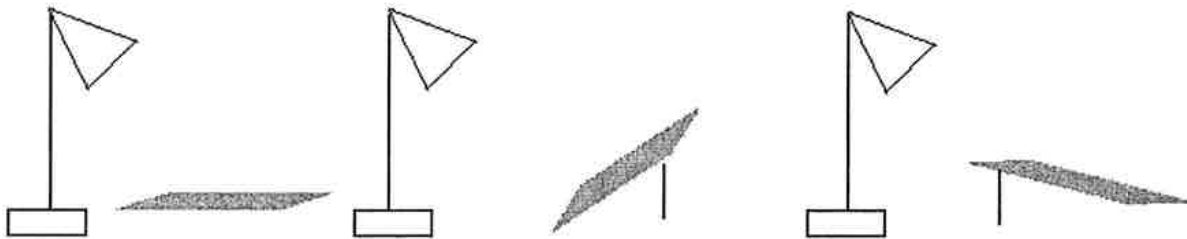


Multiple Choice

1. Why does the air temperature rise in the summer?
 - A. We are closer to the sun.
 - B. The air becomes thicker and more dense.
 - C. The sun's rays are more direct and days are longer.
 - D. The ratio of the hours of daylight to the hours of night is reduced.

2. Why is it summer in the Southern Hemisphere when it is winter in the Northern Hemisphere? The Southern Hemisphere is
 - A. Closest to the sun.
 - B. Receiving the most direct rays from the sun.
 - C. On a path of warm winds from the North.
 - D. Balancing out the temperatures for Earth.

Use this drawing of a light shining on a piece of paper to answer the next question.

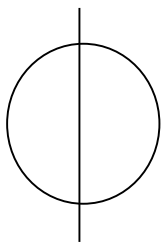
**A.****B.****C.**

3. Which paper would feel the warmest after several minutes?
 - A. A
 - B. B
 - C. C

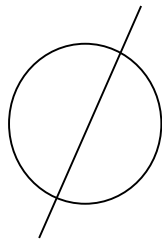
4. What time of year is the sun farthest from Earth?

- A. In our summer
- B. In our winter
- C. In our spring
- D. In our fall

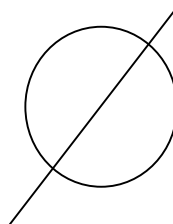
5. Which of the following shows the angle of Earth's axis relative to the sun?



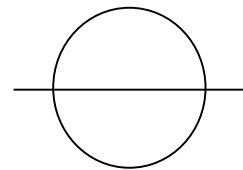
A.



B.



C.



D.

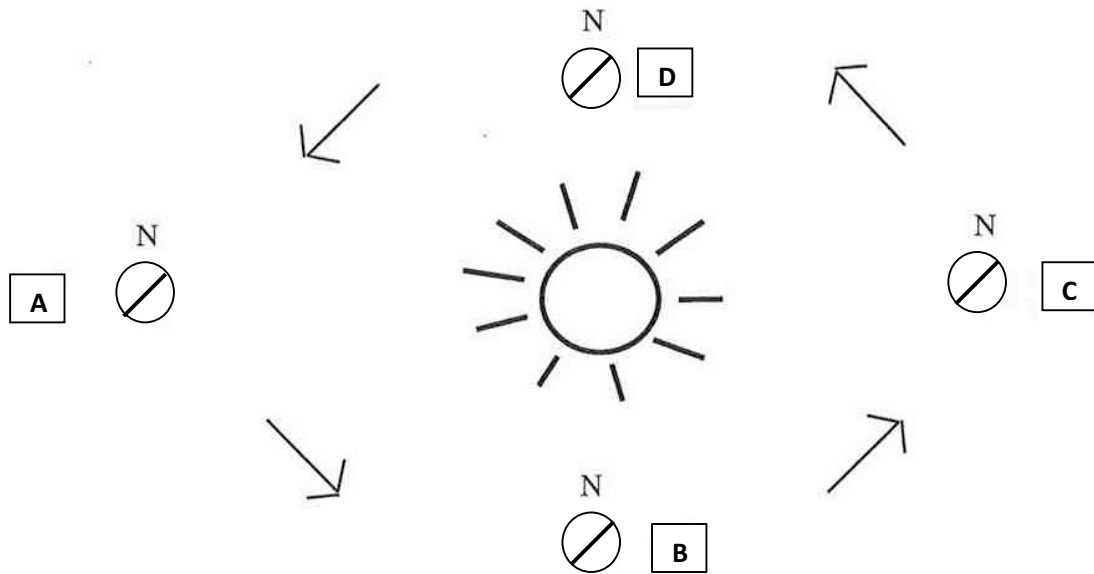
1. In what month would Utah have the **greatest** number of daylight hours per day?

- A. January
- B. June
- C. September
- D. December

2. In what month would the sun's light strike Utah at the **lowest** angle?

- A. March
- B. June
- C. September
- D. December

Use this diagram of the sun and Earth's path around the sun to answer the next three questions. The "N" indicates North and Earth is traveling from A to B to C and then to D.



3. In what season would the Northern Hemisphere be at C?

- A. Fall
- B. Spring
- C. Summer
- D. Winter

4. In what season would the Northern Hemisphere be at D?

- A. Fall
- B. Spring
- C. Summer
- D. Winter

5. At which positions will the day and night hours be equal in length?

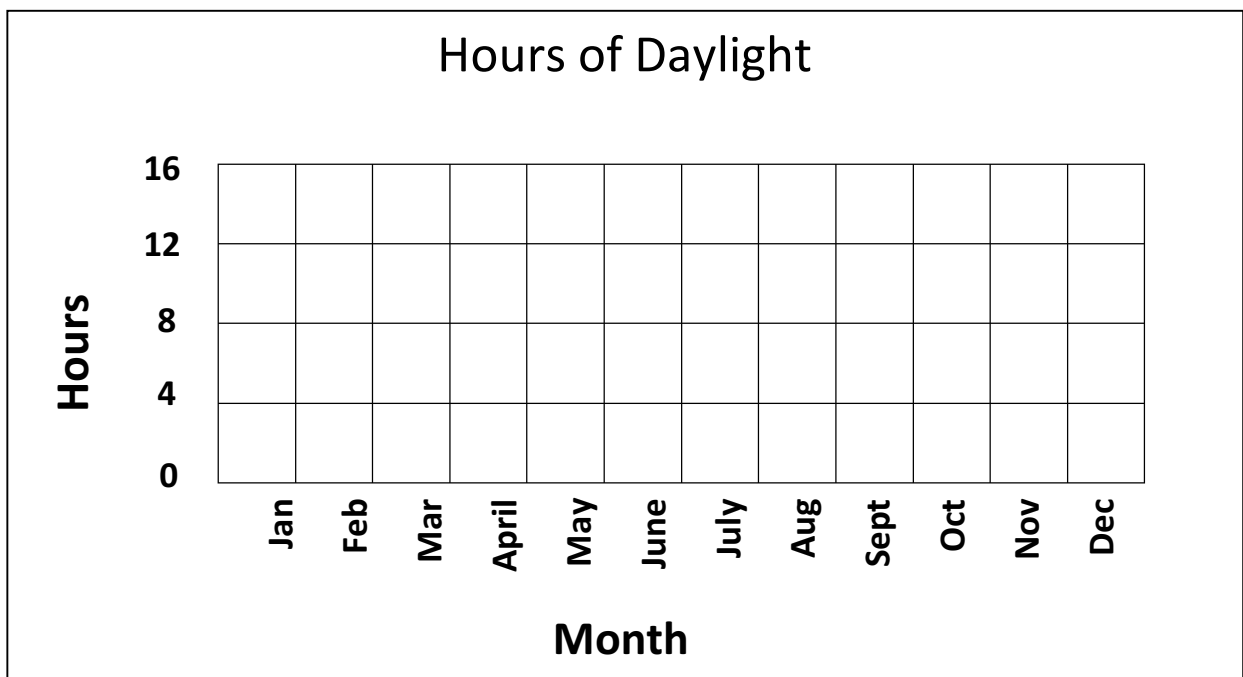
- A. A and B
- B. B and C
- C. C and D
- D. B and D

Constructed Response

1. What causes summer in the Northern Hemisphere?
2. What seasons do we have when the equator is getting the most direct rays of sunlight?

Use the data below to make a line graph. Answer the questions on the next page when you have finished.

Day	Hours of Daylight
Jan. 22	9
Feb. 22	10.5
March 22	12
April 22	13
May 22	14.5
June 22	16
July 22	14.5
Aug. 22	13
Sept. 22	12
Oct. 22	10.5
Nov. 22	9
Dec. 22	8



Questions:

3. What season has the most hours of daylight?
4. How does more daylight affect that season?
5. What causes the length of daylight to change?
6. On which day would you expect the sun to be lowest in the sky?
7. On which day would you expect the sun's rays to be most intense?

Answers:

Multiple Choice

1. C
2. B
3. B
4. A
5. B
6. B
7. D
8. D
9. A
10. D

Constructed Response

1. Earth's axis is tilted relative to the sun. When the North Pole is tilted most towards the sun, the Northern Hemisphere has summer.
2. Spring and fall
3. Summer (June)
4. It makes it warmer
5. The tilt of Earth as it orbits the sun
6. December 22
7. June 22

Activity Description

Students will measure the length of a shadow to determine how the angle of sunlight changes over a two week time period.

Materials

Meter stick or tape measure, sunny day (a shadow is needed) student sheet

Time Needed

15 minutes to explain, 10 minutes per day (5 days are enough, spread over two weeks) for observations, 20 minutes to finish.

Teacher Information

If you are doing this activity in the fall, the shadows will lengthen as winter approaches. After Dec. 22, the shadows will shorten as summer approaches. Shadows change length during the day also, which is why it is important to go outdoors at the same time for each measurement.

Procedure

1. Handout student sheet and go over directions. Have a meter stick per group of students and a location outdoors where you want to work.
2. Take students out and measure a shadow. Note the time. You must go outdoors at the same time for each measurement, otherwise it will not work. Plan around daylight savings time shifts. If you must overlap one, adjust the time accordingly.
3. You can have students measure the shadows of different objects outdoors. It doesn't matter what they pick, as long as objects are permanent.
4. Continue making measurements 5 times over a two-week period.

Scoring Guide

1. *Students make prediction*2 pts
2. *Students collect and record data*15 pts
3. *Students correctly answer questions on student sheet*10 pts

Answers:

1. Answers will vary depending on the season.
 2. The tilt of Earth as it travels around the sun causes the change.
 3. It will stop getting shorter on Dec. 22. It will stop getting longer on June 22.
 4. Yes.
 5. Long shadows are days with weak, low-angle light. Short shadows are days with stronger, more direct light.
 6. Drawing should show a long shadow with Northern Hemisphere pointing away from the sun; a short shadow with Northern Hemisphere pointing towards the sun.
4. *Students summarize experiment with a conclusion*5 pts

Student Sheet

Name _____

Title: Light and Shadow

Introduction: In this activity you will measure the shadow of an object outdoors to see how the angle of the sun changes in the sky over a two-week period. A long shadow indicates the sun is low in the sky, and a short shadow indicates the sun is high in the sky. You must take the measurements at the same time every time or you will not get accurate readings. The angle of the sun's rays changes from hour to hour and in this activity, you are measuring the change from day to day.

Directions:

1. Work in groups as your teacher directs. You will need a meter stick or other measuring devices. Make sure you know in what units you select to measure.
2. You will go outside and measure the shadow of an object your group picks. Write down what you picked to measure: _____ Make sure the object is not going to move in the next two weeks.
3. Note the time you make the measurement. Write it here: _____
4. Record the length of the shadow in the data table.
5. At the end of two weeks you will have made about 5 measurements. Answer the questions when you are finished.
6. Write a conclusion summarizing what you have learned.

Prediction: (How will the shadow change?)

Data

Day	Length of Shadow

Questions:

1. Did the shadow lengthen or shorten?
2. Why?

3. On what day will the shadow stop lengthening or shortening?

4. Is the light on a day with a long shadow different in strength from the light on a day with a short shadow?

5. How?

6. Draw a picture of Earth and sun showing Utah with long shadows and Utah with short shadows.

Conclusion: