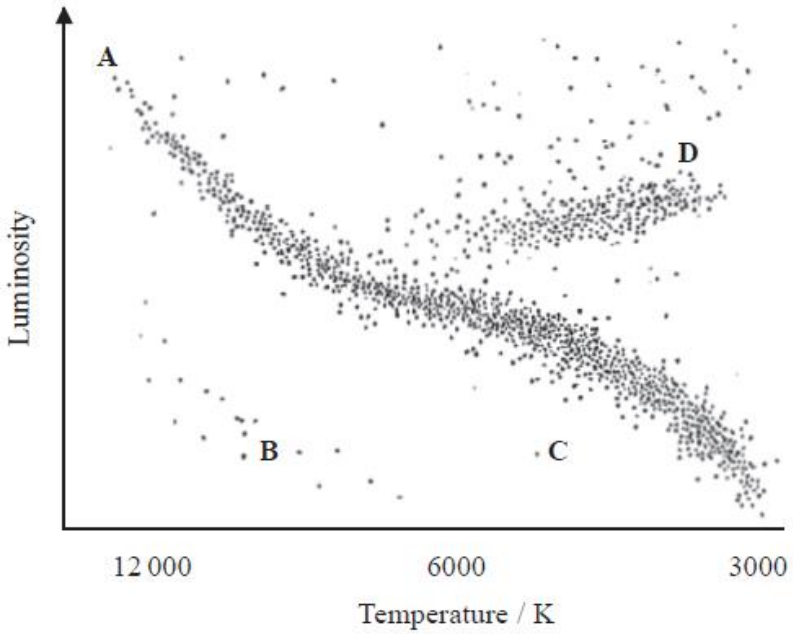
H-R Diagrams Questions

Q1.

This question refers to the Hertzsprung-Russell diagram below.



(a) Which letter, **A**, **B**, **C** or **D**, indicates the region where **a white dwarf** star would be shown?

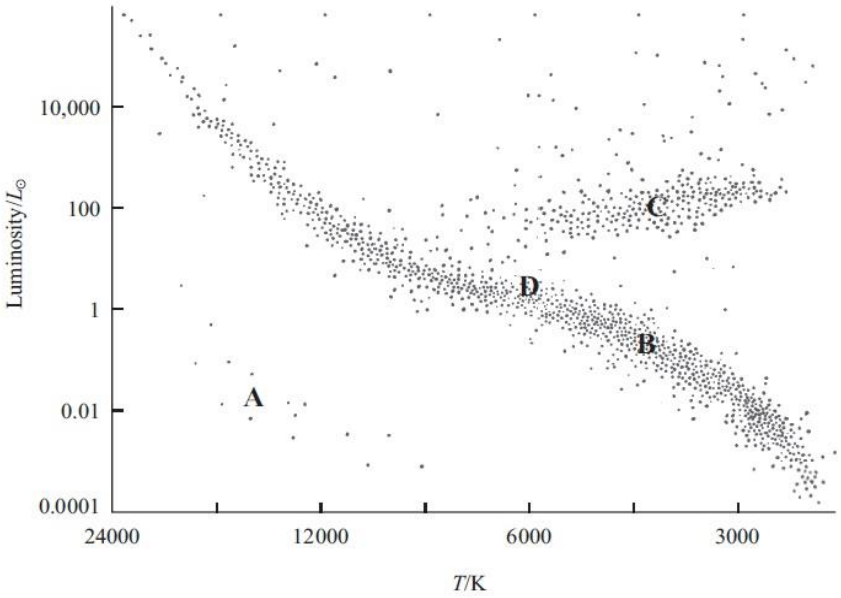
- ☒ **A**
- ☒ **B**
- ☒ **C**
- ☒ **D**

(b) Which letter, **A**, **B**, **C** or **D**, indicates the region where a **blue giant** star would be shown?

- ☒ **A**
- ☒ **B**
- ☒ **C**
- ☒ **D**

(Total for question = 2 marks)

Q2.



(a) Which letter **A, B, C or D** represents the region on the diagram where our **Sun** would be shown?

- ☒ **A**
- ☒ **B**
- ☒ **C**
- ☒ **D**

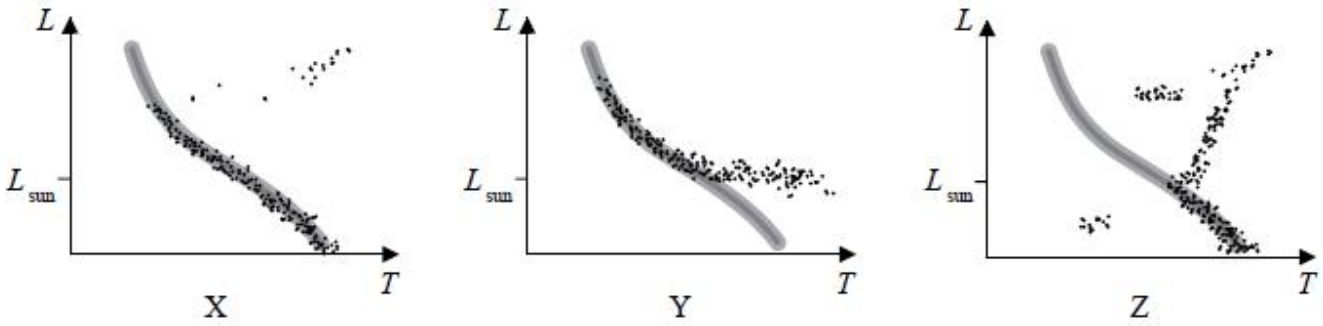
(b) Which letter A, B, C or D represents the region on the diagram where a **white dwarf** star would be shown?

- ☒ **A**
- ☒ **B**
- ☒ **C**
- ☒ **D**

(Total for question = 2 marks)

Q3.

Hertzsprung-Russell diagrams are shown for three star clusters.



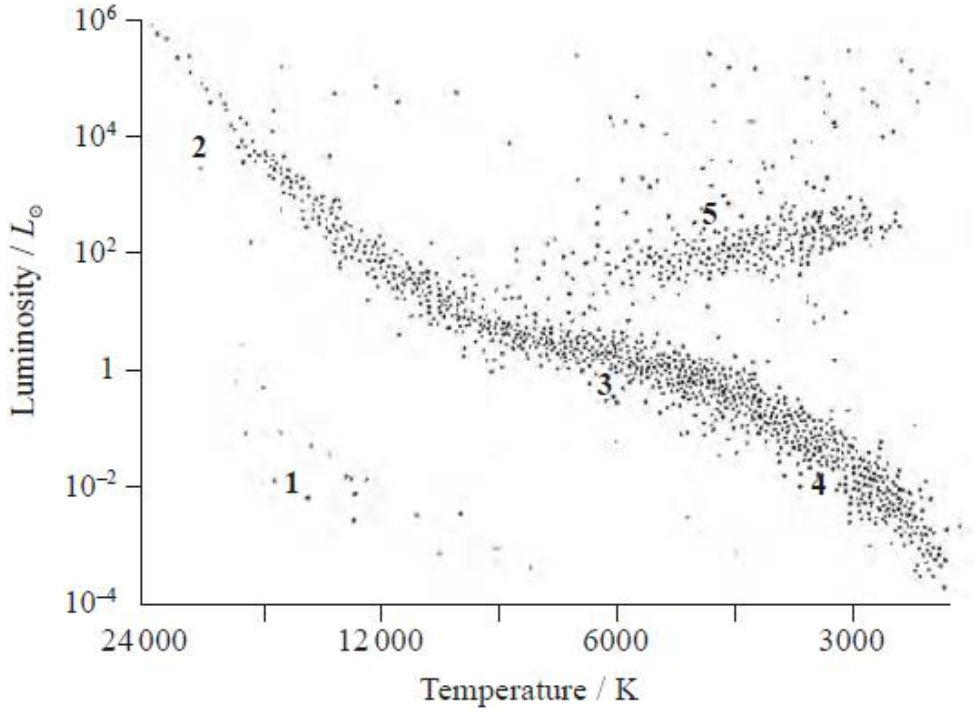
Choose the row that correctly identifies the relative ages of the three clusters.

	Youngest ⟶ Oldest		
☐ A	X	Z	Y
☐ B	Y	X	Z
☐ C	Y	Z	X
☐ D	Z	X	Y

(Total for question = 1 mark)

Q4.

Five regions are labelled on the Hertzsprung-Russell diagram shown.



Which sequence could show part of the evolution of a star like the Sun?

☒ **A** 1→5→3

☒ **B** 2→3→4

☒ **C** 3→5→1

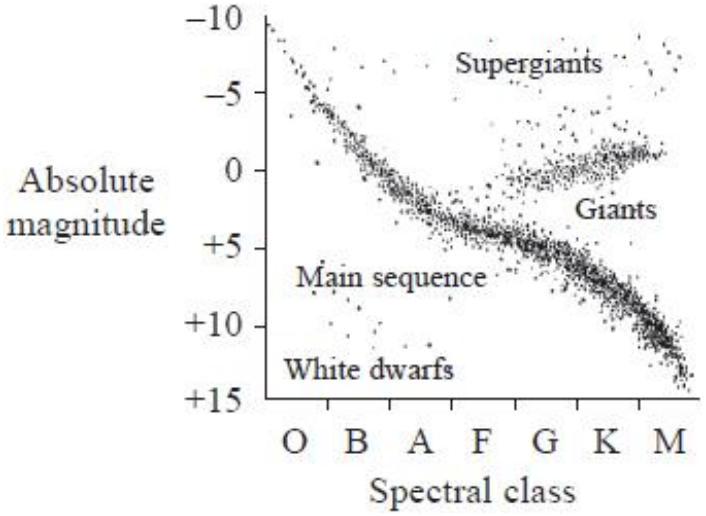
☒ **D** 4→3→2

(Total for question = 1 mark)

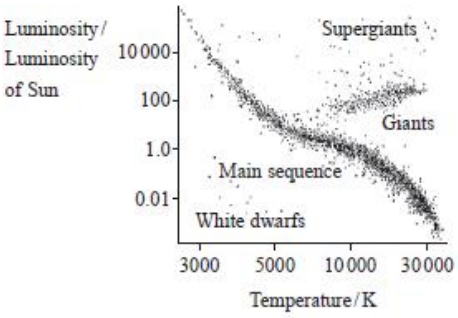
Q5.

Answer the question with a cross in the box you think is correct ☒. If you change your mind about an answer, put a line through the box ☒ and then mark your new answer with a cross ☒.

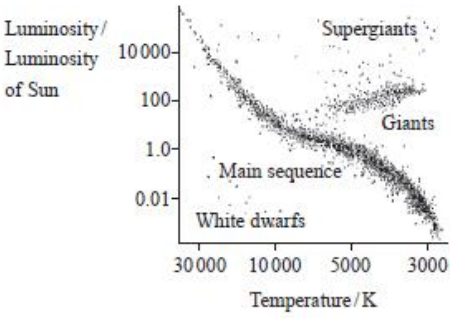
A student finds a Hertzsprung-Russell diagram in an old astronomy book and notices that the axes aren't the same as in her current textbook.



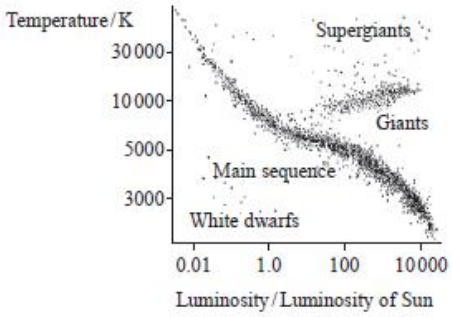
Which of the following graphs shows a correct alternative way to label the axes?



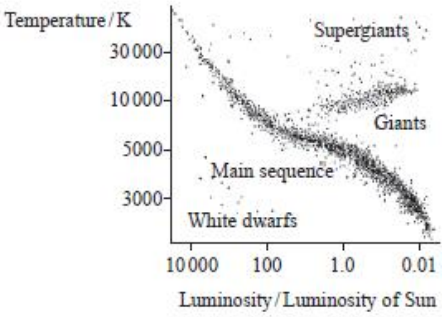
A



B



C



D

☒ **A**

☒ **B**

☒ **C**

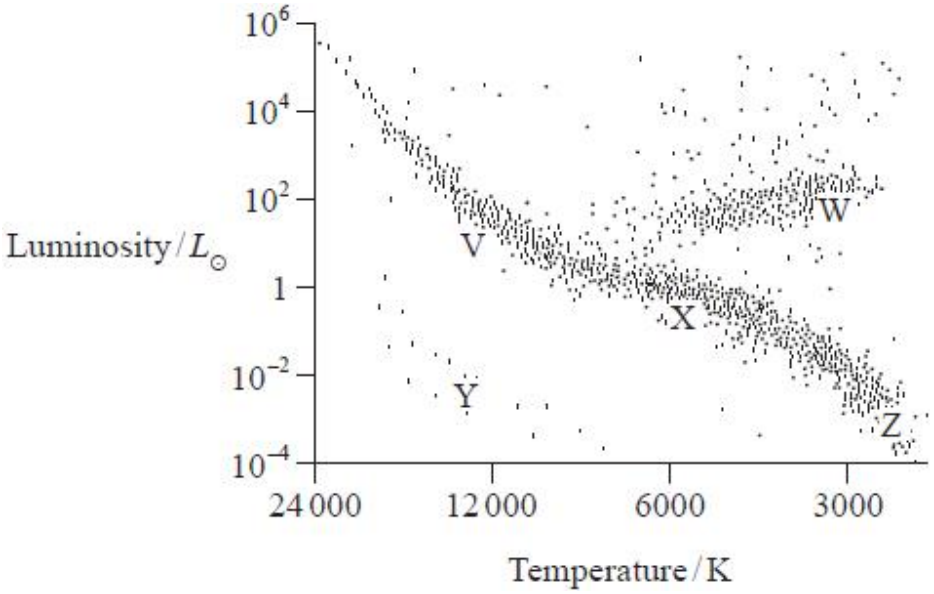
☒ **D**

(Total for question = 1 mark)

Q6.

Answer the question with a cross in the box you think is correct ☒. If you change your mind about an answer, put a line through the box ☒ and then mark your new answer with a cross ☒.

A Hertzsprung–Russell diagram for stars in our galaxy is shown. V, W, X, Y and Z are positions on the diagram.



Which of the following gives a sequence of positions of the Sun during its lifetime?

☒ **A** V X Z

☒ **B** X W Y

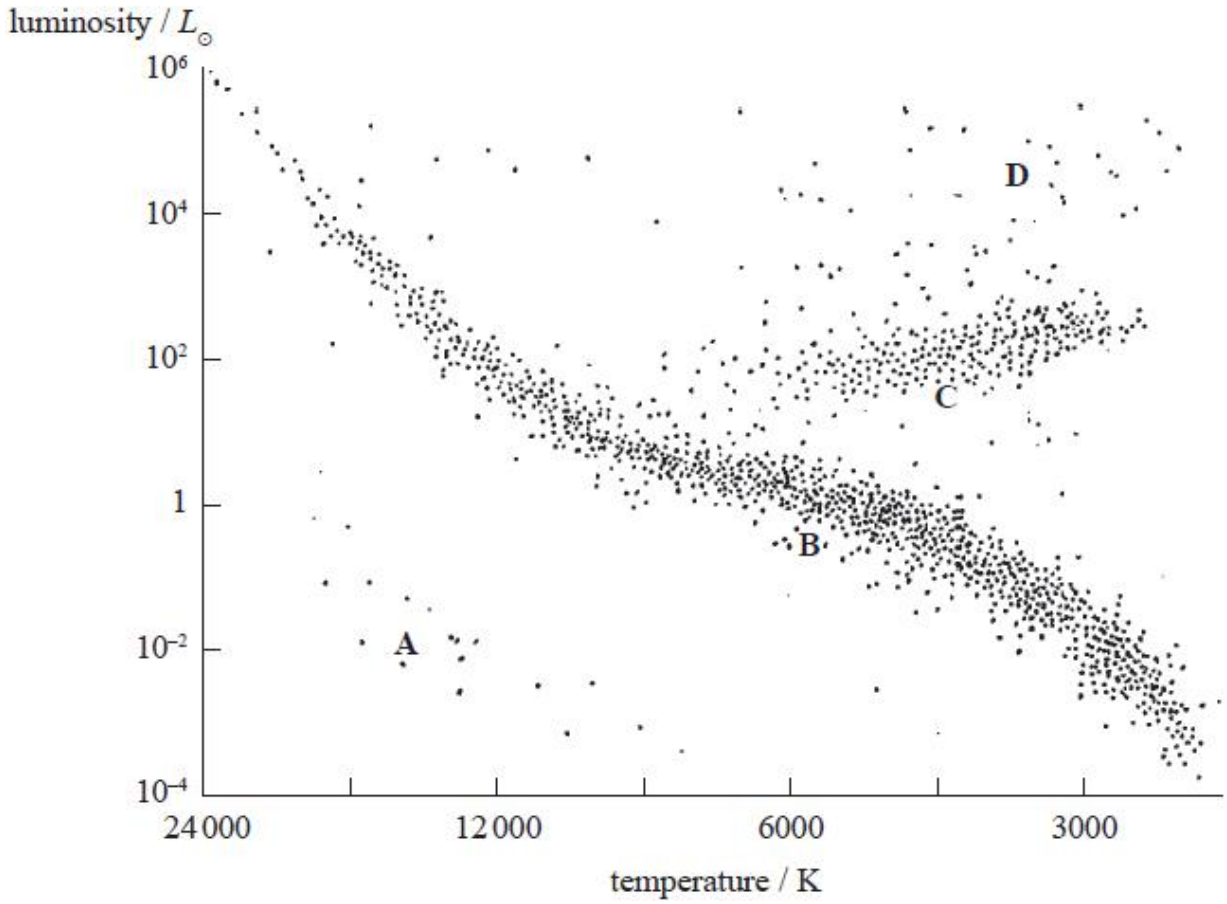
☒ **C** X W Z

☒ **D** Z X V

(Total for question = 1 mark)

Q7.

Four regions **A**, **B**, **C** and **D** are labelled on the Hertzsprung-Russell diagram.



Which region includes the position of the Sun?

- ☒ **A**
- ☒ **B**
- ☒ **C**
- ☒ **D**

(Total for question = 1 mark)

Q8.

A star is estimated to have approximately the same surface temperature as the Sun, but less than 1% of the Sun's luminosity.

The star is best classified as a

☒ **A** main sequence star.

☒ **B** red dwarf star.

☒ **C** red giant star.

☒ **D** white dwarf star.

(Total for Question = 1 mark)

Q9.

Answer the question with a cross in the box you think is correct ☒. If you change your mind about an answer, put a line through the box ☒ and then mark your new answer with a cross ☒.

Betelgeuse is a red giant star.

The surface temperature of Betelgeuse is T_B and the surface area of Betelgeuse is A_B.
The surface temperature of the Sun is T_S and the surface area of the Sun is A_S.

Which row in the table shows a correct comparison of the surface temperature and surface area of Betelgeuse with those of the Sun?

	$T_B > T_S$	$A_B > A_S$
☒ **A**	false	false
☒ **B**	false	true
☒ **C**	true	false
☒ **D**	true	true

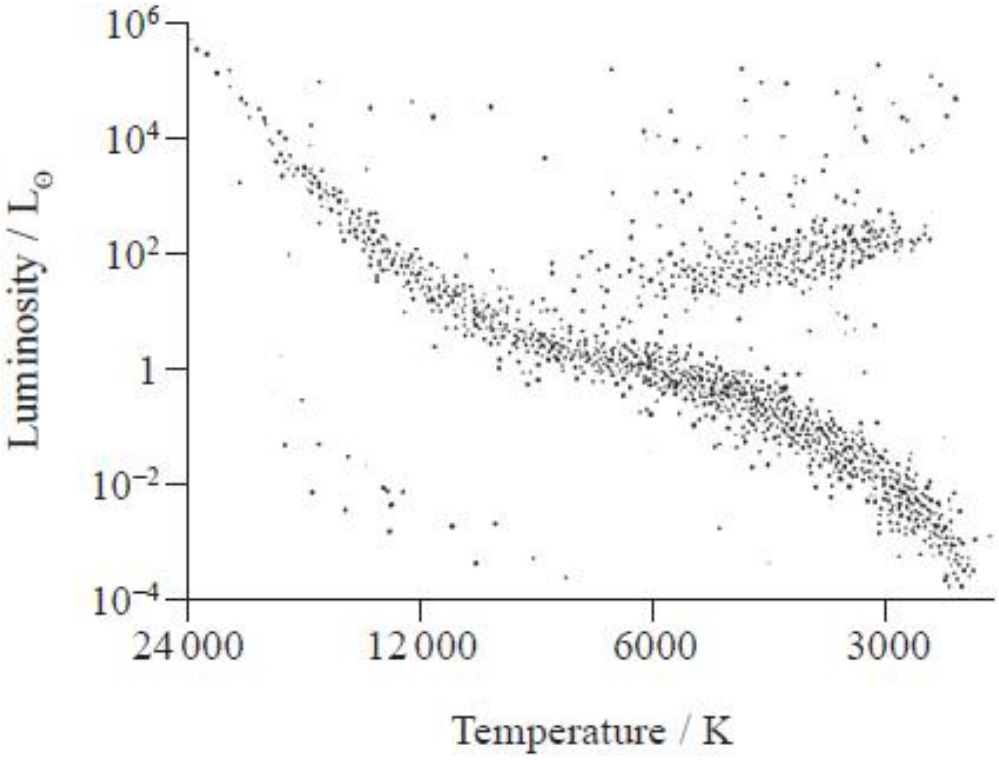
(Total for question = 1 mark)

Q10.

One of the largest stars in our galaxy is VY Canis Majoris. This star's radius is 1420 times the radius of the Sun. The luminosity of this star is 270 000 times the luminosity of the Sun. The surface temperature of VY Canis is 60% of the surface temperature of the Sun.

surface temperature of Sun = 5780 K
luminosity of Sun = 3.85×10^{26} W
radius of Sun = 6.96×10^{8} m

Add the position of VY Canis Majoris to the Hertzsprung Russell diagram to determine which type of star it is.



Type of star .....

(Total for question = 2 marks)

Q11.

Describe the characteristics of a main sequence star.

(2)

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(Total for question = 2 marks)

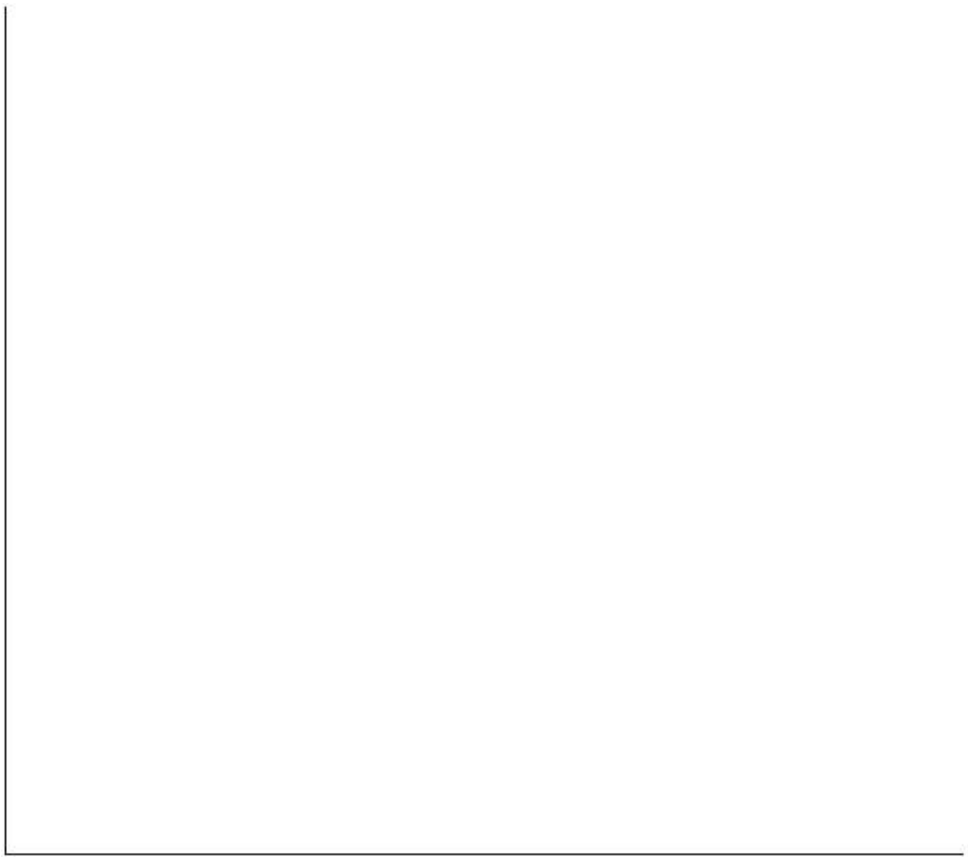
Q12.

The Hertzsprung-Russell diagram is a diagram used by astronomers to illustrate the properties of stars.

Label the axes below and use them to sketch a Hertzsprung-Russell diagram.
Your diagram should include labelled regions where the following stars are found:

- main sequence
- red giants
- supergiants
- white dwarfs

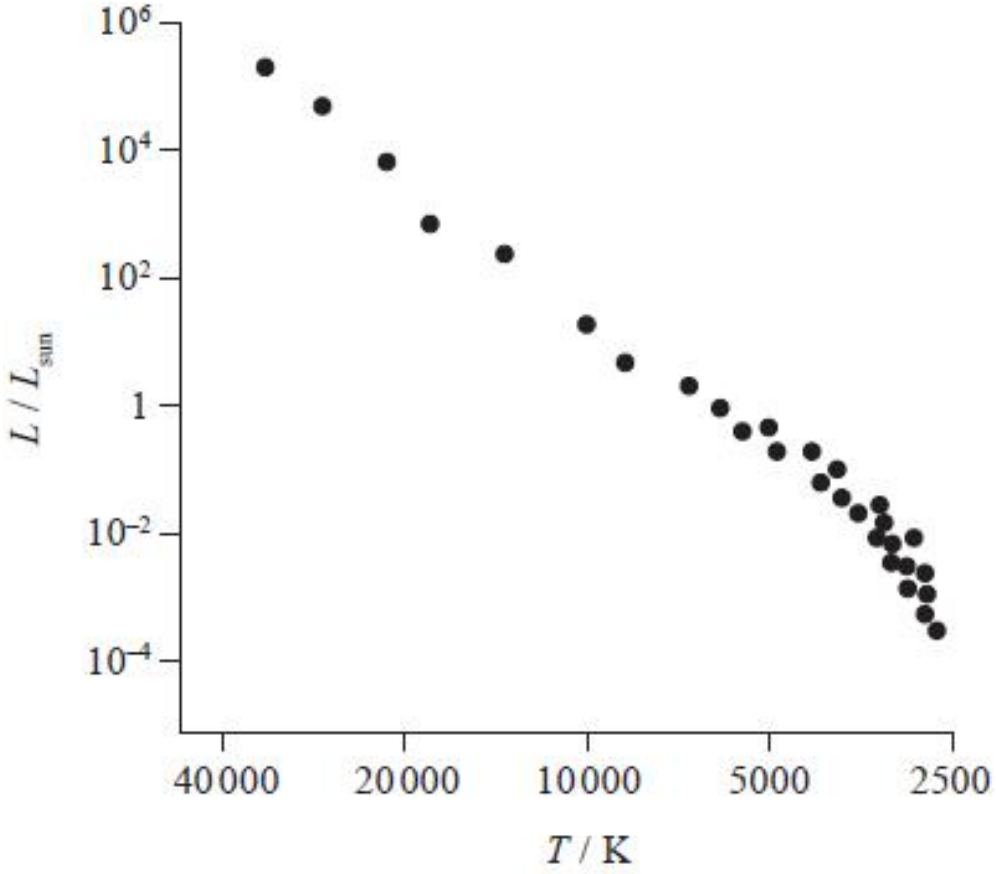
(4)



Q13.

The Hertzsprung-Russell (H-R) diagram is a plot of luminosity against temperature for a range of stars.

The H-R diagram below shows a number of main sequence stars.



(i) Label the position of our Sun on the diagram.

(1)

(ii) Label on the diagram the regions in which white dwarf and red giant stars would be located.

(2)

*(iii) Stars known as white dwarf stars have small surface areas. Explain how astronomers have deduced this.

(3)

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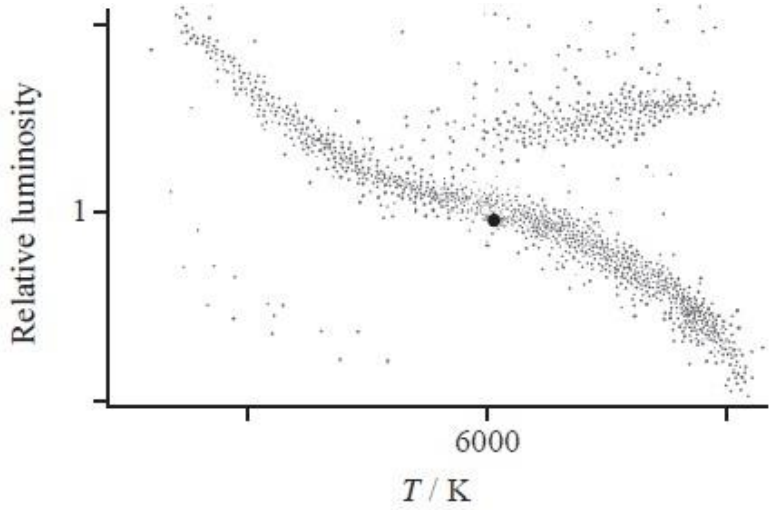
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(Total for question = 6 marks)

Q14.

This Hertzsprung-Russell diagram is a plot of relative luminosity against temperature for a large number of stars.



The position of the Sun, at a surface temperature of about 6000 K and a relative luminosity of 1, is marked on the diagram.

(a) Complete the temperature and relative luminosity scales by adding values at the positions shown.

(2)

(b) The Sun is an example of a main sequence star.

(i) State the fusion process taking place in the core of all main sequence stars.

(1)

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(ii) Draw a circle where the most massive main sequence stars are located on the diagram and explain why they are found in this position.

(3)

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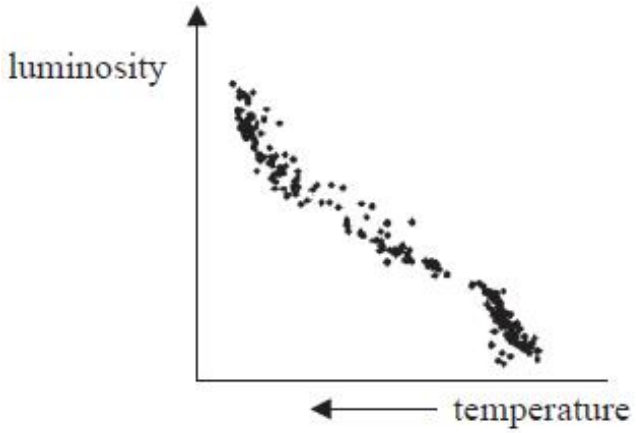
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(Total for Question = 6 marks)

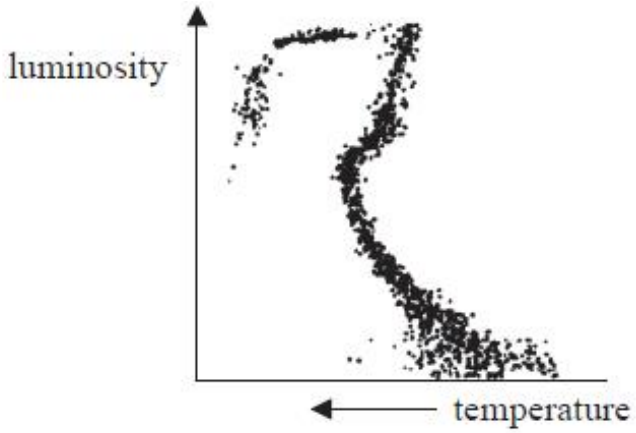
Q15.

The Herzsprung-Russell (H-R) diagram is one of the most important tools in the study of stellar evolution.

The H-R diagrams below are for a young star cluster and an old star cluster.



Young star cluster



Old star cluster

Use the diagrams to describe and explain how the old star cluster is different from the young star cluster.

(6)

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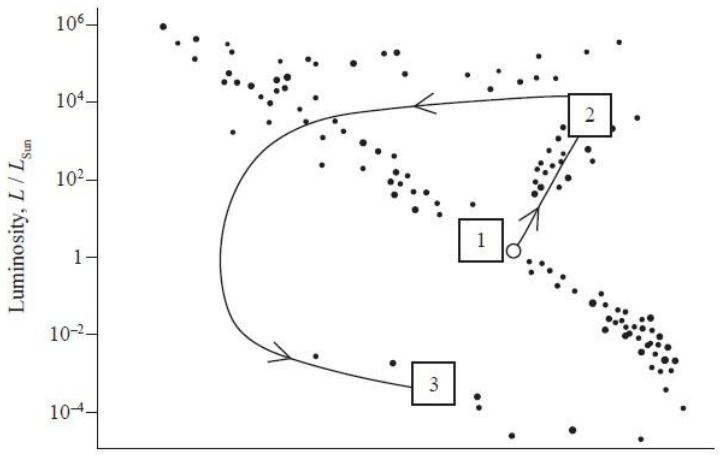
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(Total for question = 6 marks)

Q16.

The Sun has a surface temperature of 5800 K and is approximately 4.5 billion years old.

The Hertzsprung-Russell diagram maps the future evolution of the Sun, from its current position in area 1 of the diagram, through to its final position in area 3 of the diagram.



(i) Complete a suitable temperature scale on the x-axis. **(2)**

*(ii) Use the diagram to describe the lifecycle of the Sun starting from its present position in area 1 and concluding in area 3.

(6)

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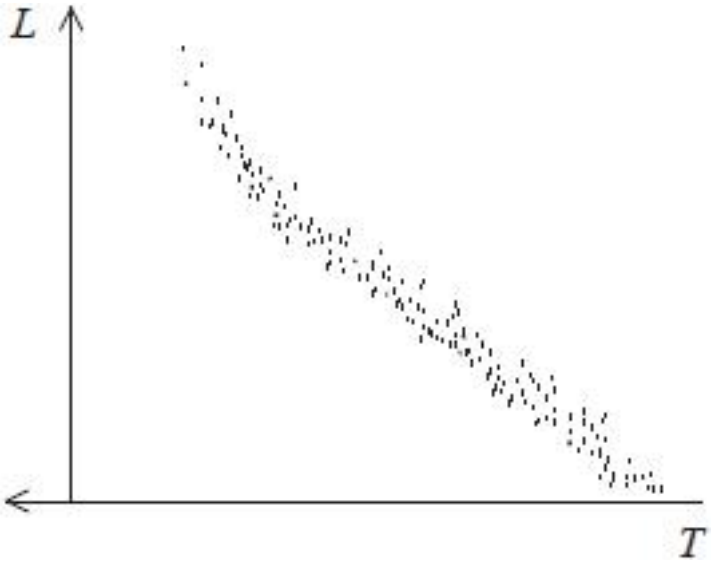
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(Total for Question = 8 marks)

Q17.

A Hertzsprung-Russell (HR) diagram shows how the luminosity *L* depends on the surface temperature *T* for a group of stars.

The HR diagram below is for a young star cluster.



(i) Explain how we can tell that the young star cluster is in the early stages of its evolution.

(2)

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(ii) Explain why the most massive stars in the cluster have the greatest luminosities.

(4)

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(Total for question = 6 marks)