

# Outdoor Lab 5 - The Moon

## 1 INSIDE PREPARATIONS

*The Position of the Sun.* One of the things we shall measure tonight is the angle between the Sun and the Moon, which is directly related to the lunar phases. Before going out, estimate the R.A. of the Sun today using the approximate method we used to estimate sidereal time: i.e., count the months and days from the last equinox/solstice position. Enter the result in the space for the R.A. of the Sun in section 3.

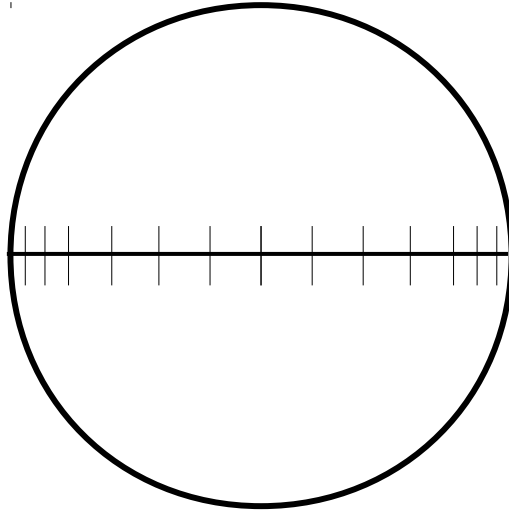
*Scale of the Moon Maps.* To get some idea of the size of things we shall see on the Moon, we want to calibrate the Moon maps in miles or km. In the M5 map (last page), the Moon diameter is given as 2160 miles. Measure the diameter in cm (ruler on back page of field guide), and figure out how many miles in 1 cm and 1mm on the map. Mark these scales above the map for later reference. Check also that you can relate the detailed Moon maps in the FG (starting at page 365) with the M5 map.

1 cm = \_\_\_\_\_      1 mm = \_\_\_\_\_

## 2 OUTSIDE

### 2.1 The Moon's phase and age

Examine the Moon with the naked eye and verify that the side facing the Sun is the side that is lit up! See if you can detect the dark side of the Moon which is dimly lit by sunlight reflected off the Earth, back to the Moon, and back to the Earth again (Earth-shine). The figure below is a circle representing the lunar disk. The horizontal line is the equator, and the tick marks along it show the position of the terminator (at the equator) for each day since the new Moon phase. Draw in the terminator as you see it, shade in the unlit side, and estimate the age of the Moon this evening.



Date = \_\_\_\_\_ Time = \_\_\_\_\_ Age(days) = \_\_\_\_\_ Constellation = \_\_\_\_\_

## 2.2 The Angle Between the Sun and Moon

Using the M5 atlas, identify the stars nearest the Moon, and thereby locate as accurately as possible the position of the Moon on the map. Enter the R.A. of the Moon below. Determine the angle in R.A. between the Sun and Moon in hr:min, and then convert this into  $^{\circ}$  (remember 1 hr =  $15^{\circ}$  and 4 min =  $1^{\circ}$ ). Using the fact that the Moon moves  $12.2^{\circ}$  east of the Sun each day, find the age of the Moon since it was last new. Fill out the little table as you go. Your final answer should be within one day of the estimate made from the phase.

The R.A. of the Moon today is: \_\_\_\_\_

The R.A. of the Sun today is: \_\_\_\_\_

The angle between the Sun and Moon in hr:min is: \_\_\_\_\_

The angle between the Sun and Moon in degrees is: \_\_\_\_\_

The age of the Moon from the Sun-Moon angle is: \_\_\_\_\_

## 2.3 Observing

Set up the telescope and study the Moon through the main eyepiece. The telescope need only be very roughly aligned with the Polaris; no need to set the RA and Dec circles. Check carefully the orientation of the image so you can find your way about; it will be upside down in the finder, but is probably upright in the main eyepiece, but possibly flipped left-right. Note how the shadows on the Moon become more prominent the nearer you get to the terminator, and the craters look more elongated the closer you get to the limb (edge) of the Moon, because of the effect of projection. Once you have found your way around, work through the following list of things to find, using the M5 map and the detailed FG maps where needed. If you cannot find an item, write none visible. After the first question try using a high power eyepiece so you can see more details.

1. Identify the most prominent mares visible tonight: \_\_\_\_\_
  
2. Identify two prominent craters close to the terminator: \_\_\_\_\_
  
3. Estimate the diameter of one of these craters in miles: \_\_\_\_\_
  
4. Estimate the size of the smallest thing you can see: \_\_\_\_\_
  
5. Find and identify by name an old crater: \_\_\_\_\_
  
6. Find and identify a crater with a dome in the center: \_\_\_\_\_
  
7. Find and identify a crater whose floor has been flooded: \_\_\_\_\_
  
8. Examine several craters close to the terminator: are they holes in the ground or do they have elevated rims as well: how can you tell?  
  
\_\_\_\_\_
  
9. Find and identify by name a mountain range: \_\_\_\_\_
  
10. Estimate the length of the mountain range in miles: \_\_\_\_\_

11. Depending on the phase, choose one or two of these special lunar features (or any others that you can find and identify). Describe what you see in the space below:

- (a) Valley or rille of Ariadaeus and Hygius (few days before 1st quarter, see M5 map)
- (b) Straight wall (1-2 days after 1st quarter, M5 map)
- (c) Straight range (1-2 days after 1st quarter, see M5 map)
- (d) Undulations/ridges in the flat mares (any phase)
- (e) Bright craters and rays (any phase)

12. Before quitting, take a look at the place where man first landed. The Apollo 11 touchdown is marked in the M5 map. Can you see any footprints or pod marks? They are still there!