

SUPERVISOR'S USE ONLY

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Draw a cross through the box (☒) if you have NOT written in this booklet



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Mana Tohu Mātauranga o Aotearoa
New Zealand Qualifications Authority

Level 2 Earth & Space Science 2023

91192 Demonstrate understanding of stars and planetary systems

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.

Check that this booklet has pages 2–16 in the correct order and that none of these pages is blank.

Do not write in any cross-hatched area (DO NOT WRITE). This area will be cut off when the booklet is marked.

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

RESOURCE

HR (Hertzsprung-Russell) diagram



Adapted from: http://www.atnf.csiro.au/outreach/education/senior/cosmicengine/stars_hrdiagram.html

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The assessment begins on the following page.**

QUESTION TWO: MATARIKI



Source: www.sciencelearn.org.nz/images/697-matariki-pleiades-star-cluster

Matariki is a star cluster indicating the beginning of the New Year to many Māori iwi. It contains many young stars, the brightest of these being 14 young, blue, main-sequence stars that have formed in the associated stellar nebula. These stars have masses in the range of 3 solar masses to 6 solar masses for the largest.

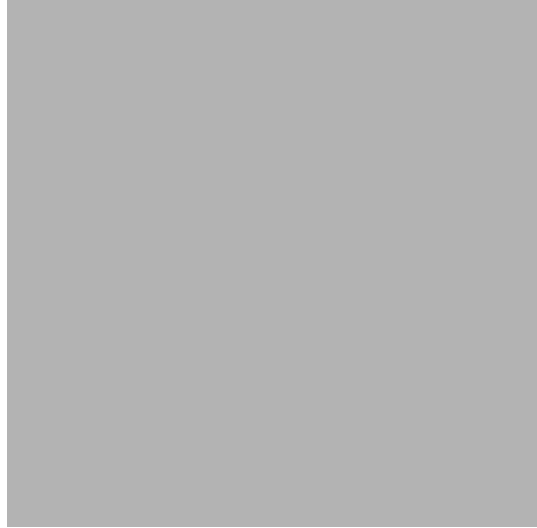
(a) Describe what is meant by the term “stellar nebula”.

(b) Explain, in detail, how these young blue stars would have formed.

In your answer you should consider the role gravity plays in star formation.

An annotated diagram may assist your answer.

QUESTION THREE: JUPITER AND THE SOLAR SYSTEM



Source: https://blogs.nasa.gov/Watch_the_Skies/2022/09/16/jupiter-to-reach-opposition-closet-approach-to-earth-in-70-years/

Our solar system consists of eight planets, with Jupiter the largest.

(a) Describe the difference between a star and planet.

(b) Explain, in detail, how gas giant planets like Jupiter are formed.

In your answer you should consider:

- the role of gravity
- temperature
- solar winds.

An annotated diagram may assist your answer.

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Question Three continues on the next page.

- (c) The picture below shows Jupiter's three rings, and the four rocky moons that accompany the rings. The rings are mainly made up of very fine dust particles.



Source: https://upload.wikimedia.org/wikipedia/commons/thumb/b/b8/Jupiter_Rings_ca.svg/2560px-Jupiter_Rings_ca.svg.png

Explain, in detail, how Jupiter's four rocky moons and ring system could possibly have been formed.

In your answer you should consider:

- the planet's gravity
- how moons may have formed around Jupiter
- the material making up Jupiter's rings.

An annotated diagram may assist your answer.

