

## The Cause of Moon Phases

Name: **SOLUTIONS**

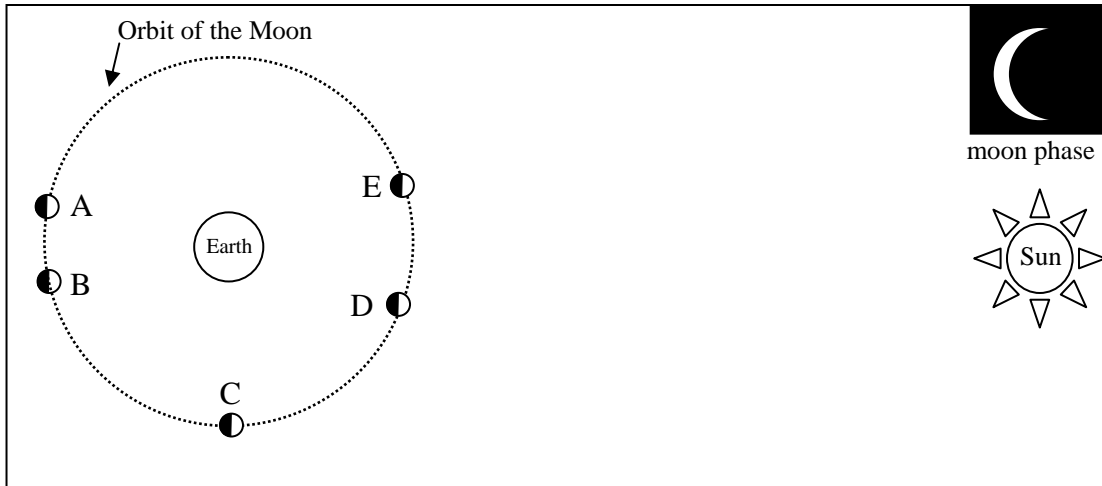
Correct responses shown in boldface.

Section:

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 darken the half of the Moon's surface that is **NOT** being illuminated by sunlight. Note that this drawing is not to scale.

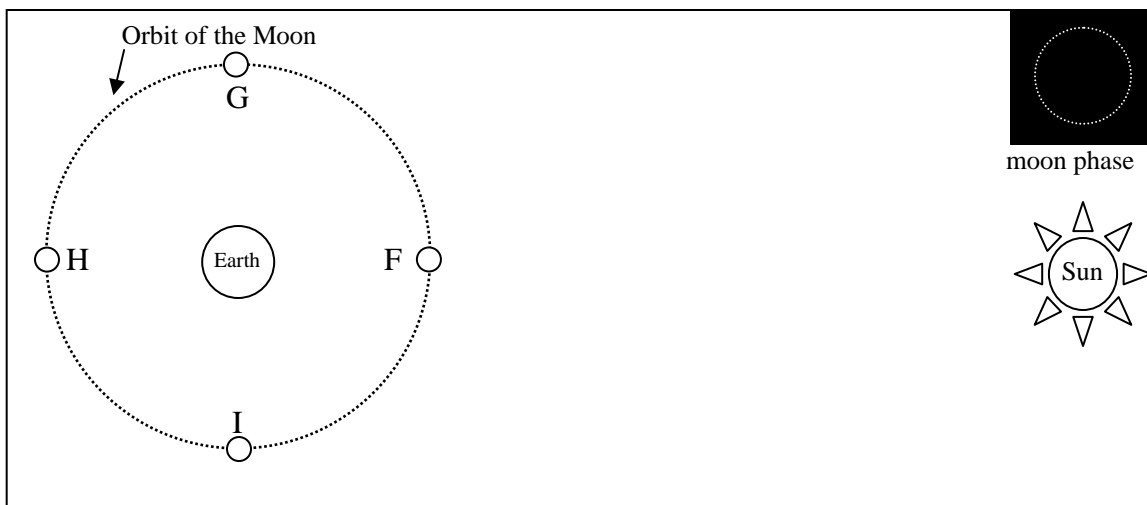
- 1) Which Moon position (A-E) best corresponds with the moon phase shown in the upper right corner of Figure 1? Make sure that the moon position you choose correctly predicts a moon phase in which only a small crescent of light on the left-hand side of the Moon is visible from Earth.

Enter the letter of your choice: **D** It is a crescent so it must be D or E and D is correct because of the direction that the "horns" are facing -- away from the Sun so that the illuminated side of the Moon is on the left.



**Figure 1**

- 2) Shade in each of the four Moons drawn in Figure 2 to darken the portion of the Moon's surface that will **NOT** be illuminated by sunlight. Use Figure 2 to answer questions 3-5. The side of the Moon facing towards the Sun is always illuminated (except on the rare occasion of a lunar eclipse. Consequently the



**Figure 2**

left hand half of all the Moons should be shaded to indicate that those areas are not illuminated.

- 3) 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:   **F**  

- 4) 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.

- 5) 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.

- 6) Consider the following debate 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?

A: Agree with Student 1 but not Student 2

B: Agree with Student 2 but not Student 1

**C: Agree with neither of them**

D: Agree with both of them

Why?

**You should disagree with both students -- look at Figure 2 to see that half of the Moon's surface is always illuminated thus disproving Student 1's argument.**

**Student 2 is wrong because the Earth's shadow always point away from the Sun and wouldn't hit the Moon at all unless the Moon were full and the orbits line up. The Earth's shadow is no where near the Moon at quarter moon or at new moon, for example.**