Names: _____ _____

_____ _____

Grade	

Exploring the Night Sky:
Star Charts and *Stellarium*

Pre-Lab Quiz

Record you team's answer as well as your reasonings and explanations.

1.
2.
3.
4.

Part 1: Using a SC001 Constellation Chart

Coordinates of stars are often listed in terms of right ascension (RA, α) and declination (DEC, δ), which are similar to longitude and latitude.

On the SC001 Constellation Chart, the **right ascension** axis spans the width of the chart and runs from 0 to 24 hours. The **declination** axis spans the height of the chart and runs from -60° to +60° (if the more polar regions were included on the chart, it would run from -90° to +90°).

1. Messier 31, or M31, is a famous galaxy in the Andromeda constellation. It is the nearest major galaxy to our own at a distance of 2.5 million light years and is the farthest object that is visible to the naked eye. Find the right ascension and declination of M31.

RA		DEC	

2. Check out the Andromeda Galaxy on pg. 60 of *The Stargazer's Handbook*.

a) What type of galaxy is M31?

b) Our Milky Way Galaxy is about 100,000 light years in diameter. How does the Andromeda Galaxy compare in size?

***Fun Fact**: If our scale model (1:100 billion) from the first lab was centered at the Sun, the Andromeda Galaxy would be at the position of Mars and its diameter would be twice the size of Jupiter.*

3. On 4 July 1054, Chinese astronomers recorded the appearance of a "guest star" in the constellation Taurus whose brightness rivaled the planet Venus. The coordinates for this object are $\alpha = 05^h\,35^m$ and $\delta = +22°$.

a) What is the name of this supernova remnant?

b) Find this supernova remnant in the *The Stargazer's Handbook*. What type of object is located at the center of the remnant and how large is that object?

4. Listed below are the current celestial coordinates for several planets. What constellation is each planet in?

Planet	RA	DEC	Constellation
Venus			
Mars			
Jupiter			
Saturn			

5. On the chart there is a curved line that represents the path of the Sun throughout the year. This path is called the ***ecliptic***. The dates listed along this path correspond to the location of the Sun on that particular date.

a) What is the current right ascension and declination of the Sun?

RA		DEC	

b) There are exactly two dates when the Sun has a declination of zero. What are these dates and what is the right ascension of the Sun at these times? What special names are given to these dates?

Day	RA	DEC	Special Name
		0°	
		0°	

c) What dates correspond to when the Sun is at its maximum and minimum values of declination? What is the right ascension and declination of the Sun at these times? What special names are given to these dates?

Day	RA	DEC	Special Name

6. Along the right ascension axis you will find dates listed below the hour values. These dates indicate when stars with the listed right ascension will be on the local meridian at 8 pm. For daylight savings (March – October), this becomes 9 pm.

To find the meridian at a later time, increase the right ascension by 1 hour for every hour of time difference (so if the right ascension of the meridian is 5 hours at 8 pm, then it is 6 hours at 9 pm and 7 hours at 10 pm).

a) What is meant by the meridian?

b) The best time to observe an object is when it is close to the meridian, as this is when it is highest above the horizon. List some constellations that will make for excellent viewing at 10 pm tonight.

c) List some constellations that will make for excellent viewing at 10 pm six months from now.

Part 2: Stellarium

In the left-hand panel,

- *Click the "Location window" and set the current location to Iowa City*
- *Click the "Date/time window" and set the time to midnight, August 1*

To search for objects, click "Search window" in the left-hand panel, or type ctrl-f.

1. The ancient astronomer Hipparchus ranked stars based on their brightness. Ptolemy expanded upon his idea, assigning the brightest stars to 1st magnitude and down onto the faintest at 6th magnitude. Astronomers nowadays use a more precise definition based on a mathematical formula that is similar to Ptolemy's system.

Find each of the following objects and record their magnitudes. Feel free to round to the nearest integer.

Object	Type	Magnitude
Vega	Star	
Deneb	Star	
Polaris	Star	
Albireo	Double Star	
M31	Galaxy	
M13	Globular Cluster	
M82	Galaxy	

2. Vega, the 5th brightest star in the night sky, is used to define the magnitude scale. It is about 25 light years away and is around 40 times more luminous than our Sun. How many times further away is the blue supergiant Deneb? (pg. 52)

3. In the bottom panel, turn on the constellation lines, labels, and art. In what constellations are the stars of the Summer Triangle found and what objects do these constellations represent?

Star	Constellation	Object
Altair		
Deneb		
Vega		

4. In the bottom menu, turn on the Equatorial Grid and find the North Celestial Pole. Zoom out so that you can see most of the sky. Simulate an entire day by changing the hour and watch the constellations move.

a) List some constellations that never went below the horizon.

b) What constellation occupied the North Celestial Pole 6000 years ago?

c) Change the location to the South Pole Telescope. Simulate an entire day and then a year. What do you notice about the path of the stars?

5. On 21 August 2017, parts of the United States experience a total solar eclipse. Let's simulate what the sky will look like during the next eclipse (*unfortunately, the sky doesn't get very dark in the latest version of Stellarium*).

- Change the current location to Bloomington, Indiana
- Click "Sky and viewing options" in the left-hand panel
  - Under the "Sky" tab make sure "Solar System objects" is checked.
  - Under the "Starlore" tab check show constellation lines, labels and boundaries; leave the art unchecked
- Change the time to 2024/04/08, 15:05

Find the three brightest planets that will be visible and identify the constellation they will be located in.

Planet	Constellation

6. Return to the current time by clicking "8" on the keyboard, change the location back to Iowa City, and change the time so that the sky is dark.

In the left panel click on the "Astronomical calculations window" and under the "WUT" (What's Up Tonight) tab find a planet and galaxy that will be visible tonight. After finding an object, click on the "Alt vs. Time" tab to find its meridian transit time and altitude.

Object	Meridian Transit Time	Altitude on Meridian

7. Click on "Sky and viewing options" in the left panel and then click on "Starlore" and look at some constellations from non-Western cultures.

a) The Big Dipper is an asterism found in many cultures. For each of the following starlores, indicate what object this pattern of stars was interpreted as.

Starlore	Object
Belarusian	
Chinese / Korean	
Inuit	

b) What are the Navajo counterparts to *Ursa Major* (The Greater Bear) and *Cassiopeia* (The Queen of Ethiopia and wife of Cepheus)?

c) In his work on Norse mythology, *The Prose Edda*, Snorri Sturluson's records that Thor carried Aurvandil (*luminous wanderer*) in a basket on his back from the land of the frost giants, but:

> *one of Aurvandil's toes had stuck out of the basket, and became frozen; wherefore Thor broke it off and cast it up into the heavens, and made thereof the star called Aurvandil's Toe.*

Aurvandil or Earendil is thought to refer to the morning star (Venus) and is mentioned in *The Lord of the Rings:*

> *And for you, Frodo Baggins, I give you the light of Eärendil our most beloved star. May it be a light to you in dark places when all other lights go out.*

What Western constellation does Aurvandil's toe likely correspond to?

Part 3: Observing the Night Sky

1. Find the following objects in the night sky and point them out to yourTA.

Object	Type	TA
Arcturus	Star	
Big Dipper	Asterism	
Mizar-Alcor	Double Star	
Polaris	Star	
Summer Triangle	Asterism	

2. Find the following objects in the night sky and point them out to yourTA.

Object	Type	TA
Altair	Star	
Deneb	Star	
Vega	Star	
Cassiopeia	Constellation	
Cygnus	Constellation	
Lyra	Constellation	