Nuclear Fission and Nuclear Fusion

Question Paper

Level	GCSE
Subject	Physics
Exam Board	AQA
Unit	P2
Topic	Nuclear Fission and Nuclear Fusion
Difficulty Level	Bronze Level
Booklet	Question Paper

Time Allowed: **54 minutes**

Score: **/54**

Percentage: **/100**

Q1. The equation below shows the process by which two atomic nuclei join to form a different nucleus.

$$ {}_{1}^{1}H + {}_{1}^{2}H \rightarrow {}_{2}^{3}He $$

(a) Where does the process shown by the equation above happen naturally?

Tick (✓) **one** box.

Inside the Earth ☐

Inside a nuclear power station ☐

iroInside the Sun ☐

(1)

(b) Use the correct answer from the box to complete the sentence.

fission	**force**	**fusion**

The process of joining two atomic nuclei to form a different nucleus is called

nuclear ..... .

(1)

(c) What is released during this process?

Draw a ring around the correct answer.

charge **energy** **force**

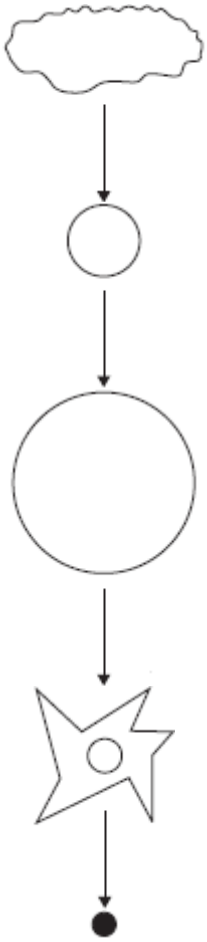
(1)
(Total 3 marks)

Q2.(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**.

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.

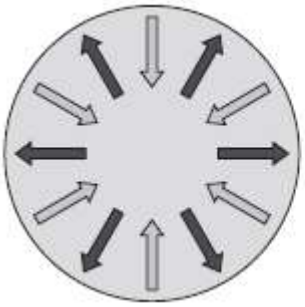
The outer layers of the star explode as a ..... .

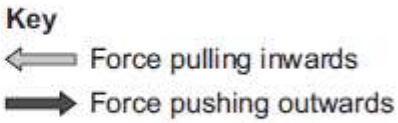
The core of the star shrinks and a black hole is formed.

(2)

(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.

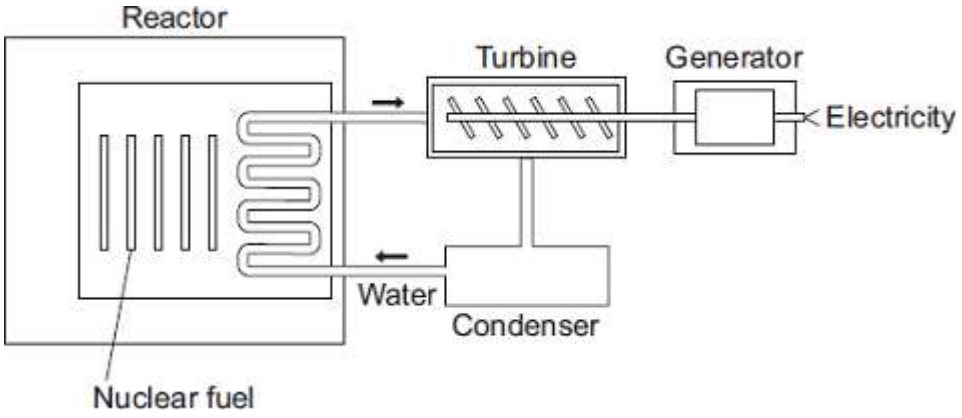
When a star is stable, the forces pushing outwards are

bigger than
smaller than
balanced by

the forces pulling inwards.

(1)
(Total 3 marks)

Q3. Nuclear power stations use the energy released from nuclear fuels to generate electricity.



(a) Which substance do the majority of nuclear reactors use as fuel?

Draw a ring around your answer.

plutonium-239 **thorium-232** **uranium-235**

(1)

(b) Energy is released from nuclear fuels by the process of nuclear fission.

Describe what happens to the nucleus of an atom during nuclear fission.

.....

.....

.....

.....

(2)

(c) Use words from the box to complete each sentence.

condenser	**gas**	**generator**	**reactor**	**steam**	**turbine**

The energy released from the nuclear fuel is used to heat water. The water turns into

..... and this is used to drive a ..... .

This turns a ..... to produce electricity.

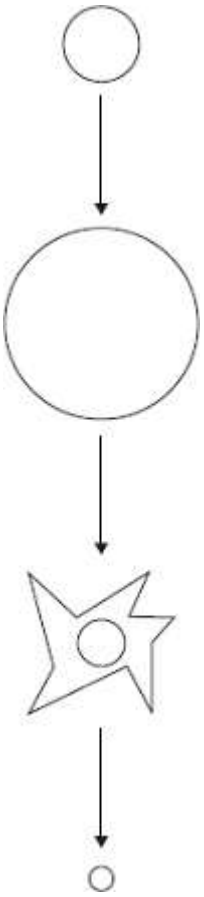
(3)
(Total 6 marks)

Q4. 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)



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 ..... .

(Total 3 marks)

Q5. Starting with the smallest, list the following in order of increasing size.

Universe **Earth** **Milky Way** **Sun**

Smallest .....

.....

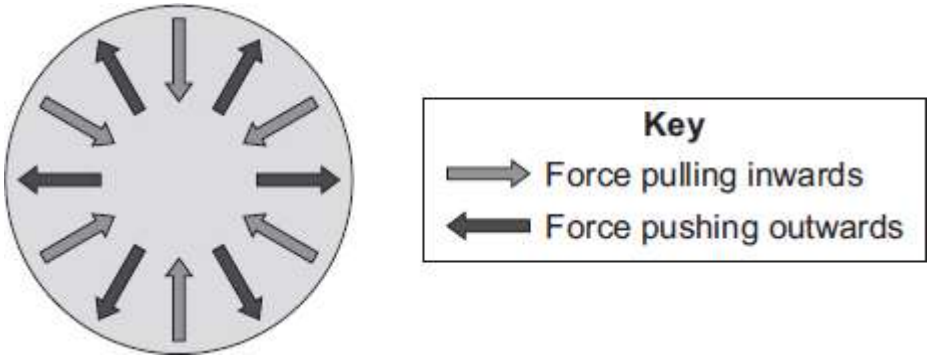
.....

Largest .....

(2)

(b) Stars pass through different stages during their life cycle.

The diagram shows the forces acting on the Sun during the stable stage of its life cycle.



Complete the following sentence by drawing a ring around the correct line in the box.

During the stable stage of the Sun's life cycle, the forces pulling inwards

are | smaller than | equal to | bigger than | the forces pushing outwards.

(1)

(c) During its life cycle, the Sun will never go through a *supernova* stage but the star Mira will.

(i) What is a *supernova?*

.....

(1)

(ii) Explain why the Sun will not go through the *supernova* stage but the star Mira will.

.....

.....

.....

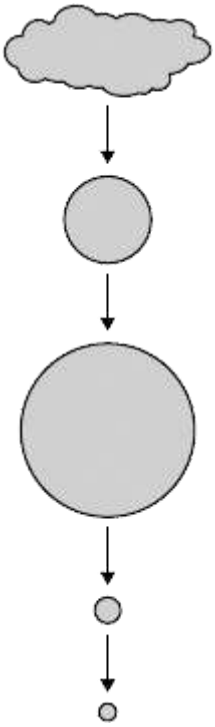
.....

(2)
(Total 6 marks)

Q6. (a) The diagram shows the lifecycle of a star.

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

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



(3)

(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)

(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)
(Total 6 marks)

Q7. The names of three different processes are given in **List A**.
Where these processes happen is given in **List B**.

Draw a line to link each process in **List A** to where the process happens in **List B**.

Draw only **three** lines.

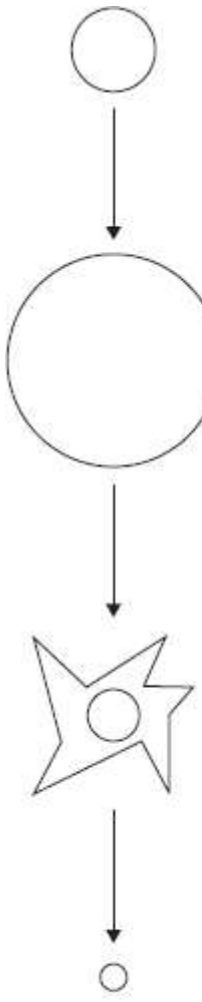
List A	List B
style='height:1.1pt'> **Process**	**Where it happens**
fusion	in a star
chain reaction	in a nuclear reactor
alpha decay	in a smoke precipitator
	in the nucleus of an atom

(Total 3 marks)

Q8. 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**



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 ..... .

(Total 3 marks)

Q9. Four different processes are described in **List A**. The names of these processes are given in **List B**.

Draw a line to link each description in **List A** to its correct name in **List B**.
Draw only **four** lines.

List A	List B
the nuclei of two atoms joining together	gamma emission
the nucleus of an atom splitting into several pieces	electric current
an atom losing an electron	ionisation
an electric charge moving through a metal	nuclear fission
	nuclear fusion

(Total 4 marks)

Q10. (a) Choose the best words from the box to complete the following sentences.

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

(i) Stars form when enough dust and ..... from

space are pulled together by ..... .

(2)

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

.....

(1)

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

(1)

(b) What is the name of our galaxy?

.....

(1)

(Total 5 marks)

Q11. This passage is from a science magazine.

A star forms when enough dust and gas are pulled together. Masses smaller than a star may also be formed when dust and gas are pulled together.

(a) What is the force which pulls the dust and gas together?

.....

(1)

(b) Complete the sentences.

(i) The smaller masses may be attracted by the star and become

..... .

(1)

(ii) Our nearest star, the Sun, is stable because the gravitational forces and the radiation pressure are ..... .

(1)

(iii) The Sun is one of billions of stars in the galaxy called the

..... .

(1)

(Total 4 marks)

Q12. (a) Complete the **two** spaces in the sentence.

Stars form when enough ..... and gas from ..... are pulled together by gravitational attraction.

(2)

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

Put a tick (✓) next to the answer.

By atoms joining together ☐

By atoms splitting apart ☐

By burning gases ☐

(1)

(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)

(d)

Why was the Universe created?

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

Put a tick (✓) 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)
(Total 5 marks)

Q13. Complete the following sentences 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.

(Total 3 marks)