Physical Science 111 Name: _____
Date: _____

Physical Science Laboratory: Skyglobe

Objectives:

- to be able to describe the difference in the stars' apparent movement throughout the night from the equator and from the poles.
- to be able to identify Polaris, Vega, Sirius, and other prominent stars.
- to be able to describe the Sun's movement across the sky during the equinoxes and solstices.
- to identify a few of the major constellations such as Ursa Major, Ursa Minor, Cassiopia, Orion and the Zodiac.
- to be able to use the equatorial coordinate system to describe a star's position giving its right ascension and declination.

Materials: A computer with the program ***Skyglobe, Klassm Software, by Mark Haney*** installed.

Procedure: Spend some time familiarizing yourself with the program and its commands. Go through each command on the command list and try it out until you understand its effect. The instructor will demonstrate the procedure.

When you believe you are familiar with the basic workings of the program use ***Skyglobe*** to do the following.

Activities:

Record the current date _____ and time _____

Observe the sky at the current time from Chicago, IL. Position your point of view so that you are looking straight up. Elevation in the top left corner should be set close to 90^{o}. (as if you were lying on your back looking at the sky). Set direction to due North.

1. Which planets are overhead? _____

2. Is the Sun currently in the sky? _____ Using the hour control (H) advance the time hour by hour over a 24 hour period. What planets will be visible tonight after the sun sets and until it rises? Change the direction to the East, West, and South so that you can see the entire sky.
   _____

3. Find "F" Polaris at sunset today. Place the mouse cursor over it and record its elevation (bottom left display). _____
   How does this compare with Chicago's latitude? _____
   Change the location to Orlando, Florida. Find Polaris at sunset today.
   What is the elevation of Polaris? _____ What is the latitude of Orlando? _____
   Change the location to the equator. What is the elevation of Polaris now? _____
   In general, what is the relationship between how high Polaris is in the sky and the latitude of a location? _____
   _____
   _____
   _____

4. Use the magnitude control "B" to display only 50 stars. What bright stars are in the sky tonight? (Name a few.)
   _____

5. Determine the time of sunset tonight _____ and sunrise tomorrow: _____ in Chicago

6. Change the date, time and location so that you are looking at the sky on the day you were born. What stars (just name a few of the bright ones) and planets were in the sky on that day. (If you know the time of your birth you may be exact, otherwise just examine the sky at midnight.)
   _____

7. Set the skyglobe for Chicago, IL at 4:00 AM on June 21 '96 September 22 "96, December 21 "96, and March 21 '97. Set the direction to due East. Use H, the hour button, to progress through the rising and setting of the sun. Note the exact times of sunrise (face East) and sunset (face West) and record them. Calculate the length of daylight.
   Summer Solstice: sunrise_____sunset_____length of daylight_____
   Autumnal Equinox: sunrise_____sunset_____length of daylight_____
   Winter Solstice: sunrise_____sunset_____length of daylight_____
   Vernal Equinox: sunrise_____sunset_____length of daylight_____

8. Set location to the North Pole, elevation to 90^{o}, and find Polaris. It should be directly overhead. Set Brightness "B" to display all stars up to at least M7.0. Press Alt-F1 to display stars only. Press "A" for automation. Describe the apparent movement of the stars.
   _____

9. Change location to the South Pole and determine what star, if any, directly above the South Pole. _____ If you stopped the animation then press Alt-F1 and "A" then describe the movement of the stars. _____
   _____

10. Set location to the Equator, elevation to 90^{o}, direction to due East. Now how do the stars move? _____
    _____
    _____

For each of the stars given determine their declination and right ascension at the location given: First set the location then press F to find the star. Then F11 to show RA-Dec lines on lower left screen.

Star	Meaning of Name	Features	RA	DEC	Location
Alpha Centauri		closest star			South Pole
Betelgeuse	armpit, beetle juice	one of the largest stars known			Chicago
Polaris	pole star, north star	star above the North Pole			Chicago
Rigel	foot	50X sun's size White, expanding			Mexico
Sirius	scorching, dog star	brightest star "dog days"			Chicago
Vega	swooping eagle	5th brightest star will be pole star one day			North Pole

Find the following constellations and use "C" to show its shape:

Constellation	Meaning of Name	Sketch It	Visible Tonight?	Name One Star in it.
Orion	The Great Hunter			
Cassiopeia	Queen of Ethiopia			
Ursa Minor (The Little Dipper)	Lesser Bear			
Ursa Major (The Big Dipper)	Greater Bear			

Now find your own Zodiac constellation on your birthday of this year at 12:00 noon.

What is the name of the constellation? _____

Sketch it:

Name one bright star in it. _____

Use Hour "H" to watch it move during the day. Why are they called sun signs?

_____

_____

Determine the time the moon rises and sets today in Chicago, IL. (Face East at an elevation around 50^o then West for the setting time.)
Moon rise _____ Moon set _____

Short Glossary of Terms:

Azimuth	Angular distance measured from 0^o to 360^o along the horizon eastward from an observer's north point to the point of intersection of the horizon and a great circle passing through the observer's zenith and a star or planet.
Declination	Measures the position of a star in the north-south direction with reference to the celestial equator.
Ecliptic	The plane of the Earth's orbit about the Sun, which is approximately the plane of the solar system as a whole. The apparent path of the Sun throughout a year.
Equatorial Coordinates	The astronomical coordinate system in which points are measured with respect to the celestial equator (in the North-South direction) and with respect to a fixed direction (in the East-West direction). The coordinates used are declination (North-South, in units of angle) and right ascension (East-West, in units of time).
Messier Object	An object listed in the Messier catalogue compiled by Charles Messier in 1787 of fixed nebulous nonstellar objects.
Right Ascension	Measured in units of hours, minutes, and seconds to the East from a fixed direction in the sky; the intersection of the ecliptic and the celestial equator during the Vernal Equinox.
Zenith	The point directly overhead.

Skyglobe 3.5 Commands

Enter	Repeat the last keystroke.
Shift-Enter	Undo the last keystroke.
F1	Help Display. Press to change the number of commands shown on the screen.
F2	Parameter Display: Time, State, Location, Latitude, Longitude, etc.
F3	Planets
F4	Messier Objects
F5	Horizon, Zenith, and Hash-Marks
F6	Ecliptic Line
F7	RA-Dec Lines
F8	Star Labels (type of display)

F9	Constellation Labels
F10	Constellation Lines
F11	Mouse Display (Location of mouse): Altitude, Azimuth, Right Ascension, Declination
F12	Star Labels (number to display)
Alt-F1	Reduce Display to Stars and Lines
Alt-F2	Reduce Display to Stars Only
Alt-F3	Background Color Shading
Alt-F4	Twilight Mode Shading
Alt-F5	Toggle Mouse Display
Alt-F6	Precession Toggle
Alt-F7	Printer Port Toggle
Alt-F8	Add line Feeds? (to printer page)
Alt-F10	Aspect Ratio Adjustment
0-9	Save Configuration
Shift 0-9	Load Configuration
Alt-U	Load last exit state Configuration
TAB	***Find next sunrise or sunset***
+	Brighten gray colors
-	Dim gray colors
=	Toggle AM-PM/24 hour Time Display
/	Text Color
.	Reverse Text Toggle
Alt-F	Flip hemisphere
Shift-V	Force Daylight Time
Ctrl-N	Navigation body filter

Use Alt and Ctrl with many commands for smaller positive or negative steps.
Use home and End with many commands to maximize or minimize the effect.

About the mouse:

If the mouse cursor is over empty sky:

Left Mouse button	Recently display at Mouse Cursor position.
Right Mouse button	Recently display at Old Mouse Cursor position.

If the mouse cursor is on top of an object:

Left Mouse Button	Display image if available.
Right Mouse Button	Lock display on object until ESC is pressed.

A	Auto-Increment Mode	Turns animation on and off. When animation is on the screen automatically increments the time. Time progression can be reversed by pressing Shift-A.
B	Brightness	This controls how many stars are displayed by only showing those brighter than a certain magnitude. This refers to apparent magnitude. Shift-B decreases the number of stars seen.
C	Constellation	Controls the number of constellation lines shown. Keep pressing it to Understand its effect.
D	Date	Advance to next day. Shift-D goes backwards in time.

E	East	Orients the viewer to face due East.
F	Find Object	Enter a menu to find stars, planets, and galaxies. Note that choosing an entry at the end of the menu opens another menu.
G	Guidelines	Shows constellation boundary lines.
H	Hour	Advances time by ***one hour***. Shift-H for reverse.
I	Inflate	Toggle type of projection.
J	Jump Century	Advance date by ***100 years*** (reverse using Shift-J).
K	Milky Way	Selects the color of the Milky Way. It can be determined from the screen if desired.
L	Location	This allows the user to select the place on Earth that the observer stands. At the end of the first menu select more locations to enter a second (international) menu.
M	Month	Adjust date by ***one month***. (Shift-M for reverse).
N	North	Orients viewer to face due North.
O	Outline	Select between round, square and no border frame.
P	Print	Prints screen.
Q	Quit	Do you really want to?
R	Real-time	Lock time to system clock.
S	South	Orients viewer to face due South.
T	Time (Minute)	Change time by ***one minute*** (shift-T for reverse).
U	MilleniUm	Change date by ***1000 years*** (shift-M for reverse).
V	Daylight Saving ‘sTime	Toggle usage of Daylight Saving’s Time.
W	West	Orients viewer to face due West.
X	Mirror Image	Flip-flop display, just like a telescope moves back).