

Name: _____

Astronomy

Log on to YouTube and search for **jocrisci** channel. All videos listed with numbers below and sorted into playlists for easy access. Use these videos if you need extra practice or instruction.

The Universe (Video 10.6, 10.7, ESRT 15a)

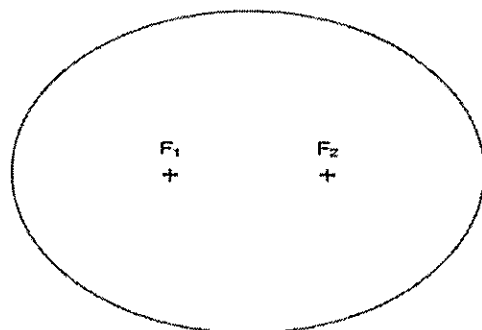
1. You must be able to explain the Earth's position in the solar system and the Sun's position in the Milky Way Galaxy.
2. Using the HR diagram (ESRT page 15), you must be able to discuss the major type of stars and their life history.
3. Know the difference between geocentric and heliocentric models of our solar system.

Earth Motions (Video 10.1)

1. Define rotation, how long it takes, which direction it happens, the proof it happens, and the result.
2. Define revolution, how long it takes, which direction it happens, the proof it happens, and the result.
3. Given the altitude of Polaris at a particular location, you should be able to determine the latitude

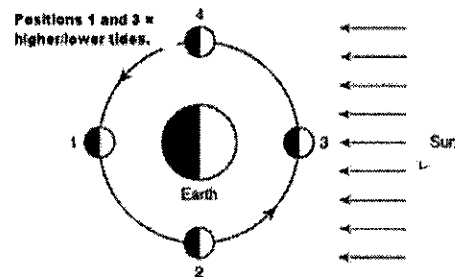
Eccentricity (Videos 10.3, 10.4, 10.5, ESRT 1b & 15b)

1. You must be able to calculate the eccentricity of a planet's orbit, and compare the eccentricity of the Earth's orbit with the other planets in our solar system.
2. You must be able to discuss how orbital velocity, period of revolution, apparent diameter and gravitational attraction change with an object's distance from the body it is orbiting.
 - a. On the diagram to the right, label one of the foci the sun. Put a dot on the orbit where the planet will have its greatest orbital velocity.
 - b. Calculate the eccentricity of the planet's orbit based on the image above. (Show all work)
 - c. Compare the eccentricity of the planet's orbit with the eccentricity of Mars.
 - d. Place an X on the orbit where the planet is going fastest around the Sun.



The Moon (Video 10.2)

1. You must know the moon's period of rotation and revolution.
2. You must know what causes the Moon to pass through phases and identify the phase based on the relative positions of the Earth, Moon, and Sun.
3. You must be able to discuss the cause of ocean tides on Earth.
4. At what position on the diagram is a lunar eclipse? Solar?



Astronomy Facts

(Search Quizlet for username MsCWood – Astronomy Facts)

1. Age of universe is approximately / 13.7 billion years old, solar system is only / 4.6 billion
2. Two proofs of the Big Bang Theory and the universe is expanding / cosmic background radiation and the red shift caused by the Doppler effect
3. Your universal address from smallest to largest / Earth, solar system, Milky Way galaxy, and the Universe
4. The Sun is a regular star, produces energy converting / Hydrogen into Helium by Nuclear Fusion
5. Inner four planets are / rocky (Terrestrial), more dense, smaller diameters, faster revolutions
6. Outer four planets are / gas giants (Jovian), less dense, larger diameters, slower revolutions
7. Heliocentric model / Sun centered, planet revolve in elliptical orbits, sun at one focus
8. Geocentric model / Earth centered, wrong model, planets and sun revolve around earth
9. Two proofs that the earth rotates / Coriolis Effect and Foucault's Pendulum
10. The earth rotates / west to east, 15 degrees per hour, in 24 hours or one day
11. The earth revolves / counterclockwise, 1 degree per day, in 365 1/4 days or one year
12. Revolution causes / different constellation to be visible at different times of the year
13. The altitude of Polaris equals / the latitude of the observer (Use ESRT for Cities in NYS)
14. Stars around Polaris make / counterclockwise circles, Polaris stays still (North star) (Pole Star)
15. Celestial objects (sun, moon, planets) rise in the / east and set in the west due to earth's rotation
16. The earth's orbit is / extremely round, almost perfect, but it is slightly elliptical
17. Eccentricity is a measure of / how flat or elliptical the orbit is (highest =1, line) (lowest=0, perfect circle)
18. The two factors affecting the force of gravity on an object are / mass and distance (closer = more)
19. As a planet gets closer to the sun or a star / the faster it orbits (further = slower)
20. When an object is close it looks / bigger (has a large apparent diameter) (farther = smaller)
21. The moon has phases because / it revolves around the Earth, in one month or 29.5 days (1/2 the moon is always lit)
22. We always see the same side of the moon / it rotates and revolves at the same rate (27.3 days)
23. A new moon occurs when / the moon is between the earth and the sun SME (all dark from Earth)
24. A full moon occurs when / the earth is between the sun and the moon SEM (all bright from Earth)
25. Tides are caused by the / moons gravitational pull b/c close to earth (also the sun's but far away)
26. When the Earth, Moon, and Sun are in a line a / spring tide occurs (most extreme – new and full)
27. When the Moon and Sun are working against each other we get / neap tides (less extreme - half)
28. A solar eclipse happens when / the moon is between the earth and the sun and it blocks out the sun (NEW MOON PHASE ALWAYS!)
29. A lunar eclipse happens when / the Earth is between the sun and the moon and the shadow hits the moon (FULL MOON PHASE ALWAYS!)
30. Eclipses don't happen every month because / the moon's orbit is tilted

The Universe & Galaxies

Facts to Memorize: 1-3

Big Bang Theory - _____

Estimated time of the creation of the Universe: _____

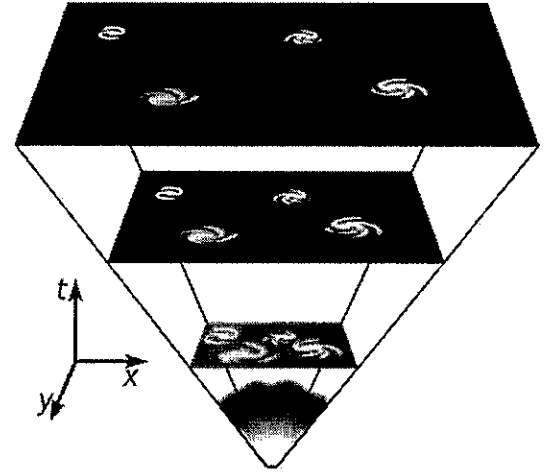
Evidence of the Big Bang:

1. _____

Defined: _____

2. _____

Defined: _____



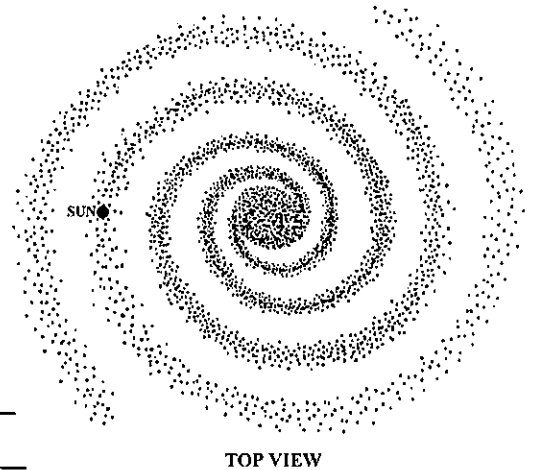
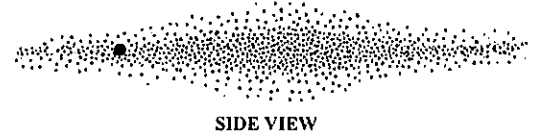
Universe - _____

Galaxy - _____

What is the name of our galaxy that we live in?

What shape is our galaxy? _____

Solar System - _____



Put these items in order of increasing size (Galaxy , Earth , Universe , Solar System)




Smallest



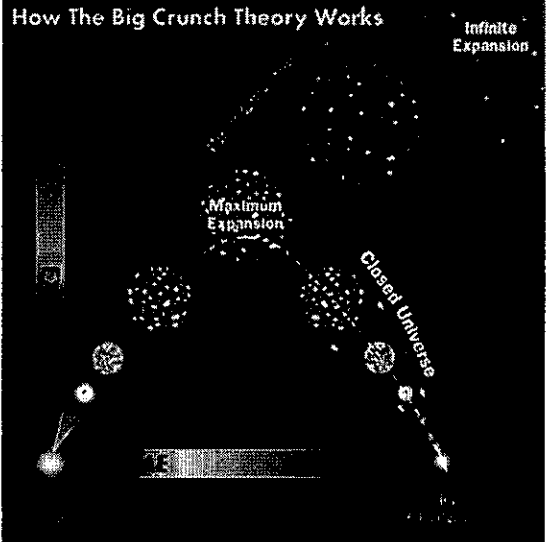
Largest

Shifting Spectral Lines

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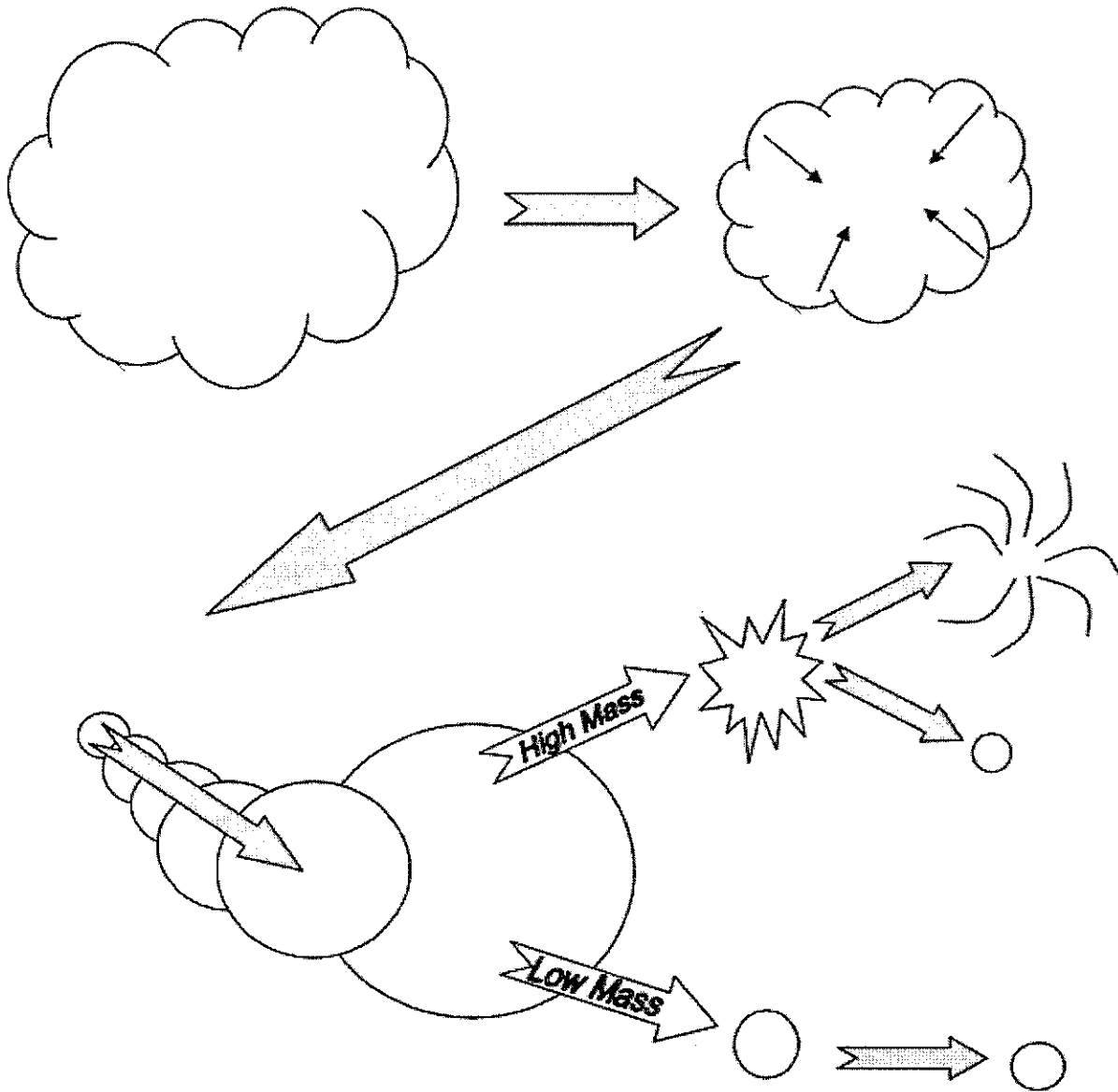
Spectral Lines	What type of shift is observed?
<p>Violet Red</p>  <p>Spectral lines } Standard Spectrum (a normal pattern)</p>	
<p>Violet Red</p>  <p>Spectral lines } Red Shift (pattern moves to right)</p>	<p>_____ Shift</p>
<p>Violet Red</p>  <p>Spectral lines } Violet Shift (pattern moves to left)</p>	<p>_____ Shift</p>

What Could Be The Future Of Our Universe?

THREE COMPETING THEORIES		
"Big Crunch"	"Big Rip"	"Big Freeze"
<p>How The Big Crunch Theory Works</p>  <p>Infinite Expansion Maximum Expansion Closed Universe</p>	<p>Continued accelerated expansion with the result of galaxies, stars and eventually even atoms themselves being literally torn apart.</p>	<p>Continued expansion of the universe followed by a long, slow decline where energy eventually 'runs out' and temperatures drop to absolute zero.</p> <p><i>*Based on current research, this is the front running theory*</i></p>

Star Formation

Facts to Memorize: 4



How do stars (and the Sun) create their energy? _____.

This process combines lighter elements with lighter elements to create heavier elements and energy.

_____ + _____ → _____ + _____

* In order for fusion to occur two conditions must be met:

1. Extremely high _____
2. Extremely high _____

Luminosity - _____

Apparent Magnitude - _____

Factors Affecting Apparent Magnitude:

1. _____
 - a. The _____ a star is from the observer, the _____ it appears.
2. _____
 - a. Large stars will appear _____ than smaller stars.
3. _____
 - a. _____ stars will appear brighter.

Hertzprung-Russel (HR) Diagram – the classification scheme of grouping stars by surface _____ compared to their _____.

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Our Sun

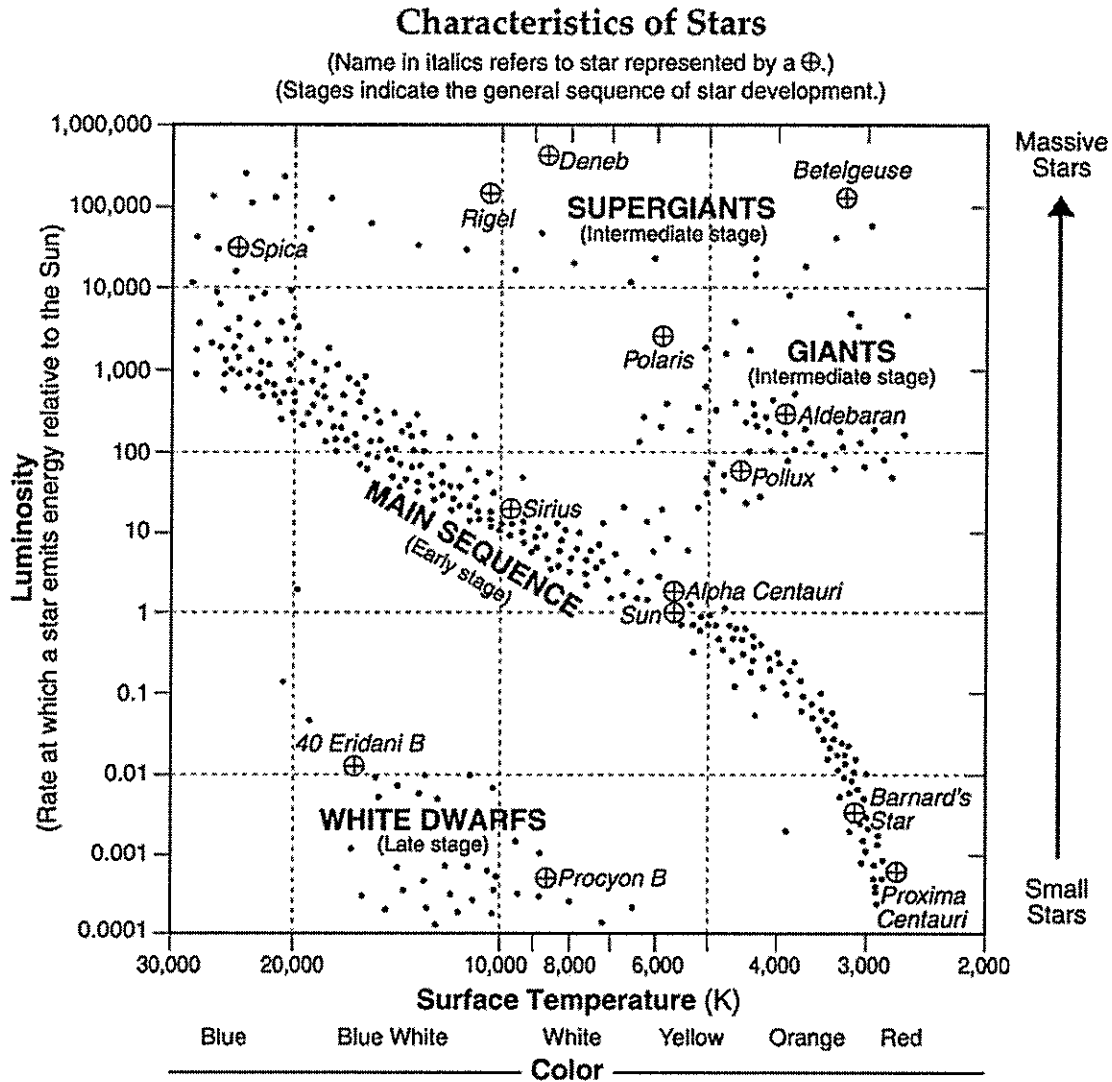
Our Sun is a _____ star which means that it is a _____ sized star with a diameter that is _____ times that of the Earth.

Our Sun is a regular star. It's proximity (closeness) to Earth is what makes life flourish here.

****The Sun is the ONLY star in our Solar System****



HR Diagram Practice Questions



1. What are the four main classification groups of stars?

2. What two characteristics are used to classify stars?

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3. Shade the chart where all of the stars are hotter than our Sun.

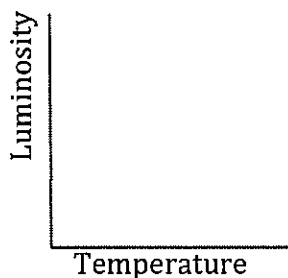
4. Draw a line on the chart, which separates those stars brighter than our Sun, and those less bright.

5. The star Betelgeuse and Rigel are located on the constellation Orion.
 What color is Betelgeuse? _____
 What color is Rigel? _____
6. What process do stars use to generate their energy? _____
7. What classification of star is our Sun? _____
8. Name the star that has a similar temperature and luminosity as our Sun. _____
9. What do Polaris and our Sun have in common? _____
10. What is the name of the hottest star located on the HR diagram? _____
11. Which star has the same luminosity as Alpha Centauri? _____
12. Name the 3 stars classified as a Supergiant.

13. Name the 2 stars classified as a White Dwarf.

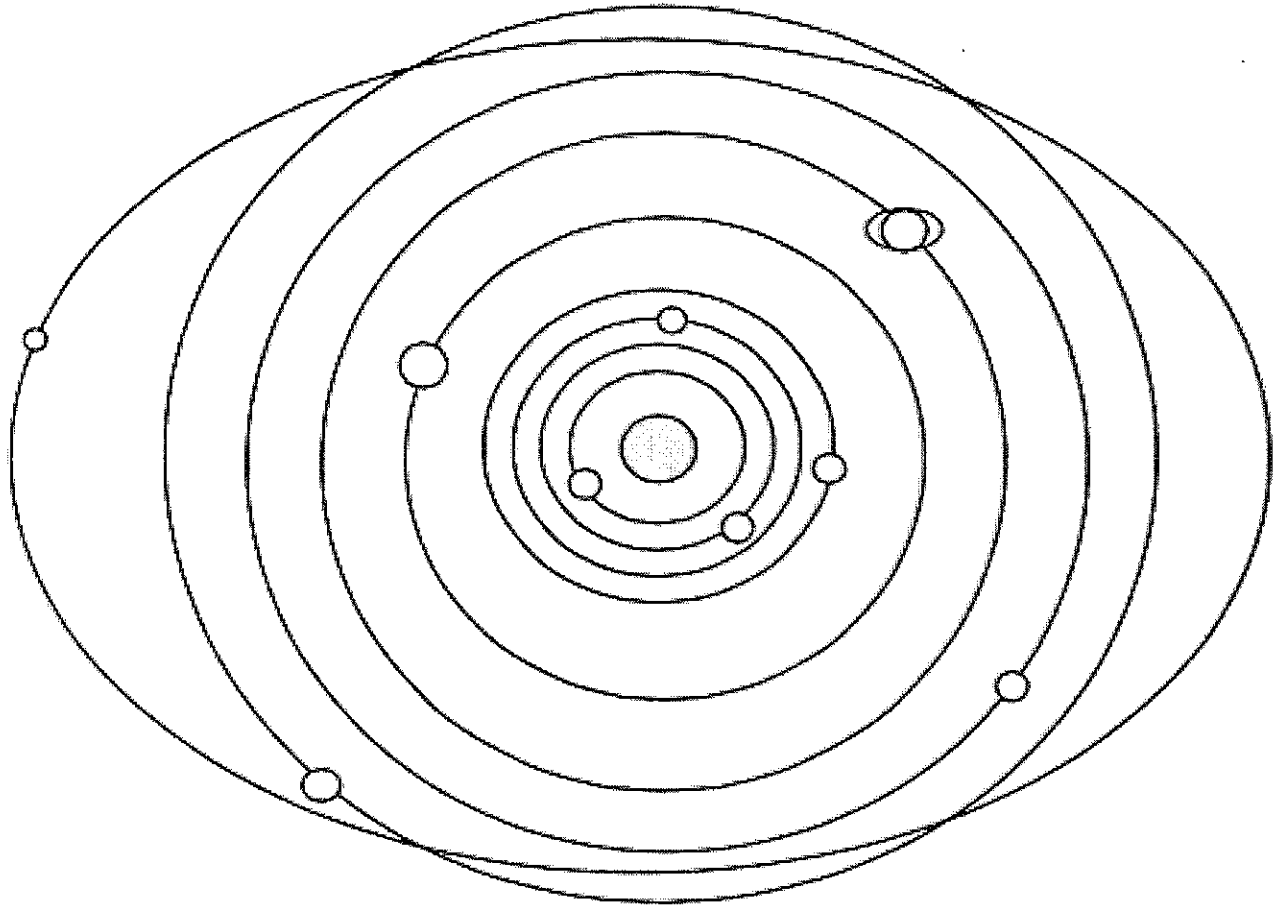
14. What color star is Proxima Centauri? _____
15. What classification of star is Rigel? _____
16. Which two Supergiants are most similar in luminosity?

17. What color is Pollux? _____
18. What is the approximate temperature of 40 Eridani B? _____
19. What is the luminosity of Deneb? _____
20. Which star is more massive Procyon B or Sirius? _____
21. Draw in the graphic relationship between Temperature and Luminosity of Main Sequence stars.



Our Solar System

Facts to Memorize: 5-6



Terrestrial Planets	
Jovian Planets	
Asteroid Belt	
Meteor	
Meteorite	
Comets	
Note on Pluto:	

Solar System Practice Questions

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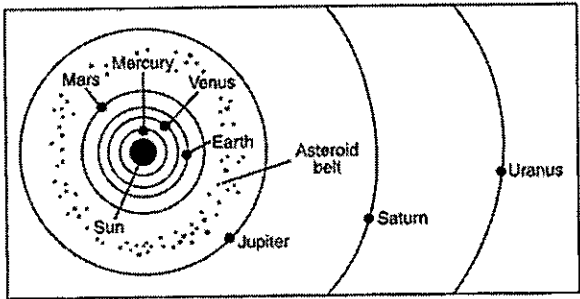
Data Table

Name	Average Diameter (kilometers)	Period of Revolution (years)
Ceres	848.4	4.60
Pallas	498.1	4.61
Juno	247.0	4.36
Vesta	468.3	3.63

Base your answers to questions 1 and 2 on the data table to the right, which shows information about the four largest asteroids found in our solar system.

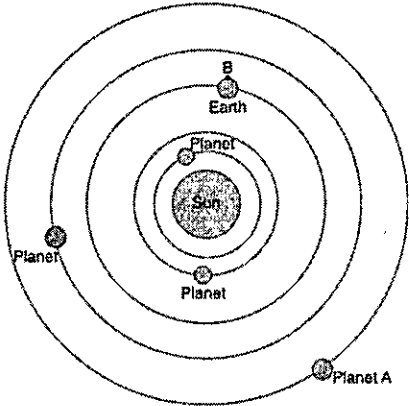
- The asteroids shown in the data table are located between the orbits of:
 - Venus and Earth
 - Earth and Mars
 - Mars and Jupiter
 - Jupiter and Saturn
- Compared to the diameter of Earth's Moon, the diameter of Ceres is about
 - One-fourth of the Moon's diameter
 - One-half of the Moon's diameter
 - Twice the diameter of the Moon
 - Four times the diameter of the Moon
- What is the average distance, in millions of kilometers, from the Sun to the asteroid belt?

a. 129	c. 503
b. 189	d. 857



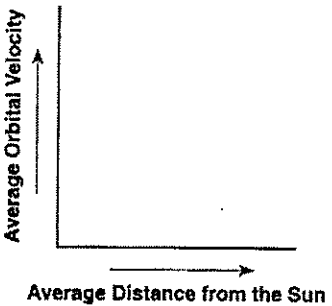
(Not drawn to scale)

Base your answers to questions 4 and 5 on the diagram to the right, which shows the heliocentric model of a part of our solar system. The planets closest to the Sun are shown. Point B is a location on Earth's equator.



(Not drawn to scale)

- State the name of planet A.
- Explain why location B experiences both day and night in a 24 hour period.
- On the graph to the right, draw a line to indicate the general relationship between a planet's average distance from the Sun and its orbital time.
- Compared to the terrestrial planets, the Jovian planets are:
 - Smaller and have lower densities
 - Smaller and have greater densities
 - Larger and have lower densities
 - Larger and have greater densities



Earth Motions

	Rotation	Revolution
Definition		
What is the direction of movement?		
How long does it take?		
What is the rate?		
What is the result of the motion?		
How can we prove this motion?	Two Ways: <ul style="list-style-type: none"> • • 	

Earth Motions

How long is one rotation of Earth? _____ How long is one revolution of Earth? _____

For each of the following events, determine whether it is caused by the Earth's rotation or revolution:

Rising and setting of the Sun	
Rising and setting of the Moon	
Seasons	
Changing Constellations	
Movement of Stars through the sky	

Calculate the rate of APPARENT motion of the stars movement throughout the night.

Answer questions #1-6 based on the diagrams shown below.

Diagram 1 — 9:00 p.m.

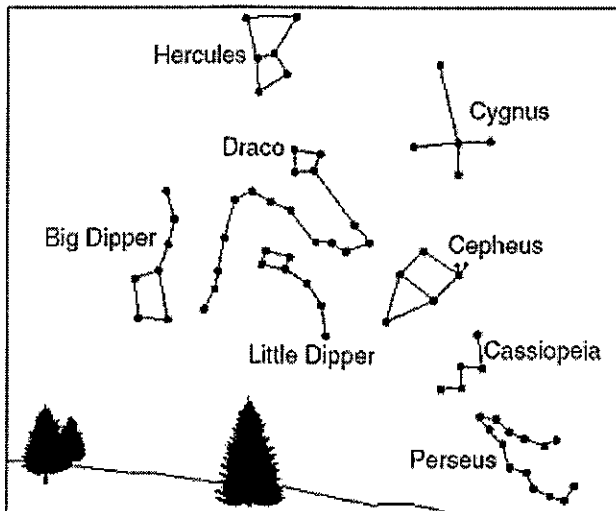
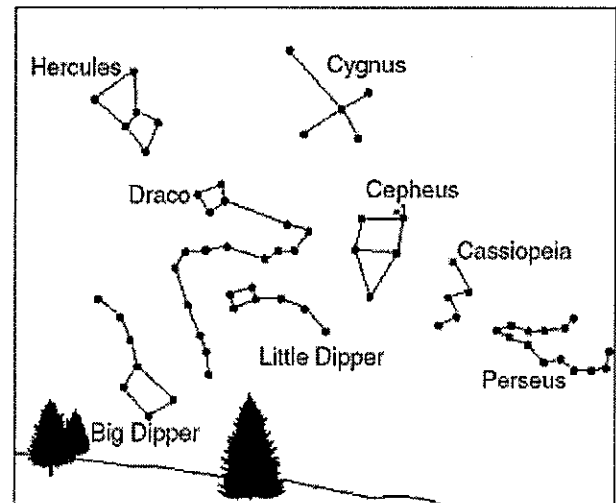


Diagram 2 — 11:00 p.m.



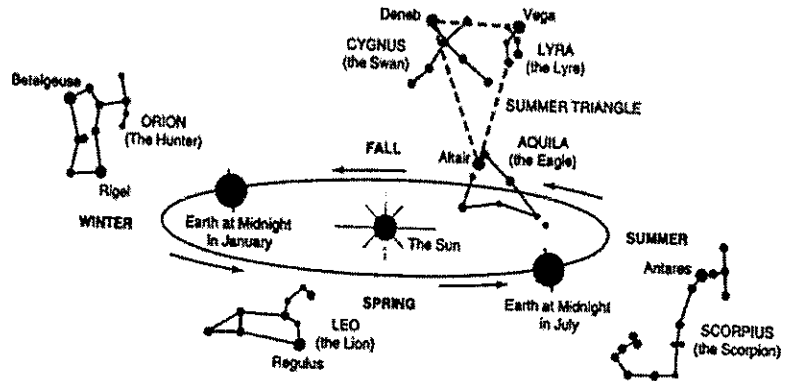
1. How many degrees did the stars move from diagram 1 to diagram 2? _____
2. How can you find Polaris (North Star)? _____
3. What Hemisphere must you be in if you can see these constellations? Why? _____

4. What direction must you be looking? _____
5. Do the stars appear to move clockwise or counterclockwise? _____
6. What causes them to appear to move at all? _____

Earth Motions Practice Questions

1. Which statement best explains why Orion can be observed from NYS on December 21 but not June 21?

- Orion has an eccentric orbit around Earth
- Orion has an eccentric orbit around the Sun
- Earth revolves around the Sun
- Earth rotates on its axis



2. Which event is a direct result of the Earth's revolution?

- The apparent deflection of winds
- The changing of the Moon phases
- The seasonal changes in constellations viewed in the night sky
- The daily rising and setting of the Sun

3. A Foucault Pendulum appears to change its direction of swing due to the

- Tilt of Earth's axis
- Spin of Earth on its axis
- Deflection of Earth's planetary winds
- Movement of Earth in its orbit around the Sun

4. Predictable changes in the direction of swing of a Foucault Pendulum provides evidence that

- Earth is tilted on its axis
- Earth's orbit is slightly elliptical
- Earth rotates on its axis
- Earth's magnetic poles reverse over time

5. The apparent shift in the direction of the swing of a Foucault Pendulum provides evidence of

- The Sun's rotation
- The Sun's revolution
- Earth's rotation
- Earth's revolution

6. The apparent change in direction of a swinging Foucault pendulum is the result of the

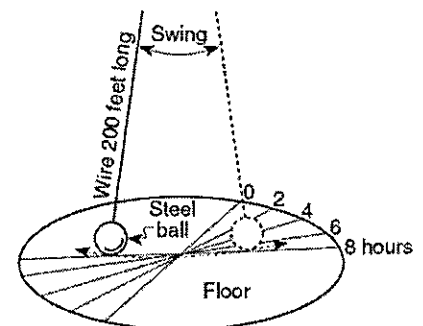
- Rotation of Earth
- Tilt of Earth's axis
- Revolution of Earth
- Shape of Earth's orbit

7. Foucault Pendulum is caused by Earth's

- Revolution
- Spherical shape
- Rotation
- Tilted axis

8. The diagram to the right represents a Foucault Pendulum swinging freely for 8 hours. The Foucault Pendulum appears to gradually change its direction of swing due to Earth's

- Orbit around the Sun
- Tilted axis
- Curved surface
- Spin on its axis



Shape of Orbits

The planets move in ellipses with the Sun at one focus.

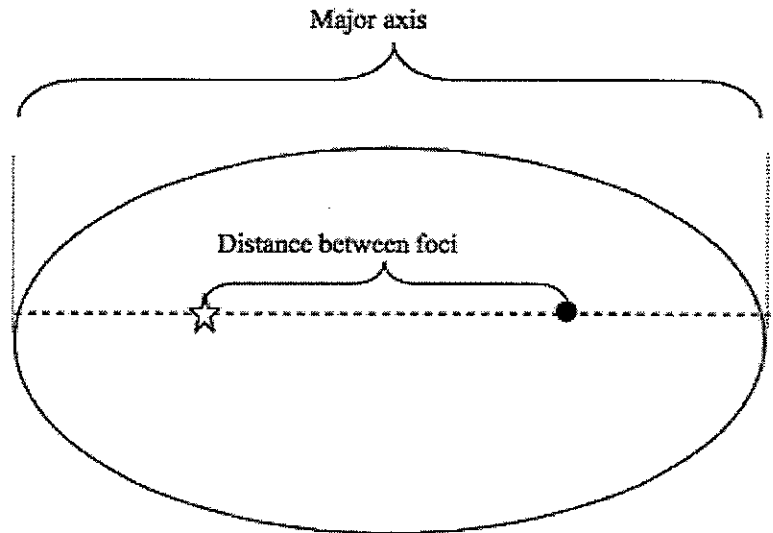
Shape of Earth's orbit: _____

Eccentricity - _____

Eccentricity Formula:

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Determine the eccentricity of the ellipse to the right:



All eccentricity calculated values are in between _____ and _____.

A perfect circle has an eccentricity of _____ and is LEAST eccentric.

The more oval an ellipse is the _____ eccentric it is, the closer the eccentricity value is to _____

Gravitational Force

Gravity - _____

Gravity depends on two things: _____ of an object and _____ between objects.

The larger the mass, the _____ the gravitational attraction.

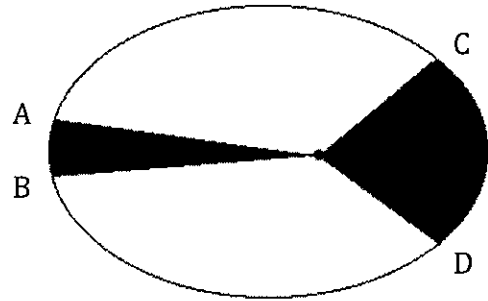
The closer the objects are together, the _____ the gravitational attraction.

Planet Velocities & Distances

Facts to Memorize: 19-20

The line joining the Sun and a planet sweeps out *EQUAL* areas in *EQUAL* intervals of time.

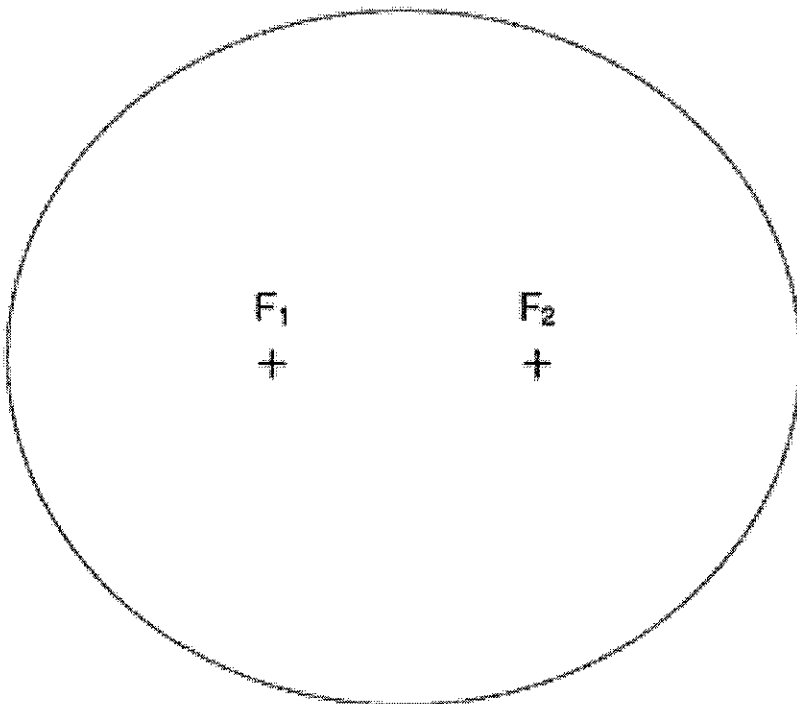
1. Between which two letters is the orbital speed the slowest? _____
2. Between which two letters is the orbital speed the fastest? _____
3. The area's covered by the Earth as it travels from A to B and from C to D are _____
4. The speed of a planet depends upon its _____ from the _____



Perihelion - _____

Aphelion - _____

Eccentricity Practice Questions



1. Calculate the eccentricity of the ellipse to the *nearest thousandth*.

2. If F1 represents the Sun, place an X on the orbit where the planets velocity is the greatest.

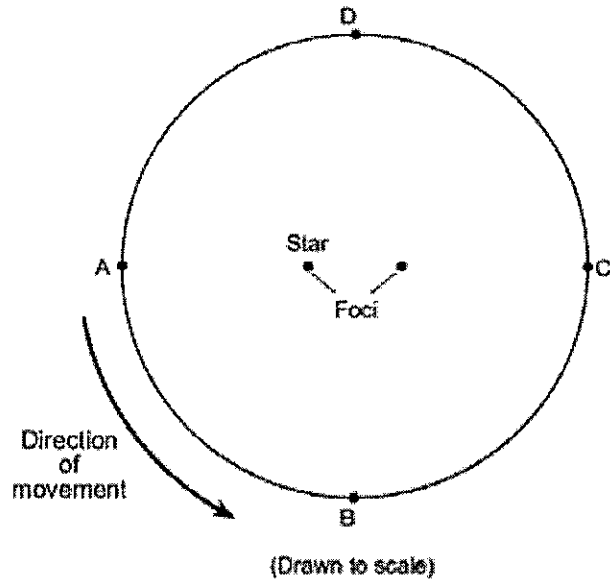
3. State how the eccentricity of the calculated ellipse compares to the eccentricity of the orbit of Mars.

Base your answers to questions 4-6 on the diagram below, which represents the elliptical orbit of a planet traveling around a star. Points A, B, C and D are four positions of this planet in its orbit.

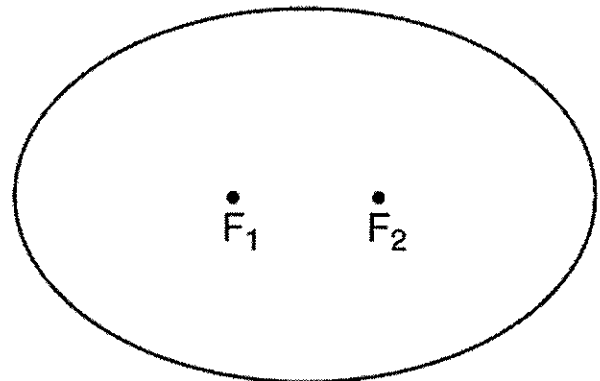
4. The calculated eccentricity of this orbit is approximately:
- a. 0.1
 - b. 0.2
 - c. 0.3
 - d. 0.4

5. The gravitational attraction between the star and the planet will be greatest at position:
- a. A
 - b. B
 - c. C
 - d. D

6. As the planet revolves in orbit from position A to position D, the orbital velocity will
- a. Continually increase
 - b. Continually decrease
 - c. Decrease, then increase
 - d. Increase then decrease



7. The diagram below is a constructed ellipse. F1 and F2 are the foci of the ellipse. The eccentricity of this constructed ellipse is closest to the eccentricity of the orbit of which planet?
- a. Mercury
 - b. Earth
 - c. Saturn
 - d. Neptune



8. Which planet has an orbit with an eccentricity most similar to the eccentricity of the Moon's orbit around Earth?
- a. Earth
 - b. Venus
 - c. Jupiter
 - d. Saturn
9. Which planet has the least distance between two foci of its elliptical orbit?
- a. Venus
 - b. Earth
 - c. Mars
 - d. Jupiter

Satellites

Satellite - _____

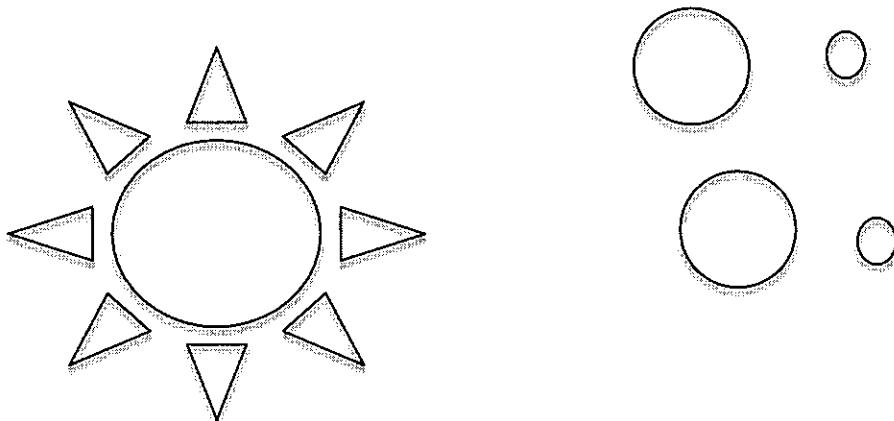
Earth is a satellite of the _____. The Moon is a satellite of the _____.

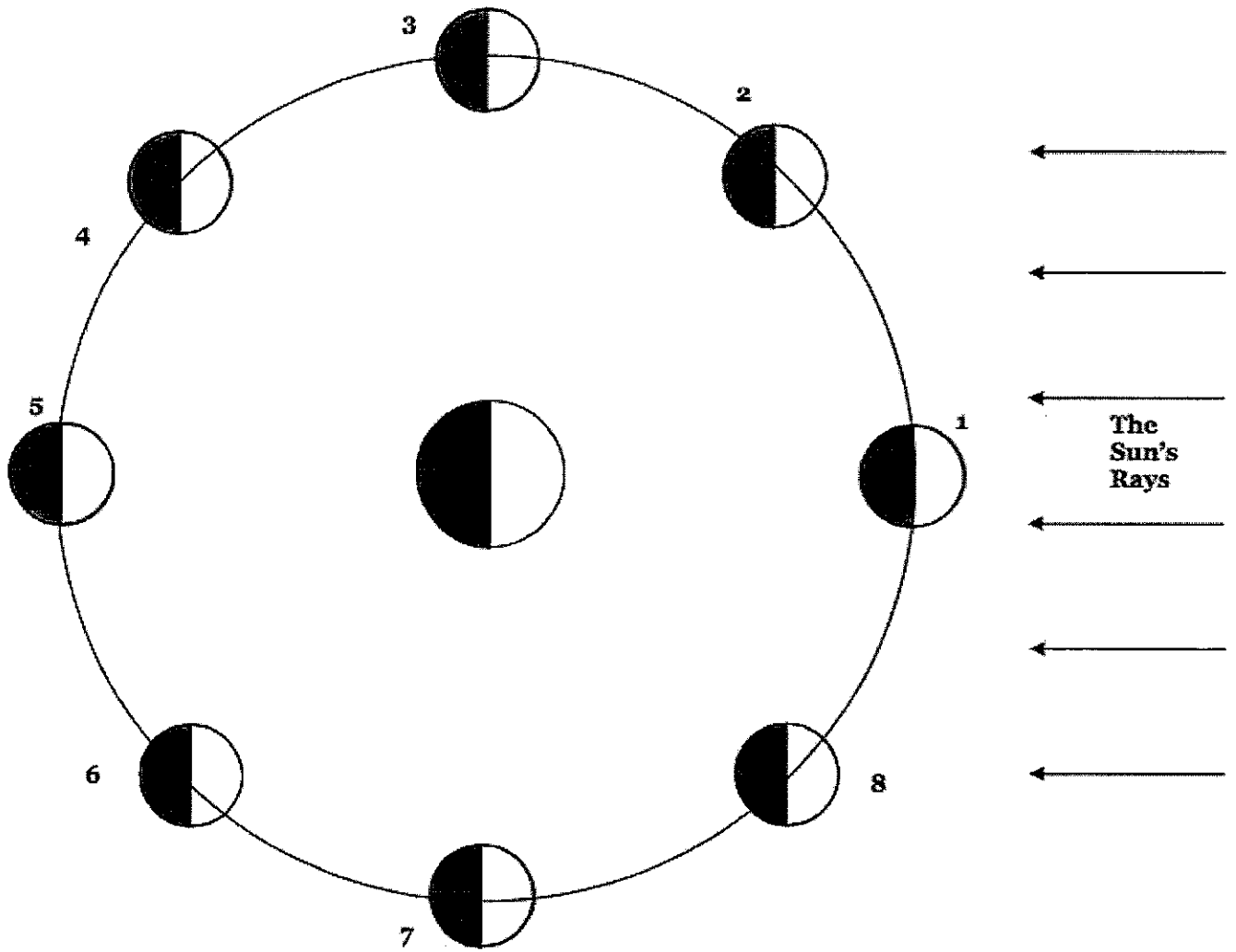
Why do the distances between the Sun and Earth change? _____

Phases of the Moon

- The apparent shape of the moon depends on the changing positions of the _____, _____ and _____.
- Approximately how long does it take the Moon to revolve around the Earth? _____
- One complete orbit of the Moon around the Earth takes exactly _____ days.
- One complete rotation of the Moon on its axis takes exactly _____ days.
 - *NOTE: Moon's period of revolution and rotation are EQUAL. This means that we always see the same side of the Moon.*
- A complete cycle the Moon's phases takes _____ days.
- Explain why there is a 2 1/2 day difference between the revolution of the moon and the amount of time it takes to complete all of its phases.

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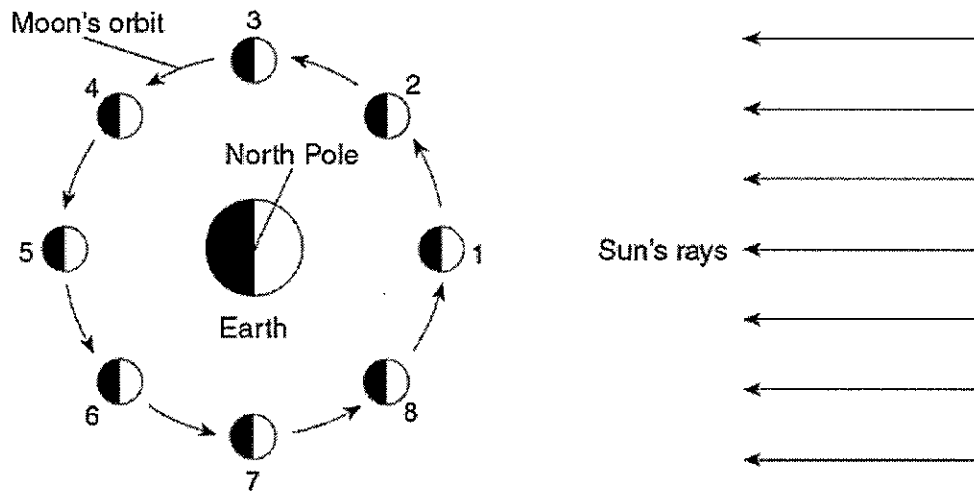




1		5	
2		6	
3		7	
4		8	

Moon Phase Practice Questions

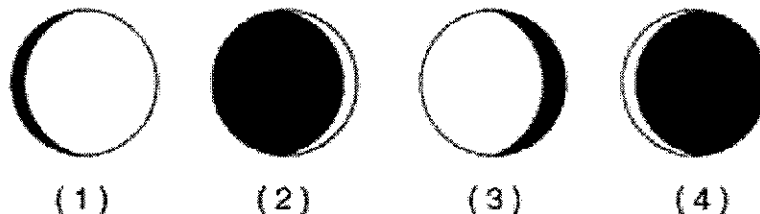
Base your answers to questions #1-5 on the diagram below, which represents the Moon orbiting Earth as viewed from space above the North Pole. The Moon is shown at eight different positions in its orbit.



(Not drawn to scale)

Key	
	Lighted, visible part of the Moon
	Dark, invisible part of the Moon

- The approximate time required for the Moon to move from position 3 to position 7 is
 - 1 hour
 - 3 months
 - 2 weeks
 - 4 days
- As the Moon changes location from position 2 to position 6, the visible portion of the Moon as observed from Earth
 - decreases, only
 - increases, only
 - decreases, then increases
 - increases, then decreases
- Which motion causes the Moon to show phases when viewed from Earth?
 - Rotation of Earth
 - Revolution of Earth
 - Rotation of the Sun
 - Revolution of the Moon
- Which device when placed on the Moon would provide evidence of Moon rotation?
 - Foucault pendulum
 - Seismograph
 - thermometer
 - wind vane
- When the Moon is in position 2, which phase would be visible to an observer in New York State?



Tides

Tides - _____

Caused by → _____

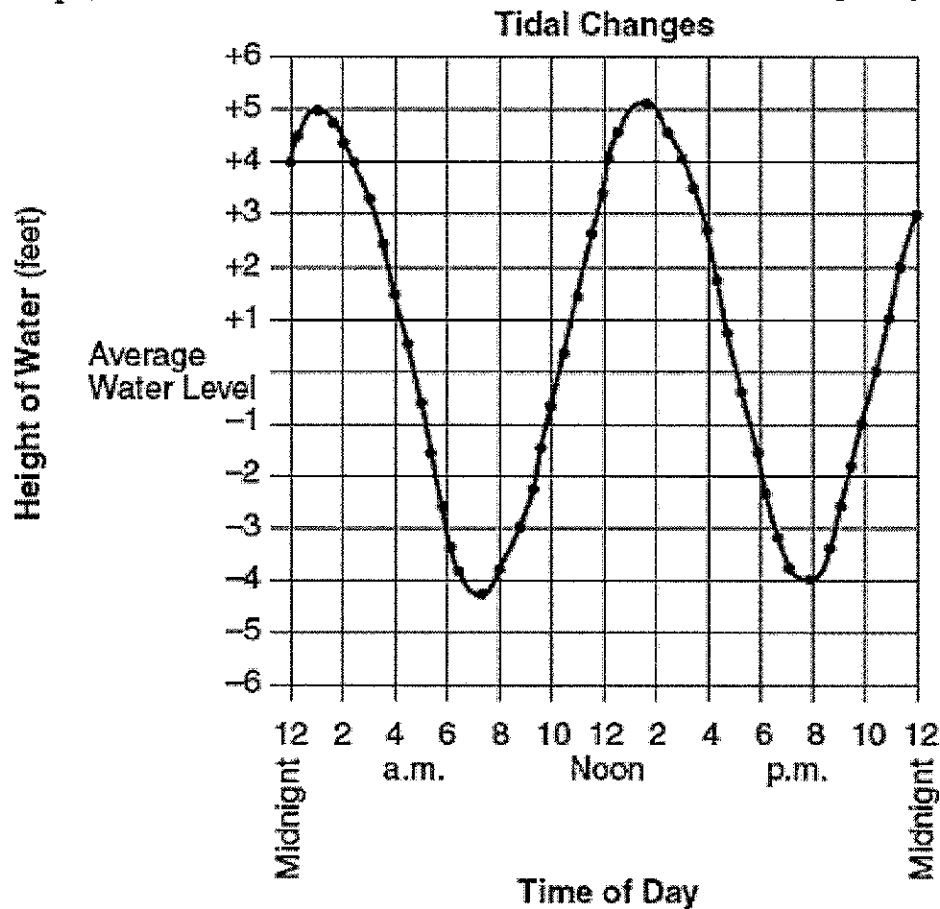
Tides are _____ and _____!

Greatest gravitational attraction occurs with _____ bodies and _____ bodies.

Spring Tide	Neap Tide

Tides Practice Questions

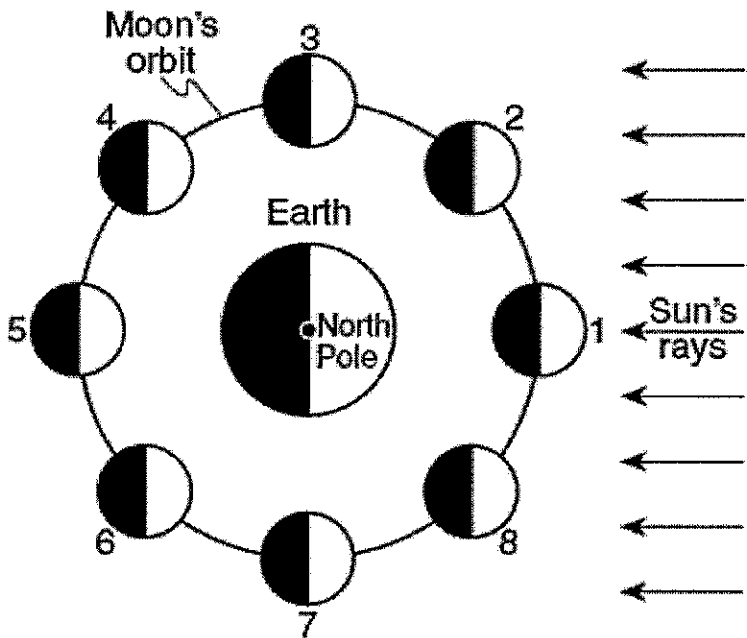
Base your answers to questions 1 and 3 on the graph below. The graph shows the recorded change in water level (ocean tides) at a coastal city in the northeastern United States during 1 day.



- Which inference about tides is best made from this graph?
 - The hourly rate of tidal change is always the same.
 - The rate of tidal change is greatest at high tide.
 - The tidal change is a random event.
 - The tidal change is cyclic
- According to the pattern shown on the graph, the next high tide will occur on the following day at approximately
 - 12:30 a.m.
 - 2:00 a.m.
 - 3:15 a.m.
 - 4:00 a.m.
- The cyclic rise and fall of ocean tides on Earth is primarily caused by Earth's rotation and the
 - Temperature differences in ocean currents
 - Revolution of Earth around the Sun
 - Direction of Earth's planetary winds
 - Gravitational attraction of the Moon and the Sun

4. Which description of change is most closely associated with ocean tides and moon phases?
- | | |
|------------------------------|--------------------------------|
| a. Cyclic and predictable | c. Cyclic and unpredictable |
| b. Noncyclic and predictable | d. Noncyclic and unpredictable |
5. Ocean tides are best described as
- | | |
|------------------------------|--------------------------------|
| a. Cyclic and predictable | c. Cyclic and unpredictable |
| b. Noncyclic and predictable | d. Noncyclic and unpredictable |

The diagram below shows the Moon orbiting Earth, as viewed from space above Earth's North Pole. The Moon is shown at eight positions in its orbit.

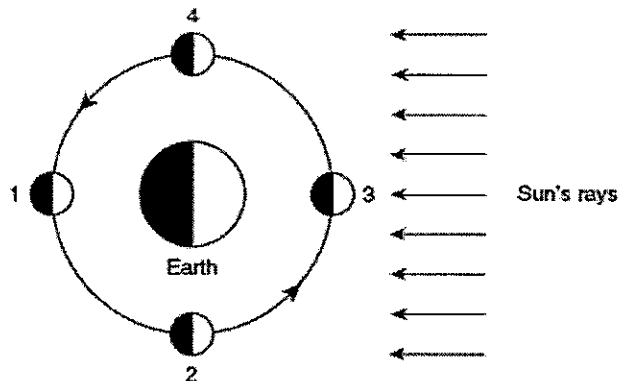


(Not drawn to scale)

6. Spring ocean tides occur when the difference in height between high tide and low tide is greatest. At which two positions of the Moon will spring tides occur on Earth?
- | | | | |
|------------|------------|------------|------------|
| a. 1 and 5 | b. 3 and 7 | c. 2 and 6 | d. 4 and 8 |
|------------|------------|------------|------------|

7. The diagram below represents the Sun's rays striking Earth and the Moon. Numbers 1 through 4 represent positions of the Moon in its orbit around Earth. The highest tides on Earth occur when the Moon is in positions

- | |
|------------|
| a. 1 and 3 |
| b. 2 and 4 |
| c. 3 and 2 |
| d. 4 and 1 |



(Not drawn to scale)

Eclipses

Facts to Memorize: 28-30

Eclipses - _____

Solar Eclipse	Lunar Eclipse
Sketch:	Sketch:
Notes:	Notes:

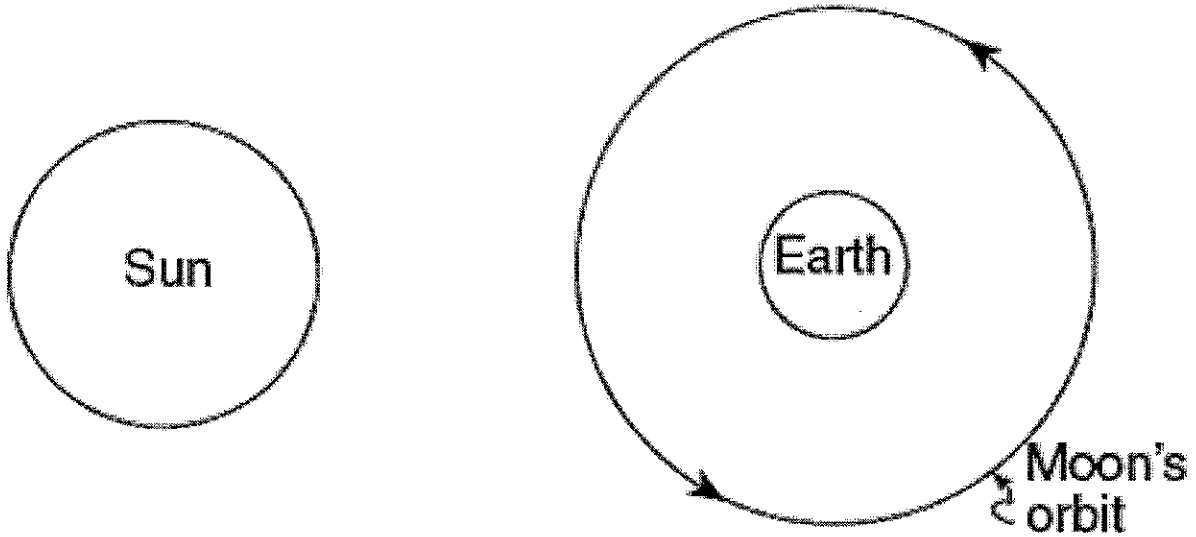
In order to have a solar eclipse, what phase must the Moon be in? _____

In order to have a lunar eclipse, what phase must the Moon be in? _____

Why don't we have solar and lunar eclipses every month? _____

Eclipse Practice Questions

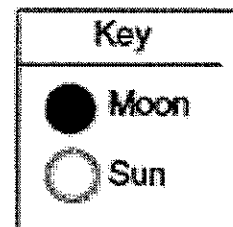
Base your answers to questions 1 through 3 on the diagram below and on your knowledge of Earth science. The diagram shows the Sun, Earth, and the Moon's orbit around Earth as viewed from space.



(Not drawn to scale)

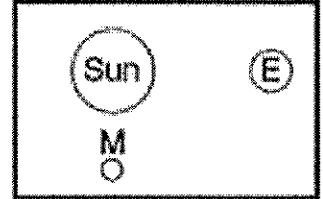
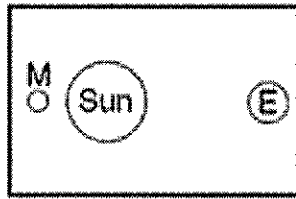
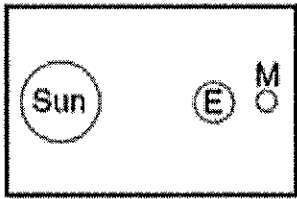
1. On the diagram provided above, draw a small circle to represent the Moon's position in its orbit when a solar eclipse is viewed from Earth.
2. Approximately how many complete revolutions does the Moon make around Earth each month?
3. Explain why solar eclipses do not occur every time the Moon revolves around Earth.

4. What does the diagram to the right represent?
 - a. Changing phases of the Sun
 - b. Changing phases of the Moon
 - c. Stages in an eclipse of the Sun
 - d. Stages in an eclipse of the Moon



Astronomy Review

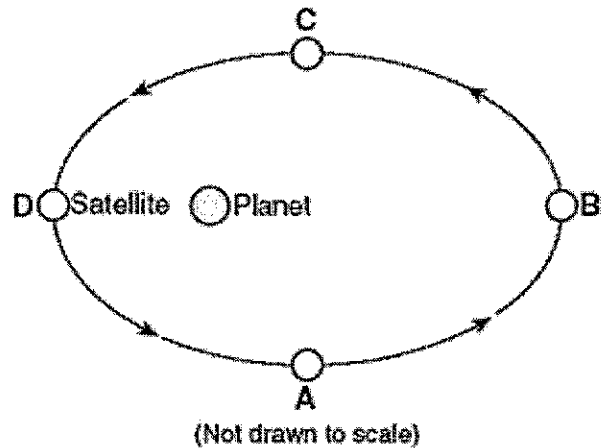
Use the following four pictures to answer questions #1-4.



1. Put an X through the picture(s) that are NOT POSSIBLE.
2. Circle the picture that could represent a Lunar Eclipse.
3. Place a triangle around the picture that could represent a Solar Eclipse.
4. Explain why a solar and lunar eclipse does NOT happen every month.

Use the following picture to answer questions #5-10.

5. Which lettered location is the satellite traveling the fastest?
6. Why is the satellite traveling the fastest at that location?
7. If the planet in the diagram were Earth, what object would the satellite represent?

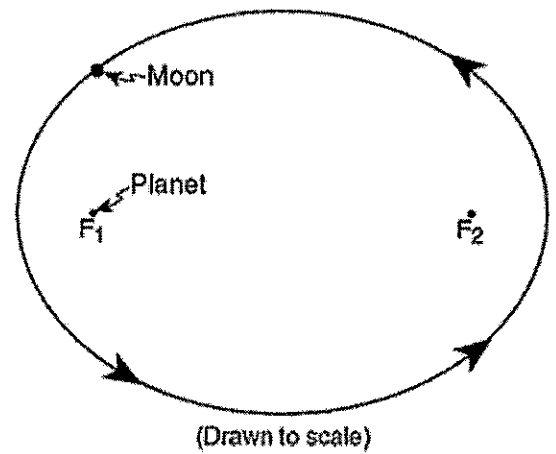


8. How long will it take the satellite named in question #7 to revolve around the Earth?
9. Name the shape of the orbit created by the satellite.
10. What happens to the velocity of the satellite as it travels from point C to A?

Use the following picture to answer questions #11-12.

11. What is the eccentricity of the ellipse?
(Rounded to nearest thousandth)

12. How does the eccentricity of this orbit compare to all the planets in our Solar System?



Use the following picture to answer questions #13-18.

13. Label the position of the New Moon with an N.

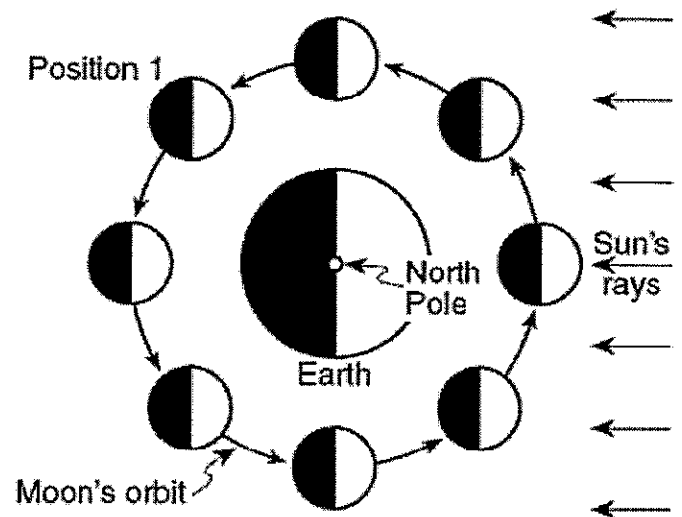
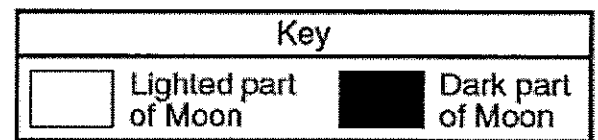
14. Label the position of the Full Moon with an F.

15. Label the position of the Third Quarter with a 3.

16. Draw a square around the moon position where a Solar Eclipse could occur.

17. Draw a triangle around the moon position where a Lunar Eclipse could occur.

18. What happens to the lit portion of the Moon we see from Earth as it moves from Position N to F?

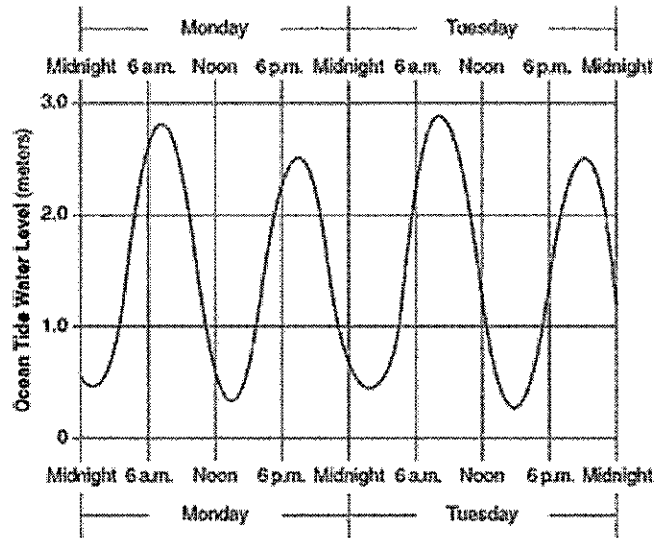


Use the following picture to answer questions #19-21.

19. What causes the tides to rise and fall on a daily basis?

20. What time and day should the next LOW tide occur?

21. What should the Ocean Tide Water level be on the next HIGH tide?

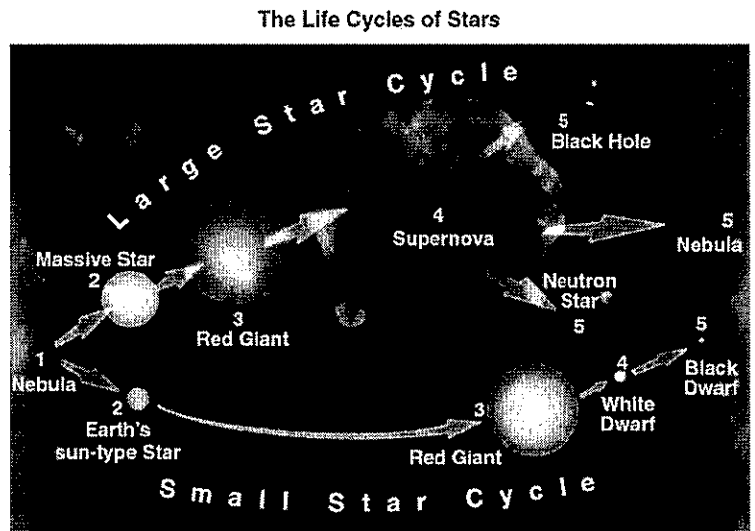


Use the following picture to answer questions #22-24.

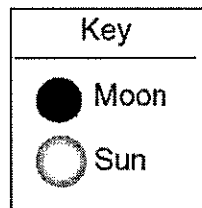
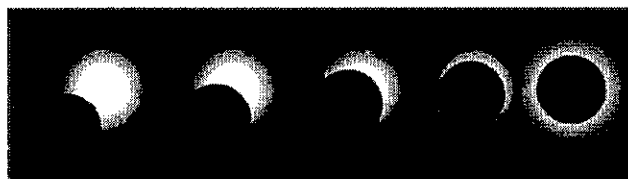
22. Describe the star cycle, from start to finish, of an Earth's Sun-type star.

23. What do stars originate from?

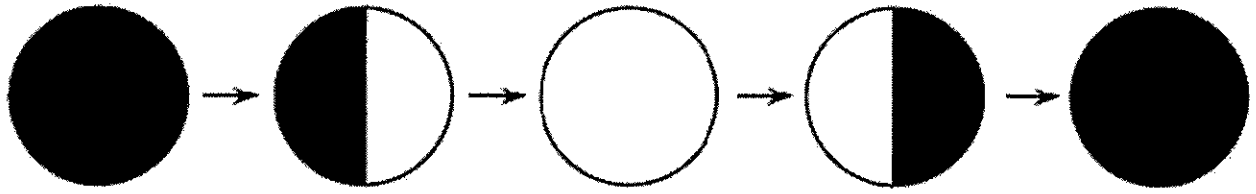
24. What are the 3 possible outcomes of a massive star?



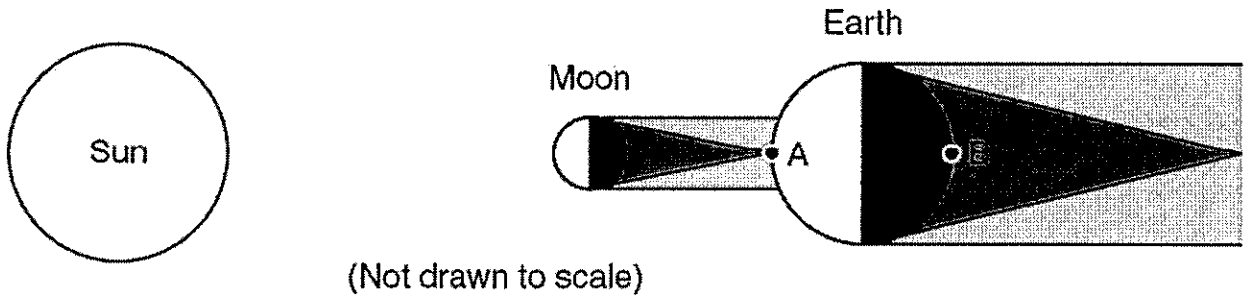
25. What phenomenon is being shown in this picture below?



26. Label the Moon phases in the diagram below.



Use the following diagram to answer questions #27-29.

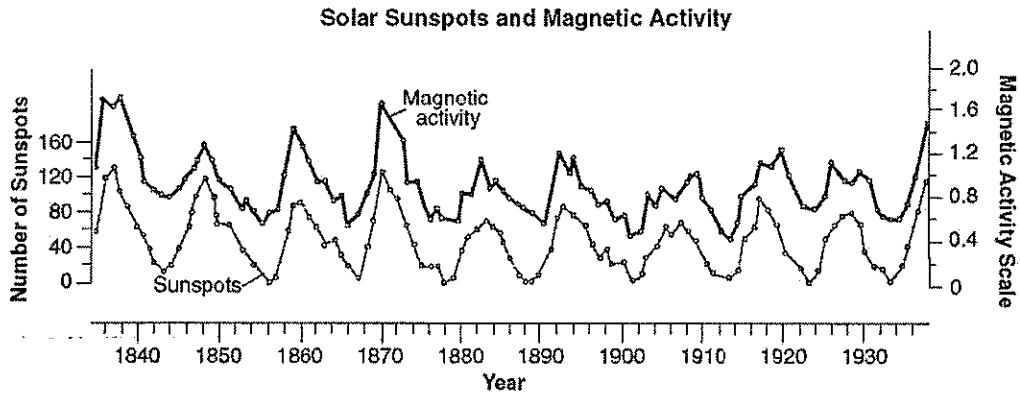


27. What time is it at location B?

28. What is location A currently experiencing?

29. What phase of the Moon is shown in the diagram?

Use the following diagram to answer questions #30-31.

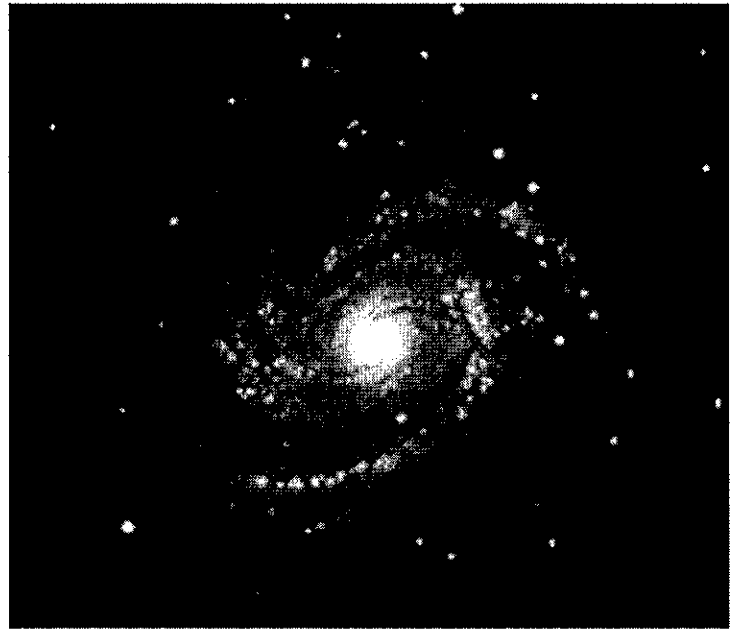


30. Describe the relationship between sunspots and magnetic activity.

31. What type of graphic relationship is this?

32. The diagram to the right represents the shape of the Milky Way Galaxy. The Milky Way Galaxy is best described as a _____ galaxy.

- a. Elliptical
- b. Circular
- c. Irregular
- d. Spiral



33. A camera was placed outside at night and pointed directly at Polaris and several other stars. The lens was kept open and a time-exposure photograph was taken. The diagram below represents that photograph of Polaris and star trails, with an angular protractor to measure apparent motion.

How many hours was the lens kept open to create the star trails in this photograph?

