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

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NZQA | Mana Tohu Mātauranga o Aotearoa
New Zealand Qualifications Authority

Level 1 Physics, Earth and Space Science 2025

92046 Demonstrate understanding of the effect on the Earth of interactions between the Sun and the Earth-Moon system

Credits: Five

Achievement	Achievement with Merit	Achievement with Excellence
Demonstrate understanding of the effect on the Earth of interactions between the Sun and the Earth-Moon system.	Explain the effect on the Earth of interactions between the Sun and the Earth-Moon system.	Analyse the effect on the Earth of interactions between the Sun and the Earth-Moon system.

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.

Show ALL working.

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 the margins (▯). 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.

QUESTION ONE: SEASONS

(a) Label the seasons that occur in the **Southern Hemisphere** in the diagram below.

Adapted from: https://quizlet.com/338281989/earths-seasons-solstices-and-equinoxes-diagram/

(b) Below is a graph of average monthly temperatures for Wellington last year.

Source: https://www.weather2visit.com/australia-pacific/new-zealand/wellington.htm

Explain the differences in average monthly temperatures for Wellington for 2024.

Include in your answer:

- why the Earth experiences seasons (include length of orbit and axial tilt)
- a comparison of the differences in the amount of solar radiation throughout the year
- why the temperature changes throughout the year.

(c) Wellington experiences changes in daylength throughout the year. In the summer, the days are longer; in the winter, the days are shorter.

	Summer day	**Winter day**
Time of sunrise	6:01 a.m.	7:45 a.m.
Time of sunset	8:55 p.m.	5:05 p.m.

Using the data above, discuss why this happens.

Include in your answer:

- why the Earth experiences day and night
- how the height of the Sun changes throughout the year
- why the daylength changes throughout the year.

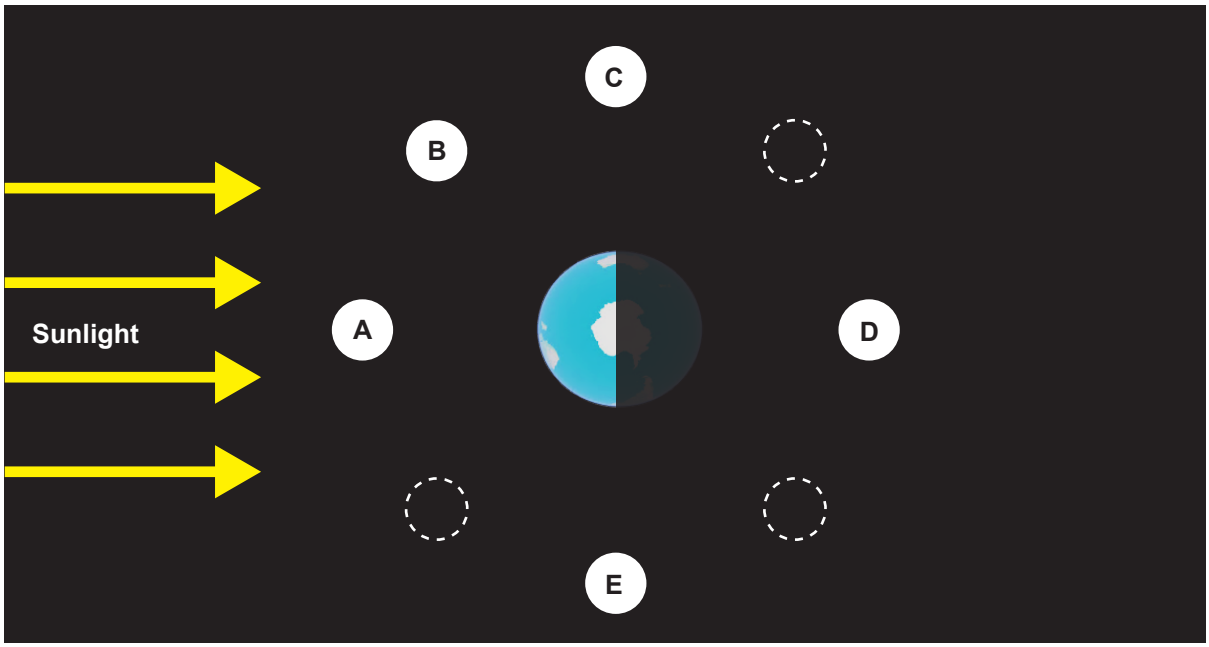
Use a diagram to support your answer.

QUESTION TWO: MOON PHASES

The Moon changes its appearance over time, going from new moon to new moon about once every month.

(a) The diagram below shows Earth as viewed towards the South Pole, with possible positions of the Moon when it is in its various phases.

NOTE: distances and sizes are not to scale.



Use the diagram to describe OR draw how the Moon will appear for the positions shown.

Position	Description of the moon phase OR	Drawing of the moon phase
A		
B		
C		
D		
E		

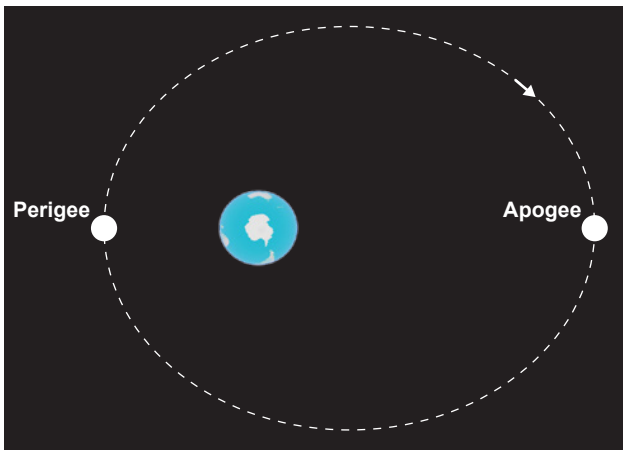
(b) Explain why viewers on Earth observe different phases of the Moon over time.

Include in your answer:

- why we see the Moon
- why the Moon appears to have different shapes over time, as seen from Earth
- how the Moon appears in the Southern Hemisphere as compared to the Northern Hemisphere.

You may use a diagram to support your answer.

(c) The Moon's orbit is elliptical, taking about 27.5 days to go from one perigee to the next. When a full moon occurs at the same time that the Moon appears to be its largest size, it is called a super full moon. In 2025, this occurs on only 6 November and 5 December.



Explain why a super full moon is not observed every month.

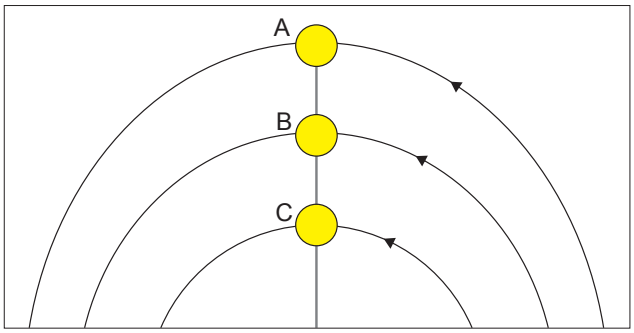
Include in your answer:

- what causes a full moon, and how often it occurs
- an explanation of why the Moon's apparent size changes over time
- an explanation of why a super full moon may occur only 1–3 times a year.

You may use a diagram to support your answer.

Question Three continues on the following page.

QUESTION THREE: EQUINOXES AND SOLSTICES



Apparent path of the Sun throughout a year as seen from the Southern Hemisphere

(a) Use the diagram above to label A, B, and C as being winter solstice, equinox, and summer solstice.

A	
B	
C	

(b) During a winter solstice, **Auckland (latitude 37°S)** experiences a longer day than **Invercargill (46°S)**, while the opposite is true for the summer solstice. During an equinox they experience similar daylengths.

The Sun rising at different times of the year in the Southern Hemisphere

Adapted fom: https://c8.alamy.com/comp/P9BFC7/path-of-the-sun-throughout-the-year-in-the-northern-hemisphere-P9BFC7.jpg

Using the above diagram, discuss why Auckland and Invercargill experience differences in daylength throughout the year.

Include in your answer:

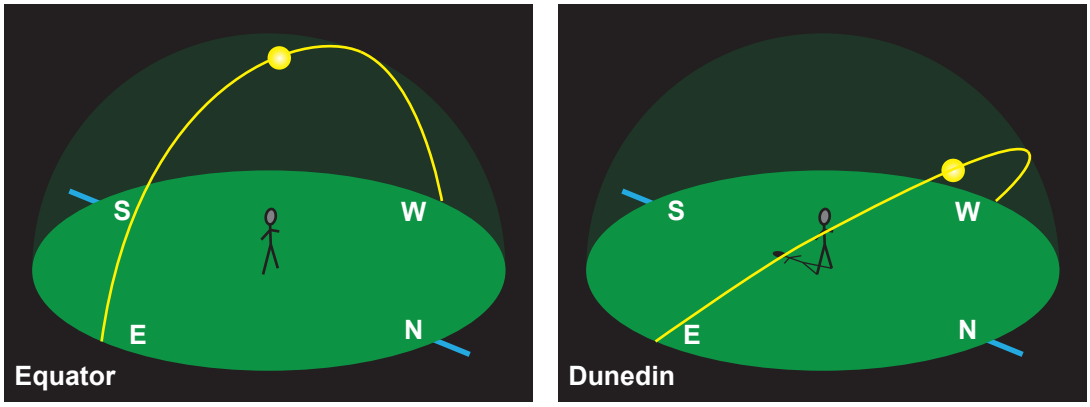
- definitions of winter solstice, equinox, summer solstice
- why the location of sunrise and sunset appear to change throughout the year
- why Auckland and Invercargill experience different daylengths during the solstices but similar during an equinox.

You may use a diagram to support your answer.

(c) The Equator and Dunedin are at different locations on the Earth, and this means that these locations experience differences in the angle of the Sun throughout the year. The Equator has a latitude of 0° and Dunedin 46°S.

Below is a table of the sun angles at noon at the spring equinox.

Location	Sun angle
Equator	90°
Dunedin	43°



Changing angle of the Sun between different locations on Earth

Discuss why these two locations experience differences in the angle of the Sun during the spring equinox.

Include in your answer:

- compare the angle of the Sun at noon between the two locations
- explain why these differences in angles occur
- discuss the differences in shadow lengths and directions between the two locations.

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

QUESTION NUMBER

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