

Exercise #2 Lab Activity

Name: _____

Earth-Sun Relationship

Lab Section: _____

Please show your work. If necessary please use additional paper to show work.

1a) Consider building a house in Massachusetts. In order to gain maximum sunlight in your living room, which direction should the window face? SOUTH

Why? WE ARE NORTH OF THE TROPIC OF CANCER, THEREFORE THE SUN IS ALWAYS TO OUR SOUTH

b. If you were building a house in Santiago Chile and wanted maximum sunlight in the living room, what direction should your window face? NORTH

Why? SANTIAGO IS SOUTH OF THE TROPIC OF CAPRICORN AND ALWAYS HAS THE SUN TO THE NORTH

2) When is the Sun directly overhead of:

- a. The Tropic of Capricorn
- b. The Tropic of Cancer
- c. The Equator
- d. The Arctic Circle

WINTER SOLSTICE DEC 21
SUMMER SOLSTICE JUNE 21
SPRING + FALL EQUINOX'S MARCH 21
NEVER! SEPT 23

3) Give the latitude and the significance of:

- a. The Tropic of Capricorn:

23.5° S
THE SOUTHERNMOST POINT OF 90° SUN RAYS (WINTER SOLSTICE)

- b. The Tropic of Cancer:

23.5° N
THE NORTHERNMOST POINT OF 90° SUN RAYS (SUMMER SOLSTICE)

- c. The Arctic Circle

66.5° N
THE SOUTHERNMOST POINT OF 24 hours of SUN/DARK (DAY/NIGHT)

- d. The Antarctic Circle

66.5° S
THE NORTHERNMOST POINT OF 24 hours of Sun/Dark

The Arctic & Antarctic Circles

The Arctic Circle ($66\frac{1}{2}^{\circ}$ N) and Antarctic Circle ($66\frac{1}{2}^{\circ}$ S), mark the limit of the possibility of 24 hours of darkness or light. For other latitudes we can roughly establish the length of day by first determining the proportion of the parallel that is in the light zone. The same proportion of 24 hours would be daylight.

4) Notice the relative length of daylight in the northern and southern hemispheres on June 21 in Figure 2.3. On June 21 what might the daylight situation be at:

- a. The Arctic Circle: 24 h
- b. The Equator: 12 h
- c. Antarctic Circle: 0 h

5) Six months later on December 22 what might the daylight situation be at:

- a. The Arctic Circle: 0 h
- b. The Equator: 12 h
- c. Antarctic Circle: 24 h

6) Usually we think of the seasons of the year as they occur in the Northern Hemisphere. Determine when the following seasonal positions occur in the Southern Hemisphere. List the dates.

- a. Vernal Equinox: SEPT 23
- b. Autumnal Equinox: MAR 21
- c. Winter Solstice: JUNE 21
- d. Summer Solstice: DEC 21

For the Summer Solstice, count the number of 15 degree increments from the left side of the circle of illumination to the right side along latitude 30° N. There are 14, thus the duration of sunlight is 14 hours for New Orleans. On the winter solstice, there are only 10 increments, thus 10 hours of daylight.

Determine the length of daylight at the following locations for the June solstice, December solstice, and equinox.

Place (approximate degrees)	June Solstice	December Solstice	Equinox
Barrow, AK (71° N)	24	0	12 h
Salem, MA (43° N)	16	8	12
Riyadh, SA (25° N)	14	10	12
Singapore (1°)	12	12	12
Cape Town, SA (34° S)	10	14	12
Vostok, Antarctica (79° S)	0	24	12

8. It should become apparent that as you go northward from the equator in the summer, the daylight hours become **LONGER** and in the winter the daylight hours become **SHORTER** as you travel northward.

9. How many hours of daylight are there at the Equator in each of the seasons?

12

10. Using what you know about latitude and length of daylight, describe the weather and amount of daylight you would expect to encounter:

a. In Vostok in July? **VERY COLD - WINTER NO DAYLIGHT**

b. In Vostok in February? **WARMER THAN JULY - STILL COLD
SOME DAYLIGHT, BUT GETTING SHORTER**

c. In Barrow in July? **COLD, BUT SUMMER 24 hours of Daylight (or close!)**

d. In Barrow in February? **MUCH COLDER, BUT WINTER IS 1/2 DONE!
NO DAYLIGHT**

e. What is the major difference in the climate at the two locations?

THEY ARE REVERSED SEASONALLY

f. Can you think of a factor that does not involve latitude or length of daylight that might further explain the climatic differences between the two locations?

Ocean Currents, Wind Patterns, Elevation

Map 2: December 22
Winter Solstice in the
Northern Hemisphere and
Summer Solstice in the
Southern Hemisphere

