Names: _____ _____

_____ _____

Grade	

Exploring the Sky

Pre-Lab Quiz

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

1.
2.
3.
4.

Part 1: Using a Star Wheel

1. Dial up 9 pm on your star wheel by aligning today's date with 9 pm. Find a constellation that has just risen. Find a constellation that has just set.

Hint: how can one simulate the passage of time throughout the night on a star wheel?

Constellation – Just Risen	
Constellation – Just Set	

2. The point about which the sky rotates in the northern hemisphere is called the *North Celestial Pole* (NCP). What star is associated with the NCP and what constellation is it part of?

3. The *zenith* is defined as the point on the celestial sphere directly above an observer. On the star wheel, the zenith will be at the center of the visible portion of the sky. What constellation will be closest to the zenith at 9 pm tonight?

4. The *meridian* is a great circle on the celestial sphere that passes through the north and south celestial poles and an observer's zenith. List some constellations that will be along the meridian at midnight tonight.

5. The word *circumpolar* is used to denote objects that never set below the horizon, and thus are visible at all times of the year.

a) Using the star wheel, list three circumpolar constellations for Iowa City.

b) Where would one look to find them?

6. Where would one currently look to find *Ursa Major* (Big Dipper)?

7. The Summer Triangle consists of the three bright stars *Altair*, *Deneb*, and *Vega*. While it isn't a constellation, it is one of the most famous "asterisms" (pattern of stars) in the night sky. During which months will it be visible at midnight?

8. The Orion constellation is home to the picturesque Orion Nebula, a popular target for amateur astronomers (*The Stargazer's Handbook*, pg. 124). Will Orion be visible tonight? If so, during what times? If not, when will it become visible in the early morning (4 am) again?

9. Arcturus (*Guardian of the Bear*) is the fourth brightest star in the night sky and is located in the constellation Boötes. Draw a diagram of the Big Dipper and illustrate how to find Arcturus and Polaris using the Big Dipper as your starting point. Also label Mizar-Alcor, part of the constelaltion Ursa Major and one of the most famous multi-star systems. More than half of all stars are thought to be part of a system with two or more stars.

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)?

Part 3: Observing the Night Sky (Fall)

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

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

Part 3: Observing the Night Sky (Spring)

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

Object	Type	TA
Rigel	Star	
Big Dipper	Asterism	
Mizar-Alcor	Double Star	
Polaris	Star	
Orion's Belt	Asterism	