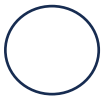
Assessment Schedule – 2025

Physics, Earth and Space Science: Demonstrate understanding of the effect on the Earth of interactions between the Sun and the Earth-Moon system (92046)

Evidence

Q	Evidence	Achievement	Achievement with Merit	Achievement with Excellence
ONE (a)	A – Summer B – Autumn C – Winter D – Spring	• Correct seasons.		
(b)	The Earth is on a tilt of 23.3°, which means it experiences uneven amounts of solar radiation. When the Southern Hemisphere is tilted towards the Sun, it receives more solar radiation and the season is summer. This means that Wellington has its warmer temperature, as January is in the summer. When the Southern Hemisphere is tilted away from the Sun, it receives less direct solar radiation, which means it is cooler and winter. This is why Wellington has its lowest temperature in July, as this is during winter. In between these times, the Southern Hemisphere is not tilted towards or away from the Sun, so it experiences a more even amount of solar radiation.	• States the tilt and orbit of the Earth. • Describes differences in solar radiation between seasons.	• Explains why the Southern Hemisphere experiences the seasons. • Explains the differences in solar radiation.	• Discusses why Wellington's average monthly temperature changes throughout the year, linking it to solar radiation.
(c)	The Earth spins once on its axis every 24 hours, and experiences daytime when it is facing the Sun and night-time when it is facing away from the Sun. Because the Earth is on a tilt, the height of the Sun changes in our sky throughout the year. During summer, the Earth is tilted towards the Sun, which means the Sun is higher in the sky and takes longer to set. This means that Wellington will have longer days in summer. Whereas in winter, as the Earth is tilted away from the Sun, it means that the Sun is lower in the sky, and doesn't spend as long in the sky. This results in shorter days in the winter.	• Describes which seasons belongs to which temperature. • Describes why we have day and night. • Describes the height of the Sun for summer and winter.	• Explains the differences in the height of the Sun. • Explains differences in daylength.	• Discusses why daylength changes throughout the year for Wellington. • Integrates two relationships and links to variation in parts (b) or (c).

NØ	N1	N2	A3	A4	M5	M6	E7	E8
No real answer	1A	2A	3A	4A	2M	3M	1E	2E

<table>
<tr><th>Q</th><th>Evidence</th><th>Achievement</th><th>Achievement with Merit</th><th>Achievement with Excellence</th></tr>
<tr><td>TWO
(a)</td><td>
<table>
<tr><td>Position</td><td>A</td><td>B</td><td>C</td><td>D</td><td>E</td></tr>
<tr><td>Moon phase</td><td>New Moon
Illuminated side of the Moon facing the Sun and the night side facing Earth.
  </td><td>Waxing Crescent Moon
Moon faces mostly away from Earth, with only a tiny portion visible to us.
  </td><td>1st Quarter Moon
The Moon is quarter of the way through its orbit and with only half of its side visible.
  </td><td>Full Moon
The Moon is fully visible and on the opposite side of the Earth to the Sun.
  </td><td>3rd Quarter Moon
Moon is back to a quarter of the way through its orbit and the other half of its side visible.
  </td></tr>
</table>
</td><td>• 4 out of 5 Moon phases correctly named.</td><td></td><td></td></tr>
<tr><td>(b)</td><td>The Moon is illuminated when sunlight is reflected off of its surface. One half of the Moon is always lit by the Sun, but this is not always visible to observers on Earth due to the Moon’s orbit around the Earth. When the Moon is positioned between the Sun and Earth, the shadowed side of the Moon faces Earth, and thus the Moon is not visible. As the Moon orbits, more and more of its sunlit side faces Earth. This makes the Moon appear to have different shapes whenever we are able to view it, and so we see it take a different phase each day, going through crescent, quarter, gibbous, and full moon phases. Observers in each hemisphere will see the same phase of the Moon as it orbits, but the phases will appear inverted, or upside down, between the two hemispheres. This is because observers in each hemisphere are orientated in different directions, causing the “top” of each Moon phase to be at the “bottom” for observers in the other hemisphere.</td><td>• Describes the position of Moon and Sun for new and full moon.
• States that the Moon is lit by the Sun.
• Describes changes in the Moon’s appearance.</td><td>• Explains the position of the Moon and Sun during the phases of the Moon.
• Explains the Moon phases using relative position of Earth, Moon, and the Sun.
• Explains any changes in the Moon’s appearance using a detailed description of its orbit.
• Explains the Moon’s apparent size by using its relative distance from Earth.
•</td><td>• Uses the Moon’s position and observers location to discuss how the Moon phases appear from different locations on Earth.
• Uses relative timing of the Moon’s position relative to the Earth, Sun, and perigee positions to discuss the occurrence of the super full moons.
• Uses the movement of the Earth AND movement of the Moon to discuss occurrence of the Moon phases / super full moons over days / months / calendar year.</td></tr>
<tr><td>(c)</td><td>The Moon’s orbit around the Earth brings it closer and farther from Earth over time, causing it to appear to change its size over the course of a month. At perigee position, the Moon is at its closest distance to Earth, and so the Moon appears largest every 27.5 days. The full moon occurs when Earth is positioned exactly between the Moon and Sun, and this occurs once a month, or every 29.5 days. This is because, as the Moon moves around the Earth, the Earth also moves around the Sun, and so it takes an additional two days for the Moon to move to a place where it is exactly opposite the Sun again. Since the perigee position does not move around the Earth at the same rate as the Moon phases, the Moon is unlikely to be both in the perigee position as well as in the full moon phase. Instead, the frequency may only occur a few times in a calendar year.</td><td>• Describes changes in the Moon’s orbit.
• Describes length of the Moon’s orbit.</td><td></td><td></td></tr>
</table>

NØ	N1	N2	A3	A4	M5	M6	E7	E8
No real answer	1A	2A	3A	4A	2M	3M	1E	2E

<table>
<tr><th>Q</th><th>Evidence</th><th>Achievement</th><th>Achievement with Merit</th><th>Achievement with Excellence</th></tr>
<tr><td>THREE
(a)</td><td><table><tr><td>A</td><td>Summer solstice</td></tr><tr><td>B</td><td>Equinox</td></tr><tr><td>C</td><td>Winter solstice</td></tr></table></td><td>• Table completed correctly.</td><td></td><td></td></tr>
<tr><td>(b)</td><td>An equinox is when New Zealand experiences similar daylengths due to the Sun being directly above the Equator. A winter solstice is when the Sun is at its lowest in the sky (shortest day) and a summer solstice is when the Sun is highest in the sky (longest day).
Throughout the year, the Sun rises in different locations on the horizon. When it is the equinox, the Sun rises (direct) east and sets (direct) west because the Earth is not tilted towards or away from the Sun. During a winter solstice, the Southern Hemisphere (New Zealand) is tilted away from the Sun, which makes its path lower in the sky. and it rises NE and sets NW. During a summer solstice, New Zealand is tilted towards the Sun, which causes it to have a higher path in the sky and rise SE and set SW.
Auckland is further north (closer to the Equator) than Invercargill, which means that during a winter solstice, it will experience a longer day, as the Sun will stay longer in the sky. However, during a summer solstice, Invercargill will experience a longer day because it is further south (closer to the poles) than Auckland, so the Sun will stay longer in the sky. During an equinox, both locations will experience similar daylength as the Sun is directly above the Equator.</td><td>• Defines equinox OR solstice.
• Describes the changing location of the Sun rising and setting throughout the year.
• Describes differences in daylength between Auckland and Invercargill.
• Describes the angle of the Sun at two locations.
• Describes why differences in the Sun angle occur.
• Describes shadow differences at two locations.</td><td>• Explains the changing location of sunrise and sunset throughout the year.
• Explains how the tilt of the Earth affects the height of the Sun throughout the year.
• Explains shadow at one location.
• Explains the differences in Sun angle between two locations.</td><td>• Discusses why the daylength is different for Auckland and Invercargill.
• Discusses why the angle of the Sun is different between two locations based on latitude.
• Discusses the differences in shadow length between two locations based on latitude.</td></tr>
<tr><td>(c)</td><td>The Sun is highest at the Equator because it is on a more direct angle, which means it receives more direct solar radiation. As you move away from the Equator and closer to the poles, the latitude increases, and this affects the angle of the Sun. Dunedin is the furthest south out of the two locations, so therefore it has the lowest angle of the Sun. The shadow lengths would also change with latitude. At the Equator when the Sun is 90°, there would be no shadow because it is directly overhead. Because Dunedin is furthest south (closest to the poles), it has the longest shadows because its Sun has the lowest direct Sun angle.</td><td>• Describes the angle of the Sun OR differences in the angle at two locations.
• Describes shadow differences at two locations.</td><td></td><td></td></tr>
</table>

NØ	N1	N2	A3	A4	M5	M6	E7	E8
No real answer	1A	2A	3A	4A	2M	3M	1E	2E

Cut Scores

Not Achieved	Achievement	Achievement with Merit	Achievement with Excellence
0 – 7	8 – 13	14 – 18	19 – 24