Sun Time: Tracking the Earth's Rotation

Geology Mr. Traeger

Name: _____ Period: ____ Date: _____

Purpose

The purpose of this activity is to learn about the rotation of the Earth and how it affects the measurement of time.

Materials

- World Map or Globe
- Sun Clock cutout Pattern
- scissors
- String
- glue
- tape
- Ruler
- pencil

Part 1: Basics of Rotation

1. What did Jean Foucalt do in 1851 to prove that the Earth was rotating?

2. What is the Coriolis Effect and how does it affect the rotation of storms and ocean currents in the three different places noted below?

What is Coriolis Effect?	Northern Hemisphere Effects	Southern Hemisphere Effects	Effects on the Equator

3. How long does it take for the earth to rotate once? What do we call this time?

4. How many degrees are in one complete rotation?

5. In which direction does Earth rotate? From east to west or west to east?

6. What kind of geometric shape is the Earth? How would this affect the hours of daylight here in La Cañada during the winter and during the summer?

Shape?	Affect on hours of daylight in summer?	Affect on hours of daylight in winter?

7. What geometric shape do you see when you look down upon the Earth from the North Pole?

8. The circumference of a circle is $2\pi r$. If the radius of the Earth is 6378 Km, then what is the circumference of the Earth at:

The North Pole?	**The Equator?**

9. How fast is the Earth moving (in Km/hr) at: (Speed = $2\pi r$/time)

The North Pole?	**The Equator?**

10. You can use the cosine function (cos) on your calculator to find the speed of the Earth's rotation for any latitude. The speed at any latitude will be the speed at the equator times the cosine of the angle of latitude. Use this to figure out what the speed of rotation is in Km/hr for the following latitudes.

Latitude	0°	15°	34° (La Canada)	45°	60°	90°
Speed of Rotation						

Part 2: Measuring Time

1. In what direction (N, E, S, W) would you look to see the sun rise on the equinox? Where would you look to see it set on the equinox?

2. In what direction (N, E, S, W) would you look to see the sun at mid-day today in La Cañada? How about in Cape Town, South Africa?

3. What is the purpose of time zones?

4. What is the purpose of Daylight Savings Time (ie: moving our clocks ahead in spring and moving them back in the fall), besides messing up our biological clocks?

5. How many time zones are in the world?

6. How many degrees of longitude are usually in each time zone?

7. At what reference line of longitude does the measurement of time zones start?

8. Does time increase or decrease as you move towards the east?

9. Look at the following times for San Diego, Los Angeles, and San Francisco on March 20, 2009. Why is there a difference in the times, given that all of these locations are in the same time zone?

	San Diego	Los Angeles	San Francisco
Sunrise Time	6:52 AM	6:57 AM	7:13 AM
Solar Noon	12:56 PM	1:01 PM	1:17 PM
Sunset Time	7:00 PM	7:05 PM	7:22 PM

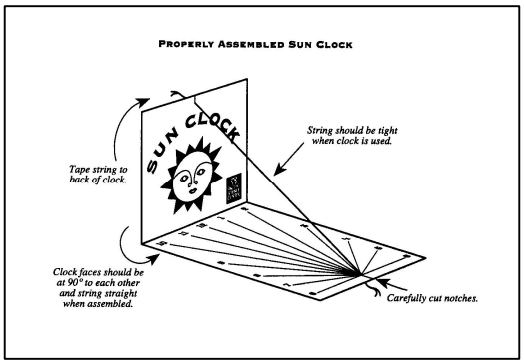
10. This question involves the possibility of crossing of the International Date Line. Remember that you add a day when going west and subtract a day when going east. Imagine that you like to call your friends around the world on the telephone. If it is 12:00 PM here on March 20, 2009, then what day and time will it be in the following cities? The center of the Pacific Time Zone is at 120° West longitude and the width of each time zone is 15° of longitude. Assume that all of your friends are on Daylight Savings Time like we are. Show your work!

City	Colombo, Sri Lanka	Honolulu, HI	New York, NY	Auckland, New Zealand	Baghdad, Iraq	London, England	Seoul, South Korea	Moscow, Russia
Day?								
Time?								

11. This question involves the crossing of the International Date Line. Remember that you add a day when flying west and subtract a day when flying east. If a plane departed at 4:00 p.m. on March 20th from Tokyo, Japan (approximately 135 degrees E), and the flight takes 9 hours and 30 minutes, what time and date would the plane arrive in Los Angeles (approximately 120 degrees west)? Show your work.

Part 3: Making a Sundial Sun clock

Obtain half a manila folder, scissors, glue, 20 cm of string, and the Pocket Sun Clock pattern. Construct a sun clock as seen in the illustration below.



1. Take your sun clock outside and position it correctly by using a compass. Make sure that the string is tight and that the clock is at a 90° angle. Describe what you did in order to correctly read the time.

2. How did peoples of ancient times read the time?

3. What kind of technology do we use nowadays to keep time?

4. What causes your sun clock to read different times? What are we doing?

Cut out the sun clock template as seen below. Use this to make your Sun Clock.