Level 1 Physics, Earth and Space Science: 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

Attempt ALL the questions. Show ALL working. Write your answers on lined paper, or in the space under each question.

QUESTION ONE

(a) Christchurch is at latitude 43.5°S. The table shows its sunrise and sunset times, day length and the height of the midday Sun above the horizon on three days in 2026.

(i) Use the table to describe how the day length and the height of the midday Sun change from June to December.

(ii) Describe why Christchurch has day and night.

(iii) Name the event that happens on each of the three dates.

Date	Sunrise	Sunset	Day length	Midday Sun height
21 June	8:03 am	4:59 pm	8 h 56 min	23.1°
23 September	6:17 am	6:26 pm	12 h 9 min	46.5°
22 December	5:44 am	9:10 pm	15 h 26 min	69.9°

(b) Christchurch's long-term average air temperature is 17.1 °C in January and 6.0 °C in July. A student says: "Christchurch is warmer in January because Earth is closer to the Sun then."

Explain why Christchurch is warmer in January than in July, and discuss whether the student is right.

Include in your answer:

• why Earth has seasons (include how long Earth takes to orbit the Sun and its axial tilt)

• how the height of the Sun changes the amount of solar radiation each square metre of ground receives

• how day length adds to the difference

• why Earth's distance from the Sun is not the cause.

You may use a diagram to support your answer.

	January	**July**
Average air temperature, Christchurch (NIWA)	17.1 °C	6.0 °C
Earth's distance from the Sun	147.1 million km (closest, 4 January)	152.1 million km (furthest, 7 July)
Midday Sun height, Christchurch (near the solstice)	69.9°	23.1°
Day length, Christchurch (near the solstice)	15 h 26 min	8 h 56 min

(c) Kaitāia is near the top of the North Island at latitude 35.1°S. Christchurch is at 43.5°S. A pole 1 m tall stands on flat ground in each town. The table shows day lengths and midday Sun heights at the two solstices.

Discuss why the two towns have different day lengths and midday shadows through the year.

Include in your answer:

• how the length and direction of the pole's midday shadow differ between the two towns on 21 June, with a reason

• why Christchurch has the longer day in December but the shorter day in June

• why both towns have about 12 hours of daylight at the equinoxes.

You may use a diagram to support your answer.

Town	21 June: day length	21 June: midday Sun	22 December: day length	22 December: midday Sun
Kaitāia (35.1°S)	9 h 47 min	31.5°	14 h 32 min	78.3°
Christchurch (43.5°S)	8 h 56 min	23.1°	15 h 26 min	69.9°

QUESTION TWO

(a) A diagram looks down on Earth from above the South Pole, with sunlight coming from the left. Sizes and distances are not to scale. The Moon is shown at four places on its orbit, which goes clockwise:

P: between Earth and the Sun.

Q: a quarter of an orbit after P, at right angles to the line from the Sun to Earth.

R: on the far side of Earth from the Sun.

S: three quarters of an orbit after P.

(i) Name the Moon phase seen from Earth when the Moon is at P, Q, R and S.

(ii) State which type of eclipse can happen when the Moon is at P, and which type can happen when it is at R.

(b) New moon was at 8:02 pm on 9 November 2026. Two evenings later, on 11 November, a student in Wellington sees a thin crescent Moon low in the western sky just after sunset.

Explain why the student sees a crescent, and how the Moon's shape will change over the next two weeks.

Include in your answer:

• why we can see the Moon at all

• why the Moon looks like a crescent on 11 November, and which side of it is lit as seen from Wellington

• how the shape changes over the next two weeks, with an estimate of the dates of first quarter and full moon

• why the Moon rises about 50 minutes later each day.

You may use a diagram to support your answer.

Moon fact	**Value**
New moon	9 November 2026, 8:02 pm
One orbit of Earth, measured against the stars	27.3 days
New moon to the next new moon	29.5 days

(c) The table shows the eclipses of 2026, and one new moon that had no eclipse. The Moon's orbit is tilted about 5° to the plane of Earth's orbit round the Sun.

Discuss why eclipses do not happen every month.

Include in your answer:

• where the Sun, Earth and Moon are in a solar eclipse and in a lunar eclipse, and the Moon phase for each

• why there is not a solar eclipse at every new moon and a lunar eclipse at every full moon

• why the 2026 eclipses came in two pairs, each pair about two weeks apart, with the pairs about six months apart

• why the whole night side of Earth could see the 3 March lunar eclipse, but the 12 August solar eclipse was total only along a narrow path.

You may use a diagram to support your answer.

Date (UT)	Event	Moon phase
17 February	Annular solar eclipse	New moon
3 March	Total lunar eclipse (seen from New Zealand)	Full moon
16 May	No eclipse: the Moon passed about 5° north of the Sun	New moon
12 August	Total solar eclipse (Greenland, Iceland, Spain)	New moon
28 August	Partial lunar eclipse	Full moon

QUESTION THREE

(a) The table shows LINZ tide predictions for Auckland (Waitematā Harbour) on 10 and 11 November 2026, in NZDT.

(i) Describe what causes the tides.

(ii) Calculate the tidal range on the morning of 10 November.

(iii) Calculate the time between the two high tides on 10 November, and how much later the morning high tide was on 11 November than on 10 November.

Date	Low	High	Low	High
10 November	2:30 am, 0.6 m	8:55 am, 3.2 m	2:48 pm, 0.8 m	9:06 pm, 3.1 m
11 November	3:09 am, 0.6 m	9:36 am, 3.2 m	3:28 pm, 0.8 m	9:48 pm, 3.0 m

(b) Explain why Auckland has two high tides and two low tides most days, and why the tides come later each day.

Include in your answer:

• why the Moon's gravity makes a bulge of water on the side of Earth facing the Moon AND on the opposite side

• how Earth's spin gives each place two high tides and two low tides

• why high tides are about 12 hours 25 minutes apart and come about 50 minutes later each day

• why the 10 and 11 November times in part (a) differ a little from these average values.

You may use a diagram to support your answer.

Date	Low	High	Low	High
10 November	2:30 am, 0.6 m	8:55 am, 3.2 m	2:48 pm, 0.8 m	9:06 pm, 3.1 m
11 November	3:09 am, 0.6 m	9:36 am, 3.2 m	3:28 pm, 0.8 m	9:48 pm, 3.0 m

(c) The table shows Auckland's tides at three times in November 2026, with the Moon's phase and its distance from Earth.

Discuss why Auckland's tidal range changed during November, and why the spring tides of 26 to 28 November were bigger than those of 9 to 11 November.

Include in your answer:

• where the Sun, Earth and Moon are at spring tides and at neap tides

• why the Sun's effect adds to or partly cancels the Moon's effect

• how often spring and neap tides happen

• how the Moon's distance from Earth affected the two sets of spring tides.

You may use a diagram to support your answer.

Days	Moon	Highest high	Lowest low	Range
9 to 11 Nov	New moon 9 Nov; furthest from Earth (apogee, 405 619 km) on 14 Nov	3.2 m	0.6 m	2.6 m
18 Nov	First quarter 18 Nov	2.8 m	1.1 m	1.7 m
26 to 28 Nov	Full moon 25 Nov; closest to Earth (perigee, 359 348 km) on 26 Nov	3.5 m	0.3 m	3.2 m

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