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NZQA | Mana Tohu Mātauranga o Aotearoa
New Zealand Qualifications Authority

# Level 1 Physics, Earth and Space Science 2026

## 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.**

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.**

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**The assessment starts on the following page.**

## QUESTION ONE: TRAVELLING TO AOTEAROA NEW ZEALAND

(a) **Figure 1: The Sun rising at different times of the year in the Southern Hemisphere**



Adapted from: www.sciencelearn.org.nz/resources/624-navigating-with-sun-moon-and-planets

Label the summer and winter solstices, and equinoxes.

| | |
|---|---|
| **A** | |
| **B** | |
| **C** | |

(b)



Source: https://teara.govt.nz/en/map/1772/the-direction-and-timing-of-settlement

Māori navigated to Aotearoa New Zealand from near Tahiti (as shown in the above diagram), where they experienced only two seasons.

Explain why they would have experienced only two seasons near Tahiti, but four seasons in Aotearoa New Zealand.

Include in your answer:

- the angle of tilt and timing of Earth's orbit
- why the Earth experiences seasons
- why Tahiti would have a different number of seasons to New Zealand.

You may use a diagram to help support your answer.

(c) Māori would have noticed that shadow- and day-lengths varied more in Aotearoa New Zealand throughout a year compared to Tahiti.



Adapted from: https://science8sc.weebly.com/direct-vs-indirect-rays.html

**Table 1: Day lengths for a year and shadow lengths of a 20 m post in Aotearoa New Zealand throughout a year**

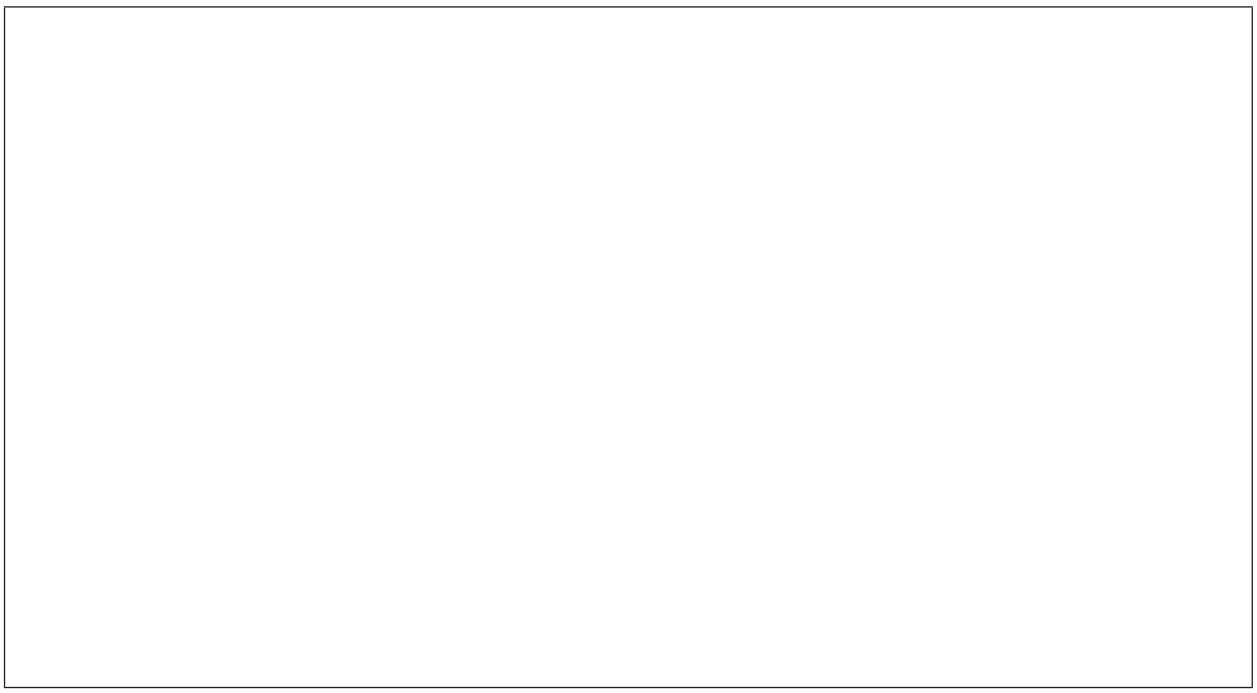
| Day | Sun angle to horizon | Length of shadow (m) | Length of day |
|---|---|---|---|
| Summer solstice | 75° | 5 | 15 hours |
| Equinox | 50° | 15 | 12 hours |
| Winter solstice | 30° | 36 | 9 hours |

Using the image and table above, explain how the length of day and shadows would vary throughout a year in Aoteroa New Zealand.

Include in your answer:

- definitions of equinox, summer, and winter solstice
- how the height of the Sun changes throughout a year
- why the length of shadows change throughout a year.

You may use a labelled diagram to help your answer.



## QUESTION TWO: TIDES

(a) Label high and low tides on the diagram below.



Adapted from: www.twinkl.co.nz/teaching-wiki/spring-and-neap-tides

(b) We experience two high and two low tides a day. Spring tides occur twice a month and neap tides occur seven days after a spring tide.

**Table 2: Tidal frequencies**

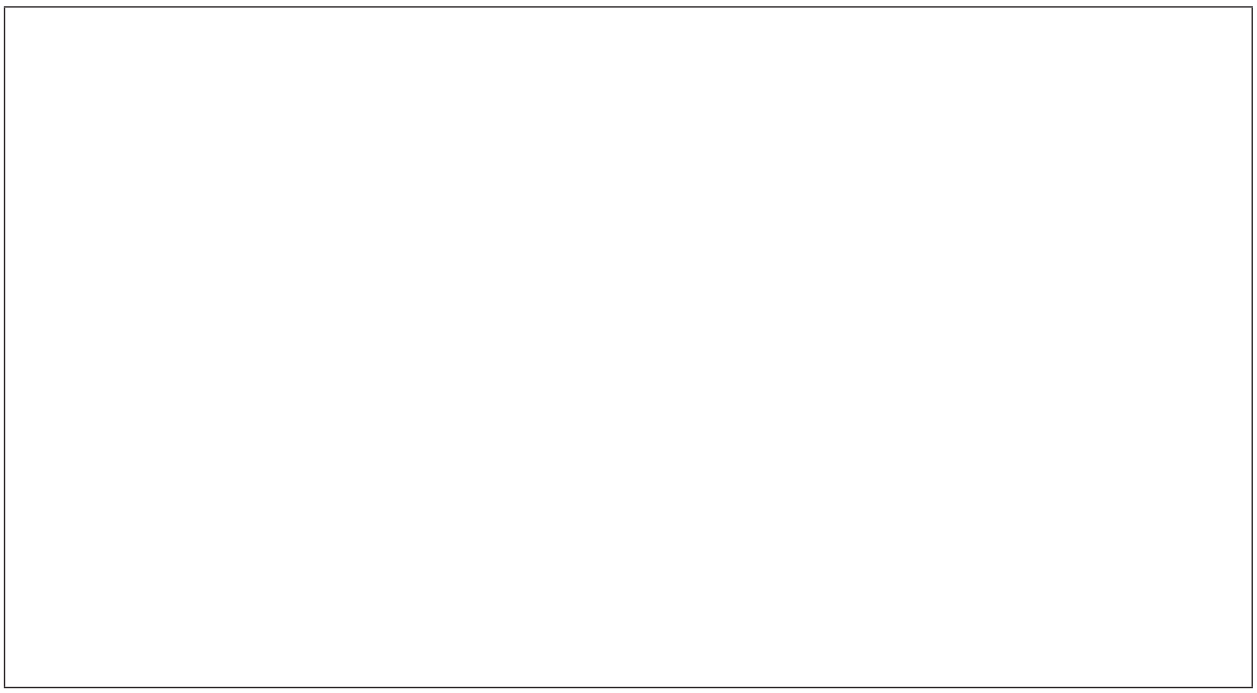
| Type of tide | Frequency |
|---|---|
| High and low | Twice a day |
| Spring and neap | Twice a month |

Explain why spring and neap tides have different time intervals to high and low tides.

Include in your answer:

- why we experience high and low tides
- why we experience spring and neap tides
- why spring and neap tides only occur twice a month while high and low tides occur daily.

You may use a diagram to help your answer.



(c) The Moon's orbit is not circular, which means that it is sometimes closer to Earth and other times further away.



Adapted from: www.bbc.com/news/science-environment-62010265

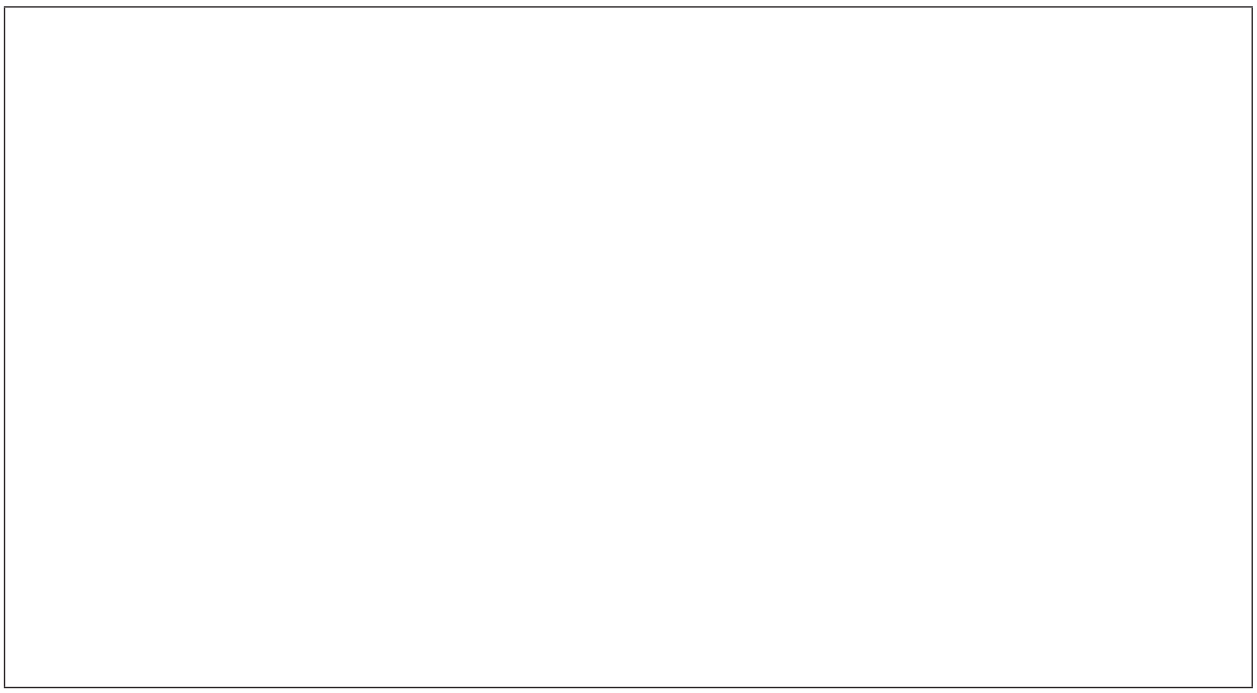
| Apogee dates | Full Moon |
|---|---|
| 10 March | 4 March |
| 7 April | 2 April |
| 4 May | 2 May |

` Explain how perigee and apogee can have an influence on the Earth's tides.

Include in your answer:

- why full moon at perigee results in a higher spring high tide (king tide)
- why full moon at apogee results in a lower spring high tide
- why these types of spring tides don't occur at regular time intervals
- an explanation of why apogee does not always coincide with the same phase of the Moon every month (refer to the table above).

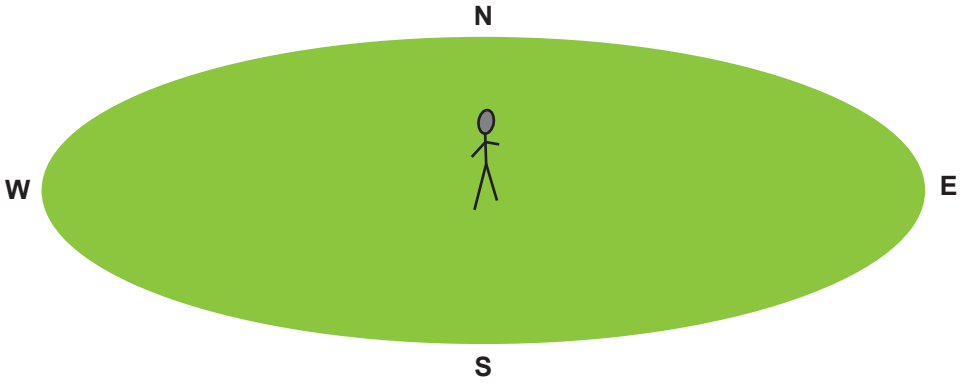
You may use a diagram to help your answer.



## QUESTION THREE: DAILY APPARENT MOTION

(a) The Sun does not rise exactly east and set exactly west every day of the year.

Show where the Sun would rise and set in June in New Zealand by marking it on the diagram below.




(b) Explain why different latitudes will see the Sun take different paths over the course of a day for the month of June.

Include in your answer:

- what causes the Sun to appear to rise and set in the sky each day
- a description of the apparent path of the Sun over the course of a day
- why an observer at the Equator would see the Sun appear to cross high in the sky at midday compared to an observer in Aotearoa New Zealand.

You may use a diagram to support your answer.

(c) The Moon's path in the sky is similar to that of the Sun. However, the Moon usually takes slightly longer to cross the sky, as seen in the table below

| **Date: 17th February 2026 (Christchurch, NZ near New Moon phase)** | | |
|---|---|---|
| | **Rises at:** | **Sets at:** |
| **Sun** | 6.51 a.m. | 8.34 p.m. |
| **Moon** | 6.01 a.m. | 8.29 p.m. |

Explain why the Moon would take longer to cross the sky compared to the Sun.

Include in your answer:

- how much longer it takes for the Moon to cross the sky compared to the Sun
- why the Moon appears to rise, cross the sky, and set
- a comparison of the timing of the Moon's movement to that of the Earth's rotation
- why the Moon doesn't have the same rising and setting times as the Sun, even though it is near the New Moon phase.

You may use a diagram to support your answer.

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

QUESTION NUMBER