

Figure 1 shows Earth, the Sun, and five different possible positions for the Moon during one full orbit (dotted line). It is important to recall that one-half of the Moon's surface is illuminated by sunlight at all times. For each of the five positions of the Moon shown below, the Moon has been shaded on one side to indicate the half of the Moon's surface that is **not** being illuminated by sunlight. Note that this drawing is not to scale.

- 1) Which Moon position (A–E) best corresponds with the Moon phase shown in the upper-right corner of Figure 1? Make sure that the Moon position you choose correctly predicts a Moon phase in which only a small crescent of light on the left-hand side of the Moon is visible from Earth.

Enter the letter of your choice: _____

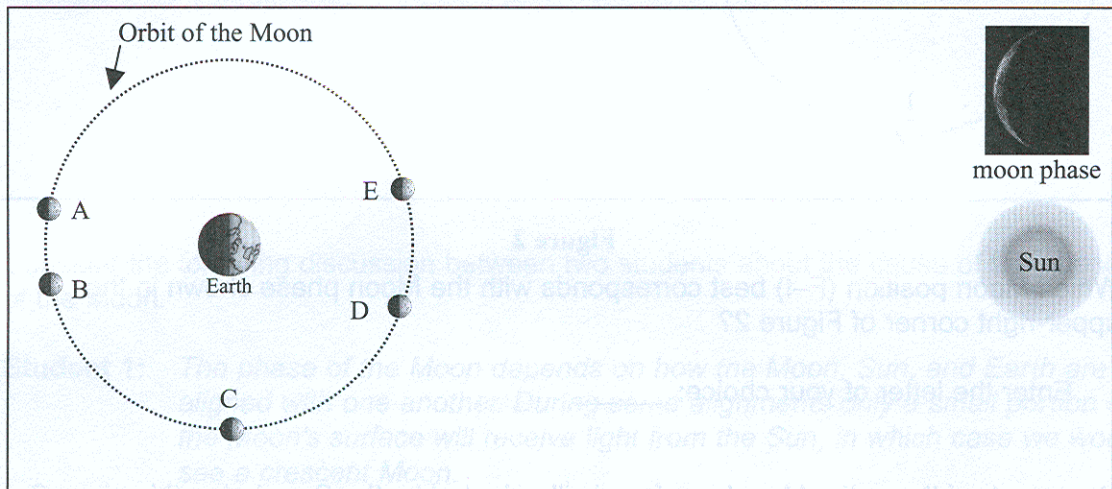


Figure 1

- 2) In the blank boxes below, sketch how the Moon would appear from Earth for the four Moon positions that you did **not** choose in Question 1. Be sure to label each sketch with the corresponding letter indicating the Moon's position from Figure 1.

The Cause of Moon Phases

- 3) Shade in each of the four Moons shown in Figure 2 to indicate which portion of the Moon's surface will **not** be illuminated by sunlight.

Use Figure 2 to answer Questions 4–7.

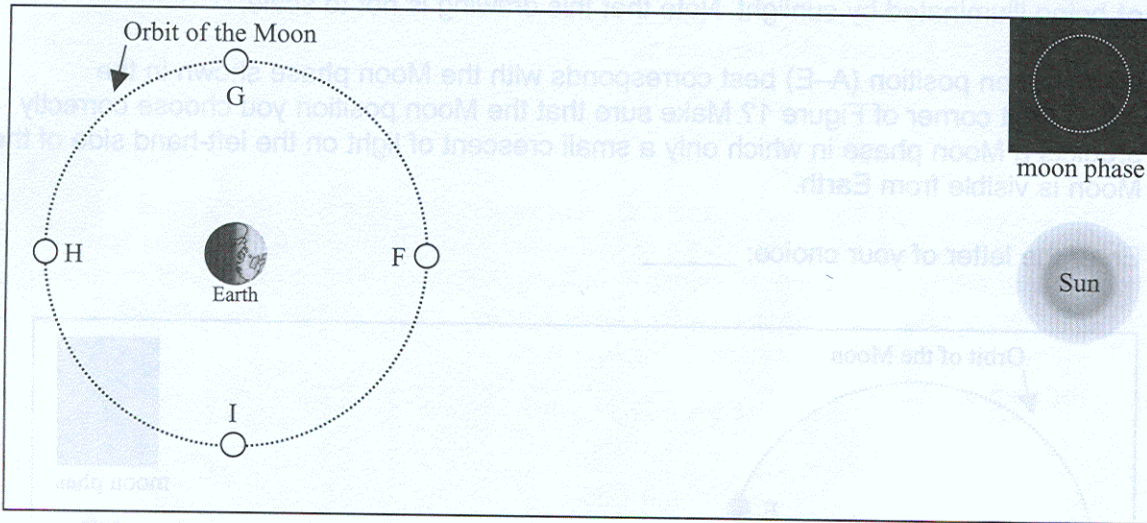


Figure 2

- 4) Which Moon position (F–I) best corresponds with the Moon phase shown in the upper-right corner of Figure 2?

Enter the letter of your choice: _____

- 5) How much of the entire Moon's surface is illuminated by the Sun during this phase?

Circle one:

- None of the surface is illuminated.
- Less than half of the surface is illuminated.
- Half of the surface is illuminated.
- More than half of the surface is illuminated.
- All of the surface is illuminated.

- 6) How much of the Moon's illuminated surface is visible from Earth for this phase of the Moon?

Circle one:

- None of the surface (visible from Earth) is illuminated.
- Less than half of the surface (visible from Earth) is illuminated.
- Half of the surface (visible from Earth) is illuminated.
- More than half of the surface (visible from Earth) is illuminated.
- All of the surface (visible from Earth) is illuminated.

- 7) Would your answers to Questions 5 and 6 change if the Moon were in the third-quarter phase rather than the phase shown in Figure 2? Explain your reasoning.

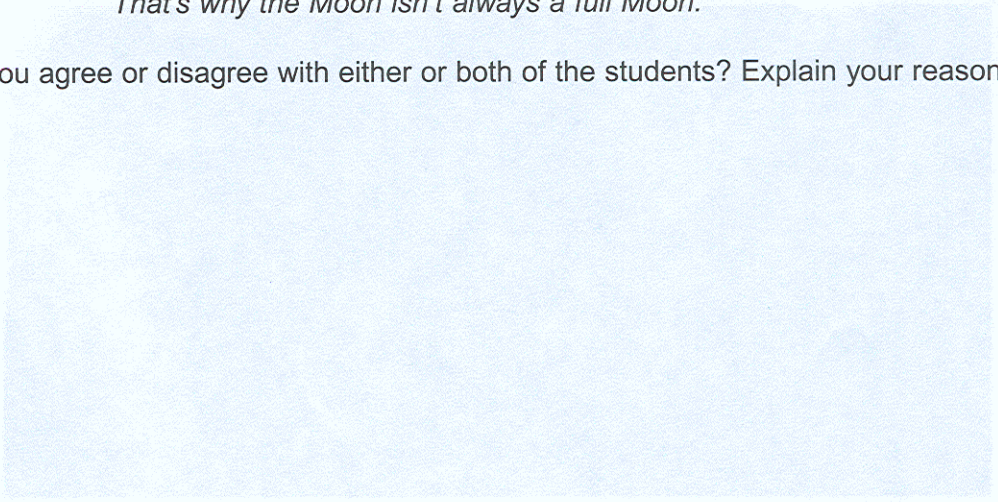
(Faint, illegible text from the reverse side of the page is visible through the paper.)

- 8) Consider the following discussion between two students about the cause of the phases of the Moon.

Student 1: *The phase of the Moon depends on how the Moon, Sun, and Earth are aligned with one another. During some alignments only a small portion of the Moon's surface will receive light from the Sun, in which case we would see a crescent Moon.*

Student 2: *I disagree. The Moon would always get the same amount of sunlight; it's just that in some alignments Earth casts a larger shadow on the Moon. That's why the Moon isn't always a full Moon.*

Do you agree or disagree with either or both of the students? Explain your reasoning.



- 1) If the Moon is a full Moon tonight, will the Moon be waxing or waning one week later? Which side of the Moon (right or left) will appear illuminated at this time?

Circle one: Waxing or Waning

Circle one: Right or Left

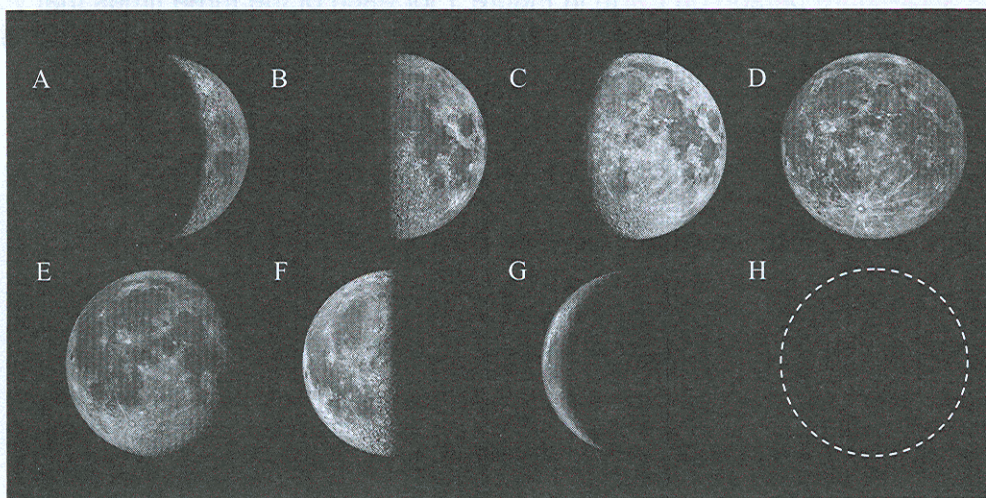
- 2) Where (in the southern sky, on the eastern horizon, on the western horizon, high in the sky, etc.) would you look to see the full Moon when it starts to rise? What time would this happen?

- 3) Where (in the southern sky, on the eastern horizon, on the western horizon, high in the sky, etc.) would you look to see the Sun when the full Moon starts to rise?

- 4) Where (in the southern sky, on the eastern horizon, on the western horizon, high in the sky, etc.) would you look to see the new Moon, if it were visible, when it starts to rise? What time would this happen?

- 5) If the Moon is a new Moon when it rises in the evening, which of the phases shown below (A–H) will it be in when it sets?

Letter of Moon phase: _____



Predicting Moon Phases

Figure 1 shows the position of the Sun, Earth, and Moon for a particular phase of the Moon. The Moon has been shaded on one side to indicate the portion of the Moon that is **not** being illuminated by sunlight. A person has been placed on Earth to indicate an observer's position at noon. Recall that with this representation Earth will complete one counterclockwise rotation in each day. Note that this drawing is not to scale.

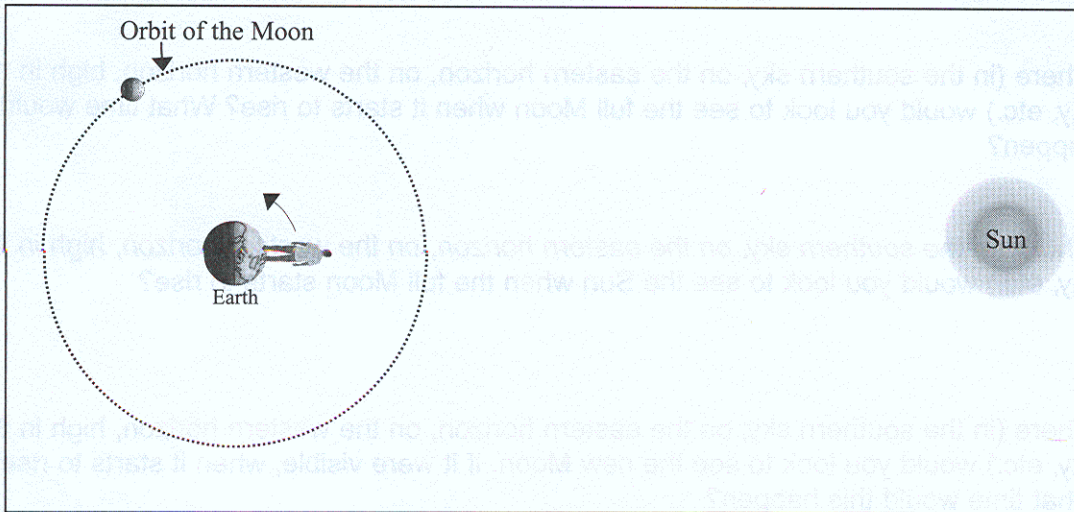


Figure 1

- 6) What time is it for the person shown in Figure 1?
- Circle one:** 6 A.M. (sunrise) 12 P.M. (noon) 6 P.M. (sunset) 12 A.M. (midnight)
- 7) Draw a stick-figure person on Earth in Figure 1 for each of the three times that you did **not** choose in Question 6. Label each of the stick-figures that you drew with the time that the person would be located there.
- 8) Answer the following questions for the position of the Moon shown in Figure 1.
- Which Moon phase would an Earth observer see?
 - At what time will the Moon shown appear highest in the sky?
 - At what time will the Moon shown appear to rise?
 - At what time will the Moon shown appear to set?

- 9) At what time would you look to see a first-quarter Moon at its highest position in the sky?
- 10) If the Sun set below your western horizon about 2 hours ago, and the Moon is barely visible on the eastern horizon, what phase would the Moon be in at this time and location?
- 11) A friend comments to you that there was a beautiful, thin sliver of Moon visible in the early morning just before sunrise. Which phase of the Moon would this be, and in what direction would you look to see the Moon (in the southern sky, on the eastern horizon, on the western horizon, high in the sky, etc.)?