Assessment schedule: practice paper 2026

AS 92046 Demonstrate understanding of the effect on the Earth of interactions between the Sun and the Earth-Moon system · Vertex Academy practice paper, not an NZQA paper

QUESTION ONE

Part	Evidence	Achievement (u)	Merit (r)	Excellence (t)
(a)	day length 8 h 56 min → 12 h 9 min → 15 h 26 min midday Sun 23.1° → 46.5° → 69.9° Earth spins once every 24 h 21 June winter solstice, 23 September spring equinox, 22 December summer solstice	Describes the day length AND the midday Sun height increasing from June to December. Describes day and night as Earth spinning on its axis once every 24 hours (facing towards or away from the Sun). Names the winter solstice, equinox and summer solstice correctly.		
(b)	orbit 365.25 days, axis tilted 23.4° in a fixed direction January: Southern Hemisphere tilted towards the Sun midday Sun 69.9° in summer, 23.1° in winter high Sun: radiation concentrated on a small area long days (15 h 26 min) heat the ground for longer July: tilted away, Sun low, radiation spread out, days under 9 h distance changes only about 3%, and Earth is closest during the northern winter Christchurch is warmer in January because of the tilt; the student is wrong	States Earth's 23.4° tilt and its 365-day orbit. Describes January as summer (warmer) and July as winter (colder). Describes the Sun as higher in the sky in summer and lower in winter.	Explains that the Southern Hemisphere is tilted towards the Sun in January and away in July. Explains that a higher Sun concentrates solar radiation on a smaller area, so each square metre receives more energy.	Discusses why Christchurch's average temperature changes through the year, linking the tilt to Sun height, the concentration of solar radiation AND day length, and uses the opposite seasons in the Northern Hemisphere (or the 3% distance change) to show the student is wrong.

(c)	midday Sun in the north from NZ 21 June: Kaitāia 31.5°, Christchurch 23.1° shadow = $\frac{1}{\tan(\text{Sun height})}$: 1.63 m and 2.34 m Christchurch is further from the Equator December: tilted towards the Sun, more of the southern circle lit June: tilted away, more of the southern circle dark equinox: no tilt towards the Sun, day-night line through both poles Latitude sets the Sun height and the size of the day-length change; the tilt sets which way it goes	Describes the midday shadow in Christchurch as longer than in Kaitāia, or both pointing south. Describes the Sun as lower in Christchurch. Describes the difference in day length between the two towns at a solstice. Defines an equinox as about 12 hours of day and night.	Explains that a lower Sun gives a longer shadow, linking it to Christchurch being further from the Equator. Explains how the tilt makes December days longer and June days shorter. Explains the equal day length at an equinox using the Sun being overhead at the Equator (no tilt towards or away).	Discusses why the day lengths differ between the towns at both solstices but not at the equinoxes, linking tilt AND latitude. Discusses the difference in shadow length (and direction) between the towns based on latitude and Sun height.

QUESTION TWO

Part	Evidence	Achievement (u)	Merit (r)	Excellence (t)
(a)	P: Moon between Earth and Sun Q: quarter orbit, at right angles R: Earth between Sun and Moon S: three quarters of an orbit solar eclipse at P (new moon); lunar eclipse at R (full moon)	Names at least three of the four phases correctly. States that a solar eclipse happens at new moon (P) and a lunar eclipse at full moon (R).		

(b)	Moon reflects sunlight; half is always lit 2 days after new moon, only a sliver of the lit half faces Earth near the Sun's direction facing north from NZ, lit side towards the set Sun first quarter ≈ 9 Nov + 7.4 days ≈ 17 Nov full moon ≈ 9 Nov + 14.8 days ≈ 24 Nov 360° ÷ 27.3 ≈ 13° a day The crescent grows to first quarter and full as more of the lit half faces Earth; moonrise is about 50 min later each day	States that the Moon is lit by the Sun (reflects sunlight). Describes the Moon's appearance changing from crescent to quarter to full. States the length of the Moon's cycle (29.5 days) or orbit (27.3 days).	Explains the crescent using the positions of the Sun, Earth and Moon (only a small part of the lit half faces Earth). Explains that the lit side faces the Sun (lower left, towards the western horizon; on the left from New Zealand when facing north). Explains the later moonrise using the Moon moving about 13° a day along its orbit.	Uses the movement of the Moon AND of Earth to discuss how the phases change over the two weeks, with dates estimated from the 29.5-day cycle, and links the observer's position in the Southern Hemisphere to how the crescent appears.
(c)	solar eclipse: Sun, Moon, Earth in a line lunar eclipse: Sun, Earth, Moon in a line Moon's orbit tilted 5° 16 May new moon, Moon 5° north of the Sun eclipse only when new or full moon is near a crossing point 17 Feb to 3 Mar = 14 days; 12 Aug to 28 Aug = 16 days 17 Feb to 12 Aug = 176 days Earth's big shadow: lunar eclipse seen by the whole night side; Moon's small umbra: total solar eclipse only on a narrow path	Describes a solar eclipse happening at new moon with the Moon between the Sun and Earth. Describes a lunar eclipse happening at full moon with Earth between the Sun and the Moon. Describes an observable effect (the Moon's small shadow on Earth, or the Moon turning red).	Explains how the 5° tilt of the Moon's orbit means most new and full moons do not give an eclipse. Explains how solar and lunar eclipses occur in terms of shadow and Moon phase. Explains why more people can see a lunar eclipse than a total solar eclipse.	Discusses why eclipses do not happen every month, linking the tilt to the timing of eclipse seasons (pairs about two weeks apart, seasons about six months apart). Discusses why a lunar eclipse is seen by the whole night side and lasts longer, while a total solar eclipse is seen only along a narrow path, using the sizes of the shadows.

QUESTION THREE

Part	Evidence	Achievement (u)	Merit (r)	Excellence (t)
(a)	Moon's gravity (and the Sun's) range = 3.2 − 0.6 = 2.6 m 8:55 am to 9:06 pm = 12 h 11 min 8:55 am to 9:36 am = 41 min Range 2.6 m; high tides 12 h 11 min apart; 41 min later the next day	States that the Moon's gravity (and the Sun's) causes the tides. Calculates the tidal range of 2.6 m. Calculates 12 h 11 min between high tides AND the 41 minute delay.		
(b)	Moon's pull: strongest on the near ocean, weakest on the far ocean near side: water pulled towards the Moon far side: Earth pulled away from the water in between: water drawn away Earth spins through 2 bulges and 2 lows Moon moves 360° ÷ 27.3 ≈ 13° a day cycle ≈ 24 h 50 min, so highs ≈ 12 h 25 min apart Two bulges give two high tides a day, coming about 50 min later each day; local conditions vary the exact times	Describes the Moon's gravity pulling the ocean towards it. Describes two high tides and two low tides a day. Describes high tides being about 12 hours apart, or about 50 minutes later each day.	Explains the near-side bulge using the Moon's pull being strongest there. Explains the far-side bulge. Explains the daily delay using the Moon moving along its orbit while Earth spins.	Discusses why each place has two high tides about 12 h 25 min apart, linking the two bulges to Earth's spin AND the Moon's orbital motion, and uses the Auckland data, including why the real times differ from the averages.
(c)	Sun makes smaller bulges, about half the Moon's new and full moon: Sun, Earth, Moon in a line first quarter: Moon at 90° to the Sun ranges 2.6 m (new), 1.7 m (first quarter), 3.2 m (full) spring and neap tides each about every 14 to 15 days full moon about 30 h before perigee (359 348 km) new moon about 4.5 days before apogee (405 619 km) Range changes with the Sun-Moon line-up; the 26 to 28 November springs were bigger because the Moon was near perigee	Describes spring tides as having a large range and neap tides a small range. Describes spring tides happening at new and full moon and neap tides at the quarters. Describes the Moon as closer at perigee.	Explains spring tides using the Sun, Earth and Moon being in a line so the Sun's effect adds to the Moon's. Explains neap tides using the Moon at right angles to the Sun so the effects partly cancel. Explains that a closer Moon gives larger tides.	Discusses why Auckland's range changes over the month, linking the positions of the Sun, Earth and Moon to the data and the 14 to 15 day timing. Discusses why the full-moon spring tides beat the new-moon ones, using the timing of perigee and apogee relative to the phases.

Judgement for each question

N0	N1	N2	A3	A4	M5	M6	E7	E8
No real answer.	One Achievement point.	Two Achievement points.	Three Achievement points.	Four Achievement points.	Two Merit points.	Three Merit points.	One Excellence point.	Two Excellence points.

Grade score out of 24 (each question's grade: N0 = 0 to E8 = 8): Not Achieved 0 to 7, Achieved 8 to 13, Merit 14 to 18, Excellence 19 to 24 (the 2025 exam's cut scores).