

# STAR CYCLE

**Q:1** Stars go through a life cycle. About 90 % of all stars are in the 'main sequence' period of the life cycle.

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

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(1 mark)

(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

(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)

(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)

(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)

(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)

**Q:2** (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)

(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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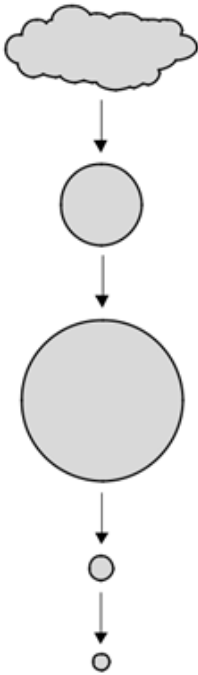
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(3 marks)

**Q:3** (a)The diagram shows the lifecycle of a star.

(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)

(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)?

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Give a reason for your answer.

\_\_\_\_\_  
\_\_\_\_\_

(2 marks)

(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)

**Q:4** Stars go through a life cycle.

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

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

**Table 1**

<b>Star</b>	<b>Mass of the star relative to the Sun</b>
<b>J</b>	0.5
<b>K</b>	14.5
<b>L</b>	20.0

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

Give a reason for your answer.

\_\_\_\_\_

\_\_\_\_\_

[2 marks]

(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.

(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?

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[1 mark]

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

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[1 mark]

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

Suggest one reason why.

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[1 mark]

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

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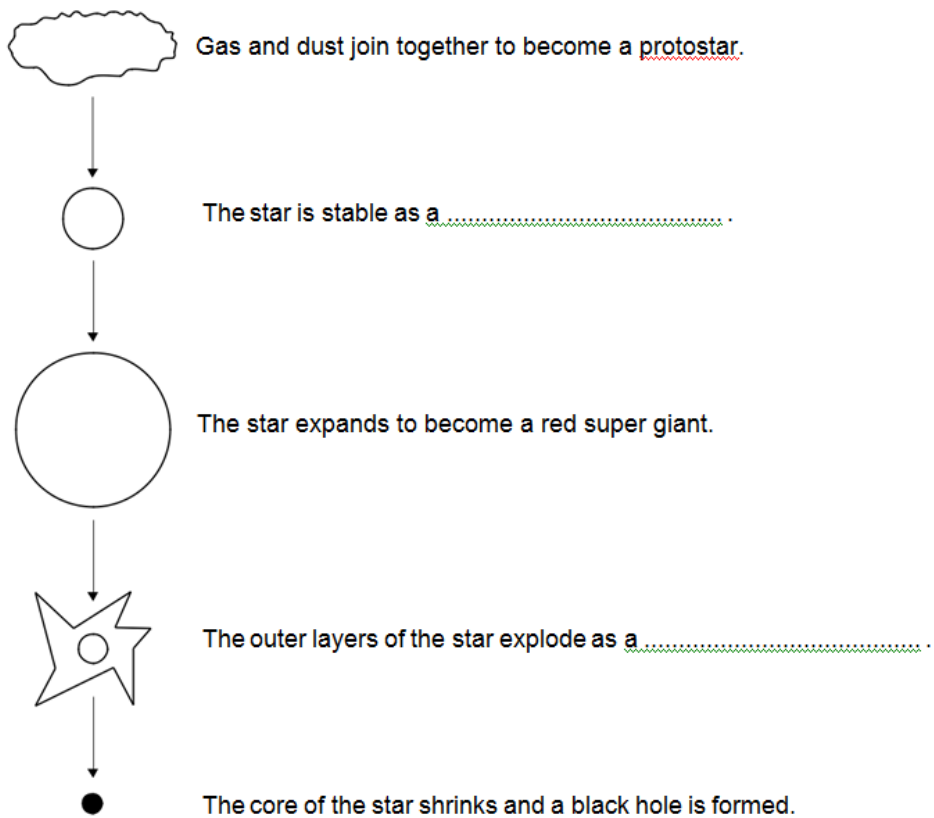
[5 marks]

**Q:5** (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**

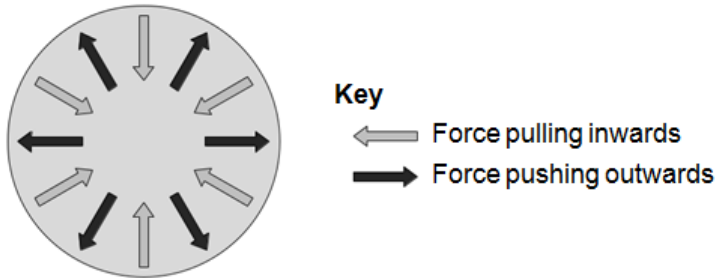


(2 marks)



(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 mark)

**TOTAL MARKS=39**