# STARS RESOURCES

## **Phases of the Moon**

#### ACTIVITY

Observe the Moon's orbit around the Earth to see how its appearance changes in the night sky.

Note: This activity takes about a month of data collection to complete. You can do this activity with the naked eye but it is fun to observe the phases of the Moon through a telescope as you can see so much more detail of the Moon's surface.



The Moon orbits the Earth once every 27.3 days. One side of the Moon permanently faces the Earth; this is known as tidal lock.

The Moon is illuminated by the Sun's rays. In fact, half of the Moon is always illuminated by the Sun but as the Moon moves around the Earth, the amount of the Moon we see from Earth changes. These changes are called 'phases', and are illustrated in the diagram below.



Ver: 1.0 March 2022



#### **BACKGROUND INFORMATION cont'd**

When you're observing, you will notice the very obvious edge between the part lit up by the Sun and the dark part in shadow. This line dividing dark and light is called the 'terminator'. As the phase of the Moon changes, the terminator line will move across the surface of the Moon.

If you're using a telescope, you may find that the most interesting features can be seen at the terminator. This is where strong shadows are cast, highlighting the landscape.

#### EQUIPMENT

You will need the following to complete this activity.

- The telescope provided by your school (or you can make observations without a telescope)
- A pen or pencil
- A print-out of the Moon sheets
- A clipboard
- A clock/watch and a calendar
- The Internet (optional)

NOTE: You will need relatively clear skies for your observations, so keep an eye on the weather and cloud cover.

#### **OBSERVATIONS**

1. Select a day to begin your observations.

Using a website such as Time and Date, <u>https://www.timeanddate.com</u>, look up the timing of the Moon phases and start your observing during a 'new' Moon.

Each night, observe the Moon at the same time. It is important that you go out roughly the same time every night. Moon rise or the 6:30 - 8pm window is optimal. In this way you will get a sense of the path of the Moon as it crosses the sky.



#### **OBSERVATIONS** - cont'd

2. Select an open location.

You will need a good, clear view from low in the western horizon and across to the eastern horizon. At the very beginning of the observing period the Moon will be towards the west and low in the sky (or already set if you wait until 8pm). Close to the full moon phase the Moon will be low over the eastern horizon.

So, identify where north, south, east and west are. You can do this with a compass, or you can use the stars of the Southern Cross and of the Pointers to identify south (as explained here: 'Beginner's Guide to the Night Sky', ABC website, <u>http://www.abc.net.au/science/articles/2009/07/27/3169018.htm</u>.

3. Locate the Moon.

If you're using a telescope, angle the tube towards the Moon and locate the Moon through the finderscope.

NOTE: When you look at the Moon in the eyepiece, some telescopes may show you a "flipped" version of what you see when you look at the Moon with just your eyes. Make sure you draw what you see with your eyes and use the telescope as a guide only to help with the shape of the Moon.

Within a few minutes the Moon will disappear from the view in the telescope. Manually adjust the telescope to ensure you stay fixed on the Moon as the Earth rotates.

4. Commence your observations.

On pages 4, 5 and 6 you will find circles on which to record your observations. Remember to also record the time and date. Shade the part of the Moon that is dark. Print out more circles if you need them.

5. Continue nightly observations of the Moon until it becomes a full moon (around two weeks).

#### EXTENSION:

While you are at it, you should take the time to look around the sky. A chart can be found on the Powerhouse Museum - Sydney Observatory webpage, 'Observations - Monthly Sky Guides: <u>https://maas.museum/observations/category/monthly-sky-guides/</u>, and there are plenty of interactive apps you can download too (e.g. Stellarium).

See if you can spot the Southern Cross, the Pointers, and virtually overhead, the constellation Scorpius.

































## RESULTS

Once you have completed your observations, have a close look at your sketches.

The phases have changed, and depending on the number of nights you observe the Moon, you can see the progression from new Moon to full or the complete cycle from new Moon to new Moon. Perhaps cut these out and turn them into a flip book.

Use your new knowledge to answer a few questions.

## FOLLOW-UP QUESTIONS

1. Describe the changes in the Moon's appearance over the course of your observations.

2. Why do we see phases of the Moon? What causes the shadow?

3. If the Moon was further away from the Earth, would a month be longer or shorter? Explain your reasoning.



## **FOLLOW-UP QUESTIONS**

4. Imagine that you are now standing on the Moon looking back at the Earth.

a) How would the Earth change over the course of 24 hours?

b) If you stayed on the Moon in the same spot for a week, would the Earth's position in the Moon's sky change?

Explain your reasoning.

5. Apply your knowledge how the Sun, Moon and Earth move to complete this table. Remember to think about both how they move individually and together.

What causes Earth day/night	Similarities between Earth day/night and phases of Moon	What causes phases of the Moon
	Both involve the motions of the Moon and the Earth	
The light from the Sun shining on the Earth		
		The Moon is tidally locked to the Earth



#### **FOLLOW-UP QUESTIONS**

#### EXTENSION QUESTIONS

1. How might your observations have been different if you had conducted this experiment in the northern hemisphere over the same dates?

2. Remembering that a day is defined as the time it takes an object to turn once on its axis, how long is a day on the Moon?

3. Many exoplanets are tidally locked to their stars. Predict what might happen if the Earth was tidally locked to our Sun. Consider the climate, ocean currents and weather patterns. (This is a hypothetical scenario.)

### **FURTHER RESOURCES**

'Moon in Motion', NASA Science website, <u>https://moon.nasa.gov/moon-in-motion/</u> <u>moon-phases/</u>

'Why can I sometimes see the moon in the daytime', *The Conversation* website, <u>https://theconversation.com/curious-kids-why-can-i-sometimes-see-the-moon-in-the-daytime-83969</u> (31 January 2018)

'Phases of the Moon', Australian Academy of Science, (9:46 mins), https://www.science.org.au/curious/video/phases-moon (6 February 2015)

'What causes the phases of the Moon?, Stile Education YouTube (2:23 mins), https://www.youtube.com/watch?v=YLczDRcd054 (14 September 2018)

All websites accessed 8/3/2022.

