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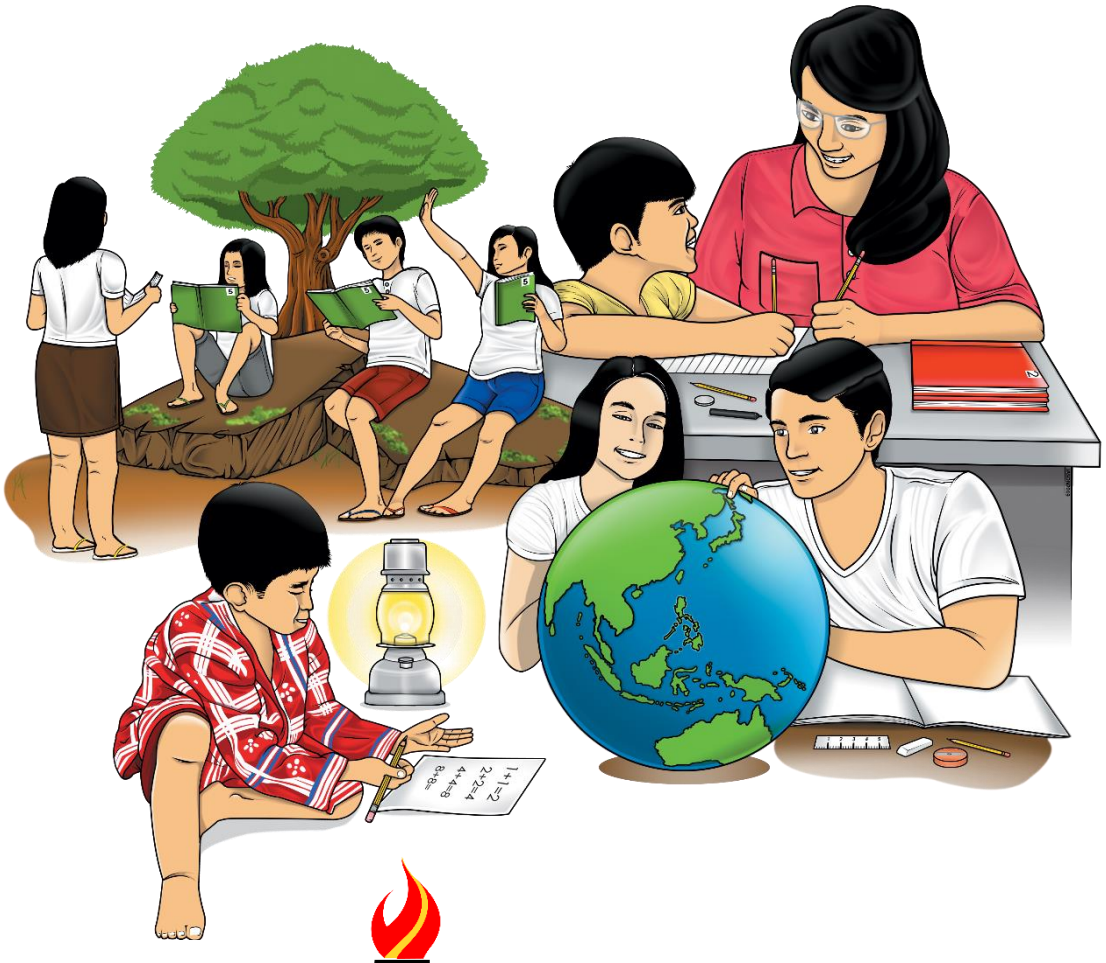
Science

Quarter 4 – Module 5:
Behind the Length of Daytime is the Tilt of the Earth's Axis



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Science

Quarter 4 – Module 5:
Behind the Length of Daytime is the Tilt of the Earth's Axis

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Introductory Message

This Self-Learning Module (SLM) is prepared so that you, our dear learners, can continue your studies and learn while at home. Activities, questions, directions, exercises, and discussions are carefully stated for you to understand each lesson.

Each SLM is composed of different parts. Each part shall guide you step-by-step as you discover and understand the lesson prepared for you.

Pre-tests are provided to measure your prior knowledge on lessons in each SLM. This will tell you if you need to proceed on completing this module or if you need to ask your facilitator or your teacher's assistance for better understanding of the lesson. At the end of each module, you need to answer the post-test to self-check your learning. Answer keys are provided for each activity and test. We trust that you will be honest in using these.

In addition to the material in the main text, Notes to the Teacher are also provided to our facilitators and parents for strategies and reminders on how they can best help you on your home-based learning.

Please use this module with care. Do not put unnecessary marks on any part of this SLM. Use a separate sheet of paper in answering the exercises and tests. And read the instructions carefully before performing each task.

If you have any questions in using this SLM or any difficulty in answering the tasks in this module, do not hesitate to consult your teacher or facilitator.

Thank you.

What I Need to Know

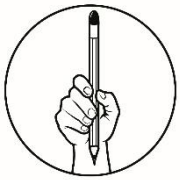
Hello! How are you? Do you know why the length of daytime varies from place to place and varies from day to day? Data show that other countries experience longer days while some have shorter length of daytime. What might have caused this phenomenon? What do you think determines the length of daytime? In order to explain this phenomenon on Earth, it is important to understand the concept about the tilt of the Earth's axis.

Most Essential Learning Competency:

Using Models, relate the tilt of the Earth's axis to the length of daytime. **(S7ES-IVh-9)**

After going through this module, you are expected to:

1. explain how the tilt of the Earth's axis affects the length of daytime;
2. draw a visual representation to describe the effect of tilt of the Earth's axis to the length of daytime; and
3. relate the importance of the tilt of the Earth's axis to real life situations.



What I Know

Directions: Read and understand the questions carefully. Choose and write your answer on a separate sheet of paper.

1. The following are true about the Earth, **EXCEPT**
   A. Its axis is tilted.
   B. It rotates on its orbit.
   C. It has a thriving atmosphere.
   D. It is the third planet from the sun.

2. Which of the following statements correctly describes the Earth's axis?

I. The axis is vertically oriented II. The axis is tilted by 23.5 degrees. III. The axis is not perpendicular. IV. The axis is imaginary.

   A. I,II,III only
   B. I,III,IV only
   C. II,III,IV only
   D. I,II,III,IV

3. Which of these changes would likely occur if the rate of Earth's rotation on its axis increased?
   A. The length of the seasons would be shorter.
   B. The length of the seasons would be longer.
   C. The length of a day would be shorter.
   D. The length of a day would be longer.

4. How many degrees is the Earth's axis tilted?
   A. 0
   B. 20
   C. 23.5
   D. 90

5. Why does length of daytime vary from place to place?
   A. Because Earth rotates on its axis
   B. Because Earth revolves around the sun.
   C. Because Earth's axis is perpendicular.
   D. Because Earth's axis is tilted by 23.5 degrees.

6.A student draws the model shown.
Which of these best compares the conditions at Location X and Location Y?

Illustrated by: Lessig, L. (Source: www.creativecommons.org.com)

   A. It is day at Location X and night at Location Y.
   B. It is winter at Location X and summer at Location Y.
   C. There are more hours of daylight at Location X than at Location Y.
   D. There are more hours of daylight at Location Y than at Location X.

7. What causes nighttime and daytime on Earth?

   A. Sun rotating on its axis
   B. Earth rotating on its axis
   C. Earth revolving around the Sun
   D. Moon revolving around Earth

8. How does the tilt of the Earth 's axis affect the number of hours of sunlight that are hitting the Earth?

   A. Sunlight hours are not affected by the tilt of the Earth
   B. Sunlight hours are greater when Earth is tilted toward the Sun.
   C. Sunlight hours are greater when Earth is tilted away from the Sun.
   D. Sunlight hours are greater when Earth is neither tilted away nor toward the Sun

9. How does the tilt of the Earth look as it rotates around the Sun?

   A. The tilt has always the same angle
   B. The tilt is the same in spring/fall and different in summer/winter.
   C. The tilt is variable and changes seasonally.
   D. The tilt is always toward the Sun.

10. Which of the following is **TRUE** about direct rays?
   A. These rays of the Sun hit the ground at 0°.
   B. These rays of the Sun hit the ground at 90°.
   C. These rays of the Sun hit the ground at 23.5°.
   D. These rays of the Sun hit the ground indirectly.

11. When the North Pole is tilted toward the Sun, will the daytime be longer than night time in the Northern Hemisphere?
    A. Yes, because it receives direct rays.
    B. Yes, because it receives diagonal rays.
    C. No, because it receives heat around the sun.
    D. No, because it receives oblique rays from the sun.

12. Why is it warmest at the equator?
    A. It is closest to the sun.
    B. It receives direct sunlight.
    C. It has no cloud formations.
    D. It has little precipitation and rain.

13. These are examples of sunrays, **EXCEPT**
    A. Direct rays
    B. Indirect rays
    C. Oblique rays
    D. Mechanical rays

14. Which of the following statements correctly describe sunrays?

I. Sunrays do not affect length of daytime. II. Sunrays are direct and indirect. III. Direct rays hit Earth at a perpendicular angle. IV. Indirect rays contribute to colder days.

    A. I,II,IV only
    B. I,II,III only
    C. II,III,IV only
    D. I,II,III,IV

15. Axis is to rotation, as orbit is to _____.
    A. eclipse
    B. revolution
    C. season
    D. precession

Lesson 1 How the Tilt of the Earth's Axis Affects the Length of Daytime

What's In

There you go! In our previous lesson, we knew the common atmospheric phenomena. These occur in the atmosphere due to the unequal heating of the sun to the Earth. Breezes, monsoons and ITCZ are examples of these common atmospheric phenomena. Aside from these occurrences brought about by this unequal heating, there is another phenomenon that is due to the unequal heating and the tilt of the Earth's axis. This module will help in understanding how the tilt of the earth's axis affects occurrences on Earth like for instance the length of daytime. Shall we now find out?

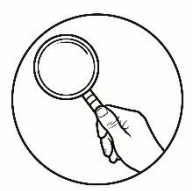
What's New

Hello there! I need your help. I want to find out if the tilt of the Earth's axis and length of daytime are related. Can you help me? Let us read, understand and perform the activity below to answer this. Are you ready? Let's start!

Word Hunt

Directions: Find the seven (7) words that are related to the lesson that are hidden in the grid. Give definition for each word found. The words may be in horizontal, vertical or diagonal in direction. Copy and write your answer on a separate sheet of paper.

L	E	N	G	T	H	F	T	I	M	E	E	M	A
I	T	O	A	D	F	R	N	I	L	R	C	A	X
P	E	R	P	E	N	D	I	C	U	L	A	R	I
H	D	P	D	A	S	Q	O	I	O	Q	A	O	S
E	A	R	A	R	P	T	E	L	E	N	G	T	G
S	Y	E	Y	T	E	I	S	A	O	S	T	R	H
P	T	R	T	H	E	L	S	Y	S	T	E	M	M
E	I	E	I	C	D	T	E	E	C	E	I	S	Y
E	M	B	M	O	B	Y	R	B	R	O	T	I	A
D	E	W	E	V	E	L	E	G	G	T	H	N	E
O	A	I	K	O	O	E	E	I	O	T	I	C	R
A	M	P	L	I	T	D	D	E	O	R	B	I	T



What is It

You know that there are 24 hours in a day. You probably think that daytime and nighttime are always equal, however that is not the case. When the North Pole is tilted towards the Sun, the length of daytime will be longer than nighttime in the Northern Hemisphere. When that happens, the ground gets to absorb more energy from the sun. The Northern Hemisphere steadily warms up and the result is summer.

At the same time, the opposite is happening in the Southern Hemisphere. The length of daytime is shorter than nighttime thus the Southern Hemisphere experiences winter. But when the Earth has moved farther along its orbit, the North Pole will then be tilted away from the Sun. Nighttime will then be longer than daytime in the Northern Hemisphere. There would be a shorter time for the ground to heat up and longer time for it to cool down. The result is winter in the Northern Hemisphere.

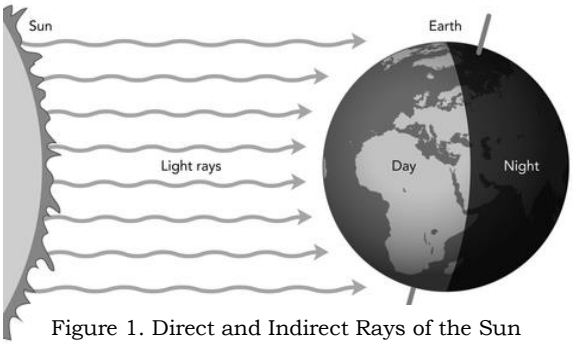
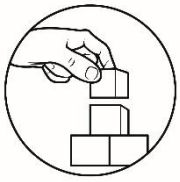


Figure 1. Direct and Indirect Rays of the Sun
(Source: Pushkin, A.www.publicdomain.com)

Because the Sun is so big compared to the Earth, only the rays that come straight at Earth will hit it. The light rays that are hitting the earth at 90 degrees are known as **direct rays**. Because the Earth is curved, not all rays hit it directly. Light rays that hit the earth at an angle are known as **indirect rays**. Areas of the Earth that are hit by direct rays are warmer than areas that are hit by indirect rays. The equator is always hit by direct rays of the sun. This is why it is always warm there. The poles are always being hit by indirect rays. That is why it is cold there.



What's More

Activity Does the tilt of the Earth's axis affect the length of daytime?

Objectives

After performing this activity, you should be able to:

1. interpret data about sunrise and sunset to tell when daytime is long and when daytime is short, and
2. relate the effect of the tilt of the Earth's axis on the length of daytime.

What to use

Table 1

What to do

The table shows the time of sunrise and sunset on a selected day of each month of the year 2011. Analyze the table carefully then answer the questions below. Write your answers on a separate sheet of paper.

DAY	SUNRISE	SUNSET	LENGTH OF DAYTIME
January 22, 2011	6:25 AM	5:50 PM	11 Hr. 25 Min
February 22, 2011	6:17 AM	6:02 PM	11 Hr. 45 Min
March 22, 2011	5:59 AM	6:07 PM	12 Hr. 08 Min
April 22, 2011	5:38 AM	6:11 PM	12 Hr. 33 Min
May 22, 2011	5:27 AM	6:19 PM	12 Hr. 52 Min
June 22, 2011	5:28 AM	6:28 PM	13 Hr. 00 Min
July 22, 2011	5:36 AM	6:28 PM	12 Hr. 52 Min
August 22, 2011	5:43 AM	6:15 PM	12 Hr. 32 Min
September 22, 2011	5:45 AM	5:53 PM	12 Hr. 08 Min
October 22, 2011	5:49 AM	5:33 PM	11 Hr. 44 Min
November 22, 2011	6:00 AM	5:24 PM	11 Hr. 24 Min
December 22, 2011	6:16 AM	5:32 PM	11 Hr. 16 Min

Table 1: Sunrise and Sunset in Manila on Selected Days of 2011

Q1. Compare the time of all sunrise from January, 2011 to December, 2011. What do you observe?
Q2. Compare the times of all sunsets during the same period. What do you observe?
Q3. Compare the time of sunrise on June 22, 2011 with that on December 22, 2011. On which day did the Sun rise earlier?
Q4. Compare the time of sunset on June 22, 2011 with that on December 22, 2011. On which day did the Sun set later?
Q5. When was the length of daytime the longest?
Q6. When was the length of daytime the shortest?

What I Have Learned

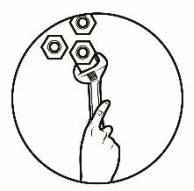
Directions: Read the paragraph carefully and identify the correct word(s) that fit in the given sentences in the box below. Write your answers on a separate sheet of paper.

orbit	23.5 degrees	length of daytime
longer	revolution	South
rotation	North	toward
axis	day and night	shorter
month and year	season	
45 degrees	away from	

Earth rotates on its 1) _____. Earth's axis is tilted 2.)_____. Because of this tilt and Earth's 3.) _____ around the Sun, there is a time when Earth's poles, namely 4.)_____ and 5.) _____ are facing toward or away from the Sun.

Earth's rotation causes 6.) _____. Daytime for any given location on Earth occurs when it is facing 7.) _____ the Sun. Night time occurs as that location on Earth is facing 8.) _____ the Sun.

Everyday, the 9.) _____ in the part of the Earth where you live changes. When North pole is facing toward the sun, days are 10.) _____ in the summer and 11.) _____ in the winter.



What I Can Do

Directions: Illustrate and explain how the tilt of the Earth's axis leads to varying length of day and night. Write your answer on a separate sheet of paper.

Longer day and shorter night	Shorter day and longer night

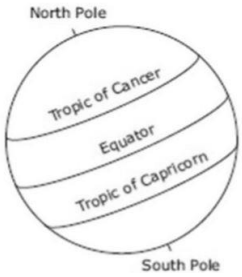
Product Rubric

Criteria	10 pts.	7 pts.	5 pts.
A. Drawing Technique and Understanding of Concepts	Drawing shows good technique and understanding of concept is clear.	Drawing shows some technique and understanding of concept is not so clear.	Drawing lacks technique and understanding of concept is vague.
B. Craftsmanship	Drawing is neat and shows very little evidence of marks, rips, tears, or folds. A few erasure lines showing.	Drawing is somewhat messy and shows marks rips, tears, or folds. Some erasure lines showing.	Drawing is messy and shows marks rips, tears, or folds. Many erasure lines showing.
C. Originality	Art work reflects originality.	Art work shows some evidence of originality.	Art work shows little or no evidence of original thought.
Total Score			

Assessment

Directions: Read and understand carefully. Choose the correct answer. Write your answer on a separate sheet of paper.

1. Which of these locations on Earth experiences the least change in the number of daylight hours throughout the year?



Illustrated by: Lessig, L. (Source: www.creativecommons.org.com)

A. Equator
B. North Pole
C. Tropic of Cancer
D. Tropic of Capricorn

2. The following are true about the Earth's axis, **EXCEPT**
   A. Its axis is not tilted.
   B. Its axis is imaginary.
   C. Its axis is perpendicular.
   D. Its axis is tilted by 23.5 degrees.

3. A student wants to use a spinning basketball to model the day-and-night cycle on Earth. What should the student do in order to best model the cause of the day- and-night cycle?

Illustrated by: Braxmeier, H. (Source: www.pixabayclipart.com)

A. Spin the ball in different directions
B. Tilt the ball while it is spinning
C. Paint one half of the ball black and the other half white
D. Shine a bright light on one side of the ball

4. What is the tilt in degrees of the Earth's axis?
   A. 12.5
   B. 23.5
   C. 25.3
   D. 90

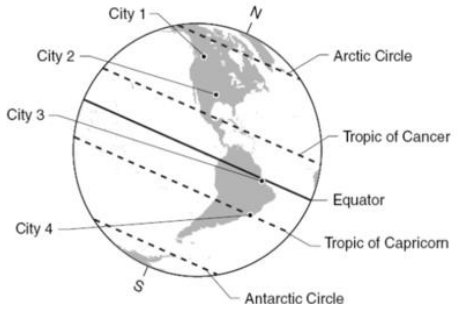
5. Why does length of daytime vary from month to month?
   A. Earth is nearest to the sun.
   B. Earth revolves around the sun.
   C. Earth's axis is very perpendicular.
   D. Earth's axis is tilted by 23.5 degrees.

6. Is the axis of the Earth **NOT** perpendicular to the plane of its orbit?
   A. Yes, because its orbit is tilted.
   B. Yes, because its axis is not tilted.
   C. No, because its axis is tilted by 23.5.
   D. No, because its axis and orbit are tilted.

7. What causes there to be longer number of hours of light during the summer

   A. Earth is tilted away from the sun in summer
   B. Earth revolves slower in summer
   C. Earth is tilted toward the sun in summer
   D. Earth is closer to the sunin summer

8. Which of the following best explains why City 3 experiences the smallest change Inday length between summer and winter out of the four cities shown in the diagram below?



Illustrated by: Vedran, B. (Source: www.free.svg.org.com)

   A. City 3 is in the Southern Hemisphere.
   B. City 3 is farthest from the equator.
   C. City 3 is located close to the equator.
   D. City 3 receives indirect rays from the sun.

9. Which of the following statements correctly describes the direct rays of the sun?

I. Direct rays hit the ground in a straight line. II. Direct rays hit the ground at 90°. III. Direct rays are parallel to the ground. IV. Direct rays hit the ground indirectly.

   A. I & II only
   B. I, II, III only
   C. II, III, IV only
   D. I, II, III, IV

10. The following are true about the rays of the sun, **EXCEPT**
   A. Sunrays are direct and indirect.
   B. Indirect rays are diagonal and oblique rays.
   C. Direct rays hit the ground at 90 degrees.
   D. Diagonal and oblique rays hit the ground directly.

11. Are the lengths of days and nights equal?
    A. Yes, days and nights happen in one day.
    B. Yes, days and nights occur in a similar way.
    C. No, days and nights change from month to month.
    D. No, days and nights change from day to day within a year.

12. Is it warmest at the equator?
    A. Yes, because it is closest to the sun.
    B. Yes, because it receives direct sunlight.
    C. No, because it has no cloud formations.
    D. No, because it has little precipitation and rain.

13. What is the result of the Earth's rotation?

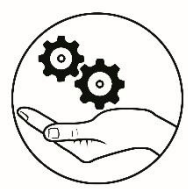
    A. Seasons
    B. Eclipses
    C. Moon Phases
    D. Day and Night

14. Which of the following statements correctly describes sunrays?

I. Sunrays do not affect length of daytime. II. Sunrays are direct and indirect. III. Direct rays hit Earth at perpendicular angle. IV. Indirect rays contribute to colder days.

    A. I,II,III only
    B. I,II,IV only
    C. II,III,IV only
    D. I,II,III,IV

15. What causes variations in the length of daytime?
    A. Tilt of the Earth's axis
    B. Tilt of the Earth's orbit
    C. Revolution around the sun
    D. Rotation around the planet



Additional Activities

Directions: The table shows the average sunrise and sunset time. Analyze the table carefully then answer the questions below. Write your answer on a separate sheet of paper.

	A	B	C
1	**Average Sunrise and sunset time**		
2			
3	**MONTH**	**Sunrise Time**	**Sunset Time**
4	Jan	7:40 AM	5:20 PM
5	Feb	7:28 AM	5:40 PM
6	Mar	6:50 AM	6:20 PM
7	Apr	6:30 AM	6:30 PM
8	May	6:10 AM	7:20 PM
9	Jun	5:50 AM	7:40 PM
10	Jul	5:30 AM	8:00 PM
11	Aug	5:50 AM	7:20 PM
12	Sep	6:40 AM	7:00 PM
13	Oct	7:10 AM	6:40 PM
14	Nov	7:30 AM	6:20 PM
15	Dec	7:35 AM	6:00 PM

Table 1: Monthly Average Time of Sunrise and Sunset

1. Compare the time of sunrise and sunset. What have you observed?
2. On which month did the sun rise earlier? Why is this so?
3. On which month did the sun set later? Why is this so?
4. When was daytime the longest?
5. When was daytime the shortest?

Answer Key

What I Know

1. B
2. C
3. C
4. C
5. D
6. C
7. B
8. B
9. A
10. B
11. A
12. B
13. D
14. C
15. B

Assessment

1. A
2. C
3. D
4. B
5. D
6. A
7. C
8. C
9. A
10. D
11. D
12. B
13. D
14. C
15. A

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