produced by intelligent life.

.....

.....

(1 mark)

(iii) What is the link between a *neutron star* and a *super nova*?

.....

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.....

(2 marks)

4.8.1.2 The life cycle of a star

Question 02 · continued

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(c) In 2001, equipment was carried by balloons to a height of 41 km above the Earth's surface. The equipment detected the presence of bacteria.

(i) The natural movement of air in the Earth's atmosphere may have carried the bacteria up **or** the bacteria may have come from outer space.

Suggest **one** other explanation.

.....

.....

(1 mark)

(ii) Suggest **one** way in which bacteria may have travelled through space to reach the edge of our atmosphere.

.....

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(1 mark)

8

4.8.1.2 The life cycle of a star

Question 03

June 2003 | 3462H3 | Original Q4 | Legacy

4 (a) The table gives information about some planets.

Name of planet	Gravitational field strength in N/kg	Diameter of planet in thousands of km	Time for 1 orbit around the sun in years
Mercury	4	4.9	0.2
Venus	9	12.0	0.6
Earth	10	12.8	1.0
Jupiter	26	143.0	12.0

(i) Write down the equation that links gravitational field strength, mass and weight.

.....

(1 mark)

(ii) An astronaut has a mass of 75 kg. Calculate the weight of the astronaut on Venus. Show clearly how you work out your answer.

.....

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Weight of astronaut = ...newtons

(2 marks)

(iii) Why would the astronaut weigh more on the Earth than on Venus?

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(1 mark)

(iv) The radius of the orbit of Jupiter is greater than the radius of the orbit of Mercury, Venus or the Earth. What evidence is given in the table to show this?

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(1 mark)

4.8.1.2 The life cycle of a star

Question 03 · continued

MARGIN BLANK

(b) *To gain full marks in this question you should write your ideas in good English. Put them into a sensible order and use the correct scientific words.*

Explain briefly how stars like the Sun are thought to have been formed.

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(2 marks)

7

4.8.1.2 The life cycle of a star

Question 04

June 2004 | 3451H | Original Q12 | Legacy

12 (a) Explain how stars produce energy.

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(2 marks)

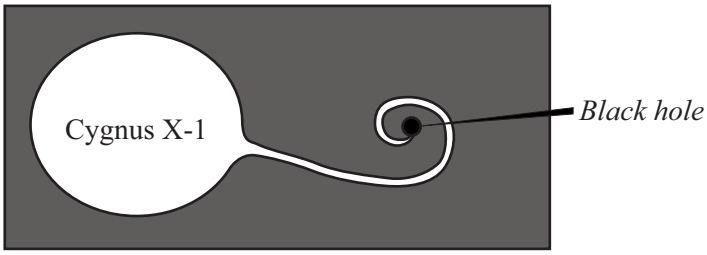
(b) What evidence is there to suggest that the Sun was formed from the material produced when an earlier star exploded?

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(1 mark)

(c) It is thought that gases from the massive star Cygnus X-1 are spiralling into a black hole.



(i) Explain what is meant by the term *black hole*.

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(2 marks)

(ii) What is produced as the gases from a star spiral into a black hole?

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(1 mark)

4.8.1.2 The life cycle of a star

Question 04 · continued

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(d) The light spectrum from a distant galaxy shows a red shift.

What is meant by *red shift* and what does it tell us about distant galaxies?

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(2 marks)

(e) What name is given to the theory that the Universe started with a massive explosion?

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(1 mark)

9

4.8.1.2 The life cycle of a star

Question 05

June 2004 | 3462H3 | Original Q10 | Legacy

10 (a) Explain how stars produce energy.

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(2 marks)

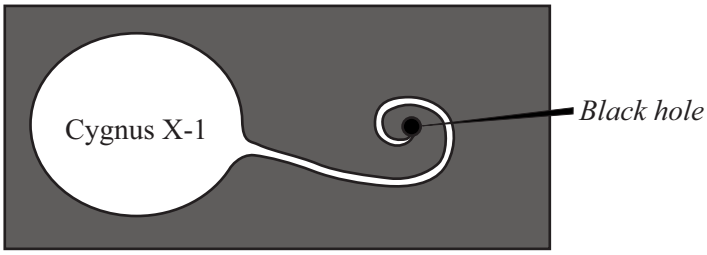
(b) What evidence is there to suggest that the Sun was formed from the material produced when an earlier star exploded?

.....

.....

(1 mark)

(c) It is thought that gases from the massive star Cygnus X-1 are spiralling into a black hole.



(i) Explain what is meant by the term *black hole*.

.....

.....

(2 marks)

(ii) What is produced as the gases from a star spiral into a black hole?

.....

(1 mark)

4.8.1.2 The life cycle of a star

Question 05 · continued

1 /

MARGIN BLANK

(d) The light spectrum from a distant galaxy shows a red shift.

What is meant by *red shift* and what does it tell us about distant galaxies?

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(2 marks)

(e) What name is given to the theory that the Universe started with a massive explosion?

.....

(1 mark)

9

4.8.1.2 The life cycle of a star

Question 06

June 2005 | 3451 | Original Q8 | Legacy

8 Stars do not stay the same forever.

(a) Over billions of years the amount of hydrogen in a star decreases. Why?

.....

.....

(1 mark)

(b) Describe how a massive star (at least five times bigger than the Sun) will change at the end of the main stable period.

To gain full marks in this question you should write your ideas in good English. Put them into a sensible order and use the correct scientific words.

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(4 marks)

(c) The inner planets of the solar system contain atoms of the heaviest elements.

(i) Where did these atoms come from?

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.....

(1 mark)

(ii) What does this tell us about the age of the solar system compared with many of the stars in the Universe?

.....

(1 mark)

7

4.8.1.2 The life cycle of a star

Question 07

June 2005 | 3462 | Original Q6 | Legacy

6 Stars do not stay the same forever.

(a) Over billions of years the amount of hydrogen in a star decreases. Why?

.....

.....

(1 mark)

(b) Describe how a massive star (at least five times bigger than the Sun) will change at the end of the main stable period.

To gain full marks in this question you should write your ideas in good English. Put them into a sensible order and use the correct scientific words.

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(4 marks)

(c) The inner planets of the solar system contain atoms of the heaviest elements.

(i) Where did these atoms come from?

.....

.....

(1 mark)

(ii) What does this tell us about the age of the solar system compared with many of the stars in the Universe?

.....

(1 mark)

7

4.8.1.2 The life cycle of a star

Question 08

January 2008 | PHY3H | Original Q8 | Legacy

8 Read the passage.

> In the Solar System, the inner planets, such as the Earth, contain elements which are heavier than the elements hydrogen and helium.
>
> Our star, the Sun, is a medium sized star.
>
> If a star is much more massive than the Sun it will eventually swell into a red giant, start to contract, continue to contract and finally explode.

(a) What is the explosion called?

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(1 mark)

(b) Explain why scientists believe that the Solar System was formed from the material produced when earlier stars exploded.

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(3 marks)

4

4.8.1.2 The life cycle of a star

Question 09

November 2008 | PHY1BP | Original Q6 | Legacy

QUESTION SIX

The tables show the types of radiation observed by different telescopes, and the types of radiation emitted by different parts of the universe.

Name of telescope	Type of radiation
Arecibo	Radio
COBE	Microwave
Hess	Gamma
Hopkins	Ultraviolet
Keck	Visible light
Spitzer	Infra red
XMM Newton	X-rays

Origin of radiation in universe	Main radiation emitted
Pulsars	Radio
Neutron stars	X-rays
Nebulae	Infra red
Stars	Visible light
Gamma ray bursts	Gamma
Big bang	Microwaves

6A Which telescope could be used to hunt for neutron stars in galaxies?

1 Arecibo

2 Spitzer

3 Hopkins

4 XMM Newton

6B Which telescope could be used to analyse the radiation of the universe left over from the 'big bang'?

1 COBE

2 Spitzer

3 Keck

4 Hopkins

4.8.1.2 The life cycle of a star

Question 09 · continued

6C Which one of the following emits the longest wavelength radiation?

1 Gamma ray bursts

2 Neutron stars

3 Pulsars

4 Stars

6D Which one of the following emits radiation with the highest frequency?

1 Nebulae

2 Neutron stars

3 Pulsars

4 Stars

Turn over for the next question

4.8.1.2 The life cycle of a star

Question 10

January 2009 | PHY3H | Original Q7 | Legacy

7 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 the Universe contains atoms of over one hundred elements.

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

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(2 marks)

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

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(2 marks)

7 (c) Explain how, and when, atoms of different elements may be distributed throughout the Universe.

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(2 marks)

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4.8.1.2 The life cycle of a star

Question 11

June 2009 | PHY1BP | Original Q7 | Legacy

QUESTION SEVEN

Some types of electromagnetic radiation from space are absorbed by the Earth's atmosphere.

	Short wavelength radio	Short wavelength microwaves	Infra red	Visible light	Ultraviolet	X-rays	Gamma rays
Percentage absorbed by atmosphere	0	95	96	5	98	100	100

Different objects or events in the universe emit different types of electromagnetic radiation.

	Gamma ray bursts	Nebulae	Pulsars	Stars	Universe background radiation
Radiation emitted	gamma rays	infra red	radio	all types	short wavelength microwaves

The planets and moons of the solar system reflect light from the Sun.

7A Early civilisations observed the sky with the naked eye.

Which objects did they see?

1 moons, nebulae and pulsars

2 gamma ray bursts, moons and planets

3 nebulae and pulsars

4 moons, planets and stars

7B Telescopes that could detect electromagnetic waves of the lowest frequency were built in the 20th century. These telescopes are on the surface of the Earth.

From the information in the tables, which of the following, which could not have been observed before, could then be easily observed from the Earth's surface?

1 pulsars

2 gamma ray bursts

3 nebulae

4 stars

4.8.1.2 The life cycle of a star

Question 11 · continued June 2009 | PHY1BP | Original Q7 | Legacy

7C In 1989, the background radiation from the universe was mapped from a telescope in space.

Why was this **not** done with telescopes based on Earth?

1 Because only 2% of ultraviolet radiation penetrates Earth's atmosphere.

2 Because only 4% of infra red radiation penetrates Earth's atmosphere.

3 Because only 5% of short wavelength microwave radiation penetrates Earth's atmosphere.

4 Because only 95% of visible radiation penetrates Earth's atmosphere.

7D The first table suggests that, with the exception of . . .

1 radio, the percentage of radiation absorbed by the atmosphere, increases with increasing wavelength.

2 radio, the percentage of radiation absorbed by the atmosphere, decreases with increasing wavelength.

3 visible light, the percentage of radiation absorbed by the atmosphere, increases with increasing wavelength.

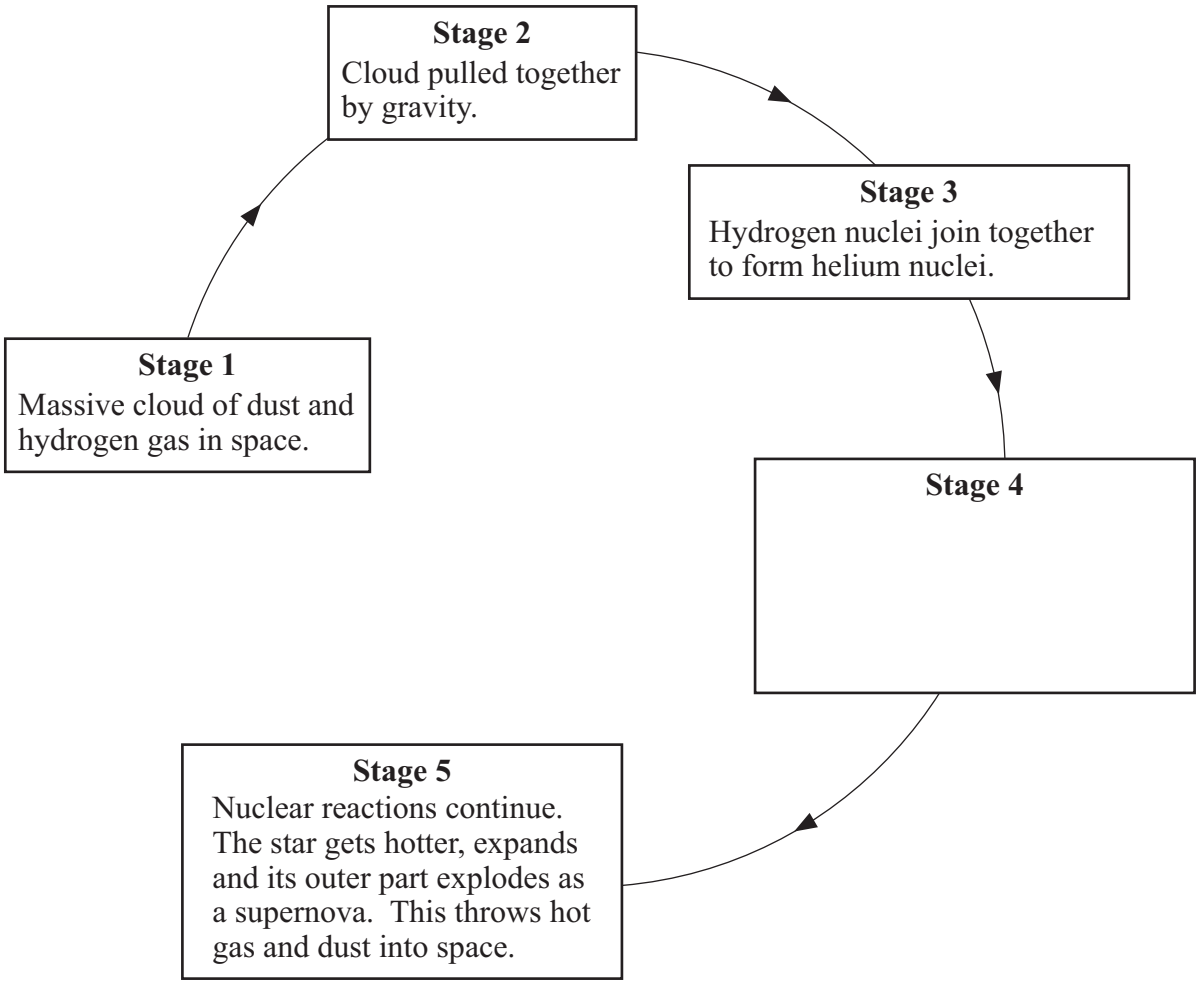
4 visible light, the percentage of radiation absorbed by the atmosphere, decreases with increasing wavelength.

4.8.1.2 The life cycle of a star

Question 12

June 2009 | PHY3H | Original Q4 | Legacy

4 The diagram shows part of the life cycle of a star which is much bigger than the Sun.



4.8.1.2 The life cycle of a star

Question 12 · continued

for mark

4 (a) (i) What is the relationship between the masses of the dust and gas in the cloud in **Stage 2** and the force of gravity between them?

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.....

(1 mark)

4 (a) (ii) What is the relationship between the distance apart of the dust and gas in the cloud in **Stage 2** and the force of gravity between them?

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(1 mark)

4 (b) In **Stage 3** the star remains stable for millions of years.

Explain why.

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(2 marks)

4 (c) What happens in **Stage 4**?

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(2 marks)

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4.8.1.2 The life cycle of a star

Question 13

January 2010 | PHY3H | Original Q7 | Legacy

7 (a) Our star, the Sun, is stable.

Explain what the conditions need to be for a star to remain stable.

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(2 marks)

7 (b) Shortly after the 'big bang', hydrogen was the only element in the Universe.

Explain how the other elements came to be formed.

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(3 marks)

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4.8.1.2 The life cycle of a star

Question 14

June 2010 | PHY3H | Original Q8 | Legacy

8 Every star goes through a 'life cycle'.

8 (a) Describe how a star forms.

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(2 marks)

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

Explain why a star remains stable.

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(2 marks)

8 (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.

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(2 marks)

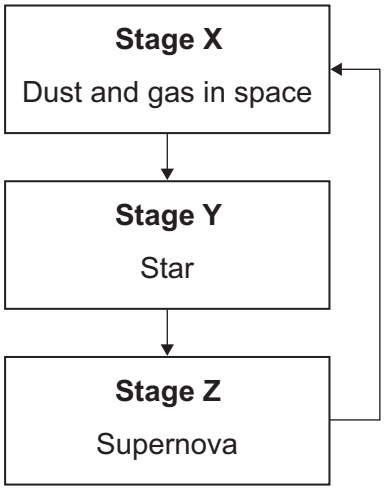
6

4.8.1.2 The life cycle of a star

Question 15

January 2011 | PHY3H | Original Q8 | Legacy

8 The flowchart shows a simple version of the life cycle of a star that is much more massive than the Sun.



8 (a) What causes the change from **Stage X** to **Stage Y**?

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(1 mark)

8 (b) For most of its time in **Stage Y**, the star is stable.

Explain why the star remains stable.

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(2 marks)

8 (c) (i) Explain how a star is able to produce energy in **Stage Y**.

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(2 marks)

4.8.1.2 The life cycle of a star

Question 15 · continued

8 (c) (ii) Why is a star in **Stage Y** able to give out energy for millions of years?

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(1 mark)

8 (d) What happens to the elements produced in a supernova?

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.....

(1 mark)

7

4.8.1.2 The life cycle of a star

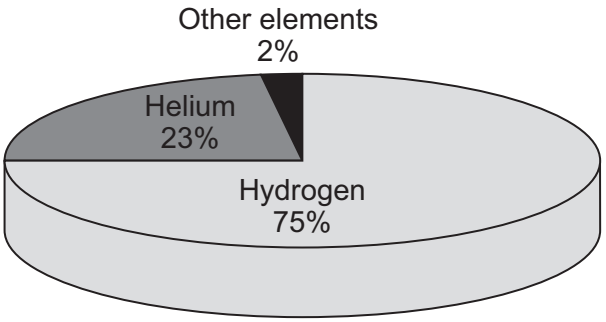
Question 16

June 2011 | PHY3H | Original Q6 | Legacy

6 This passage is from a web page.

Our nearest star, the Sun

The pie chart shows the proportions of chemical elements in the Sun.



Most of the Sun's helium has been produced from the Sun's hydrogen by the process of nuclear fusion. This process also produces vast quantities of energy. The process takes place in the core of the Sun at a temperature of about 15 million °C and has been going on for about 4.5 billion years. During this period of time, the Sun has remained stable and scientists think that it will remain stable for several billion years into the future.

6 (a) Explain why the Sun remains stable.

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(3 marks)

6 (b) A scientific opinion is expressed on this web page.

Identify this opinion and suggest how scientists could justify it.

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(2 marks)

5

4.8.1.2 The life cycle of a star

Question 17

June 2012 | PH2HP | Original Q6 | Legacy

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.

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(2 marks)

6 (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.

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(3 marks)

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4.8.1.2 The life cycle of a star

Question 18

January 2013 | PH2HP | Original Q3 | Legacy

3 Stars go through a life cycle. About 90% of all stars are in the 'main sequence' period of the life cycle.

3 (a) Stars are stable during the 'main sequence' period of the life cycle.

Why?

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.....

(1 mark)

3 (b) The table gives an estimated time for the number of years that three stars, **X**, **Y** and **Z**, will be in the 'main sequence' period of their life cycle.

Star	Relative mass of the star compared to the Sun	Estimated 'main sequence' period in millions of years
X	0.1	4 000 000
Y	1.0	9 000
Z	40.0	200

3 (b) (i) This data suggests that there is a pattern linking the mass of a star and the number of years the star is in the 'main sequence' period of its life cycle.

What is the pattern suggested by the data?

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.....

(1 mark)

3 (b) (ii) Scientists cannot give the exact number of years a star will be in the 'main sequence' period.

Suggest why.

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(1 mark)

Question 3 continues on the next page

4.8.1.2 The life cycle of a star

Question 18 · continued

3 (b) (iii) Nuclear fusion is the process by which energy is released in stars.

Which **one** of the following can be concluded from the data in the table?

Draw a ring around the correct answer in the box to complete the sentence.

The rate of nuclear fusion in a large star is

faster than
the same as
slower than

in a small star.

Explain the reason for your answer.

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(3 marks)

4.8.1.2 The life cycle of a star

Question 18 · continued

3 (c) *In this question you will be assessed on using good English, organising information clearly and using specialist terms where appropriate.*

Describe what happens to a star **much bigger** than the Sun, once the star reaches the end of the 'main sequence' period of its life cycle.

Your answer should include the names of the stages the star passes through.

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(6 marks)

12

4.8.1.2 The life cycle of a star

Question 19

June 2014 | PH2HP | Original Q2 | Legacy

2 Stars go through a life cycle.

Some stars will finish their life cycle as a black dwarf and other stars as a black hole.

2 (a) **Table 1** gives the mass, relative to the Sun, of three stars, **J**, **K** and **L**.

Table 1

Star	Mass of the star relative to the Sun
J	0.5
K	14.5
L	20.0

Which **one** of the stars, **J**, **K** or **L**, will become a black dwarf? .....

[2 marks]

Give a reason for your answer.

.....

.....

2 (b) Scientists can take the measurements needed to calculate the mass of many stars.

Scientists cannot calculate the mass of the star Betelgeuse.

They estimate that the star has a mass between 8 and 20 times the mass of the Sun.

2 (b) (i) Betelgeuse is in the red super giant stage of its life cycle.

What will happen to Betelgeuse at the end of the red super giant stage?

[1 mark]

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4.8.1.2 The life cycle of a star

Question 19 · continued

2 (b) (ii) Suggest **one** reason why scientists can only estimate and **not** calculate the mass of Betelgeuse.

[1 mark]

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2 (b) (iii) In the future, it may become possible for scientists to calculate the mass of Betelgeuse.

Suggest **one** reason why.

[1 mark]

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2 (c) Describe what happens to a star, after the main sequence period, for the star to eventually become a **black dwarf**.

[5 marks]

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4.8.1.2 The life cycle of a star

Question 20

June 2016 | PH2HP | Original Q6 | Legacy

6 (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.

6 (a) (i) Describe how a star is formed.

[2 marks]

6 (a) (ii) Describe the process of nuclear fusion.

[1 mark]

6 (a) (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 mark]

4.8.1.2 The life cycle of a star

Question 20 · continued

6 (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.

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

[1 mark]

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_____

6 (b) (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 mark]

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6 (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 mark]

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7

4.8.1.2 The life cycle of a star

Question 21

June 2017 | PH2HP | Original Q3 | Legacy

3 The lifecycle of some stars includes a supernova stage.

3 (a) (i) What happens to a star during the supernova stage?

[1 mark]

_____

3 (a) (ii) Complete the following sentence.

[1 mark]

After the supernova stage either a black hole or a _____ star will be formed.

3 (a) (iii) The lifecycle of the Sun will **not** include a supernova stage.

Give the reason why.

[1 mark]

_____

_____

3 (b) **In this question you will be assessed on using good English, organising information clearly and using specialist terms where appropriate.**

Describe what happens to a star like the Sun as it passes through its lifecycle.

Your answer should include how the star was formed and the names of the stages the star passes through.

[6 marks]

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4.8.1.2 The life cycle of a star

Question 21 · continued

Extra space

3 (c) There are a number of theories about how the Universe will end.
A recent theory suggests that 22 billion years from now the Universe will rip itself apart.

Suggest why scientists may support one particular theory and reject others.

[2 marks]

11

4.8.1.2 The life cycle of a star

Question 22

November 2020 | 8463/2H | Original Q2

0 2 . 1 Complete the sentences.

[2 marks]

The Sun is a stable star. This is because the forces pulling inwards caused by _____ are in equilibrium with the forces pushing outwards caused by the energy released by nuclear _____.

0 2 . 2 Write down the equation that links distance travelled (s), speed (v) and time (t).

[1 mark]

_____

0 2 . 3 The mean distance between the Sun and the Earth is 1.5×10^{11} m.

Light travels at a speed of 3.0×10^{8} m/s.

Calculate the time taken for light from the Sun to reach the Earth.

[3 marks]

_____

_____

_____

_____

_____

Time = _____ s

4.8.1.2 The life cycle of a star

Question 22 · continued

0 2 . 4 Some stars are much more massive than the Sun.

Describe the life cycle of stars much more massive than the Sun, including the formation of new elements.

[6 marks]

Question 2 continues on the next page

4.8.1.2 The life cycle of a star

Question 22 · continued

0 2 . 5 Stars emit radiation with a range of wavelengths.

Which property of a star does the range of wavelengths depend on?

[1 mark]

Tick (✓) **one** box.

Density ☐

Mass ☐

Temperature ☐

Volume ☐

13

4.8.1.2 The life cycle of a star

Question 23

November 2021 | 8463/2H | Original Q3

0 3 A main sequence star in a distant galaxy is the same size and mass as the Sun.

0 3 . 1 Explain why the star is stable while it is in the main sequence stage of its life cycle.

[2 marks]

0 3 . 2 Describe what will happen to the star between the main sequence stage and the end of the star's life cycle.

You should include the names of the stages in the life cycle of the star.

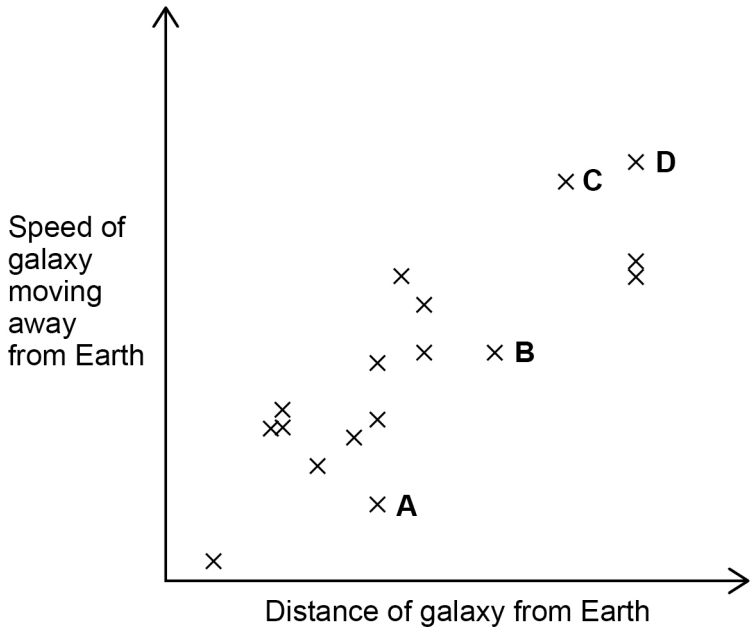
[3 marks]

4.8.1.2 The life cycle of a star

Question 23 · continued

0 3 . 3 **Figure 5** shows how the speed of galaxies moving away from Earth varies with the distance of the galaxies from Earth.

Figure 5



Which galaxy would show the smallest observed change in the wavelength of visible light?

Give a reason for your answer.

[2 marks]

Tick (✓) **one** box.

A ☐ **B** ☐ **C** ☐ **D** ☐

Reason _____

_____

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4.8.1.2 The life cycle of a star

Question 24

0 3 The Universe contains many stars.

0 3 . 1 The Sun is the star at the centre of our solar system.

Give **three** other types of object that form our solar system.

[3 marks]

1 _____

2 _____

3 _____

Some main sequence stars will eventually form black holes.

Table 3 gives the mass of four stars.

Table 3

Star	Mass in kg
Arcturus	2.2×10^{30}
Betelgeuse	2.2×10^{31}
Cygni A	1.4×10^{30}
The Sun	2.0×10^{30}

0 3 . 2 Which star in **Table 3** is most likely to form a black hole?

[1 mark]

_____

4.8.1.2 The life cycle of a star

Question 24 · continued

0 3 . 3 The distance from Cygni A to the Earth is 1.1×10^8 gigametres.

Which distance is the same as 1.1×10^8 gigametres?

[1 mark]

Tick (✓) **one** box.

1.1×10^{11} m ☐

1.1×10^{14} m ☐

1.1×10^{17} m ☐

1.1×10^{20} m ☐

Question 3 continues on the next page

4.8.1.2 The life cycle of a star

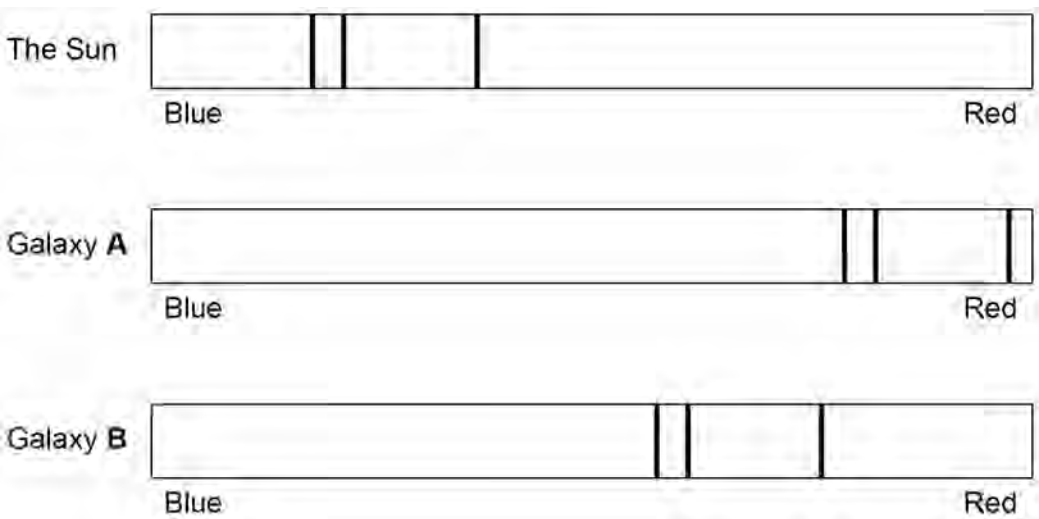
Question 24 · continued

0 3 . 4 The light spectrum from every galaxy includes dark lines.

The lines have the same pattern.

Figure 7 shows the position of dark lines in the visible spectra of light from the Sun and from two distant galaxies.

Figure 7



Explain what these light spectra tell us about the velocities of galaxy **A** and galaxy **B**.

[3 marks]

4.8.1.2 The life cycle of a star

Question 24 · continued

0 3 . 5 The distance between Arcturus and the Earth is 3.6×10^{14} km.

speed of light = 3.0×10^{8} m/s

Calculate the time taken for light from Arcturus to reach the Earth.

Use the Physics Equations Sheet.

[4 marks]

Time taken = _____ s

0 3 . 6 When stars are formed, they contain mostly hydrogen.

Describe how stars produce all other naturally occurring elements.

[4 marks]

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4.8.1.2 The life cycle of a star

Question 25

June 2025 | 8463/1H | Original Q5

0 5 Scientists have used lasers to start a nuclear **fusion** reaction.

The scientists used the lasers to heat a small amount of an isotope of hydrogen.

0 5 . 1 Describe what is meant by 'isotopes' of an element.

[2 marks]

0 5 . 2 Explain how nuclear **fusion** releases energy.

[3 marks]

4.8.1.2 The life cycle of a star

Question 25 · continued

0 5 . 3 The fusion reaction releases large amounts of energy.

The fusion reaction takes place in a reactor.

Explain why the walls of the reactor should be made from a material with a very high specific heat capacity.

[2 marks]

0 5 . 4 Nuclear fusion is safer than nuclear fission.

Nuclear **fission** can lead to an uncontrolled chain reaction.

Give **one** consequence of an uncontrolled chain reaction.

[1 mark]

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