LEAP

Science is Fun!

LEARN EXPLORE AND PLAY

Activity Kit

Getting to Know the Moon

Materials

- *Orion* 10-25x42 Zoom Waterproof Monocular **with strap** in Carrying Case
- *Ever Wonder?* Moon in My Room Moon Phase light **with Remote**
- Lunar Minerals & Rocks Simulation Kit with 6 Specimens & Guide
  - 1 Olivine mineral specimen (1)
  - 1 Augite mineral specimen (2)
  - 1 Ilmenite mineral specimen (3)
  - 1 Anorthosite rock specimen (4)
  - 1 Gabbro rock specimen (5)
  - 1 Breccia rock specimen (6)

Binder—includes monocular instructions & moon light battery replacement guide

Book, Pocket Guide, & Poster

- *Luna: The Science and Stories of Our Moon* by David A. Aguilar
- *The Moon: A Folding Pocket Guide to the Moon, its Surface Features, Phases, and Eclipses*
- *Poster: Ever Wonder why the moon looks different each night?* (laminated)

Recommended for Grades 5 and up

What to know about this kit…

As long as humans have been on Earth, the Moon has been our companion. Throughout human history, each culture has told its own imaginative stories about the Moon. We have questioned its origins, and even sent astronauts to orbit the Moon and to explore its surface. Now, we look to the Moon as a launch pad to Mars, our Solar System, and beyond.

The Moon is an excellent target for all beginning observers, because it is easy to find in the sky, and its surface features and lunar cycle can be observed from Earth.

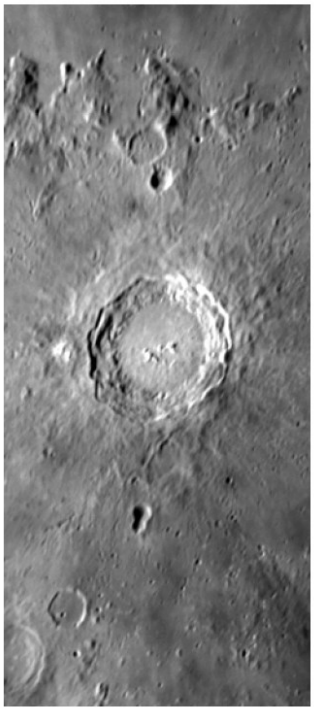
With this kit, using the monocular and the map from the folding pocket guide, observers will be able to locate and view craters, maria, mountain ranges, and other surface features. Using the Moon in My Room light, observers can move through each phase of the 29.5 day lunar cycle in just a few minutes.

For hands-on exploration, you'll find a set of rocks and minerals. Over the course of the many manned missions to the moon, astronauts have collected and returned samples of lunar rocks to the earth. The rock and mineral specimens in this kit are six hand samples of rocks and minerals which are similar to the rocks and minerals found on the moon. The six samples include Olivine, Augite, Ilmenite, Anorthosite, Gabro, and Breccia. These specimens help us learn about the formation of the moon and its subsequent evolution.

Unleash your curiosity as you Learn Explore and Play with this kit!

Recommended for Grades 5 and up

SKYWATCHER'S GUIDE TO THE MOON



Impact!

The Moon's cratered surface tells a violent story. Bright areas are ancient crust that make up the highlands. Dark areas are newer regions of lava that formed after asteroid impacts.

Copernicus

This crater (left) is easy to spot. It formed about 800 million years ago, and is 57 miles (92 km) wide. Note central peaks and terraced walls, caused by impact.

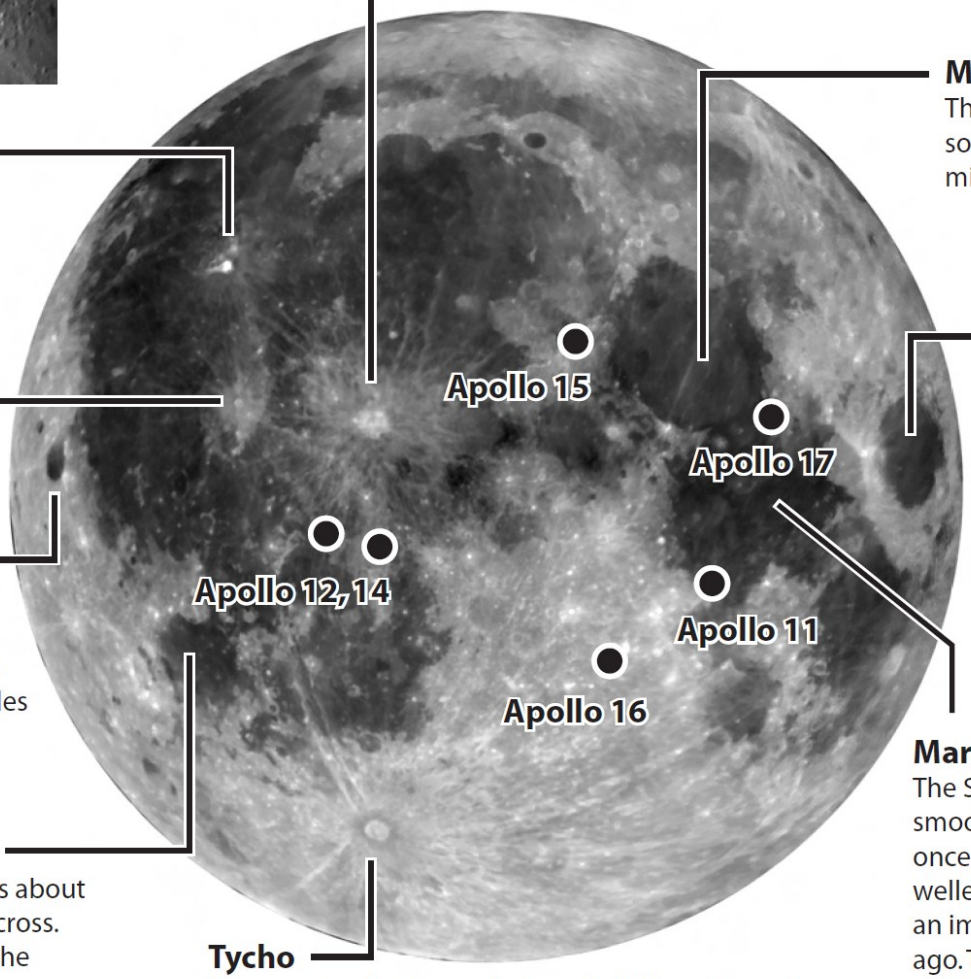
What do you see on the Moon?

Face south and look up in the sky.

Can you find the Moon?

Compare the Moon in the sky to the large Moon map below. The Moon map shows the side of the Moon that is always facing us. How much of the Moon in the sky is lit up right now? You will only see the features on the part of the Moon that is lit up.

Through a telescope, you may need to turn the map to match your view of the Moon in the eyepiece. Some telescopes will flip the image, so the Moon might look like the image to the right through a telescope.



Aristarchus
Young crater. So bright that Sir William Herschel thought it was an active volcano.

Kepler
Small version of Copernicus

Grimaldi
Lava-filled crater is one of the darkest spots you can see on the Moon. It's 145 miles wide (233 km).

Mare Humorum
The Sea of Moisture is about 220 miles (350 km) across. You can spot it with the naked eye. With a telescope, you might notice two craters along its edge.

Tycho
Young crater best seen during a full Moon. Rays of bright material are ejecta blasted out of the crust when a large asteroid struck about 109 million years ago.

Mare Serenitatis
The Sea of Serenity is solid lava, some 380 miles (610 km) across.

Mare Crisium
The Sea of Crisis is about 340 miles wide (550 km) and visible to the naked eye.

Mare Tranquillitatis
The Sea of Tranquility is a smooth plain filled with once-molten lava that welled up from below after an impact billions of years ago. The first humans to walk on the Moon, Apollo 11 astronauts, landed near the edge.

SOURCES: NASA; ADVANCED SKYWATCHING; CAMBRIDGE ATLAS OF ASTRONOMY; DK VISUAL ENCYCLOPEDIA

Photos: James Scala. Layout and text for Moon map used with permission: Robert Roy Britt/SPACE.com.

NASA Night Sky Network (nightsky.jpl.nasa.gov) administered by Astronomical Society of the Pacific (www.astrosociety.org)

Using the Monocular

Wrist strap - Secure around your wrist to avoid dropping the monocular.

Eyepiece ring - Gently turn this ring to adjust between 10x and 25x magnification.

Focus ring - Gently turn this ring to the left or right to bring the object into focus.

The best time to observe the moon is two or three days after first quarter, for several reasons:

- The moon is in position for evening study.
- Nearly all of the major lunar features can be seen.
- The moon is not sufficiently bright to cause loss of detail through glare.
- As the line of darkness – called the terminator – recedes, features near the border stand out in bold relief; the shadows become stronger and details are more easily seen.

Using in Cold Weather

All optics, when exposed to excessive temperature changes or high humidity, have the potential to fog up. Always allow the monocular to slowly adjust to cold weather by storing the instrument (in its case) in a cold area such as an unheated garage or the trunk of a car for a few hours before use. When bringing the instrument back inside a warm house, store it in a cool area for one to two hours. The instrument should be stored in a cool dry place.

Orion® Monocular Instructions

WARNING: Never look directly at the Sun through your monocular without professionally made solar filters, even for an instant, or permanent eye damage could result. Young children should use these monoculars on sunny days only with adult supervision.

Introduction to Monoculars

Monoculars are really just small diameter, very compact telescopes. If you have used a telescope or a binocular (two small telescopes mounted side-by-side), you'll get comfortable using a small monocular quickly. Hand held monoculars excel in situations where you need to save space and weight – such as when hiking or traveling through rough country for birding. Small diameter monoculars, those under about 25mm (1-inch), are usually small enough to fit in a pocket, so they are great for traveling.

Monocular Terminology

Objective Lens – This is the larger, light gathering front lens of the monocular that should point toward the direction you want to view.

Eyepiece or Ocular – This is the smaller lens on the end of the monocular that you place near your eye to view through the monocular.

Eyecup – The eyepiece end of a monocular will usually have a softer rubber "bumper" that serves to cushion the area around your eye for comfortable use.

Focus Wheel, Focus Ring or Focus Knob – Your monocular will have an area that when twisted or adjusted allows you to sharpen the image or "focus" the object you want to view.

10x25 or **10x42** (examples) – These are examples of how a monocular is designated. The first number is the power or magnification – how many times bigger and object will look through a monocular. The second number is the size of the objective lens, measured in millimeters. Thus, 10x25 and 10x42 monoculars both make an object 10 times bigger, but, the monocular with a larger objective lens of 42mm actually collects more light (~280 percent more light), so it gives a brighter image.

Field-of-View – This is a measure of the "width" of the image or how much space/area your monocular allows you to see through the eyepiece at any given distance, and is often printed on the monocular. It can be referred to as an angular measurement in degrees (example 5.0 degrees) or as a linear measurement such as 50m/1000m – where an object 50 meters wide at 1000 meters distance will just fit in the field of view.

Near Focus – The closest distance a monocular can focus.

Using a Monocular

A monocular is similar to a point-and-shoot camera, to use a monocular you simply point the objective end at what you want to view and look in the eyepiece for a magnified view! You still need to focus a monocular and you'll find that most models will have a focus ring near the eyepiece end (twist the barrel to focus); however, depending on the design of the monocular, the area you twist to focus may be located near the larger objective end of the monocular for ease of use.

Most monoculars have a fairly large range of focus – you will be able to focus on very distant objects as well as objects that are very close ("near focus"). Try moving the focus ring to one end of its travel while you are looking at closer objects and see how close you can focus; note that it may take quite a bit of turning the focus ring to go from far distance to a much closer object.

For really small monoculars, it is sometimes hard at first glance to tell which end is the eyepiece end! The objective lens is the larger lens of the monocular; and the eyepiece usually has a fold-down or roll-down eyecup.

When using monoculars, those models with a bigger objective lens will always make an object brighter than a monocular which has the same power, but a smaller objective lens. However, larger objective monoculars will be physically larger as well – you trade image brightness for compactness and weight with a larger monocular.

Cleaning and Care of Monoculars

The lens surfaces of Orion monoculars are coated with anti-reflection coatings that can be damaged with careless handling. Avoid touching surfaces with fingers or any coarse material.

Most monoculars, eyepieces, and camera lenses are cared for in a similar manner. All optics, even if stored, must be cleaned approximately twice a year or whenever they are dirty. The dust that builds up on coatings promotes mold growth, which etches glass and destroys optical coatings. Avoid over-cleaning; it can damage the coatings. Always use lens cleaning tissue and fluid that are specifically designed for multi-coated lenses. Do not use fluids or tissue that are for eyeglass or household use.

To clean the monoculars, blow off the lens with a blower bulb to remove the larger particles. Make sure your hands are clean. Have several pieces of tissue ready. Put two drops of lens cleaning fluid on a piece of lens cleaning tissue (never directly on the lens). Gently wipe the dirt off the lens. Quickly wipe the excess with a new, dry piece of lens cleaning tissue. On larger lenses, clean only a small area at a time, using new tissue each time. On excessively dirty lenses, wipe across using one stroke for each tissue, alternating wet and dry. The more fresh, clean lens tissue you use, the less likely you are to scratch your lenses. Always avoid excessive pressure or rubbing. It is better to leave a tiny amount of dirt on the lens than to use too much pressure and destroy the lens coatings.

ORION®
TELESCOPES & BINOCULARS
Providing Exceptional Consumer Optical Products Since 1975

OrionTelescopes.com
89 Hangar Way, Watsonville, CA 95076
Customer Support Help Line (800) 676-1343
E-mail: support@telescope.com

Using the Moon in my Room

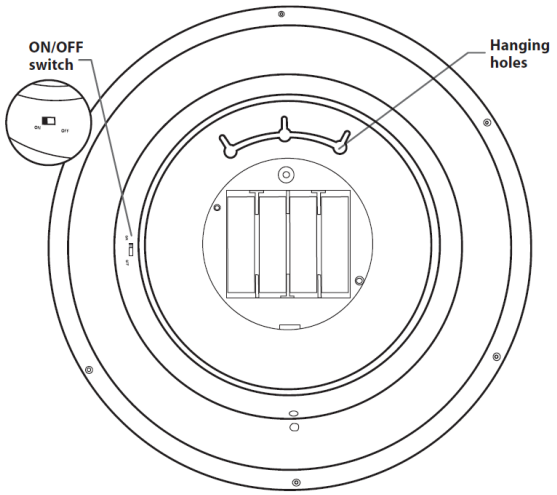


Figure 4

IMPORTANT: Before operating, be sure on/off switch located on the back of Moon In My Room is turned to the **"ON"** position.

NOTE: *In order for the moon to function properly, the room lights should be off.*

On/Off

To turn the moon off, press the ON/OFF button on your remote. Press ON/OFF button again to reactivate a full moon.

Auto Off

Moon automatically shuts off after 30-minutes if there is no manual interaction.

Manual Phase

To manually cycle through the moon phases, press the manual phase button (see figure 5). If you leave the moon on in a phase, it will automatically turn off after 30 minutes.

Auto Phase

Your Moon In My Room will cycle through the moon phases automatically, when you *push* the automatic phase button. The moon will cycle from phase to phase in five-second intervals. In this mode, the moon will automatically turn off after 30-minutes.

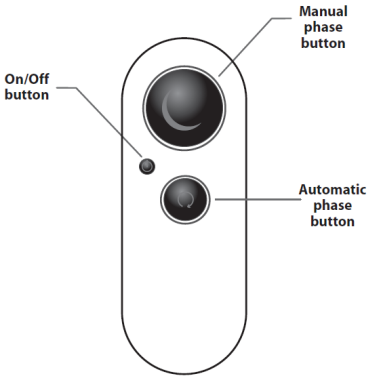
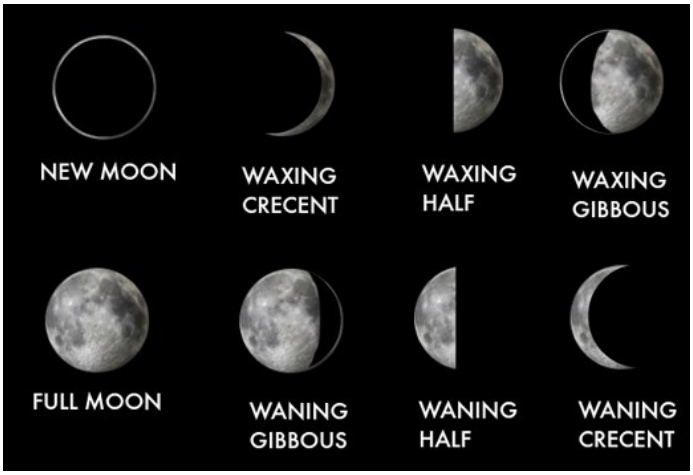


Figure 5



Lunar Minerals & Rocks Simulation Kit

1. Olivine
2. Augite
3. Ilmenite
4. Anorthosite
5. Gabbro
6. Breccia

Olivine

Mineral	1. Olivine		
Chemical Composition	(Ca,Mg,Fe) (Mg,Fe) SiO4		
Color	emerald green to pale yellow-green	Streak Color	white
Luster	non-metallic	Transparency	translucent
Hardness	6.5-7	Specific Gravity	3.27-4.20
Cleavage	poor; two directions at almost a right angle		

Augite

Mineral	2. Augite		
Chemical Composition	(Ca,Na) (Mg,Fe,Al,Ti) (Si,Al)2O6		
Color	dark green, dark brown, or black	Streak Color	dark greenish-gray
Luster	non-metallic	Transparency	opaque to translucent
Hardness	5-6	Specific Gravity	3.2-3.5
Cleavage	two directions at almost a right angle		

Ilmenite

Mineral	3.Ilmenite		
Chemical Composition	FeTiO3		
Color	dark grey, black, or brown	Streak Color	Brownish-black or grey
Luster	metallic	Transparency	opaque
Hardness	5-6	Specific Gravity	4.5-5.0
Cleavage	none		

Anorthosite

Rock	4. Anorthosite		
Color	light grey, tan, or dark grey	Grain Size	coarse
Texture	trachytic (preferential orientation of elongate crystals)		
Composition	rich in SiO_2, Al_2O_3, CaO, NaO, with <5% iron and magnesium oxides		
Minerals	Mostly anorthite (>90%), some pyroxene, olivine, magnetite, chromite, garnet, and ilmenite		
Occurrence	intrusive complexes, including plutons, dikes, sills, and batholiths		

Gabbro

Rock	5. Gabbro		
Color	medium grey to dark green or black	Grain Size	coarse grained to pegmatic
Texture	equigranular or porphoritic		
Composition	rich in SiO_2, Al_2O_3, CaO, NaO, with <15% iron and magnesium oxides and <5% K_2O		
Minerals	Mostly anorthite, augite, and olivine; some magnetite, chromite, garnet, rutile, and ilmenite		
Occurrence	intrusive complexes, including plutons, dikes, sills, and batholiths		

Breccia

Rock	6. Breccia		
Color	highly variable, depends on source	Grain Size	greater than 2mm, can be larger than 1m
Texture	angular clasts within a finer grained matrix; often poorly sorted		
Composition	rock fragments		
Minerals	depends on source rock		
Occurrence	sedimentary deposits, pyroclastic flows, meteorite impacts		