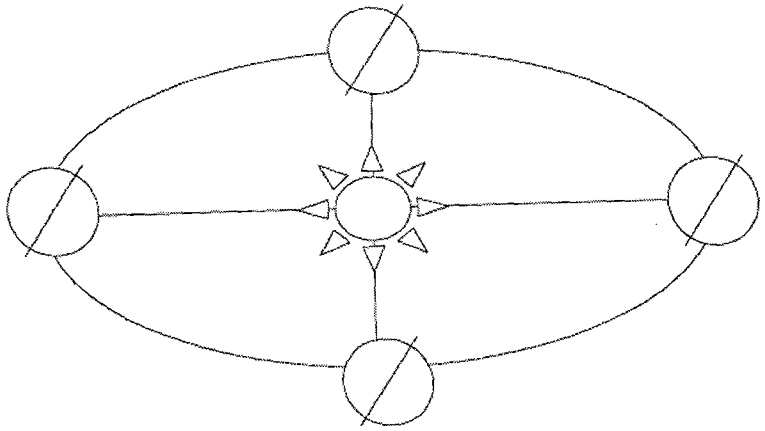
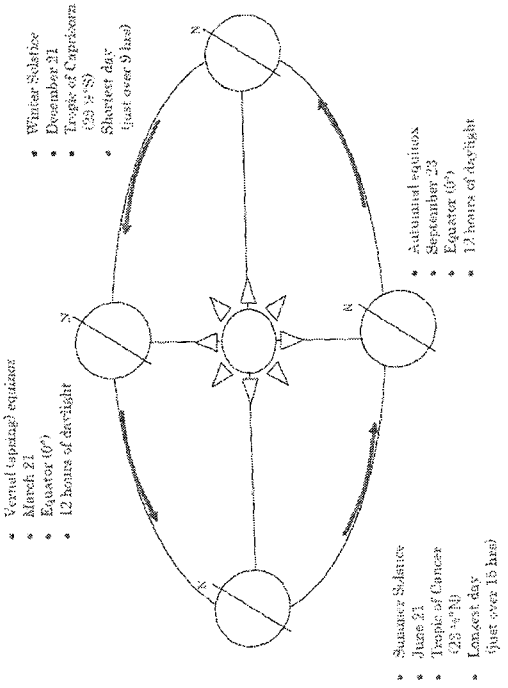
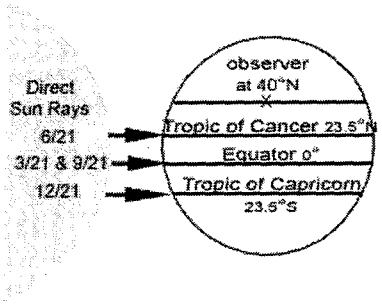
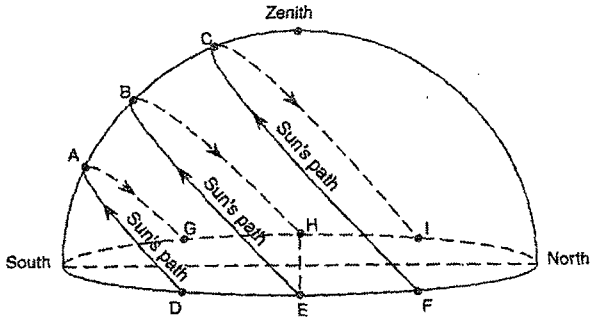
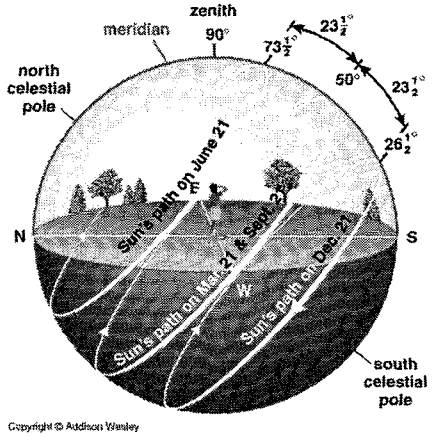
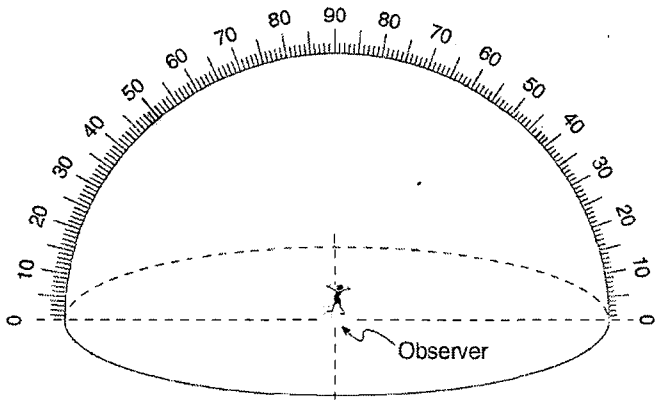
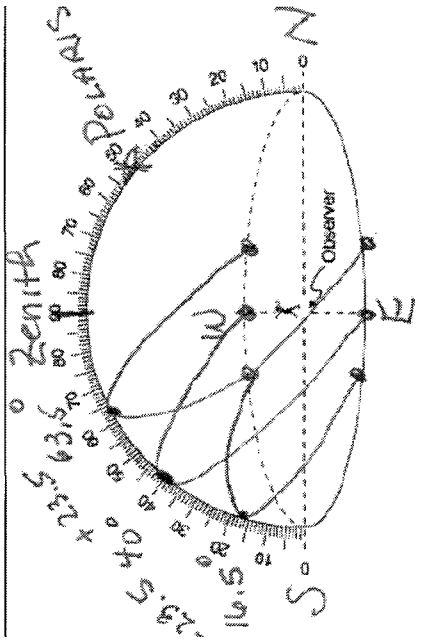
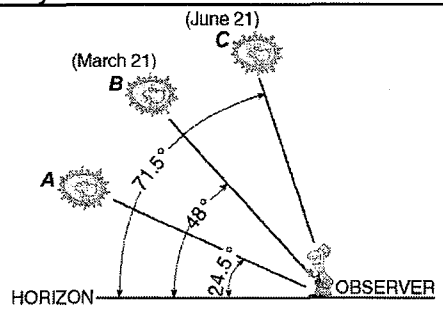
Question	Answer
1. What earth motion causes the Sun to appear to rise and set?	Earth's rotation
2. What shape does the sun's path make as it moves across the sky?	An arc
3. What Earth motion causes the sun's path position and length of the arc to change over the course of the year?	Earth's revolution
4. In addition to Earth's revolution what causes the seasonal changes in the Sun's path?	Earth's axis is tilted 23.5° from our orbit
5. As the Earth revolves around the Sun, the north end of the axis is always pointed towards what star?	The North Star - POLARIS
 6. Identify the season and what latitude the sun is directly overhead (90° - ZENITH POSITION) for each season. Indicate the direction of revolution	
7. Why is the sun never directly overhead in the continental United States?	Direct rays of sun never go above the Tropic of Cancer or below the Tropic of Capricorn 

8. At different latitudes, an observer at Earth's surface would see the Sun's changing path as Earth orbits the sun. The following diagram is somewhere in New York State. Label each season.  	Arc A - Winter Solstice – Point D is sunrise SOUTH OF EAST and Point G is sunset SOUTH OF WEST Arc B - Equinoxes – Point E is sunrise DUE EAST and Point H is sunset DUE WEST Arc C – Summer Solstice – Point F is sunrise NORTH OF EAST and Point I is sunset NORTH OF WEST
9. The altitude of the local solar noon sun can be calculated for any latitude in the Northern Hemisphere using a simple formula. **THE TRICK IS TO START WITH THE EQUINOXES WHEN THE SUN IS DIRECTLY OVERHEAD AT THE EQUATOR (0°).** **1. 90 ° - (minus) latitude = MAGIC NUMBER** **a. What is the magic number?** 2. Once you have established the Sun's angle during the Equinoxes it is very easy to find the Sun's angle for the Summer Solstice (June 21st) and Winter Solstice (December 21st) **a. MAGIC NUMBER + 23.5° = _____** **b. MAGIC NUMBER – 23.5° = _____**	1a. Altitude of the noon sun at the Equinoxes - in the diagram below it is 50° 2a. Summer Solstice b. Winter Solstice 
10. What direction must an observer look for the sun in New York?	South
11. What direction must an observer look for Polaris in New York?	North
12. What is my cheesy saying about latitude and Polaris?	Latitude of Observer = Altitude of Polaris
13. If the altitude of Polaris is 45°, calculate the magic number for the altitude of noon sun on March 21st.	Altitude of Polaris = Latitude of observer 90° - 45° = Magic number 45°

14. a. What is the altitude of noon sun on December 21st for your location? Magic number - 23.5° = _____ b. Noon Sun on June 21st? Magic number + 23.5° = _____	Latitude of 45°N a. 21.5° is the altitude of the noon sun on the Winter Solstice b. 68.5° is the altitude of the noon sun on the June Solstice
15. Label the compass directions on the celestial sphere and draw the Sun's path for the Winter and Summer Solstice and the Equinoxes for 50° N. Using the 6 point method for the positions of sunrise and sunset on the horizon. Label Polaris and the Zenith position. 	
16. How many times will the Sun's perpendicular rays cross Earth's Equator between March 1 of one year and March 1 of the next year?	Two times
17. Accurate observations of the Sun were made by a New York State observer. This person observed the time of sunrise and the position of sunrise along the eastern horizon for each day during the month of May. Describe how the time of sunrise and the position changed for the observer each day during the month of May.	Each day the sunrise time was earlier and the sun's position moved more northward.
 What season begins at position A in the diagram?	Winter
What other date could the Sun be observed at pos. B?	September 21st