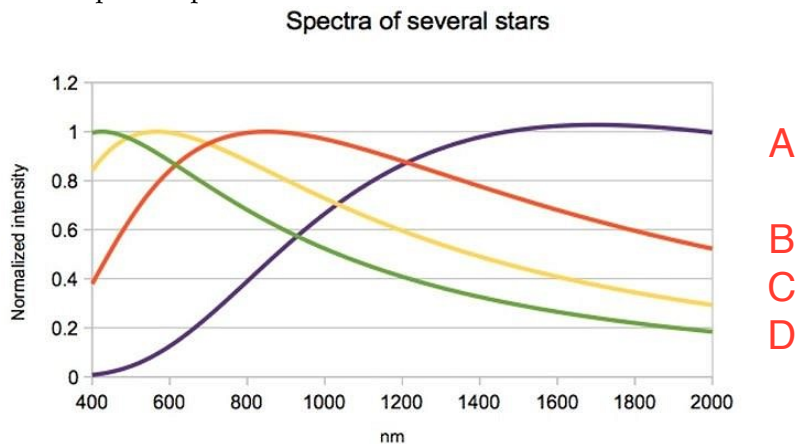


## Discussion Questions

1) *Light Travel Time*: Because of the finite speed of light, we see more distant objects as they were in the past. For example, we see our nearest star Alpha Centauri as it was 4.4 years ago, and the Andromeda Galaxy as it was 2.5 million years ago. Astronomers are often asked how we know that these objects still exist when we look at them in the night sky. How would you try to answer this question?

2) *Cognitive Dissonance*? You are talking to a friend who insists that the seasons are caused by a varying Earth-Sun distance over the course of a year. What other fact can you use to contradict this view of how the seasons are caused? How would you explain the cause of seasons to your friend?

3) The simplified spectra for four stars is shown here. Which star has the lowest temperature?



4) Explain what *synchronous rotation* is. What is it caused by? How does this relate to why we only see the same side of the moon?

5) Describe the major accomplishment for each of the following people:

Ptolemy:

Copernicus:

Tycho Brahe:

Kepler:

Galileo:

Newton:

6) Briefly explain how we can use spectral lines to determine the composition an object and the object's motion (toward or away from us).

## **What is our place in the universe?**

*Earth is part of a star system, which is in the Milky Way Galaxy consisting of 100 billion stars, which is a member of the Local Group of galaxies in the Local Super cluster, which reside in the Universe containing 100 billion other galaxies.*

*Some people think that our tiny physical size in the vast universe makes us insignificant.*

*Others think our ability to learn about the wonders of the universe gives us significance despite our small size.*

**What do you think?**

Name: \_\_\_\_\_

## How many stars are there in the universe?

The Milky Way is one of about 100 Billion galaxies. There are about 100 billion stars in each galaxy. That is,

$$10^{11} \text{ stars} \times 10^{11} \text{ galaxies} = 10^{22}$$

10 000 000 000 000 000 000 000

Thus, there are as many stars in the universe as there are grains of (dry) sand on all Earth's beaches. To get a sense of this count the number of salt grains in one single pack. Explain how you got to this number then answer the following.

Suppose you tried to count the more than 100 billion stars in our galaxy, at a rate of one per second... How long do you think it would it take you? (circle one).

- A. a few weeks
- B. a few months
- C. a few years
- D. a few thousand years

Name: \_\_\_\_\_

### ***Lunar Phases and Time of Day.***

The following diagram represents the Moon's orbit as seen from above Earth's North Pole (not to scale): Discuss and answer the following questions as a group: (Look at CH4 slides "Understanding Phases").

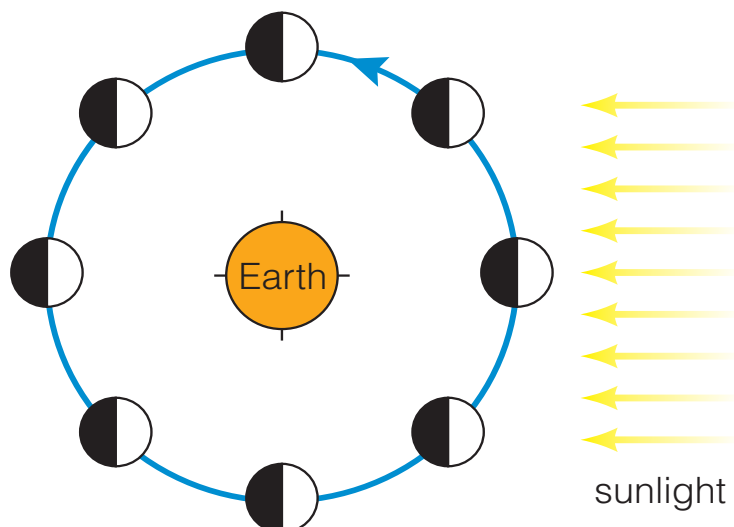
Group members name: \_\_\_\_\_

- 1) How would the Moon appear from Earth at each of the eight Moon positions? Draw and label each one with the corresponding phase.
- 2) What time of day corresponds to each of the four tick marks on Earth? Label each tick mark accordingly.
- 3) Indicate at what time each phase will rise, set and be at it's highest point.
- 4) At what times of day would a full moon be visible to someone standing on Earth? Write down when a full moon rises and explain why it appears to rise at that time.

5) At what times of day would a third quarter moon be visible to someone standing on Earth? Write down when a third quarter moon sets and explain why it appears to set at that time.

6) Why doesn't the Moon's phase change during the course of one night? Explain your reasoning.

7) Assume you came home late from a night out. As you make your way to your front door you happen to stumble and fall flat on your back. You notice a waxing crescent moon at it's highest point in the sky. What time did you arrive home?



Name: \_\_\_\_\_

Group members \_\_\_\_\_

## **Group Quiz**

1. Which of the following statements about constellations is false?
2. Ptolemy was important in the history of astronomy because he
3. Suppose that Star X is red and Star Y is blue. What can you conclude?
4. The age of the universe is about?
5. What happens during the apparent retrograde motion of a planet?
6. What is stellar parallax?
7. How did Eratosthenes estimate the size of Earth in 240 B.C.?
8. Copernicus was the first person to suggest a Sun-centered solar system.
9. What practical value did astronomy offer to ancient civilizations?
10. Which of the following is not an advantage of the Hubble Space Telescope over ground-based telescopes?