

AST101: Our Corner of the Universe

Take Home Lab: Observing the Moon and the Sun

Name:

Grading scheme

Student number (SUID):

Lab section number:

1 Introduction

Objectives

This lab is designed to help you understand the motion of the Sun and the Moon by making observations during the semester.

You should complete **either** Section 2 **or** Section 3, **you do not need to do both**. Only one section will be graded and there is no extra credit for completing both sections. Please indicate which section you would like the TA to grade by checking the section that you want graded below:

Please grade Section 2: Phases of the Moon *One point for each 5 checks*

Please Grade Section 3: The Sunset Point *One point for each 5 checks.*

In Section 2 you are asked to make three observations of the Moon and answer some questions about your observations. In Section 3 you will make observations of the Sun over several weeks and answer some questions on your observations.

Materials

Your eyes, a pencil or pen and this lab handout.

Submission Deadline

You must submit your completed lab assignment to your TA by **5pm on November 21**. Labs should be placed in your TA's mailbox, located opposite Room 201, Physics Building. You are responsible for figuring out your TA's name and the location of their mailbox. No take home labs will be accepted after 5pm on November 21. To complete this assignment you must start it **as soon as possible**. If you leave it too late to start you will not have enough time to complete it and/or the weather may not be good enough.

2 Phases of the Moon

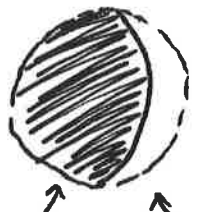
The moon changes its position in the sky from day to day as a consequence of its orbital motion around the earth. The goal of this lab is to watch and chart the lunar motion. To complete this lab you will need to make three observations of the moon. *These observations should be separated by at least 5 days.* It will only take you a few minutes to make the observations, but you will need to make sure you do them with enough time to complete them before the lab is due. For each observation you should find the moon in the sky and make a note of

1. The date and time of the observation.
2. A sketch of the moon at the time of your observation.
3. The location of the moon at the time of your observation (e.g. low in the east, high in the south-west).

For the three observations, complete the observing chart as shown in the example below. You should then complete the figure to the right of the observations as follows:

1. Indicate the location of the moon on its orbit around the Earth at the time of your observation.
2. Complete the blanks for the name of the phase you observed, it's rise and set time, and the time that it is highest in the sky.
3. **Comment on whether your observation is consistent with your answers above.**

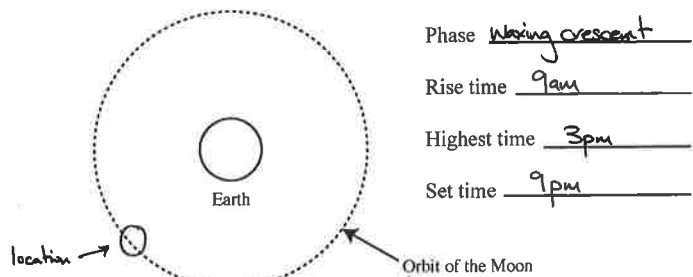
One of the hazards of being an astronomer is clouds—and there is not much you can do about it. So if you find that you cannot observe on certain nights when you had planned, just imagine what its like to fly across the country to use a large telescope for three days and then watch nothing but rain. Rest assured that professional astronomers are sympathetic to such problems; do the best you can.

| |
|---|
| Observation 1 |
| Date and Time: October 8, 3pm |
| Moon Sketch:  dark light |
| Location: high in the south |



Sun

Not to scale

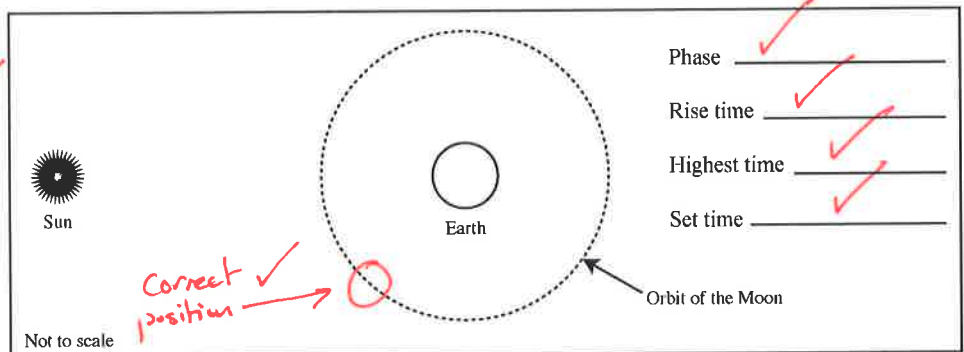


Observation 1

Date and Time:
Date ✓ *Time* ✓

Moon Sketch:
Sketch ✓

Location:
Location ✓



Is your observation consistent with your sketch? Comment on why.

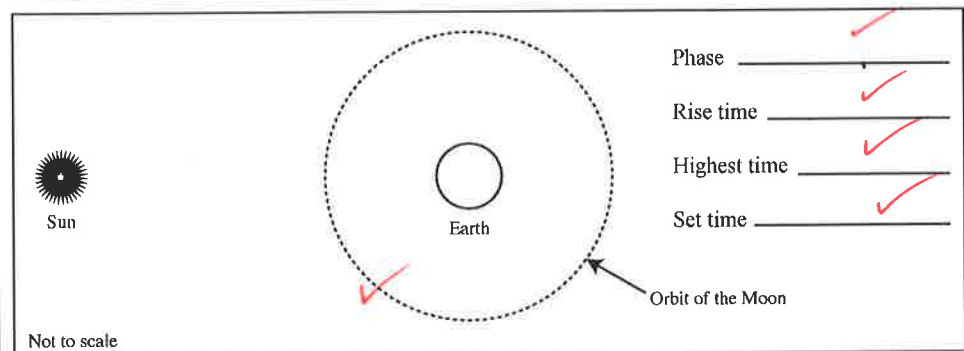
Yes they match ✓ or no and explanation

Observation 2

Date and Time:
 ✓ ✓

Moon Sketch:
 ✓
 ✓

Location:
 ✓



Is your observation consistent with your sketch? Comment on why.

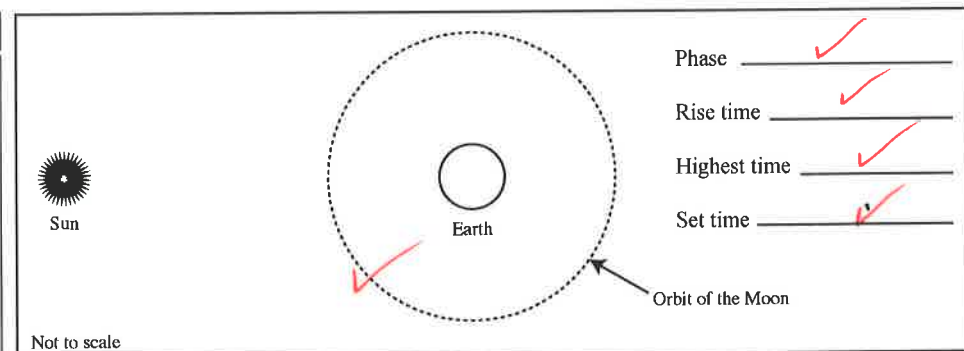
✓

Observation 3

Date and Time:
 ✓ ✓

Moon Sketch:
 ✓
 ✓

Location:
 ✓



Is your observation consistent with your sketch? Comment on why.

✓

3 The Sunset Point

The motion of the Sun on the celestial sphere can be easily detected in observations of the sunset or sunrise. In this section you will record the point of sunset three times in a month and compare your observation to the answers to the question in the previous section. On your first evening observing the sun, you will need to make a sketch of the horizon from your observing location, so make sure you go out 20 minutes before sunset to give yourself chance to complete the sketch before your first observation. You can find the sunrise and sunset times for Syracuse, NY on the web site <http://www.sunrisesunset.com>

Choose an observing location with a clear view of the western horizon. All your observations must be made from exactly the same point, so make a note of the location you chose below. Good places to observe on campus are from the western edge of the Law School plaza or Mount Olympus.

Observing Location:

Location ✓

Make a sketch of the horizon from your observation location on page 5 of this lab packet. To do this, first draw a line in the middle of the page indicating the horizon (you can rotate the page sideways to give yourself more space). Now locate two or three easy to identify landmarks on the horizon, such as water towers, radio masts or distant buildings. You will be measuring the position of the sunset relative to these objects, so choose some objects near to and either side of the position of the Sun near sunset time. Mark the location of these objects on your diagram. Now, using your hand as an angular measuring device, measure the angular separation between the distant landmarks you have chosen. Mark the angular separation of these objects on your diagram.

Now wait for the Sun to set. Just as the Sun is setting, mark on your drawing the point where it goes below the horizon. Label this point with the time and date of the observation. Now, using your hand as an angular measuring device, measure the location of the sunset with respect to a convenient object on the horizon chosen as reference point. Mark this point on your drawing and report the angle, together with the time and date, in the first row of the table below. Mark L or R to indicate if the angle is to the left or to the right of the landmark.

After one week, return to the same observing location to measure and draw the location of the sunset point in the same way as above. After one more week has passed, make a third and final observation. Record your answers in the table below and on your diagram. When your observations are complete, answer the questions on the next page.

| | Date | Time | Landmark | Angle (L or R) |
|---------------|------|------|----------|----------------|
| Observation 1 | ✓ | ✓ | ✓ | Angle ✓ LR ✓ |
| Observation 2 | ✓ | ✓ | ✓ | ✓ ✓ |
| Observation 3 | ✓ | ✓ | ✓ | ✓ ✓ ✓ |

1. Has the sunset point moved along the horizon? In which direction?

Yes ✓

Further south ✓

2. Why did the sunset point move and why in that direction?

✓ or [It moved because of the tilt of the Earth's axis ~~over the~~
with respect to the ecliptic plane and the Earth's orbit around the sun]
[It moved because the sun set point changes with the seasons]
✓ It is after the summer solstice and before the winter solstice

3. What is the average daily rate of motion (in degrees per day)?

✓

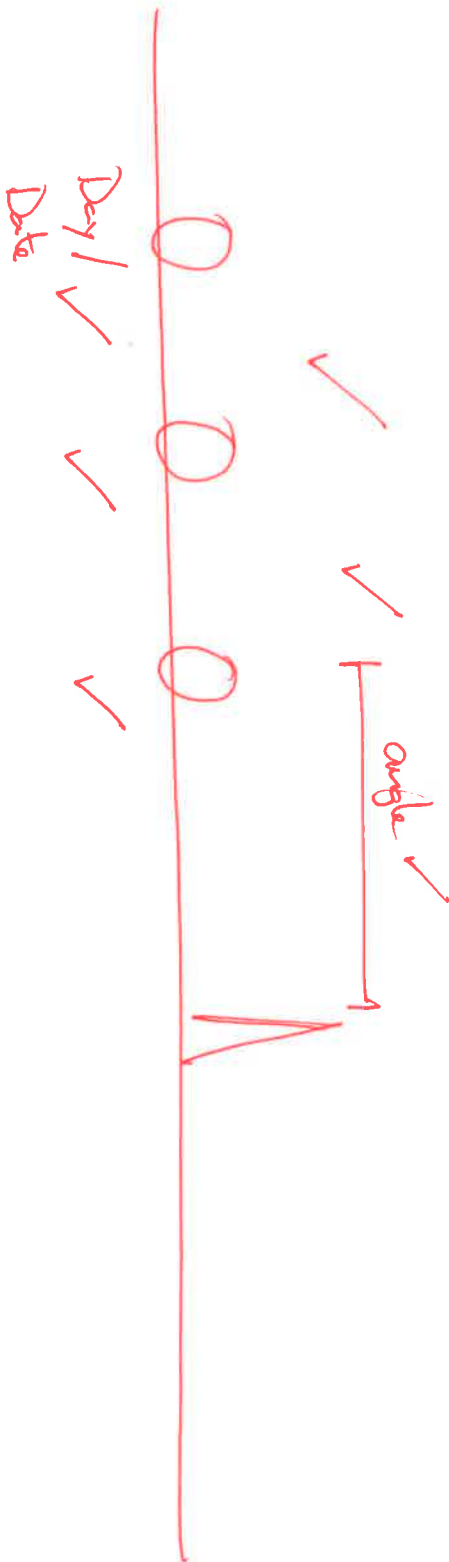
4. In what direction should you look to see the sun rise and set at this time of the year? Are your observations consistent with this?

South of east for sunrise ✓

South of west for sunset ✓

Yes ✓

Horizon Sketch



{ Sun labelled with day and date
(3 checks)

{ Angles (3 checks)