AQA GCSE Physics | 8463

SPECIFICATION POINT 4.8.1.2

The life cycle of a star

Past-paper questions

Tier	**Foundation**
Question groups	**21**
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 | 3451F | Original Q12 | Legacy

12 (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*?

.....

.....

.....

(2 marks)

4.8.1.2 The life cycle of a star

Question 01 · continued

MARGIN
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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.

.....

.....

(1 mark)

8

4.8.1.2 The life cycle of a star

Question 02

June 2003 | 3462F3 | Original Q10 | Legacy

10 (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*?

.....

.....

.....

(2 marks)

4.8.1.2 The life cycle of a star

Question 02 · 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 03

June 2004 | 3451F | Original Q1 | Legacy

1 (a) Complete the sentences by choosing the correct word or phrase from the box.

Each word or phrase may be used once or not at all.

circular	**comet**	**elliptical**	**Milky Way**
Moon	**solar system**	**Universe**	

A planet and a ..... both move in ..... orbits around the Sun.

The Sun is part of the ..... galaxy.

The ..... contains at least a billion galaxies. *(4 marks)*

(b) The following sentences describe the stages that a star such as the Sun goes through during its life.

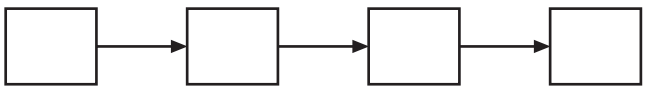
A The star is stable.

B The star contracts to a white dwarf.

C The star expands into a red giant.

D The star is formed when the force of gravity pulls dust and gases together.

(i) Arrange the sentences in the order in which the stages happen.



(3 marks)

(ii) The Sun is at which stage in its life, **A**, **B**, **C** or **D**?

.....

(1 mark)

8

4.8.1.2 The life cycle of a star

Question 04

June 2004 | 3462F3 | Original Q1 | Legacy

1 (a) Complete the sentences by choosing the correct word or phrase from the box.

Each word or phrase may be used once or not at all.

circular	**comet**	**elliptical**	**Milky Way**
Moon	**solar system**	**Universe**	

A planet and a ..... both move in ..... orbits around the Sun.

The Sun is part of the ..... galaxy.

The ..... contains at least a billion galaxies. *(4 marks)*

(b) The following sentences describe the stages that a star such as the Sun goes through during its life.

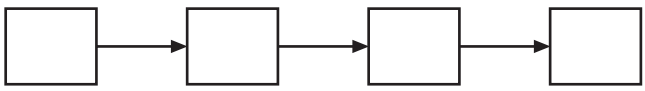
A The star is stable.

B The star contracts to a white dwarf.

C The star expands into a red giant.

D The star is formed when the force of gravity pulls dust and gases together.

(i) Arrange the sentences in the order in which the stages happen.



(3 marks)

(ii) The Sun is at which stage in its life, **A**, **B**, **C** or **D**?

.....

(1 mark)

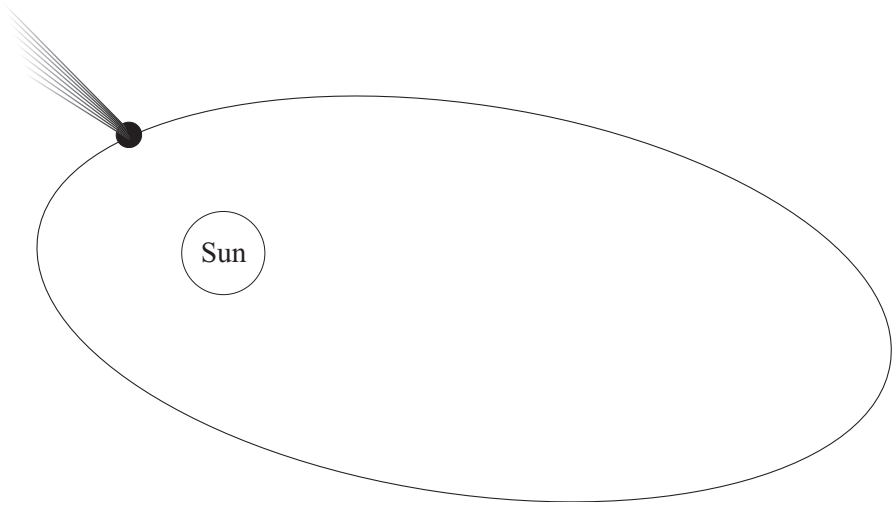
8

4.8.1.2 The life cycle of a star

Question 05

June 2005 | 3451 | Original Q2 | Legacy

2 (a) The diagram shows an object in orbit around the Sun.



Which **one** of the following is the object most likely to be?

Draw a ring around your answer.

comet **moon** **planet** **star**

(1 mark)

(b) The Sun is part of the Milky Way galaxy.
What is a galaxy?

.....

(1 mark)

(c) Complete the following sentence by choosing the correct words from the box.
Each word may be used once or not at all.

dwarf	**giant**	**neutron**	**proton**	**supernova**

If a red ..... star is large enough, it may eventually blow up in an explosion called a ....., leaving behind a very dense ..... star.

(3 marks)

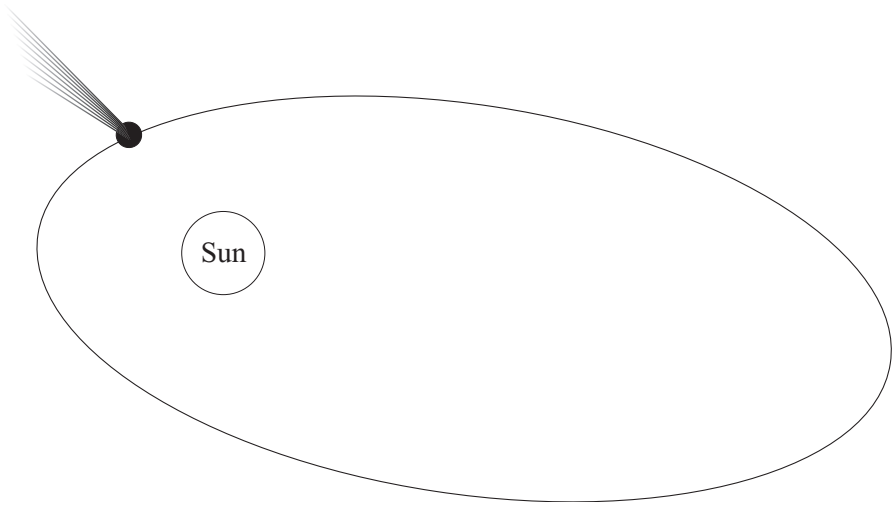
5

4.8.1.2 The life cycle of a star

Question 06

June 2005 | 3462 | Original Q2 | Legacy

2 (a) The diagram shows an object in orbit around the Sun.



Which **one** of the following is the object most likely to be?

Draw a ring around your answer.

comet **moon** **planet** **star**

(1 mark)

(b) The Sun is part of the Milky Way galaxy.
What is a galaxy?

.....

(1 mark)

(c) Complete the following sentence by choosing the correct words from the box.
Each word may be used once or not at all.

dwarf	**giant**	**neutron**	**proton**	**supernova**

If a red ..... star is large enough, it may eventually blow up in an explosion called a ....., leaving behind a very dense ..... star.

(3 marks)

5

4.8.1.2 The life cycle of a star

Question 07

June 2006 | 3451 | Original Q3 | Legacy

3 (a) Read the following statements.

J – It is made up of at least a billion galaxies.

K – It is one of the stars in the Milky Way.

L – It is a slightly squashed circle.

M – It keeps the Moon in orbit around the Earth.

N – It is a large number of stars grouped together.

O – It is the explosion of a massive star.

Which statement, **J**, **K**, **L**, **M**, **N** or **O**, describes:

(i) the force of gravity; Letter .....
(1 mark)

(ii) the Sun; Letter .....
(1 mark)

(iii) the Universe; Letter .....
(1 mark)

(iv) a supernova? Letter .....
(1 mark)

4.8.1.2 The life cycle of a star

Question 07 · continued

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(b) The Sun is in the main stable stage of its lifecycle.

(i) How long will the Sun be in this stage of its lifecycle? Put a tick (✓) in the box next to your choice.

Hundreds of years ☐

Thousands of years ☐

Millions of years ☐

Billions of years ☐

(1 mark)

(ii) Describe what will happen to the Sun after it has reached the end of the main stable stage of its lifecycle. The answer has been started for you.

At the end of the stable stage of its lifecycle the Sun will expand

.....

.....

.....

.....

.....

.....

(3 marks)

8

4.8.1.2 The life cycle of a star

Question 08

June 2006 | 3462 | Original Q3 | Legacy

3 (a) Read the following statements.

J – It is made up of at least a billion galaxies.

K – It is one of the stars in the Milky Way.

L – It is a slightly squashed circle.

M – It keeps the Moon in orbit around the Earth.

N – It is a large number of stars grouped together.

O – It is the explosion of a massive star.

Which statement, **J**, **K**, **L**, **M**, **N** or **O**, describes:

(i) the force of gravity; Letter .....
(1 mark)

(ii) the Sun; Letter .....
(1 mark)

(iii) the Universe; Letter .....
(1 mark)

(iv) a supernova? Letter .....
(1 mark)

4.8.1.2 The life cycle of a star

Question 08 · continued

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(b) The Sun is in the main stable stage of its lifecycle.

(i) How long will the Sun be in this stage of its lifecycle? Put a tick (✓) in the box next to your choice.

Hundreds of years ☐

Thousands of years ☐

Millions of years ☐

Billions of years ☐

(1 mark)

(ii) Describe what will happen to the Sun after it has reached the end of the main stable stage of its lifecycle. The answer has been started for you.

At the end of the stable stage of its lifecycle the Sun will expand

.....

.....

.....

.....

.....

.....

(3 marks)

8

4.8.1.2 The life cycle of a star

Question 09

June 2008 | PHY3F | Original Q4 | Legacy

4 (a) Complete the **two** spaces in the sentence.

Stars form when enough ..... and gas from ..... are pulled together by gravitational attraction. *(2 marks)*

4 (b) How are stars able to give out energy for millions of years?

Put a tick (✓) in the box next to the answer.

By atoms joining together ☐

By atoms splitting apart ☐

By burning gases ☐

(1 mark)

4 (c) There are many billions of stars in our galaxy. Our Sun is one of these stars. What is the name of our galaxy?

.....

(1 mark)

4 (d)

Why was the Universe created?

We cannot expect scientists to answer this question. What is the reason for this?

Put a tick (✓) in the box next to the reason.

It will take too long to collect the scientific evidence. ☐

The answer depends on beliefs and opinions, not scientific evidence. ☐

There is not enough scientific evidence. ☐

(1 mark)

5

4.8.1.2 The life cycle of a star

Question 10

5 (a) Choose the best words from the box to complete the following sentences.

billions	**fission**	**friction**	**fusion**	**gases**
gravity	**liquids**	**millions**	**thousands**	

5 (a) (i) Stars form when enough dust and ..... from space are pulled together by ..... .

(2 marks)

5 (a) (ii) Stars are able to give out energy for millions of years by the process of

..... .

(1 mark)

5 (a) (iii) The Sun is one of many ..... of stars in our galaxy.

(1 mark)

5 (b) What is the name of our galaxy?

.....

(1 mark)

5

4.8.1.2 The life cycle of a star

Question 11

January 2010 | PHY3F | Original Q5 | Legacy

5 (a) Complete the following sentences by drawing a ring around the correct word in each box.

5 (a) (i) Stars form when enough dust and gas from space is pulled together

by | centripetal / gravitational / magnetic | attraction.

(1 mark)

5 (a) (ii) Stars give out energy for millions of years by their nuclei | burning / joining / splitting | .

(1 mark)

5 (a) (iii) When gravitational forces balance radiation pressure, a star is | shrinking / stable / swelling | .

(1 mark)

5 (b) The Universe is made up of billions of galaxies.

5 (b) (i) What is a galaxy?

.....

.....

(1 mark)

5 (b) (ii) Name the galaxy which contains the Sun.

.....

(1 mark)

5

4.8.1.2 The life cycle of a star

Question 12

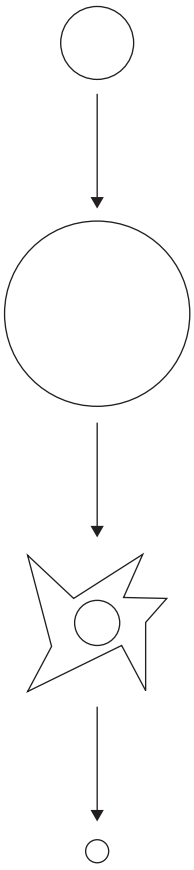
June 2011 | PHY3F | Original Q1 | Legacy

1 The diagram shows part of the lifecycle of a very large star.

Use words or phrases from the box to complete the sentences contained in the diagram.

black hole	**red supergiant**	**supernova**	**white dwarf**

(3 marks)



The star is stable.

The star expands forming

a ..... .

The star collapses, the outer layers explode

as a ..... .

The centre collapses further and further until

it finally forms a ..... .

3

4.8.1.2 The life cycle of a star

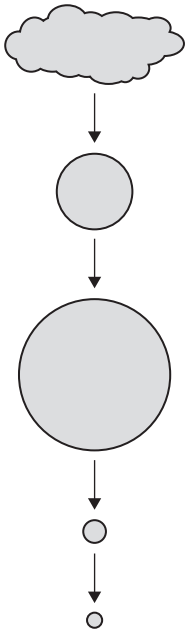
Question 13

June 2012 | PH2FP | Original Q1 | Legacy

1 (a) The diagram shows the lifecycle of a star.

1 (a) (i) Use words or phrases from the box to complete the sentences contained in the diagram.

black dwarf	**black hole**	**protostar**	**red giant**



Gas and dust are pulled together to form a

..... .

The star gives out energy as a main sequence star.

The star expands forming a ..... .

The star shrinks to form a white dwarf.

The star fades away as a ..... .

(3 marks)

4.8.1.2 The life cycle of a star

Question 13 · continued

1 (a) (ii) The table compares the approximate size of three stars with the size of the Sun.

Star	Size
Alpha Centauri A	the same as the Sun
Betelgeuse	1120 times bigger than the Sun
Cephei	1520 times bigger than the Sun

Which **one** of these three stars has the lifecycle shown in part **(a)(i)**?

.....

Give a reason for your answer.

.....

.....

(2 marks)

1 (b) Which **one** of the following describes the process by which energy is given out in stars?

Tick (✓) **one** box.

Atomic nuclei inside the star join together. ☐

Atomic nuclei inside the star split apart. ☐

Gases inside the star burn. ☐

(1 mark)

6

4.8.1.2 The life cycle of a star

Question 14

January 2013 | PH2FP | Original Q9 | Legacy

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

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

Why?

.....

.....

(1 mark)

9 (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

9 (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?

.....

.....

(1 mark)

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

Suggest why.

.....

.....

(1 mark)

4.8.1.2 The life cycle of a star

Question 14 · continued

9 (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.

.....

.....

.....

.....

(3 marks)

Question 9 continues on the next page

4.8.1.2 The life cycle of a star

Question 14 · continued

9 (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 15

June 2014 | PH2FP | Original Q1 | Legacy

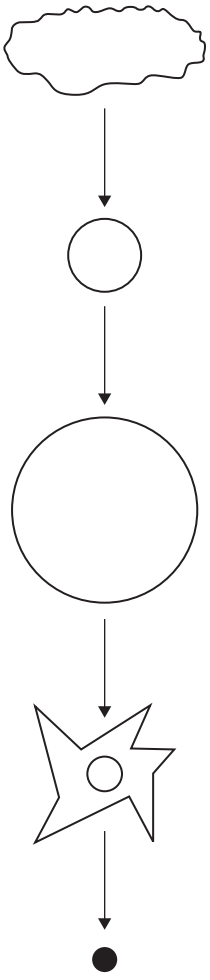
1 (a) **Figure 1** shows the life cycle of a very large star.

Use the correct answers from the box to complete the sentences in **Figure 1**.

[2 marks]

main sequence star	**neutron star**	**supernova**	**white dwarf**

Figure 1



Gas and dust join together to become a protostar.

The star is stable as a ..... .

The star expands to become a red super giant.

The outer layers of the star explode as a ..... .

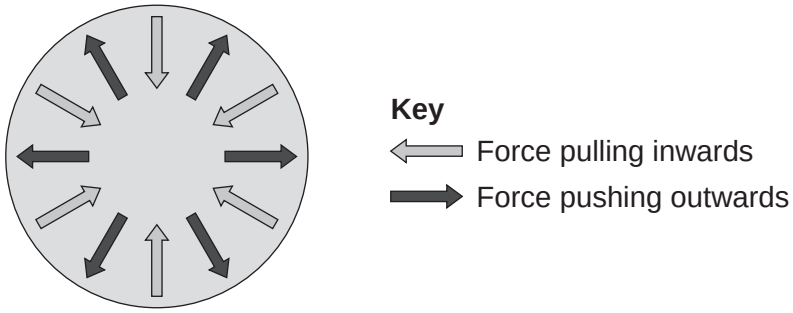
The core of the star shrinks and a black hole is formed.

4.8.1.2 The life cycle of a star

Question 15 · continued

1 (b) **Figure 2** shows the forces acting on a star when the star is stable.

Figure 2



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

[1 mark]

When a star is stable, the forces pushing outwards are

bigger than

smaller than

balanced by

the forces pulling inwards.

3

4.8.1.2 The life cycle of a star

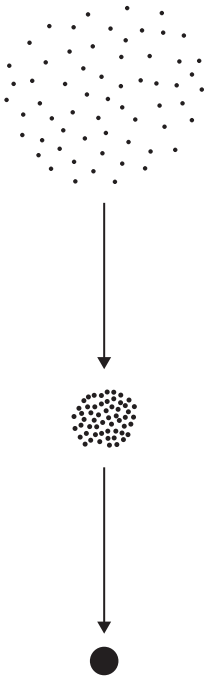
Question 16

1 (a) **Figure 1** shows how a star is formed.

Use **one** answer from each box to complete the sentences in **Figure 1**.

[3 marks]

Figure 1



gas	**rock**	**water**

A star starts as a huge cloud of dust and _____ particles in space.

friction	**fusion**	**gravity**

The force of _____ pulls the particles in the cloud closer together.

protostar	**red giant**	**white dwarf**

The compressed mass of particles

forms a _____ .

4.8.1.2 The life cycle of a star

Question 16 · continued

1 (b) Elements heavier than iron are formed in a supernova.
What is a supernova?

[1 mark]

Tick (✓) **one** box.

the explosion of a massive star ☐

a very bright, hot young star ☐

a very cool super giant star ☐

1 (c) Brown dwarf stars are small stars too cool to give out visible light. They were first discovered in 1995. Scientists think that there are millions of these stars spread throughout the Universe.

Which **one** of the following is the most likely reason why brown dwarf stars were not discovered before 1995?

[1 mark]

Tick (✓) **one** box.

Brown dwarf stars did not exist before 1995. ☐

Scientists were looking in the wrong part of the Universe. ☐

The telescopes and measuring instruments were not sensitive enough. ☐

5

4.8.1.2 The life cycle of a star

Question 17

June 2017 | PH2FP | Original Q8 | Legacy

8 The lifecycle of some stars includes a supernova stage.

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

[1 mark]

_____

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

[1 mark]

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

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

Give the reason why.

[1 mark]

_____

_____

8 (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]

_____

_____

_____

_____

_____

_____

_____

_____

_____

4.8.1.2 The life cycle of a star

Question 17 · continued

Extra space

8 (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 18

November 2020 | 8463/2F | Original Q9

0 9 . 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 9 . 2 Write down the equation that links distance travelled (s), speed (v) and time (t).

[1 mark]

_____

0 9 . 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

Question 9 continues on the next page

4.8.1.2 The life cycle of a star

Question 18 · continued

0 9 . 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]

4.8.1.2 The life cycle of a star

Question 18 · continued

November 2020 | 8463/2F | Original Q9

0 9 . 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 19

November 2021 | 8463/2F | Original Q6

0 6 The Sun is the closest star to the Earth.

0 6 . 1 A 2.5 kg mass would have a weight of 750 N at the surface of the Sun.

Calculate the gravitational field strength at the surface of the Sun.

Use the equation:

$$\text{gravitational field strength} = \frac{\text{weight}}{\text{mass}}$$

[2 marks]

Gravitational field strength = _____ N/kg

0 6 . 2 Gravity is a non-contact force.

Which of the following is also a non-contact force?

[1 mark]

Tick (✓) **one** box.

- Air resistance ☐
- Electrostatic ☐
- Friction ☐
- Tension ☐

4.8.1.2 The life cycle of a star

Question 19 · continued

0 6 . 3 All stars have a life cycle.

Figure 15 shows part of the life cycle of a star that becomes a black dwarf.

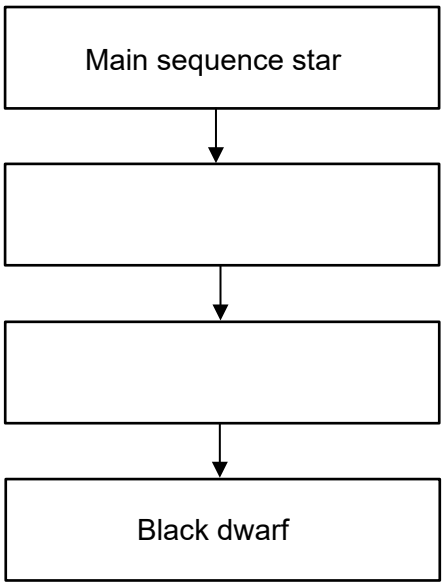
Complete **Figure 15**.

Choose answers from the box.

[2 marks]

Black hole		**Neutron star**
Red giant	**Supernova**	**White dwarf**

Figure 15



Question 6 continues on the next page

4.8.1.2 The life cycle of a star

Question 19 · continued

Table 3 gives the mass of three stars compared to the mass of the Sun.

Table 3

Star	Mass compared to the mass of the Sun
X	× 25.0
Y	× 15.0
Z	× 0.9

0 6 . 4 Which letter represents the star most likely to become a black dwarf?

Give a reason for your answer.

[2 marks]

Tick (✓) **one** box.

X ☐ **Y** ☐ **Z** ☐

Reason _____

_____

_____

0 6 . 5 In which stage of the life cycle of a star are elements heavier than iron produced?

[1 mark]

Tick (✓) **one** box.

Nebula ☐

Protostar ☐

Supernova ☐

8

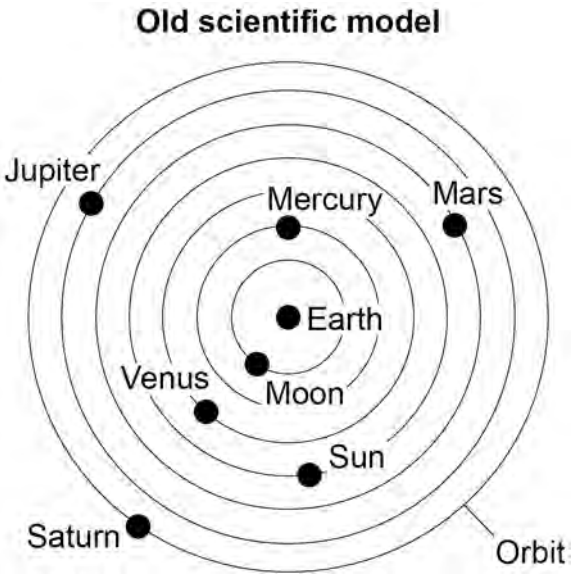
4.8.1.2 The life cycle of a star

Question 20

June 2023 | 8463/2F | Original Q4

0 4 **Figure 10** shows an old scientific model of the solar system that has now been replaced.

Figure 10



0 4 . 1 Which statement is a reason for replacing an old scientific model with a newer scientific model?

[1 mark]

Tick (✓) **one** box.

- The old model cannot explain new observations. ☐
- The old model has been used by scientists for a long time. ☐
- The old model is too simple. ☐

4.8.1.2 The life cycle of a star

Question 20 · continued

0 4 . 2 Compare the model of the solar system used now with the old model of the solar system shown in **Figure 10**.

[4 marks]

Question 4 continues on the next page

4.8.1.2 The life cycle of a star

Question 20 · continued

Table 1 shows data about four planets.

Table 1

Planet	Mean distance from the Sun in millions of kilometres	Time taken for one orbit in Earth years
Mercury	58	0.25
Venus	108	0.60
Earth	150	1.00
Mars	228	1.90

0 4 . 3 How does the time taken for one orbit change as the mean distance from the Sun increases?

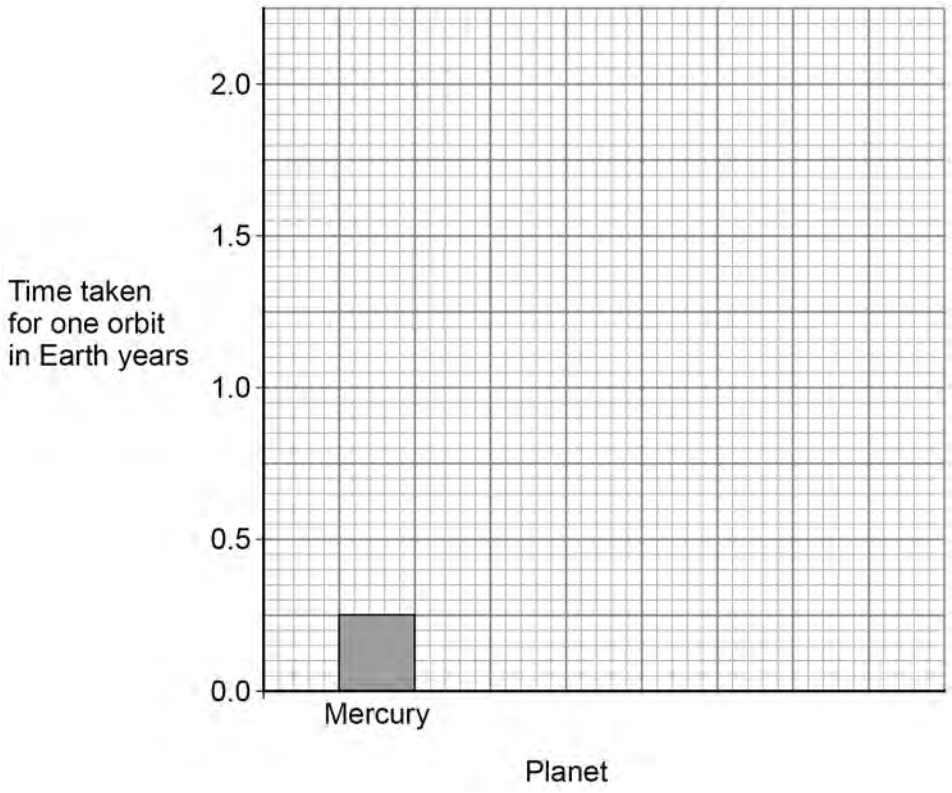
[1 mark]

4.8.1.2 The life cycle of a star

Question 20 · continued

0 4 . 4 The bar chart in **Figure 11** shows some of the data from **Table 1**.

Figure 11



Complete the bar chart.

Use data from **Table 1**.

[2 marks]

Question 4 continues on the next page

4.8.1.2 The life cycle of a star

Question 20 · continued

0 4 . 5 All stars have a life cycle.

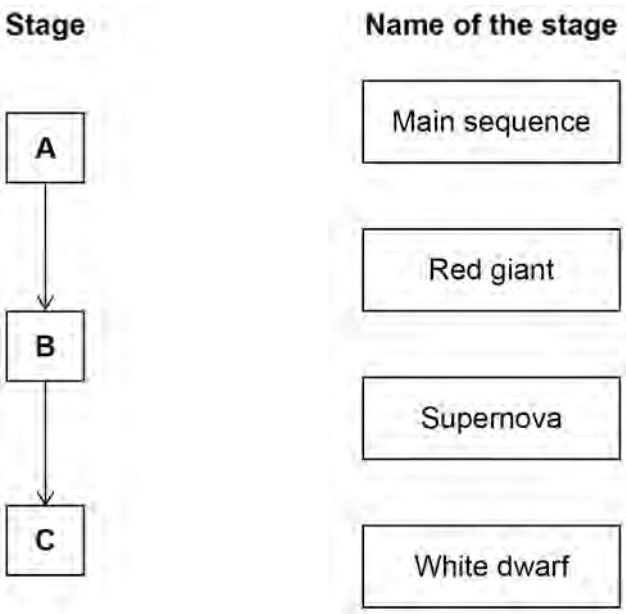
A, **B** and **C** in **Figure 12** represent three stages in the life cycle of the Sun.

The stages are in the correct order.

Draw **one** line from each stage to the name of the stage.

[2 marks]

Figure 12



0 4 . 6 Stars act like black bodies.

Which statement is true for perfect black bodies?

[1 mark]

Tick (✓) **one** box.

They are good reflectors of radiation. ☐

They are the best emitters of radiation. ☐

They easily transmit radiation. ☐

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4.8.1.2 The life cycle of a star

Question 21

0 3 Telescopes are used to observe distant objects.

0 3 . 1 Complete the sentences.

Choose answers from the box.

[2 marks]

galaxy	**moon**	**nebula**	**star**	**universe**

A natural satellite of a planet is called a _____.

A planet orbits a _____.

0 3 . 2 What is the name of our galaxy?

[1 mark]

Tick (✓) **one** box.

- Andromeda ☐
- Centaurus ☐
- Milky Way ☐
- Whirlpool ☐

4.8.1.2 The life cycle of a star

Question 21 · continued

0 3 . 3 The Sun is our nearest star.

What will happen to the Sun at the end of its life cycle?

[1 mark]

Tick (✓) **one** box.

- It will become a black dwarf. ☐
- It will become a black hole. ☐
- It will become a neutron star. ☐

The James Webb Space Telescope is the most powerful telescope ever launched into space.

0 3 . 4 Very distant galaxies can be observed using the James Webb Space Telescope.

How does the speed of a very distant galaxy compare to the speed of a much nearer galaxy?

[1 mark]

Tick (✓) **one** box.

- A very distant galaxy moves faster. ☐
- The speeds are the same. ☐
- A very distant galaxy moves slower. ☐

Question 3 continues on the next page

4.8.1.2 The life cycle of a star

Question 21 · continued

0 3 . 5 There is an observed increase in the wavelength of light from most distant galaxies.

What name is given to this increase in the wavelength of light?

[1 mark]

Tick (✓) **one** box.

Blue-shift ☐

Green-shift ☐

Red-shift ☐

0 3 . 6 Observations from the James Webb Space Telescope support the Big Bang theory.

Complete the sentence.

Choose the answer from the box.

[1 mark]

cold	hot	large

The Big Bang theory suggests that the universe began from a region that was extremely _____.

0 3 . 7 What does the Big Bang theory suggest is happening to the size of the universe?

[1 mark]

Tick (✓) **one** box.

The universe is getting smaller. ☐

The size of the universe is constant. ☐

The universe is getting bigger. ☐

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