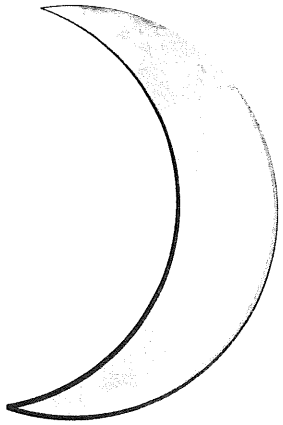
Seeing the Moon



How often have you looked up into the sky and seen the Moon? Put an X next to all the times when you think you can go outside and see the Moon.

___ in the morning

___ at noon

___ in the middle of the afternoon

___ in the evening before sunset

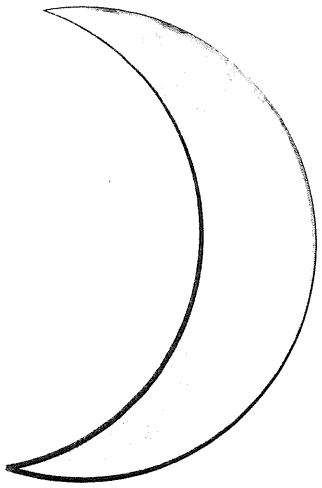
___ in the evening after sunset

___ at midnight

Explain your thinking. How did you decide when you could see the Moon?

Seeing the Moon

Teacher Notes



Purpose

The purpose of this assessment probe is to elicit students' ideas about when we can see the Moon. The probe is designed to reveal whether students recognize that the Moon can be seen at different times during the daylight hours as well as at night.

Related Concepts

Moon: appearance
Objects in the sky
Solar system objects: identity

Explanation

The best answer is all of the choices. The Moon can be seen in the daytime as well as at night, although different Moon phases are seen at different times. The Moon can readily be observed during the evening hours, when a dark sky provides strong contrast to the bright Moon. What is less obvious and often goes unnoticed is that the Moon can also be seen during the day, although it is harder to see because there is less contrast between the Moon and the bright daytime sky.

There are other reasons that the Moon may not be visible. Either in daytime or nighttime the Moon may be below the horizon or obscured by clouds. During the new Moon phase, which lasts three or four days, the Moon is so close to the Sun in the sky that it cannot be observed in the daytime or nighttime.

The Moon can be observed in any of its phases during the day or night except for the full Moon, which is only visible at night or just at sunrise or sunset. That is because the full Moon is always opposite the Sun in the sky, so it is just rising when the Sun is setting, or just setting when the Sun is rising.

Administering the Probe

This probe can be used with students at all age levels. Although the concept is elementary, and people have many opportunities to see the Moon during the daytime, many adults have never noticed it except at night. Consequently

it is a good idea to administer this probe prior to any unit on the Moon, including high school, since students rarely take the time to observe the daytime and night sky. For the youngest students it's best to modify the probe by asking if the Moon can be seen only in the daytime, only at nighttime, or both. The probe can be extended for older students by asking them to draw a model to support their explanation.

Related Ideas in *Benchmarks for Science Literacy* (AAAS 2009)

K–2 The Universe

★ The Sun can be seen only in the daytime, but the Moon can be seen sometimes at night and sometimes during the day.

- The Moon looks a little different every day but looks the same again about every four weeks.

3–5 The Universe

- The Earth is one of several planets that orbit the Sun, and the Moon orbits around the Earth.

3–5 Constancy and Change

- Some things in nature have a repeating pattern, such as the day-night cycle, the phases of the Moon, and seasons.

Related Ideas in *National Science Education Standards* (NRC 1996)

K–4 Objects in the Sky

★ The Sun, Moon, stars, clouds, birds, and airplanes all have properties, locations, and movements that can be observed and described.

Related Research

- Children's early ideas about the Moon include the belief that the Moon is only visible at night or is in some way connected with the occurrence of night (Vosniadou and Brewer 1994).
- In a study by Sharp (1996) of 10- to 11-year-old students in England, 64% of the students did not believe that the Moon appears to move through the sky. Similar studies show that young students have not developed the understanding that celestial objects, such as the Moon, can be seen to move continuously, though very slowly.
- Many students believe that the Moon rises straight up, stays at the top of the sky throughout the night, and then sets straight down (Plummer 2009).
- A study of students in a small midwestern school revealed that 40% of the first graders (n = 20) believed that the Moon could only be seen at night, but by third grade 80% (n = 20) knew the Moon was visible during the day (Plummer and Krajcik 2010).

Suggestions for Instruction and Assessment

- Combine this probe with "Objects in the Sky" in *Uncovering Student Ideas in Science, Vol. 2: 25 More Formative Assessment Probes* (Keeley, Eberle, and Tugel 2007).
- It is not uncommon for children in the earliest grades to be taught the idea that "the Sun is for the day and the Moon is for the night," even though it is not true. While the Sun does indeed define daytime as the hours between sunrise and sunset, the Moon can be seen during the daytime or nighttime. That is why it is important that students have a chance to see the Moon during the day on occasion.
- Be aware that the misconception that the Moon is only visible at night may be

★ Indicates a strong match between the ideas elicited by the probe and a national standard's learning goal.

perpetuated by picture books young children see and read that associate the Moon with nighttime. Some books and nursery rhymes even depict the Moon as a character ready to go to sleep wearing a nightcap. Show children a picture book with one of these images and ask them if the Moon would ever come out in the day (Allen 2010).

- Understanding that the Moon can be seen both in the daytime and at night is a prerequisite to middle school students' identifying and explaining the pattern of moonrise and moonset times and providing evidence that the Moon must be slowly orbiting the Earth.
- You can check the time of moonrise in the nearest large city using a local newspaper or the internet. Then make sure that the Moon is not obscured by clouds before taking the children outdoors to see the Moon in the daytime sky.
- In the primary grades (K–2) students should be observing familiar objects in the sky, including the Sun and Moon, clouds, birds, and airplanes, noting which demonstrate regular patterns and which do not. Their observations of the daytime sky should include the changing positions of the Sun and Moon during the day, and changes in the Moon's apparent shape over about a month.
- In the upper elementary grades (3–5) students expand their observations and descriptions of the Sun and Moon to include stars and planets. They develop ideas about light reflection and light sources to explain why some things are seen in the daytime, some are seen at night, and others are seen in both the daytime and night. By fifth grade they begin to move from observations of the sky and describing patterns to developing explanations for these patterns.
- Have students spend a month making Moon observations, recording when they can see the Moon during the daytime and when they see the Moon at night. Have them record which Moon phase is visible at different times of the day as well as evening.
- Challenge older students to come up with an explanation and model for why a full Moon is not visible during the daytime.

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