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NZQA
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MANA TOHU MĀTAURANGA O AOTEAROA

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SUPERVISOR'S USE ONLY

Level 2 Earth and Space Science, 2014

91192 Demonstrate understanding of stars and planetary systems

9.30 am Monday 1 December 2014
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 space for any answer, use the page(s) provided at the back of this booklet and clearly number the question.

Check that this booklet has pages 2–10 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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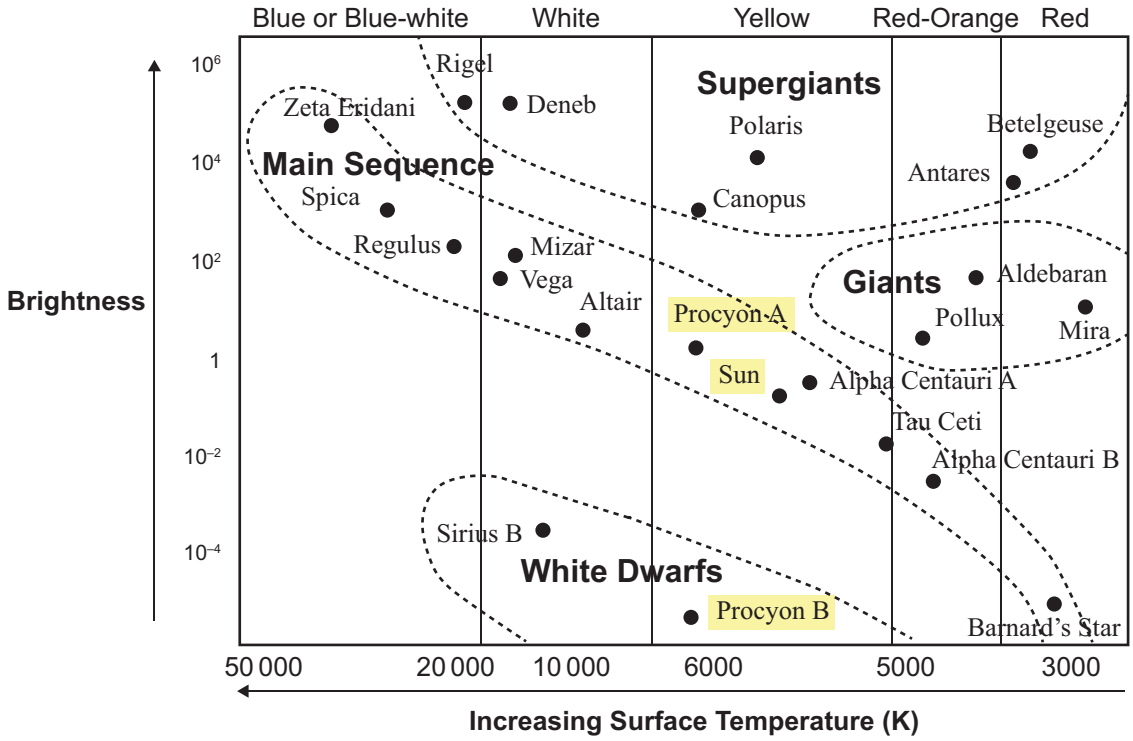
RESOURCE

The Hertzsprung-Russell (HR) Diagram



Source (adapted): http://www.slideshare.net/shayna_rose/hr-diagrams

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The examination continues on the following page.

QUESTION ONE: THE LITTLE DOG STAR

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Procyon is called the Little Dog Star as it rises before Sirius, which is known as the Dog Star. The Little Dog Star is seen as one star in the night sky, but it is actually two stars that rotate around each other (binary star system). The two stars are called Procyon A and Procyon B.

It is thought that Procyon A and B were formed at the same time as they are so close together. At the time of formation, one of the stars was larger than the other, and so is further through its life cycle.

Complete this table using the Hertzsprung-Russell (HR) diagram on page 2, and then use this information to help you explain which star was **initially larger**.

	Procyon A	**Procyon B**
Colour		
Temperature		
Brightness		

In your answer you should refer to:

- star type
- star formation
- size
- mass
- fuel usage.

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QUESTION TWO: INNER AND OUTER MOONS OF SATURN

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Saturn is one of the gas giant planets in our solar system and it has over 50 identified satellites or moons. Of these moons, the 21 that are closest to Saturn are circular in shape and have regular orbits. The remainder are irregular in shape and have irregular orbits much further away from Saturn.

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Source: www2.ess.ucla.edu/~jewitt/papers/2006/JSK06.pdf originally appeared in Scientific American August 2006.

Explain in detail the origins of the inner and outer moons of Saturn.

In your answer you should:

- identify possible origins of the inner and outer moons
- compare and contrast the origins of the inner and outer moons.

An annotated diagram or sketch may assist your answer.

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QUESTION THREE: ANOTHER EARTH?

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Kepler-62f is a remarkably Earth-like planet about 1200 light-years from our planet in the constellation of Lyra. The planet is only 1.4 times bigger than Earth and is in orbit around a star that is slightly dimmer and smaller than our Sun. There are five planets orbiting this star, and Kepler-62f is believed to be in the habitable region of its star.

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Source: www.nasa.gov/mission_pages/kepler/multimedia/images/kepler-62-diagram.html#.UvKVVvmSyzY

Explain in detail how planets form in a solar system, and how Kepler-62f came to be an Earth-like rocky terrestrial planet.

In your explanation you should:

- describe a protoplanetary disk and how it forms
- explain in detail the effect of gravity on the formation of planets
- explain in detail the stages in the formation of rocky terrestrial planets
- explain the likely materials that make up a rocky terrestrial planet, based on mass and boiling point
- explain in detail how Kepler-62f could be Earth-like and in the habitable zone for life.

An annotated diagram or sketch may assist your answer.

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

QUESTION NUMBER

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