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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.

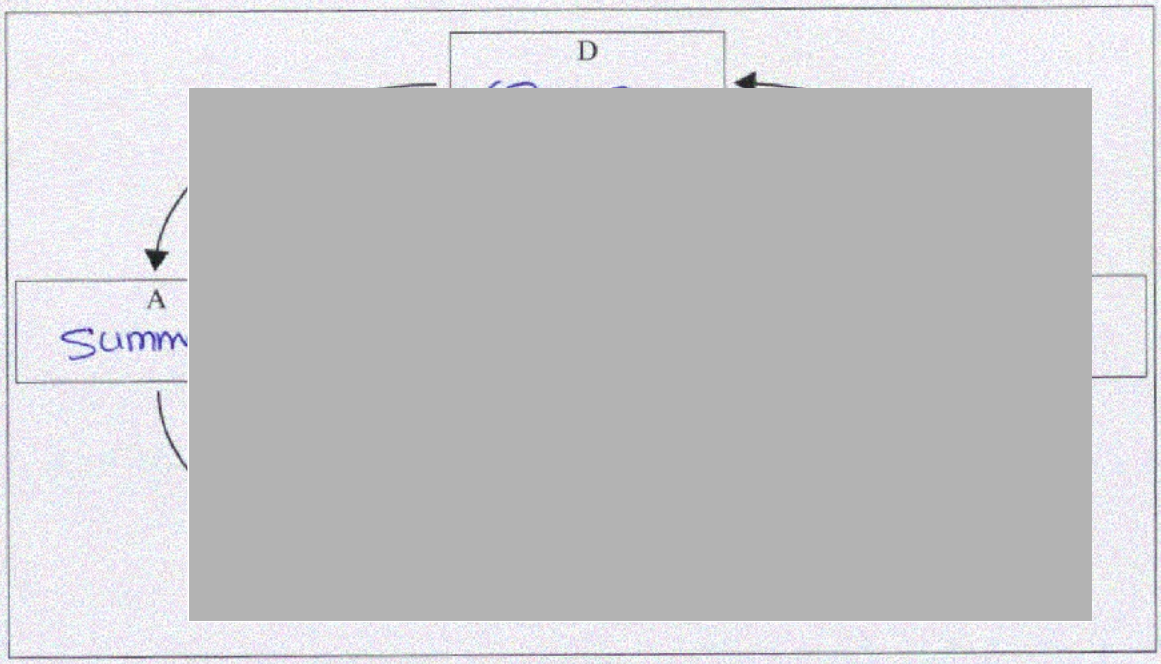
Do not write in the margins (▯). This area will be cut off when the booklet is marked.

YOU MUST HAND THIS BOOKLET TO THE SUPERVISOR AT THE END OF THE EXAMINATION.

Achievement TOTAL 10

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.

Seasons are caused due to the earths spinning on its axis, at 23.5°. Due to the tilt of the earth and its constant orbit around the sun it causes seasons. When it is summer in the northern hemisphere the southern hemisphere is faced away from the sun, experiencing winter. when ~~the~~ experiencing summer the temperature increases, while in winter it decreases. this is due to the angle that the sun hits earth during winter, meaning the amount of solar radition is dispersed over a larger area, while in summer it is more concentrated in a smaller area causing temperature rise. It takes earth 365 days to complete a orbital rotation, experiencing one summer, Autumn, winter, and spring each year. During spring and Autumn the temperature stays relatively similar as the suns placement in the sky is equal.

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

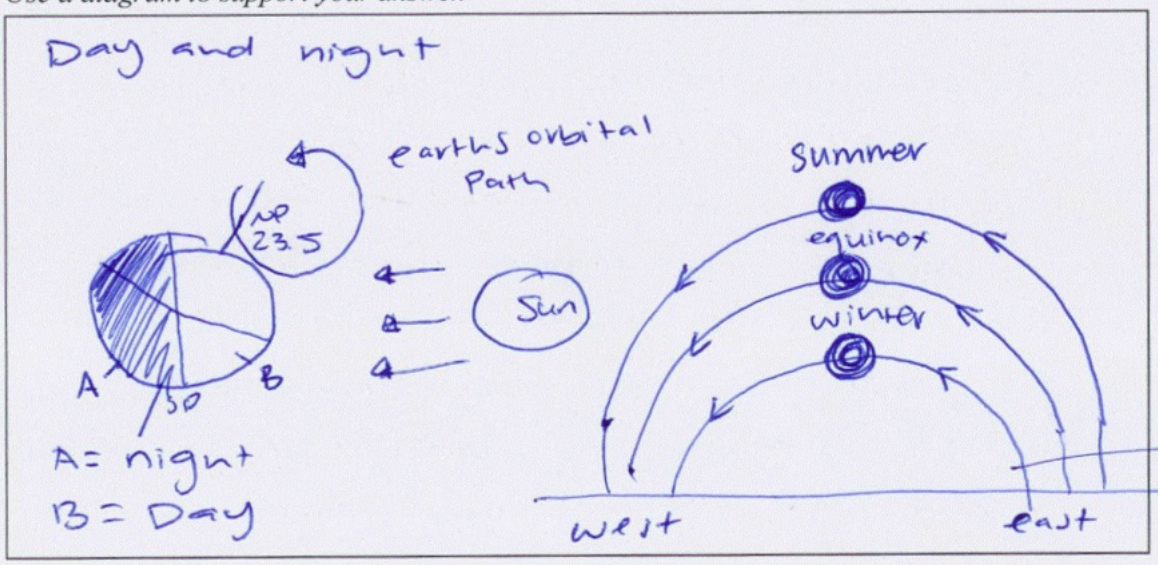
	Summer day	Winter day
Time of sunrise	6:01 a.m.	7:45 a.m.
Time of sunset	8:55 p.m.	5:05 p.m.

Using the data above, discuss why this happens.

Include in your answer:

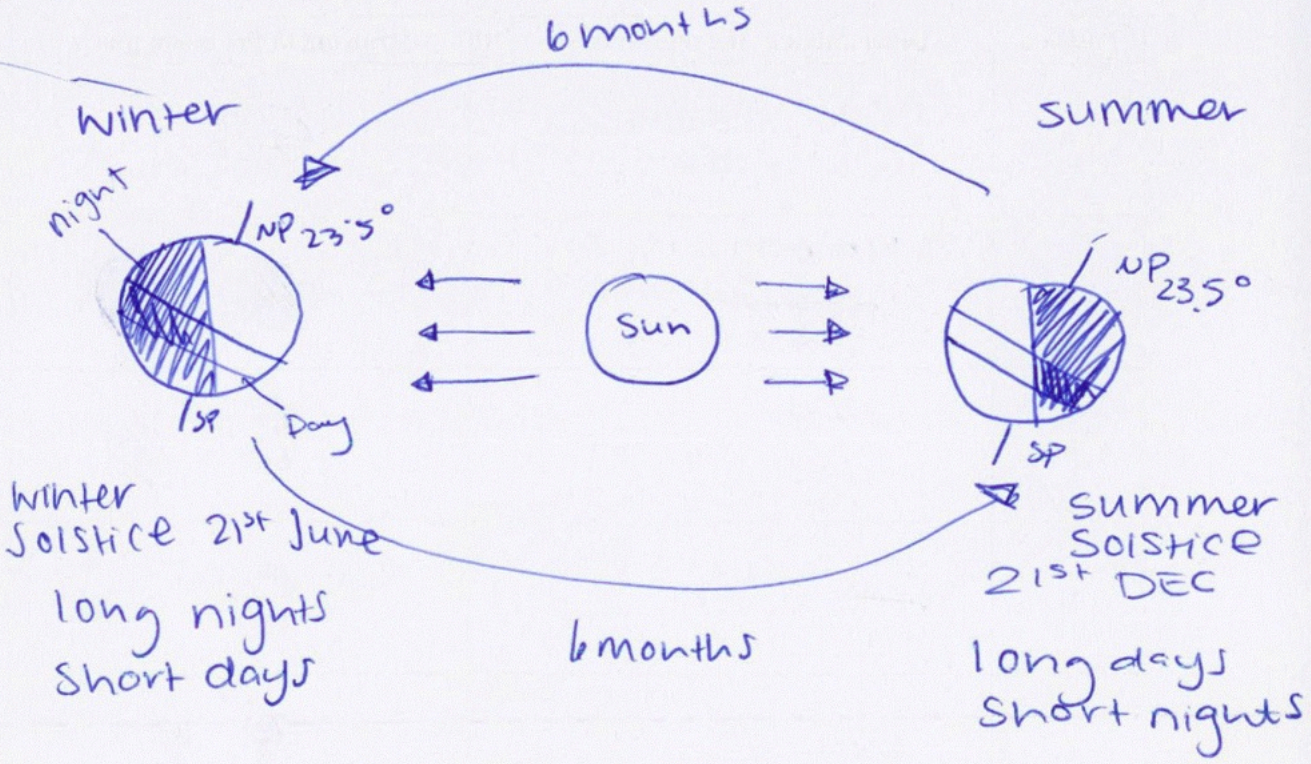
- why the Earth experiences day and night
- how the height of the Sun changes throughout the year
- why the daylength changes throughout the year.

Use a diagram to support your answer.



The earth experiences day and night due to earths spin on its axis. As Earth orbits around the ~~earth~~ sun it is constantly spinning which causes the sun to appear to be moving through the sky. The tilt of the earths axis causes different areas to recieve more sunlight. In summer the sun appears to be higher in the sky, rising in the east and setting in the west. Due to the sun being

higher in the sky it means it takes longer for it to set creating longer days, while in comparison, during winter the sun is lower in the sky making its path shorter. This leads to winter experiencing shorter amount of daylight hours.

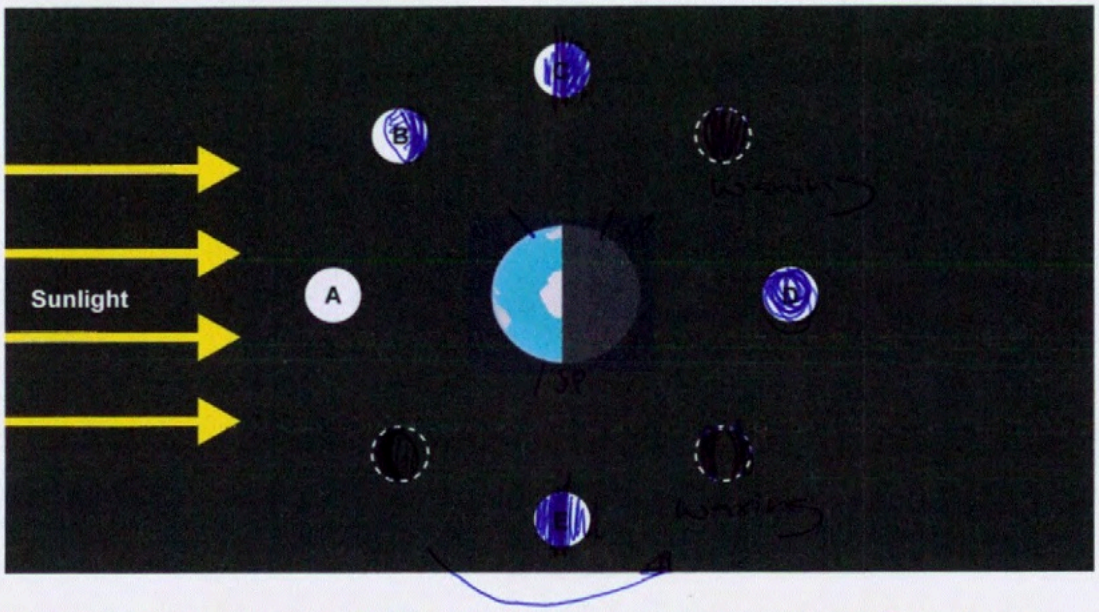


QUESTION TWO: MOON PHASES

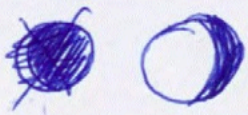
The Moon changes its appearance over time, going from new moon to new moon about once every month.

(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	~~new moon~~ full moon	
B	Waning ~~Crescent~~ gibbous	
C	~~First~~ ~~third~~ first quater	
D	~~Full~~ moon New	
E	~~first~~ 3rd quater	

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

Include in your answer:

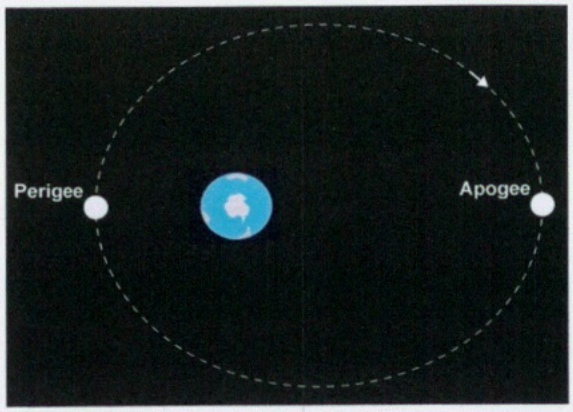
- why we see the Moon
- why the Moon appears to have different shapes over time, as seen from Earth
- how the Moon appears in the Southern Hemisphere as compared to the Northern Hemisphere.

You may use a diagram to support your answer.

the moon does not create its own light, it reflects light from the sun. when the moon is in the suns direct sunlight we are seeing a full moon as the whole moon is lit up, ~~when~~ as we experience a full moon every 29.5 days and takes the moon around 27.5 days to complete a full ~~rotation of the earth~~ perigee. When the earth is in between the sun and moon it causes less ~~sun~~ light to be able to hit it, making the moon appear dark, also known as a new moon. The moon appears to have different shapes depending on the placement of the moon on its orbit, and the angle and amount of sunlight

Extra space at back

(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.

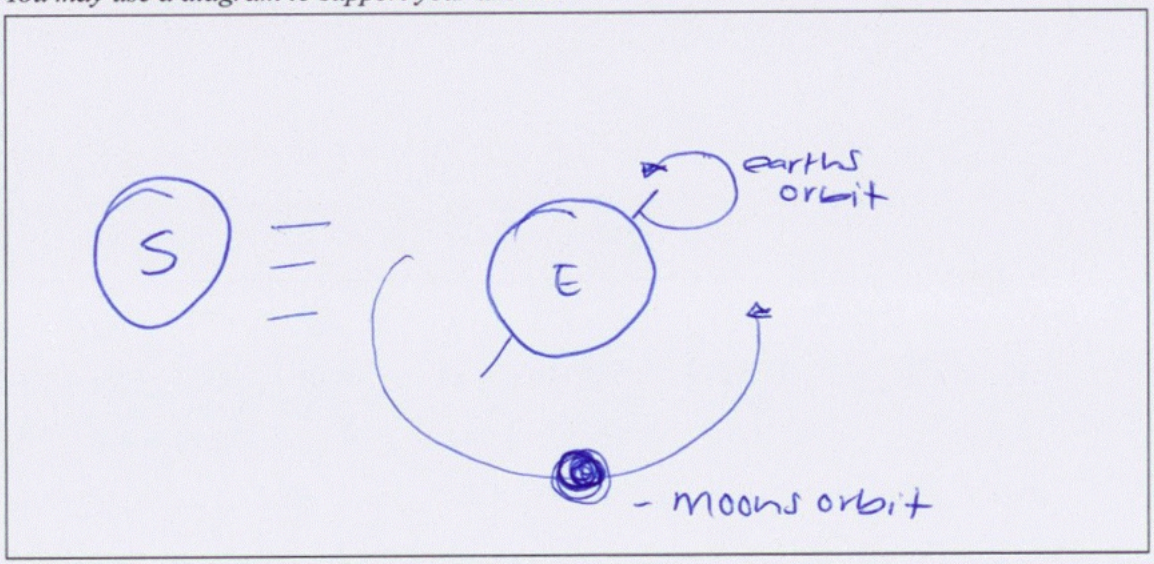


Explain why a super full moon is not observed every month.

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.

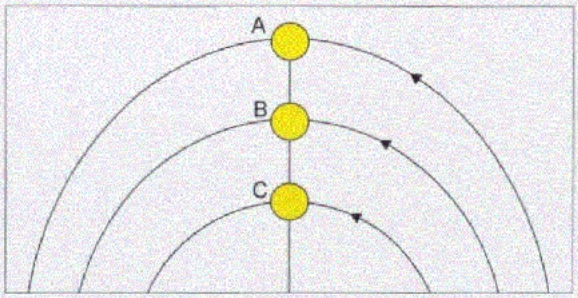


A full moon is caused by the light from the sun reflecting onto the moon, this occurs every 29.5 or so days. The moon appears to vary in size, although it is not physically changing it appears to. Depending on the placement of the moon during its rotation it will recieve different amounts of light. Depending on how direct the moon is in the suns path it will reflect some areas of the moon while

others remain in the dark, facing away from the sun. This causes the illusion of the moon taking different shapes. A super full moon may only occur 1-3 times a year due to earths tilt, the tilt of the earth causes it to turn on an angle, while the moons orbits the earth directly around it some areas are being avoided. Because it isn't just spinning in a direct circle the sun, moon and earth rarely allign directly as the earths tilt causes it to miss it.

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	Summer Solstice	21st DEC
B	equinox	
C	winter solstice	21st June

(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

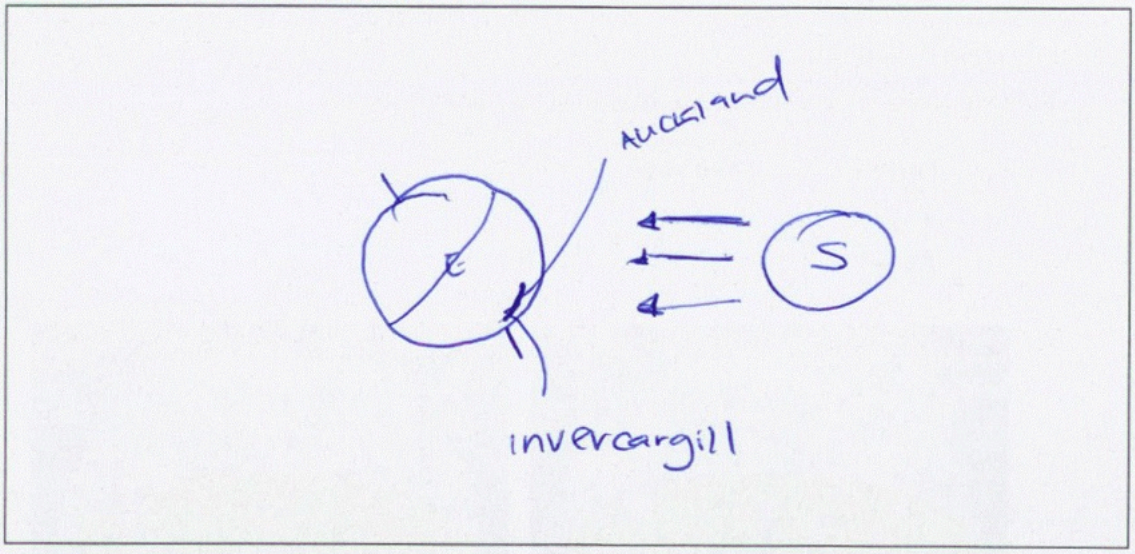
Adapted fom: https://c8.alamy.com/comp/P9BFC7/path-of-the-sun-throughout-the-year-in-the-northern-hemisphere-P9BFC7.jpg

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.

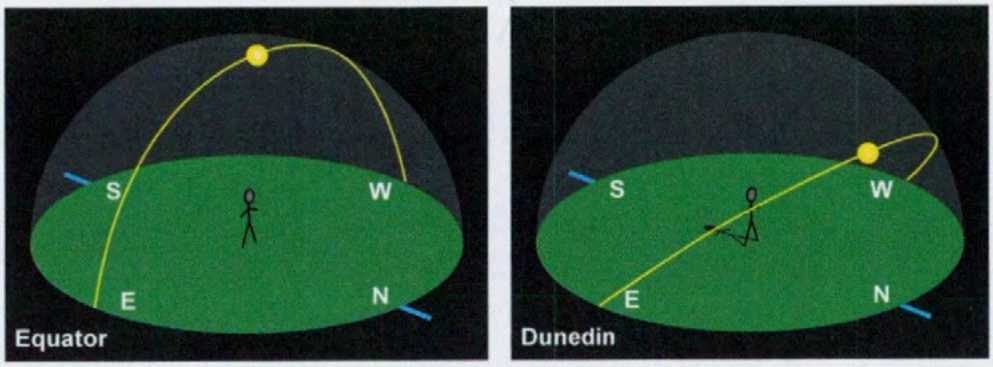


invercargill and Auckland experience differences in day lengths due to where they are located. Auckland is higher meaning it is closer to the ~~earth~~ equator, the sun is then hitting auckland more directly. Summer solstice is when the sun is ~~when the~~ in the sky for the longest, meaning it has the longest daylight hours and shortest night hours, occuring on December 21st. Winter solstice is the shortest daylight hours and longest night hours due to the sun being low in the sky, occuring on June 21st. An equinox, occuring during spring and Autumn is when there is an even amount of daylight hours as there are nighttime hours. invercargill being located further from the equator causes it to recieve less direct sunlight, resulting in shorter days compared to Auckland.

(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.

The angle of the sun at noon at the equator is directly overhead while in dunedin it is at more of an angle. This is caused by the equator being close to the sun, the sun hits it overhead and direct while Dunedin is further down, recieving sun light at a more significant angle. When the sun is directly above you shadows tend to be less visible and short, whereas when the sun hits you from an angle it creates a longer

Shadow.

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

QUESTION NUMBER

Question 2: Moon phases ; Part (B)
that is hitting the moon.
~~The~~

Achievement

Subject: L1 Physics, Earth and Space Science

Standard: 92046

Total score: 10

Q	Grade score	Marker commentary
One	4	Candidate has described that summer is hotter than winter as well as the changing height of the Sun between these two seasons. Furthermore, they have described why the Earth experiences day and night. However, they did not explain why the Southern Hemisphere experiences four seasons.
Two	3	Candidate has described that the changes and length of the Moon's orbit. Furthermore, they have described how we can see the Moon. They have not explained any of the concepts listed above.
Three	3	Candidate has defined equinox and solstices as well as how the angle of Sun is different between the Equator and Dunedin. However, they did not explain why the shadow lengths are different between the two locations.