Why can’t we have 24 hours of sunlight each day?

# Part one – Graphing Photoperiods (This is individual)

A photoperiod is the amount of time between sunrise and sunset.  One way to graph the photoperiod (and reduce the amount of math you do) is to graph the sunrise/sunset times for various dates.   The graph will be a bar graph in which you will shade the time before the sunrise, and shade the time after the sunset.   (See example).  The dates are listed on the x axis and the hours are on the y axis.

Using Form A on<http://aa.usno.navy.mil/data/docs/RS_OneDay.php> , you will use the dates – March 21, 2013; June 21, 2013; September 21, 2013; and December 21, 2013 for our current location – Hallsville Missouri.  You need to copy down the sunrise/sunset data for each time.  You will notice that the times are given as 24 hour clock period.  Examples – 524 means 5:24 a.m.; 2034 means 8:34 p.m.  The a.m. times are before noon (or 1200) after 1200 becomes the p.m. times....1300 (1:00 p.m.), 1400 (2:00 p.m.) and so on.

|  |  |  |
| --- | --- | --- |
| Date | **Sunrise** | **Sunset** |
| **March 21** |  |  |
| **June 21** |  |  |
| **September 21** |  |  |
| **December 21** |  |  |

For the graph paper that you have been provided, one block equals 1 hour.  You will have to estimate times on the scale.  You need to graph the sunrise/sunset times.  Shade (you can use markers, colored pencils, or crayons) the area before the sunrise and after the sunset.



# Questions

1.  What time of day does the shaded areas on your graph represent?

2.  What time of day does the un-shaded areas on your graph represent?

3.  What date do we have the longest photoperiod?

4.  What date do we have the shortest photoperiod?

5.  Is the graph a model for photoperiods for our location? How do you know?

6.  What would you expect the graph to look like 100 years from now (assuming all other current conditions remain the same)? How do you know?

7.  Our current latitude is approximately 40 degrees north.  Predict what the photoperiod graph would look like for:

|  |  |
| --- | --- |
| Equator  | 60 degrees North |
| North Pole             | 40 degrees South |

# Part Two – Graphing the photoperiods for different locations on the world (Group of seven)

This time around, we will be making a bit more detailed photoperiod graph.  We have sunrise/sunset data for seven locations on the world.  You need to form a group of seven students.  **Each student will need to be responsible for one location graph.**

# Locations

1. North pole region 80 degrees North
2. Oslo, Norway 59 degrees North
3. Hallsville
4. Nairobi Kenya 1 degree South
5. Random location 39 degrees South
6. Punta Arenas, Chile 53 degrees South
7. South pole region 80 degrees South

The graph needs to have the dates (1st and 15th of each month) across the x axis and the hours of day along the y axis.

# Questions:

1. What is the pattern that you see between the photoperiod of the northern hemisphere and the southern hemisphere?
2. Construct a written explanation including drawn representations that explains how the Earth and Sun must be arranged to cause the documented changes in photoperiod.

1. Fill in the table:

|  |  |  |
| --- | --- | --- |
| Date | Season | Hours of Daylight (long /short/equal) |
| March 21 | 1.  North\_\_\_\_\_2.  South\_\_\_\_\_ | 1.  North- long /short/equal2.  South- long /short/equal |
| June 21 | 1.  North\_\_\_\_\_2.  South\_\_\_\_\_ | 1.  North- long /short/equal2.  South- long /short/equal |
| September 21 | 1.  North\_\_\_\_\_2.  South\_\_\_\_\_ | 1.  North- long /short/equal2.  South- long /short/equal |
| December 21 | 1.  North\_\_\_\_\_2.  South\_\_\_\_\_ | 1.  North- long /short/equal2.  South- long /short/equal |

1. What about the photoperiod at 23.5 degrees north?  Or 23.5 degrees south latitudes?  How will the graph look compared to the others?  Sketch examples (be sure to label)

1. The initial question was “Why can’t the there be a 24 hour photoperiod?”  Is it possible?  If so, where?