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Level 2 Earth and Space Science, 2019

91192 Demonstrate understanding of stars and planetary systems

9.30 a.m. Wednesday 27 November 2019
Credits: Four

Achievement	Achievement with Merit	Achievement with Excellence
Demonstrate understanding of stars and planetary systems.	Demonstrate in-depth understanding of stars and planetary systems.	Demonstrate comprehensive understanding of stars and planetary systems.

Check that the National Student Number (NSN) on your admission slip is the same as the number at the top of this page.

You should attempt ALL the questions in this booklet.

If you need more room for any answer, use the extra space provided at the back of this booklet and clearly number the question.

Check that this booklet has pages 2–12 in the correct order and that none of these pages is blank.

YOU MUST HAND THIS BOOKLET TO THE SUPERVISOR AT THE END OF THE EXAMINATION.

TOTAL

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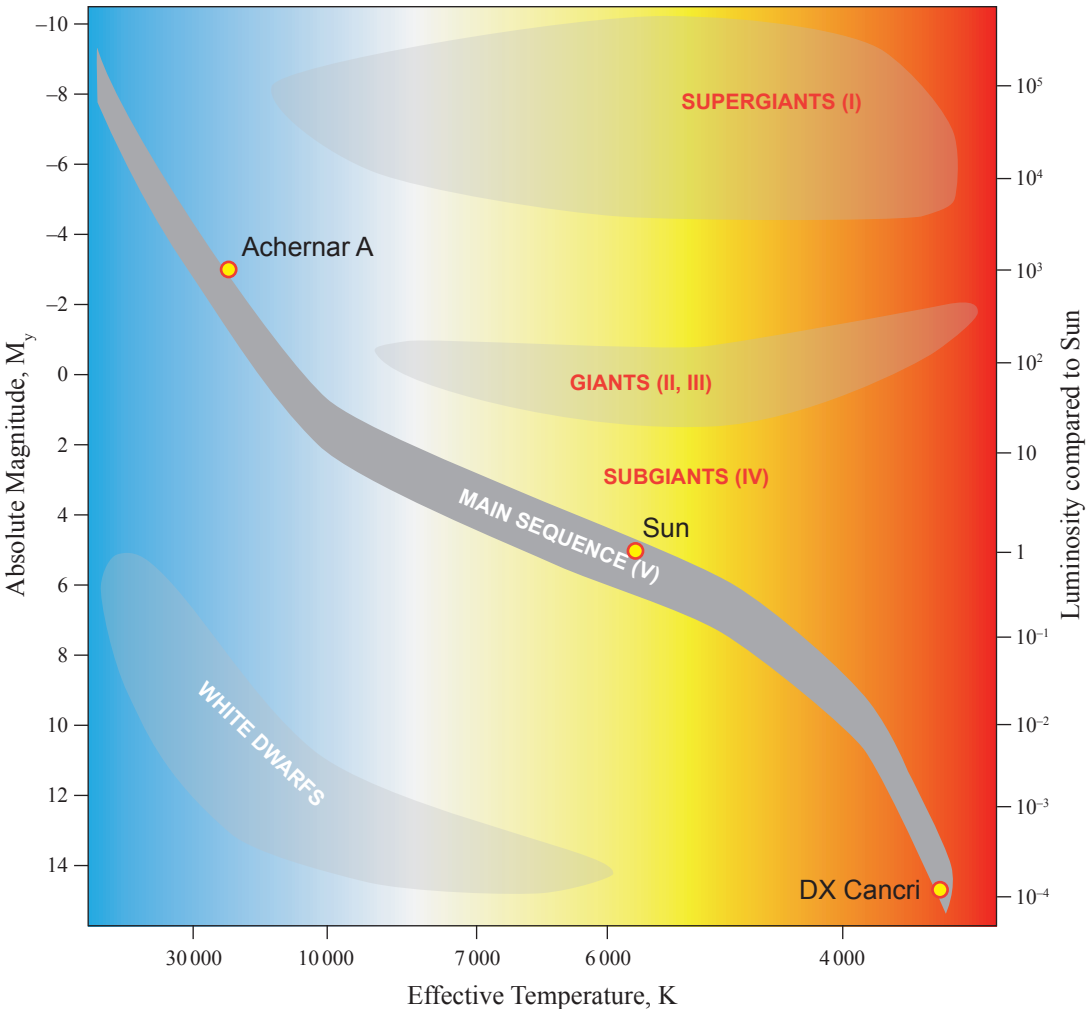
RESOURCE

Hertzsprung-Russell (HR) Diagram



Adapted from: http://astronomy.swin.edu.au/cosmos/h/hertzsprung-russell+diagram

QUESTION ONE: FIRST CONFIRMED VIEW OF A NEWBORN PLANET

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An observatory in Chile recently confirmed an image of a forming planet around a star known as PDS 70. The star is blacked out to show the bright spot just to the right of the centre of the image.

www.eso.org/public/news/eso1821/

The forming planet is a few times larger than Jupiter and has similar properties to the outer planets of our solar system. However, the surface of the planet has a temperature of around 700 K, making it much hotter than any planet in our solar system.

Explain, in detail, each stage in the formation of this planet.

In your answer, you should consider:

- the main stages in the formation of this planet
- why the material in this planet is likely to be different to any inner planets
- possible reasons why this planet is so much hotter than Jupiter.

A diagram may assist your explanation.

More space for this answer is available on the following pages.

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QUESTION TWO: ACHERNAR A AND DX CANCRI

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Achernar A and DX Cancri are both main sequence stars.

(a) Use the HR diagram on page 2 to describe the characteristics of each star in terms of colour, temperature, and luminosity.

Star	Colour	Temperature	Luminosity
Achernar A			
DX Cancri			

(b) Use the table above to help explain in detail the similarities and differences between Achernar A and DX Cancri.

In your answer, you should consider:

- the effects of the difference in the mass of each star
- the energy source and output of each star
- which star will have a longer life cycle.

A diagram may assist your explanation.

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More space for this answer is available on the following page.

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QUESTION THREE: NEUTRON STAR OR WHITE DWARF?

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The largest possible white dwarf is thought to be 1.4 solar masses. A white dwarf of this size would result from a main sequence star of about 8 solar masses. A star of more than 8 solar masses may end up as a neutron star.

Adapted from: http://cronodon.com/SpaceTech/WhiteDwarf.html
https://i.imgur.com/XY3nJ9D.jpg

Explain, in detail, the reasons a star may end up as either a white dwarf or a neutron star.

In your answer you should consider:

- how the mass and volume of a star may change during its life cycle
- the role that gravity plays in the birth, life, and eventual death of stars.

A diagram may assist your answer.

More space for this answer is available on the following pages.

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Extra paper if required.
Write the question number(s) if applicable.

QUESTION NUMBER

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