ROYAL OBSERVATORY GREENWICH

Phases of the Moon

Key Stage 3

Topics covered: Sun, Earth, Moon, lunar phases, light and dark, shapes

Teacher's Notes

Watch the video "Moon Watch", https://vimeo.com/64563198

This extension activity challenges students to explain the phases of the Moon by linking the movement of the Moon around the Earth with our perspective from Earth of light and shadow on the Moon.

Equipment: Cut-out phases (see page 5), Earth and Moon diagram (see page 4). Foam ball on a stick and torch (for demonstration purposes).

Class discussion before the activity:

How can we see the Moon?
Answer: The light from the Sun reflects off the Moon and into our eyes or our telescopes. Reflections are how we see things on a day-to-day basis. Sunlight also reflects off the planets and that is how we see them. Stars, like the Sun are light sources, while other objects are not.

What type of shape is the Moon?
Answer: The Moon is spherical. We can't see the whole sphere from Earth, but we can see the way that sunlight falls on the Moon – this can be demonstrated with a ball on a stick. Show students the ball lit up from the side with the torch. Students should see that the line between the darkness and the light is curved just as it is on the Moon (when it isn't full).

How much of the ball is lit up by the torch?
Answer: Half. Change the position of the torch a few times and repeat the question. This demonstrates that the Moon (being a sphere) is always half lit up when sunlight shines on it.

What does the Moon orbit and how long does one orbit take?
Answer: The Earth. Approximately 27.3 days. {However, the Moon takes longer to come back to the same phase (29.5 days) because it has moved a little around the Sun with the Earth.}

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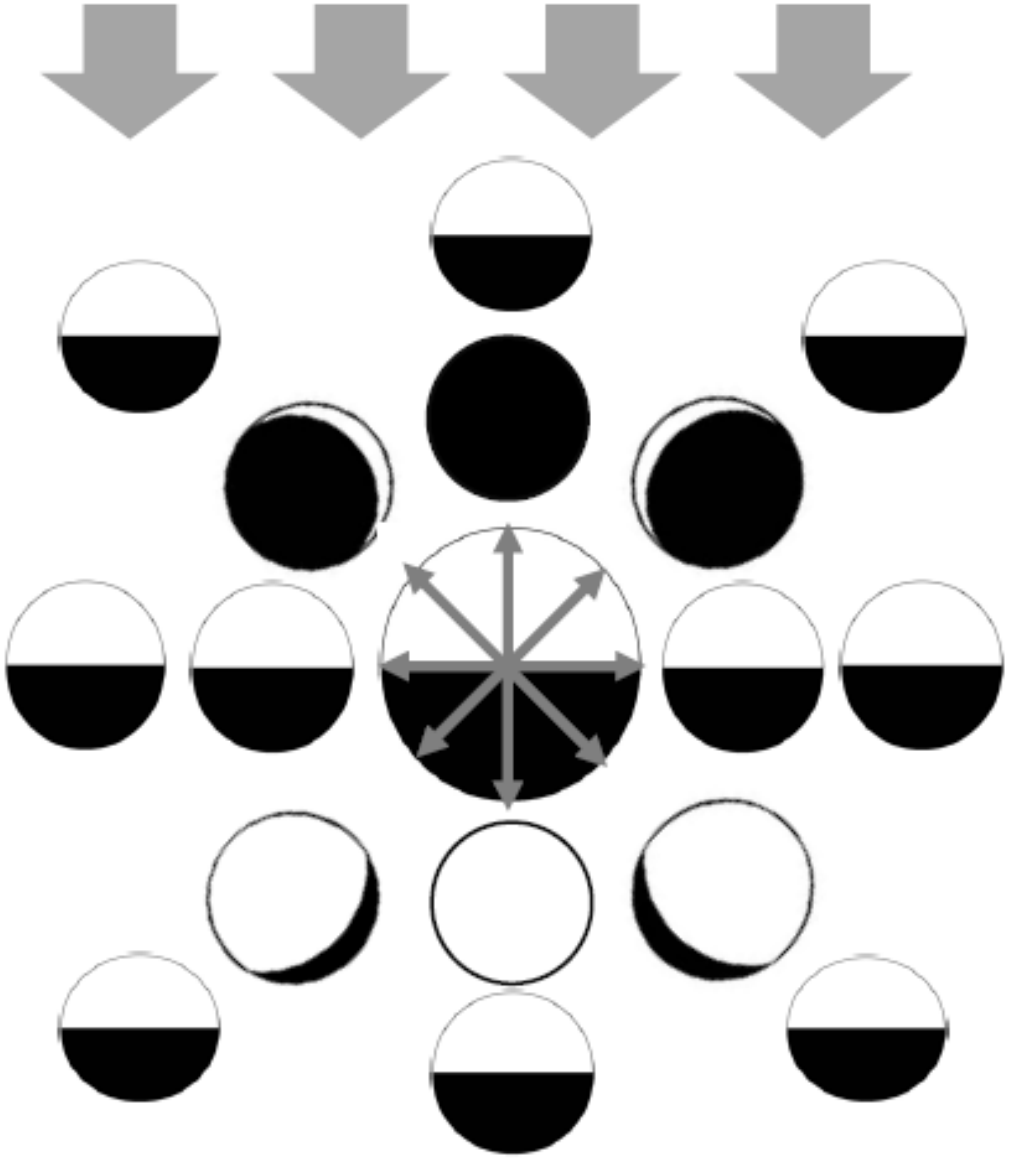
Activity: Phases of the Moon

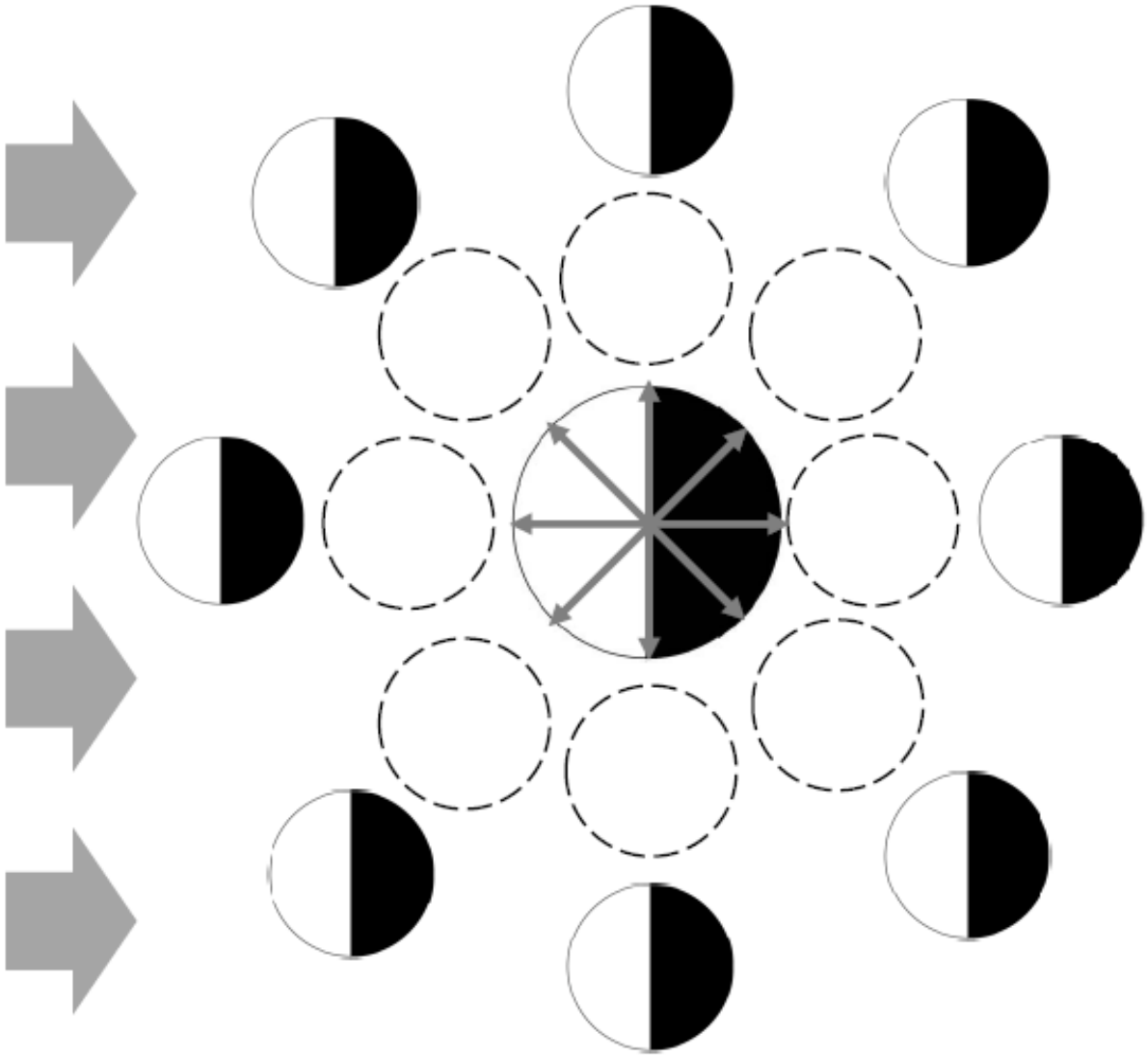
The diagram on page 3 is the answer sheet for the student's diagram on page 4. The Earth-Moon sizes and distances are not to scale. The large parallel arrows represent the direction of light incident from the Sun. The outer circles represent different positions of the Moon in its orbit around the Earth (top-down view). The inner circles represent the phases of the Moon as seen from the Earth. The phases of the Moon can be found on page 5, students can cut these out and place them on the diagram on page 4.

To use the diagram, students can turn the page around as directed by the arrows on the Earth so that they are facing that particular position of the Moon. They can then imagine they are standing where the tip of the arrow is, looking at the Moon and work out what the face of the Moon would look like. Students can be eased in by first attempting to identify where the full moon and new moon phases should go and then attempting the quarter phases, followed by the more difficult crescent and gibbous phases. The distances and sizes on diagrams are not to scale.

When students have placed the correct phases beside the Moon positions the activity can be concluded with the "match the phase name to the picture" section beneath the cut-out phases.



The Earth is at the centre of this picture. The positions of the Moon at different times of the month are also shown. Can you place your cut-outs of the Moon phases in the right place? Imagine you are on the tips of the arrows on the Earth looking up at the Moon. What would you see for each position? The large block arrows show where the Sun's light is coming from. Place the correct phase cut-outs in the dashed circles beneath each Moon position.



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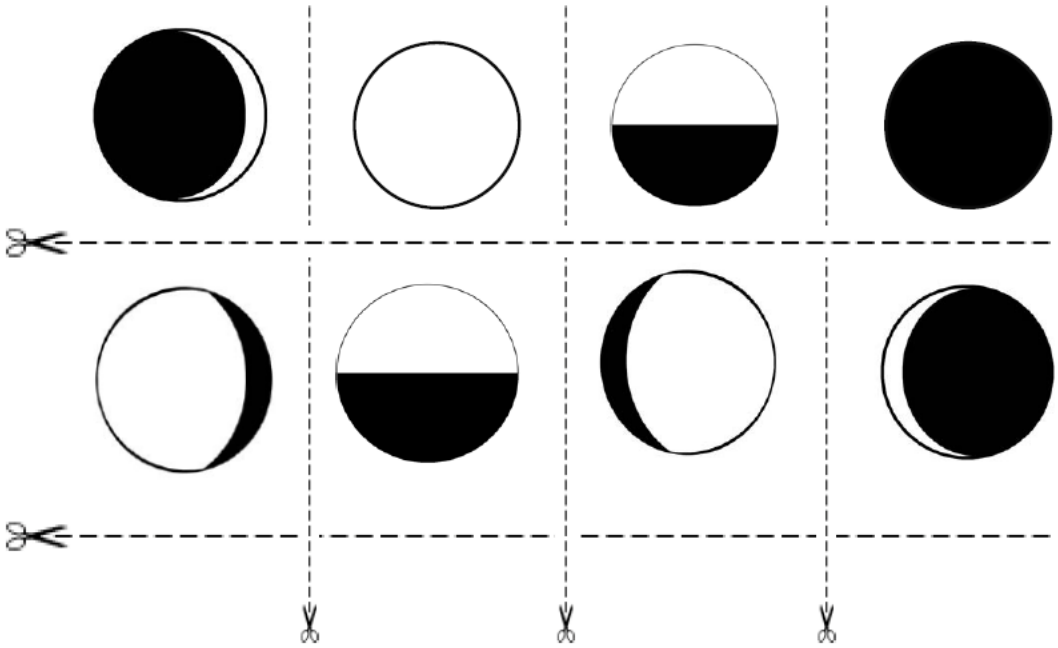
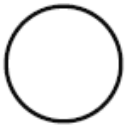


Match the Name to the Phase:

Full Moon

New Moon



Waxing Crescent

Waning Crescent

Waxing Gibbous

Waning Gibbous

First Quarter

Last Quarter