Earth and Space

2013-2014

To infinity and beyond!

Your guide for success for the Earth and Space

Name: _____

Table of Contents—Earth and Space

I. What is Astronomy? 3

II. What tools and processes do astronomers use?

A. Telescopes 4

B. Electromagnetic Radiation 4

C. Size and Scale in the Universe 6

D. Doppler Effect 6

III. What is the structure and composition of the universe?

A. Stars

1. Color 8

2. Composition 8

3. Classification 8

4. Life Cycle 10

B. Galaxies 12

C. Formation of the Universe 12

IV. What is the Structure and Composition of our Solar System

A. Formation 14

B. Our Sun 16

C. Earth Formation 18

D. Planetary Motion 20

V. What is the relationship of objects in space?

A. Phases of the moon 22

B. Eclipses 24

C. Tides 26

D. Seasons on Earth 28

Table of Contents—Earth and Space

VI. What is Geology 3

VII. What is Geologic Time ?

A. Geologic Time Scale 4

B. Determining The Age 6

C. Rock Cycle 6

VIII. How is the Earth layered?

A. Inside the Earth 8

B. Tectonic Plates 10

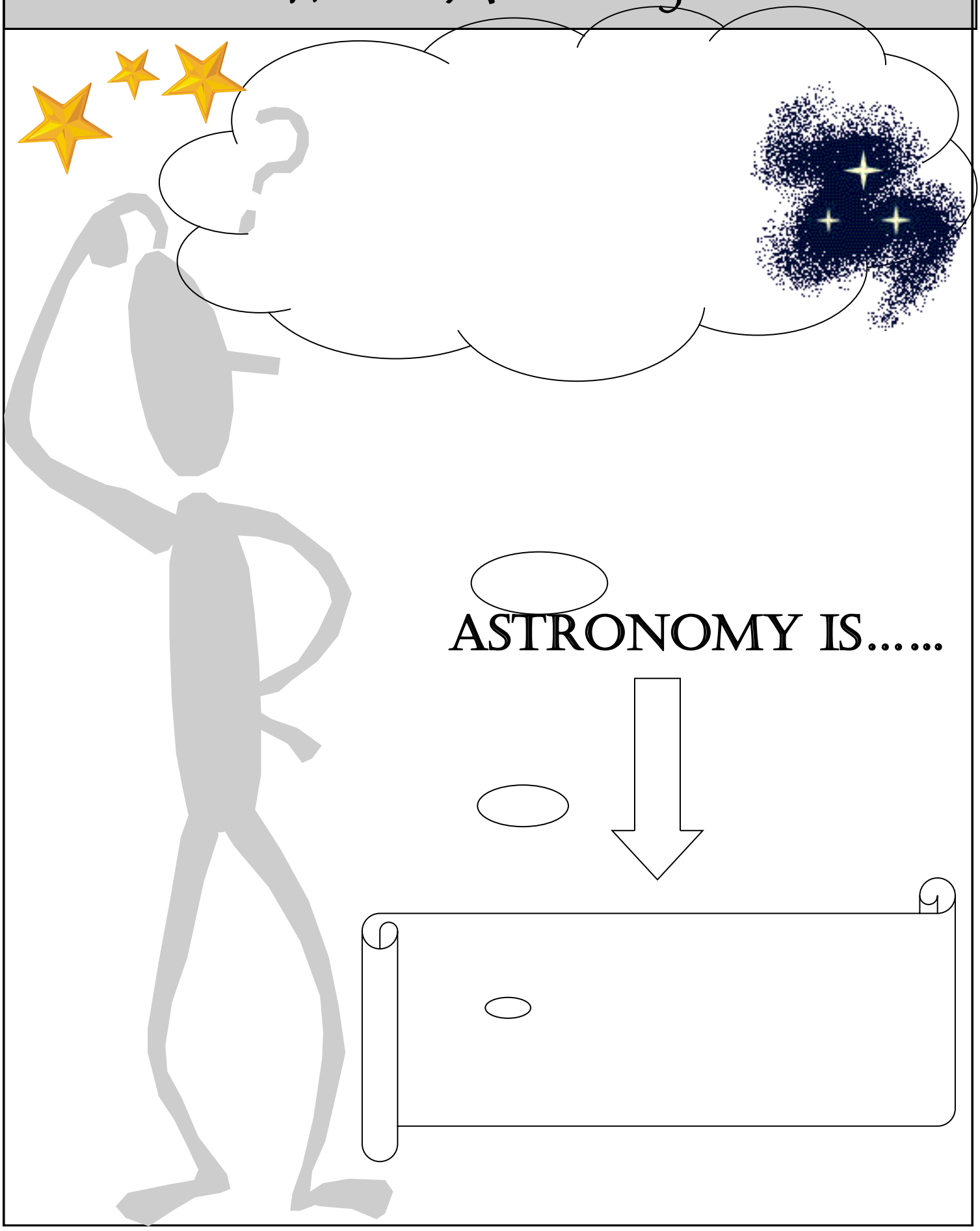
VIIII. What ideas led to the Theory of Plate Tectonics?

A. Continental Drift 12

B. Sea Floor Spreading 14

C. Theory of Plate Tectonics 16

What is Astronomy?



ASTRONOMY IS……

Extra Doodle Page

Tools of Astronomy

Chapter: 1 Section: 2 Pages: 8-13

Telescope

- Instrument that _____ electromagnetic radiation from the _____ and _____ it for better _____.
- There are two basic types of telescopes: _____ and non-_____.

Optical

- Most _____
- Used to study _____.
- Collects visible light and focuses it to a _____ point for closer _____.
- The bigger the _____ lens, the more _____ it can gather .

2 Types of Optical Telescopes:

Refracting:

- Uses _____

2 Disadvantages:

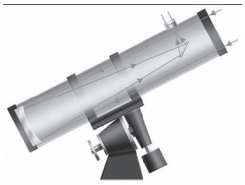
1. Images are _____.
2. Size is _____.

Reflecting

- Uses _____

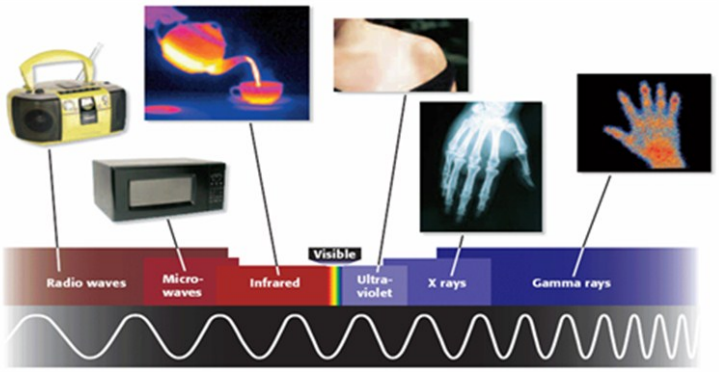
2 Advantages:

1. Mirrors can be _____.
2. Gathers more _____.



Non -Optical

- Detects _____ **not** seen by the _____ eye.
- Reveals more _____ about the _____.
- Place in _____ to get above Earth's _____ and avoid _____.
- Types of Non-Optical Telescopes
  -
  -
  -
  -
  -



Current Telescopes can measure across the Electromagnetic Spectrum

Electromagnetic Spectrum:

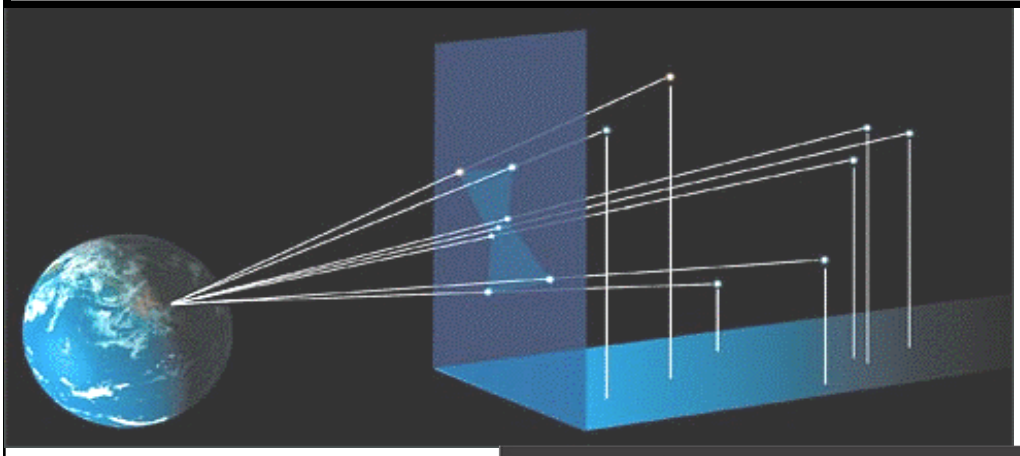
- All of the _____ or _____ of electromagnetic _____.
- Humans can only detect _____ with the human eye.
  Red (_____) ———> Blue (_____)
- Earth's _____ blocks most _____ radiation from objects in space.
- Atmosphere serves as a _____ shield around _____.

Size and Scale of the Universe/Doppler Effect

Chapter: 1 Section: 3 Pages: 18-20

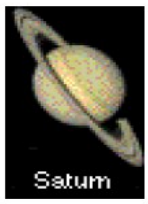
Measuring Distance in Space:

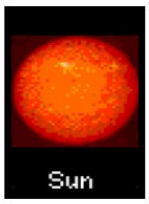
- Stars are much _____ away than the planets are.
- Astronomers use a special unit of length to measure these distances: _____.
- A light—year is a unit of length equal to the distance that _____ travels in one _____.
- One light year is equal to about _____ trillion kilometers



Doppler Effect:

- A _____ change in the frequency of a wave as the _____ between the source and the observer changes. For example, the sound of a siren on a moving vehicle appears to change as it approaches and passes an observer.
- We experience the Doppler Effect in two basic ways.
  - _____ Shift = Moving _____—There is a displacement in the spectral lines toward the _____ end indicating the source and the observers are moving _____ from one another. (_____ wavelengths)
  - _____ Shift = Moving _____ - There is a displacement in the spectral lines toward the _____ end indicating the source and the observers are _____ each other. (_____ wavelengths)
- _____ discovered that the universe is _____ .
- Therefore the universe shows evidence of _____.





#1 How Big? Group according to size: Smallest to Largest

Ranking	My Ideas	Group's Answer	Actual Answer
1			
2			
3			
4			
5			
6			
7			
# Correct			

#2 How Far? Group according to distance from Earth: Closest to Farthest

Ranking	My Ideas	Group's Answer	Actual Answer
1			
2			
3			
4			
5			
6			
7			
# Correct			

#3 How Old? Group according to age: Youngest to Oldest

Ranking	My Ideas	Group's Answer	Actual Answer
1			
2			
3			
4			
5			
6			
7			
# Correct			

1. Which category was the easiest to place in order? _____
2. Why?_____
3. Which category was the hardest to place in order? _____
4. Why?_____
5. What interesting fact did you learn today?

_____

_____

Stars…..Color, Composition, and Classification

Chapter: 2 Section: 1 Pages: 32-36

The _____ of the star reveals its _____.

- _____ = Hottest Color
  - Example— _____
-
-
-
- _____ = Coolest Color
  - Example— _____

Stars are made up of different _____ in the form of _____.

Inner Layer:

-

Outer Layer: (Also known as the star's atmosphere)

- Made up of _____ gases.
- Produces a _____
- Use a _____to identify _____ and _____ in a star's spectrum.
- Each _____ has a _____ spectrum.

Stars are classified by _____ and _____.

Temperature differences result in _____ differences.

Letters represent different temperature classifications:

- Type ____—(hottest, blue), B, A F, G, K, _____ (coolest, red)

Brightness is classified by using negative (-) or positive (+) numbers.

- Negative numbers = _____
- Positive numbers = _____

Astronomers use two different classifications for brightness:

- Apparent brightness: _____
- Absolute brightness: _____
  - Uses _____ and _____ to calculate.
- Example: Our sun—Apparent Magnitude = _____ and Absolute Magnitude = _____

Star Types – Color and Surface Temperature

Determine the color and letter of these stars:

Star Name	Luminosity	Surface Temperature Kelvin	Color	Letter
Our Sun	1	5,750	White-Yellow	G
Betelgeuse	16,000	3,100		
Polaris	5,500	5,400		
B. Centauri	1,700	25,000		
Antares	910	3,200		
Spica	760	24,000		
Aldebaran	160	3,600		
Regulus	160	13,600		
Arcturus	100	4,500		
Vega	50	11,300		
Sirius	20	10,600		
Fomalhaut	12	9,600		
Altair	10	8,400		
Procyon	6	6,600		
A. Centauri	2	6,000		
Lacaille 8760	0.03	3,500		
40 Eridani B.	0.01	9,000		

Life Cycle of Stars

Chapter: 2 Section: 2 Pages: 40-45

Classification of stars based on size:

-
-
-
-
-

- A star's _____ classification changes throughout its _____ cycle.
- _____ star use their _____ supply much faster, therefore, they _____ more _____ and do not have as long of "_____."

Stage 1—A Star is Born

- Begins when _____ and _____ in a _____ contract to form a _____.
- _____ pulls gas, dust together, _____ gets denser, hotter.
- The process of _____ begins as _____ is changed to _____.

Stage 2—Main Sequence—Longest Stage

- _____ is _____ in the core.
- Process releases an _____ amount of _____.
- Size changes very _____ as long as there is a _____ supply of _____.

Stage 3—Giant or Supergiant

- _____ supply has been _____.
- Core _____.
- Outer layers grow very _____.
- Red giants grow _____ bigger.
- Super giants grow _____ bigger.

Stage 4—A Star's Ending

Option A

- _____ Occurs
- Sun-sized and smaller become _____.
- Can no longer generate _____ by fusion.
- Can shine for billions of years before they _____ and become_____.

Option B

- _____Occurs
- Leftovers form a _____ star.
- If it spins = _____

Option C

- _____Occurs
- Biggest of all stars - _____ the mass of the _____.
- Forms a _____.
- Detected by studying _____ objects.

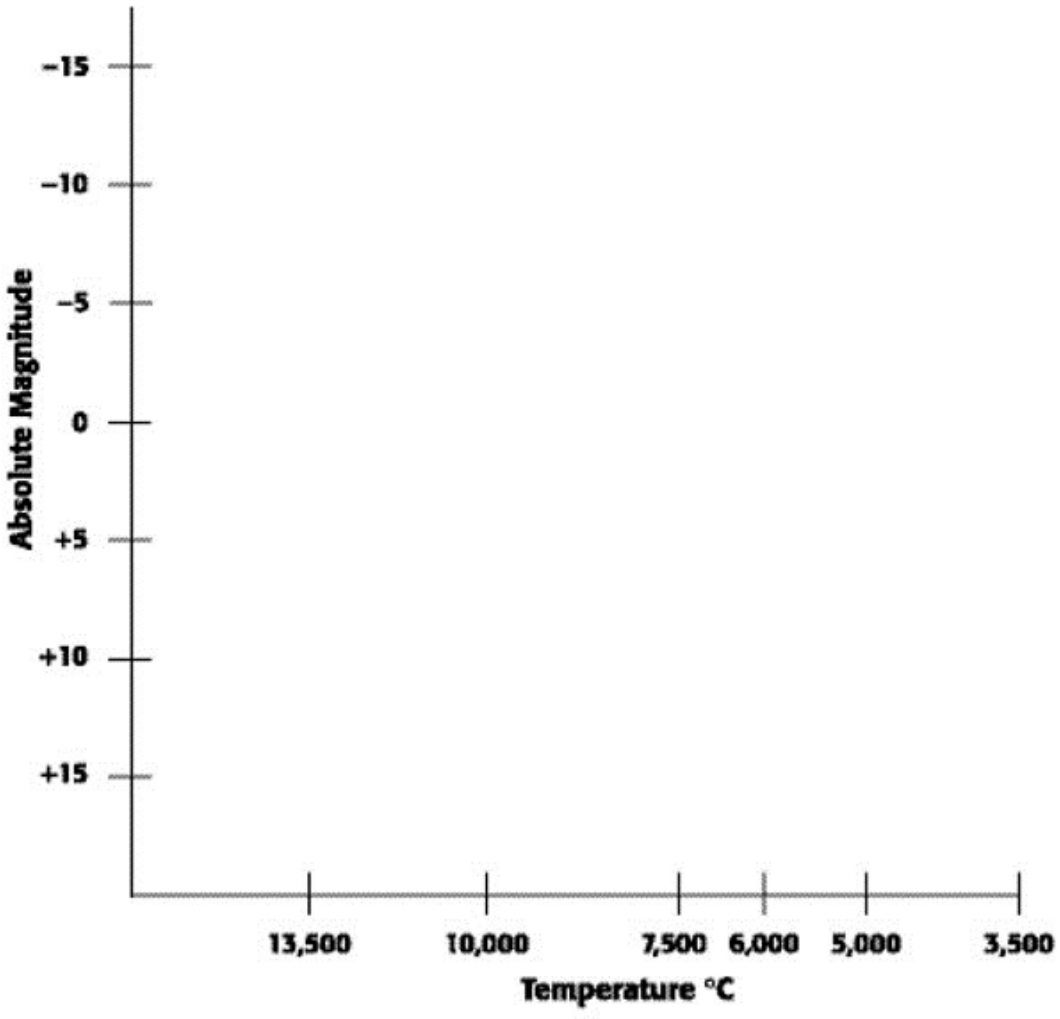
Hertzsprung-Russell Diagram (H-R Diagram)

An H-R diagram shows the relationship between a star's surface _____ and its absolute _____. The diagram shows how stars change over time. Follow the instructions below to create your own H-R diagram on the next page. You may want to use colored pencils or crayons for this activity. Remember that a star's brightness increases as you move toward the top of the H-R diagram.

1. Our sun is an average star. It should be located at about the center of the diagram. Draw and label the sun on the diagram.
2. Draw and label a red dwarf star on the diagram. Red dwarf stars are dim and have a low temperature.
3. Draw and label a white dwarf star on your diagram. White dwarf stars are dim and have a high temperature.
4. Draw and label a blue star on the diagram. Blue stars are very hot and bright.
5. Draw and label a red giant on the diagram. Red giants are cool and bright.
6. Most stars can be plotted along the main sequence of an H-R diagram. These stars range from very bright, very hot stars to dim, cool stars. Indicate and label on your diagram where the main sequence should go. What is the main sequence?_____
7. Which of the stars that you have plotted are included in the main sequence?

   _____
8. Imagine that you have discovered a new star in the night sky. Your measurements show that it has a surface temperature of 10,000°C and an absolute magnitude of +10. Based on your diagram, what type of star do you think it is?

   _____



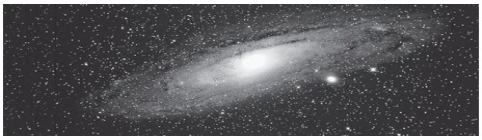
Galaxies

Chapter: 2 Section: 3 Pages: 46-49

- Large groups of stars , dust and gas are called_____.
- Which are classified by their _____.
- There are _____ main types of classifications;
  - _____
  - _____
  - _____

Spiral

- Huge _____ in the center.
- _____ Arms
- Made up of _____, dust, and _____.
- Example: _____



Elliptical

- More _____ in appearance
- _____ Centers
- Very little _____ and gas
- Contains mostly _____ stars.

Irregular

- The "_____"
- Shape is _____
- Do not fit into any other _____.
- Close companions of large _____ galaxies.

Formation of the Universe

Chapter: 2 Section: 4 Pages 50-53

What do scientists study to understand how the universe formed?

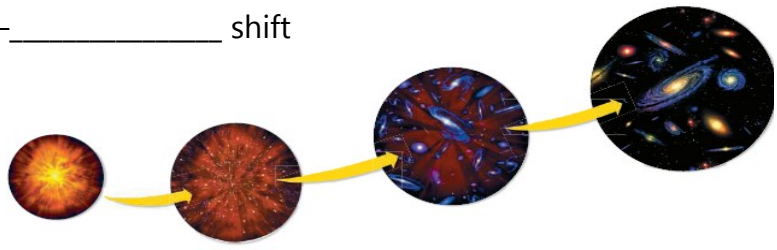
- _____ of galaxies.

What evidence do they use?

- The _____ universe—_____ shift

What is the name of a current theory?

- Big _____ Theory



The BBT proclaims.....

- 13.7 billions of years ago all the _____ of the universe was _____ under extreme _____, temperature, and density in a very _____ spot. Then the universe _____ rapidly.

How is the age of the universe calculated?

- Measure the _____ from Earth to various galaxies.
- Calculate the _____ of old, nearby stars.
-

SHO-WAT-CHA-KNO

History of the Universe

◆ Understanding Main Ideas

Write an answer for each of the following questions in the spaces provided.

1. In which direction are nearly all galaxies moving relative to Earth?

_____

2. What is the general relationship between a galaxy's distance from Earth and its speed?

_____

Place the following events in the order in which they occurred. Place the order number (1 through 7) in the blank to the left of each event.

_____ **3.** nebula shrinks to form a spinning disk

_____ **4.** gravity pulls gases to center of the disk

_____ **5.** big bang

_____ **6.** the planets form

_____ **7.** gas and dust accumulate as a nebula

_____ **8.** matter separates into galaxies

_____ **9.** gas at the center of the disk becomes hot and dense enough for nuclear fusion to begin

◆ Building Vocabulary

Write an answer for the following question in the space provided.

10. What is the big bang theory?

_____

_____

_____

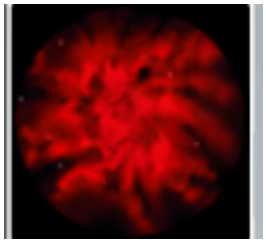
A Solar System is Born

Chapter: 3 Section: 1 Pages: 64-67

In the beginning...

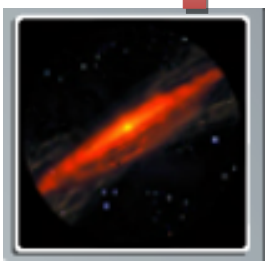
- The _____ needed for a _____ Solar System are found in nebulas.
- Nebulas are vast clouds of _____ and dust.
- The ingredients include: Hydrogen, _____, and Dust (made of Carbon and Iron).
- Need help from two forces: _____ and Pressure
- With all these factors, a solar nebula is born. The density of a nebula _____. This could be due to a collision with another nebula or a the explosion of a nearby star.

Step 1:



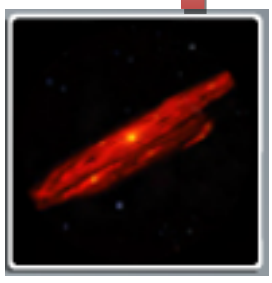
- The young solar nebula begins to _____.
- Scientists estimate that the following process took approximately _____ million years.

Step 2:



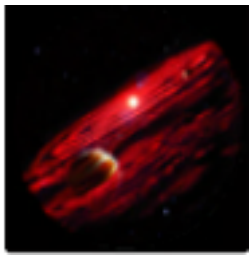
- The Solar Nebula _____, flattens, and becomes _____near the center.

Step 3:



- Planetesimals begin to _____ within the swirling disk.

Step 4:

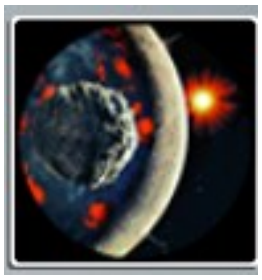


- As the largest planetesimals grow in size, their _____ attracts more gas and dust.

Step 5:

- Smaller planetesimals _____ with larger planetesimals, and planets begin to _____.
- Rocky planets formed because it was too _____for gases to remain that close to the sun therefore the rocky material was left for the inner planets to form.
- Gaseous planets formed because they were _____ enough away from the sun that their gravities could attract the nebula gases.

Step 6:



- The center of the sun becomes so _____ and dense that nuclear _____ begins.
- A star _____ and the remaining gas and dust are blown out of the new solar system.

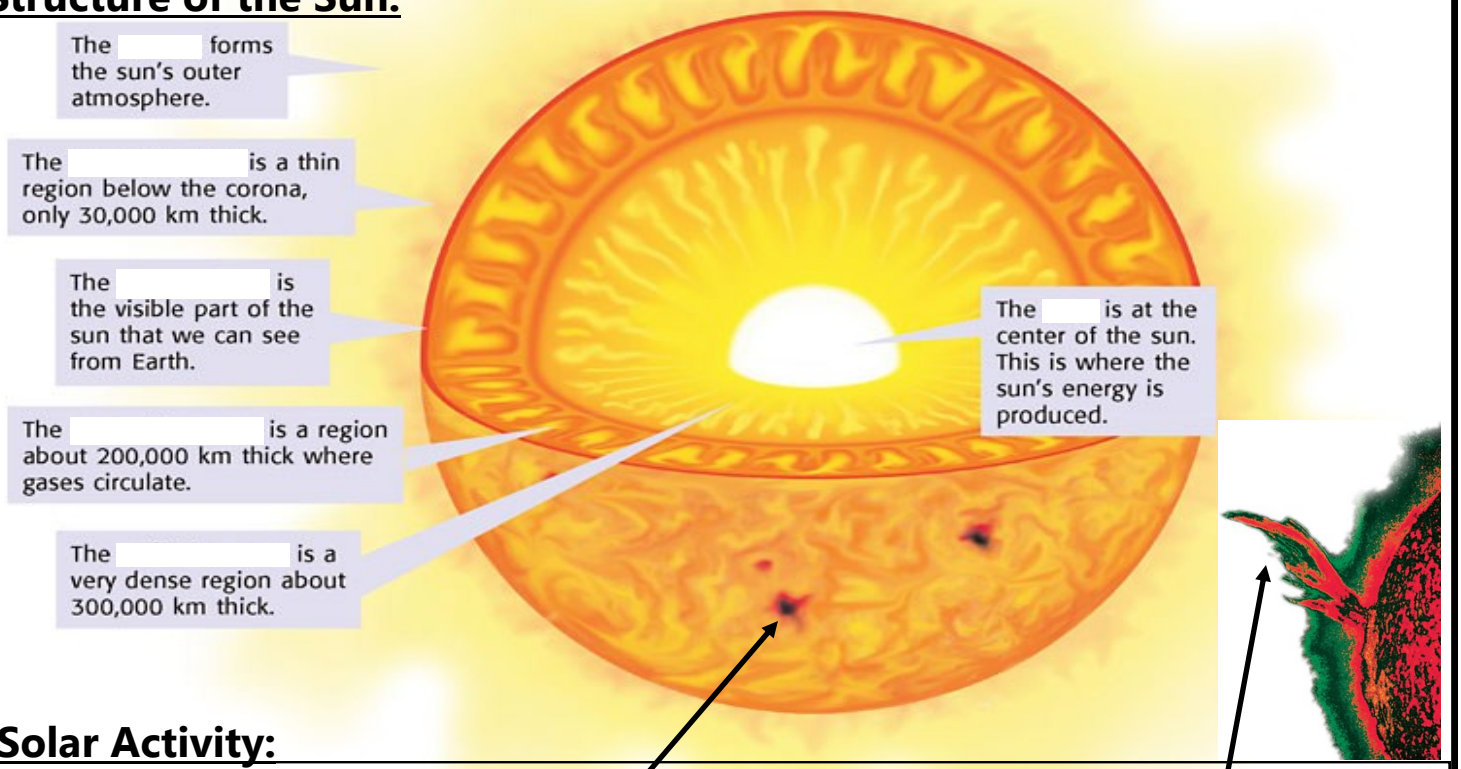
The Sun: Our Very Own Star

Chapter: 3 Section: 2 Pages: 68-73

Fast Facts:

- Energy from the sun _____ and _____the Earth's surface.
- Energy from the sun drives the _____.
- The sun makes up more than _____ of the Solar System's mass.
- Nuclear Fusion is the process that produces the _____.
- Albert Einstein helped scientists determine the sun's energy source with his famous equation - _____
- The sun is a large ball of gas composed mainly _____ and He and held together by gravity.
- It is _____ solid.
- It takes light _____ minutes to reach Earth.

Structure of the Sun:



Solar Activity:

- Much of the solar activity is created due to the sun's _____ field.
- The magnetic field is generated by the _____ of the sun's gases and the sun's rotation.
- This constant flow is referred to as the "_____."
- The solar wind can reach _____into space, sometimes damaging satellites and disrupting tv signals.
- _____ and Solar Flares are caused by the sun's magnetic fields.

Sunspots

- Occur when the sun activity is _____ down in the convective zone causing areas in the photo-sphere to become _____ than surrounding areas.
- On an _____ year cycle.
- May affect Earth's _____.

Solar Flares

- Regions of extremely _____ temperatures and _____ that develop on the sun's surface.
- An eruption sends huge _____of electri-cally charged particles into the Solar System.
- Can i_____ radio communication on Earth.

Our Star: The Sun

An average star

93 million miles away

5 billion years old

A million planet Earths could fit inside

Burns 700 million tons of hydrogen fuel every second

Mostly hydrogen and helium

The source of energy for all life on Earth

The Earth Takes Shape

Chapter: 3 Section: 2 Pages: 68-73

Today...

- The Earth is mostly made of _____.
- Nearly _____ of its surface is covered with water.
- Our planet is surrounded by a _____ atmosphere of N, O and Ar
- However, it has not always been this way!

Formation of Solid Earth...

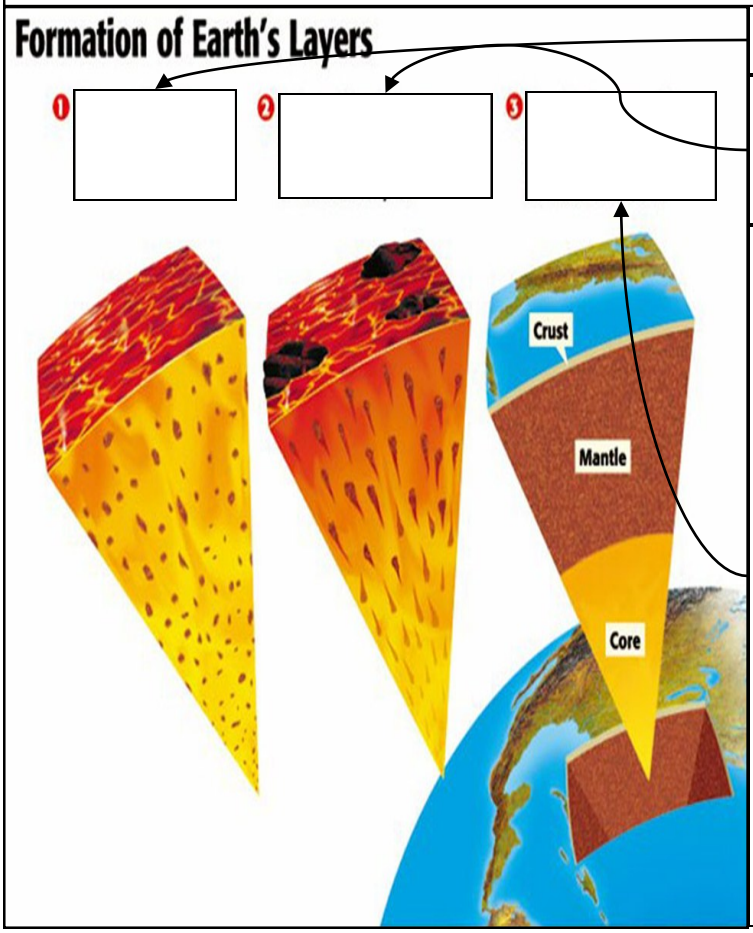
- The Earth formed as planetesimals in the Solar System _____ and combined.
- From what scientists can tell, the Earth formed within the first _____ million years of the collapse of the solar nebula.

The Effects of Gravity:

- As the planet gains more matter, the force of _____increases.
- When Earth reached a diameter of about 350 km, the force of gravity became _____ than the strength of the rock.
- At this point, the rock at its center was _____ by gravity and the planet started to become _____.

The Effects of Heat :

- As planetesimals continued to collide with the Earth, the energy of their motion _____the planet.
- _____ material, which was present in the Earth as it formed, also heated the young planet.
- After Earth reached a certain size, the temperature rose faster than the interior could cool, and the rocky material inside began to _____.
- Today, the Earth is still _____ from the energy that was generated when it formed.
- Volcanoes, earthquakes, and hot springs are effects of this _____ trapped inside the Earth.



1. Materials in the early Earth are _____mixed.

2. Rocks melt, and denser materials (Fe and Ni) _____ toward the center. Less dense elements _____and form layers.

3. According to composition the Earth is divided into _____ layers: the crust, the mantle, and the core.

- The _____is the thin and solid outermost layer of the Earth above the mantle. It is 5 to 100 km thick.
- Crustal rock is made of materials that have _____ such as oxygen, silicon, and aluminum.
- The _____is the layer of rock between the Earth's crust and core. It extends 2,900 km below the surface.
- Mantle rock is made of materials such as magnesium and iron. It is _____ than crustal rock.
- The _____ is the central part of the Earth below the mantle. It contains the densest materials, including nickel and iron.
- The core extends to the _____ of the Earth—almost 6,400 km below the surface.

Formation of the Earth's Atmosphere...

Earth's Early Atmosphere :

- _____ and steamy...Scientists think that the atmosphere was a mixture of gases (CO_2 and H_2O Vapor) that were released as the Earth cooled.

Earth's Changing Atmosphere:

- As the Earth cooled and its layers formed, the atmosphere changed again. This atmosphere probably formed from _____ gases.
- Volcanoes released chlorine, nitrogen, and sulfur, in addition to large amounts of _____ and water vapor. Some of this water vapor may have condensed to form the Earth's first oceans.
- Comets, which are planetesimals made of _____, may have contributed to this change of Earth's atmosphere.
- As they crashed into the Earth, comets brought in a _____ of elements, such as carbon, hydrogen, oxygen, and nitrogen.
- Comets also may have brought some of the _____ that helped form the oceans.

The Role of Life

Ultraviolet Radiation:

- Scientists think that _____ (UV) radiation helped produce the conditions necessary for life.
- UV light has a lot of energy and can _____ apart molecules.
- Earth's early atmosphere probably did not have the protection of the _____ layer.
- Over time, broken down molecular material collected in the Earth's waters, which offered _____ from UV radiation.
- In these sheltered pools of water, chemicals may have combined to form the _____ molecules that made life possible.
- The first life-forms were very _____ and did not need oxygen to live.

The Source of Oxygen:

- Sometime before 3.4 bya, organisms that produced food by _____ appeared.
- During the process _____ was released.
- Played a major role in changing Earth's atmosphere to become the _____ of gases it is today.
- As oxygen levels increased, some of the oxygen formed a layer of _____ in the upper atmosphere.
- The ozone blocked most of the _____ radiation and made it possible for life, in the form of simple plants, to move onto land about 2.2 billion years ago.

Formation of Oceans and Continents...

- Scientists think that the oceans probably formed during Earth's _____ atmosphere, when the Earth was cool enough for rain to fall and remain on the surface.
- After millions of years of rainfall, water began to cover the Earth. By _____ billion years ago, a global ocean covered the planet.

The Growth of Continents:

- After a while, some of the rocks were light enough to pile up on the surface. These rocks were the beginning of the earliest _____.
- The continents gradually _____ and slowly rose above the surface of the ocean. These continents did not stay in the same place, as the slow transfer of thermal energy in the mantle pushed them around.
- About 2.5 billion years ago, continents really started to _____. By 1.5 billion years ago, the upper mantle had cooled and had become denser and heavier.
- At this time, it was easier for the cooler parts of the mantle to sink. These conditions made it easier for the continents to _____ in the same way they do today.

Planetary Motion

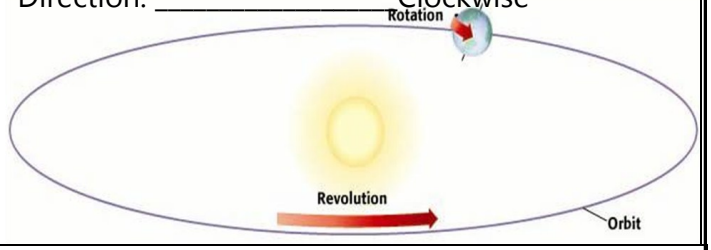
Chapter: 3 Section: 4 Pages: 80-83

Rotation:

- Is the _____of a body (an object) on its axis.
- Rotation Duration: _____ Hours
- Tilt: _____ ˚
- Direction: _____ Clockwise

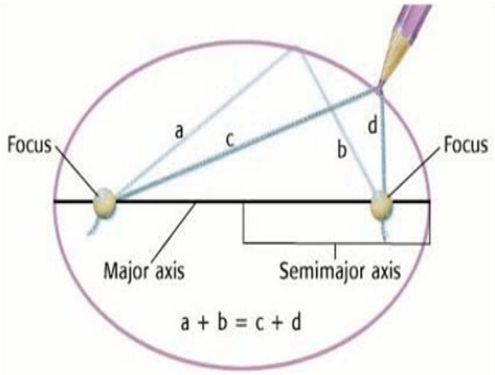
Revolution:

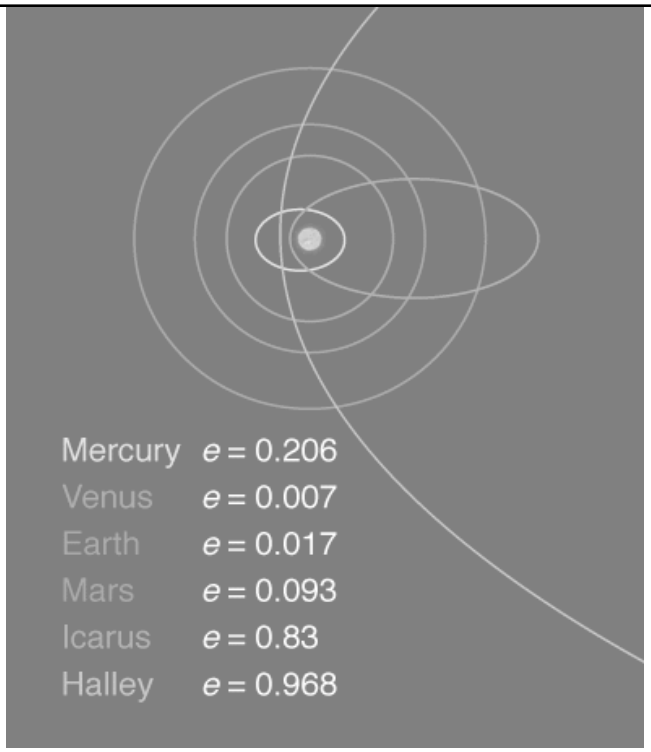
- Is the motion of a body (an object) that travels around _____body in space; one complete trip along an orbit.
- An _____is the path a body follows as it travels around another body in space.
- Rotation Duration: ~ _____Days
- Shape: _____
- Direction: _____Clockwise

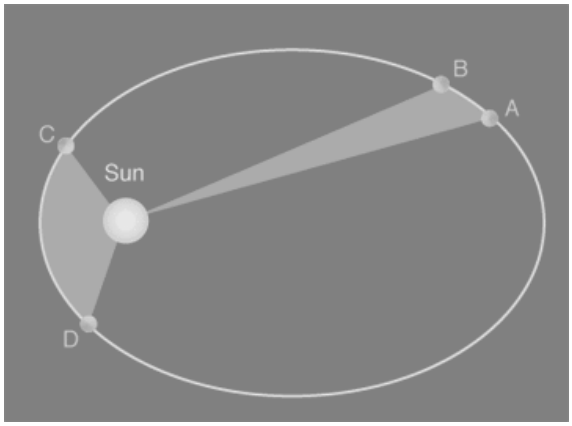


Kepler's 3 Laws of Motion:

1. Planets move in an elongated circle called an _____.
   - An ellipse is a curved _____ drawn around _____ points.
2. Planets seem to move _____when they are _____ to the sun and slower when they are farther away.
3. Planets that are _____ away from the sun take _____to orbit the sun.

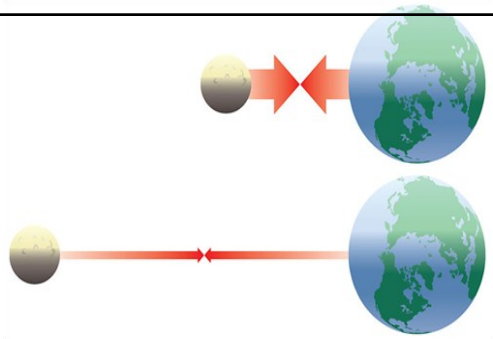


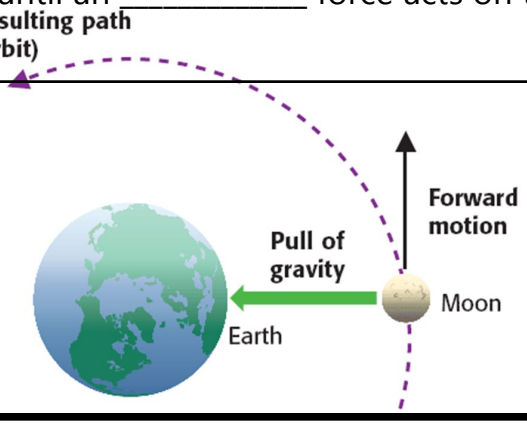




Newton:

- Answered _____ question: Why?
- Law of Universal Gravitation—States that the force of gravity depends on the product of the _____ of the objects divided by the square of the _____ between the objects.
- Newton also determined that _____ and _____ keep the planets in orbit.
- Inertia is an object's resistance in speed or direction until an _____ force acts on the object. (Newton's _____ Law)





SHO-WAT-CHA-KNO

1. In your own words, write a definition for each of the following terms: -*revolution* and *rotation*.

_____

_____

2. Kepler discovered that planets move faster when they
   a. are farther from the sun.
   b. are closer to the sun.
   c. have more mass.
   d. rotate faster.

3. On what properties does the force of gravity between two objects depend

_____

4. How does gravity keep a planet moving in an orbit around the sun?

_____

_____

5. The Earth's period of revolution is 365.25 days. Convert this period of revolution into hours. Show your work below.

6. If a planet had two moons and one moon was twice as far from the planet as the other, which moon would complete a revolution of the planet first? Explain your answer.

_____

_____

These two planetary motions cause:

1. 3.
2. 4.

Moon Phases

Chapter: 4 Section: 4 Pages: 112

Cause of Moon Phases:

- **The moon's _____ position relative to _____ and the _____. The _____ of sunlight that _____ the side of _____ changes.**

Duration of moon phase cycle:

-

Difference between waxing and waning:

-

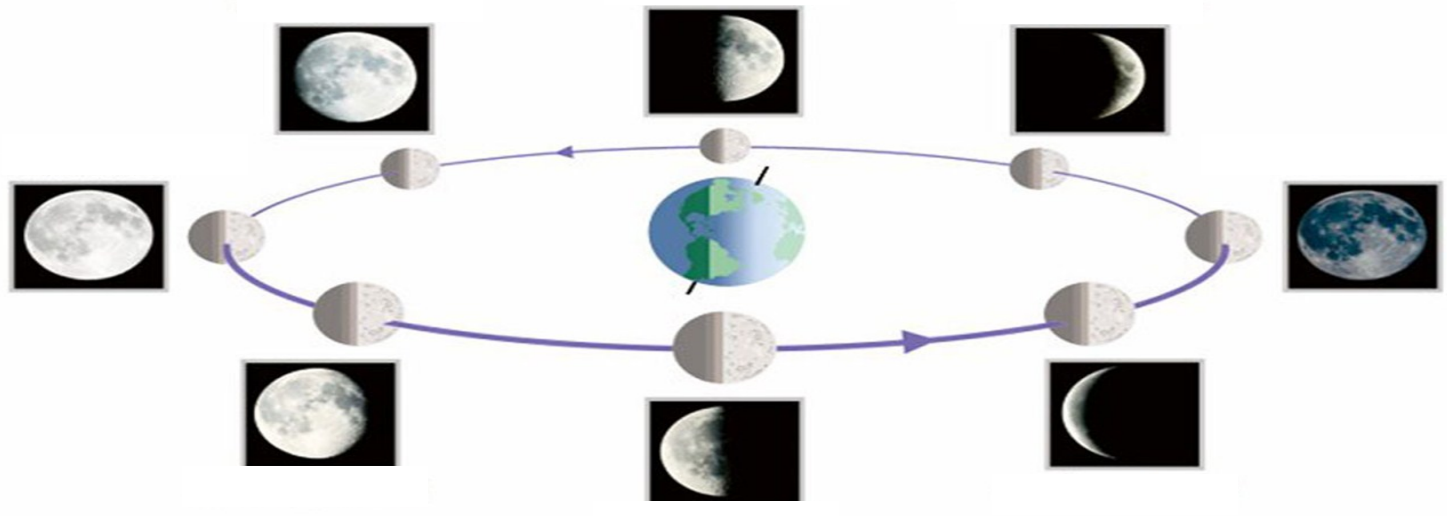
How does the moon's phase differ, when seen from above?

-

What is unique about the moon's period of rotation and period of revolution?

-

Phases of the Moon



Name_____

Arranging the Moon

Directions: Cut out the phases of the moon and arrange them in order in the table below. After your teacher checks for accuracy, glue the pictures to the paper.

	New Moon	
	Moon Phases 	
	14^{th} Day Full Moon	

Eclipses

Chapter: 4 Section: 4 Pages: 113-114

What causes an eclipse?

•

Why aren't eclipses visible every month?

•

At what moon phase does a Solar Eclipse occur?

•

At what moon phase does a Lunar Eclipse occur?

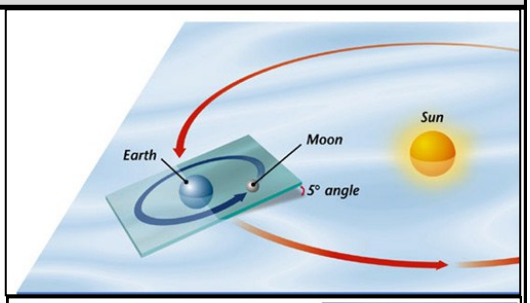
•

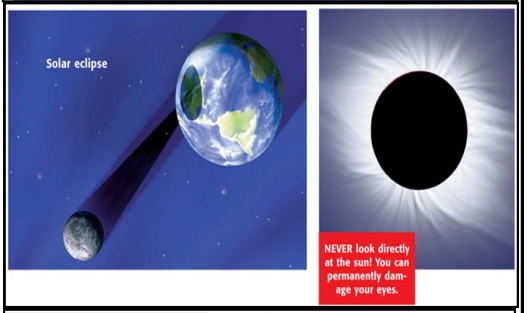
What is the Umbra?

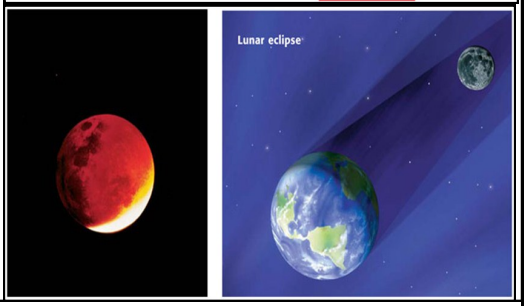
•

What is the Penumbra?

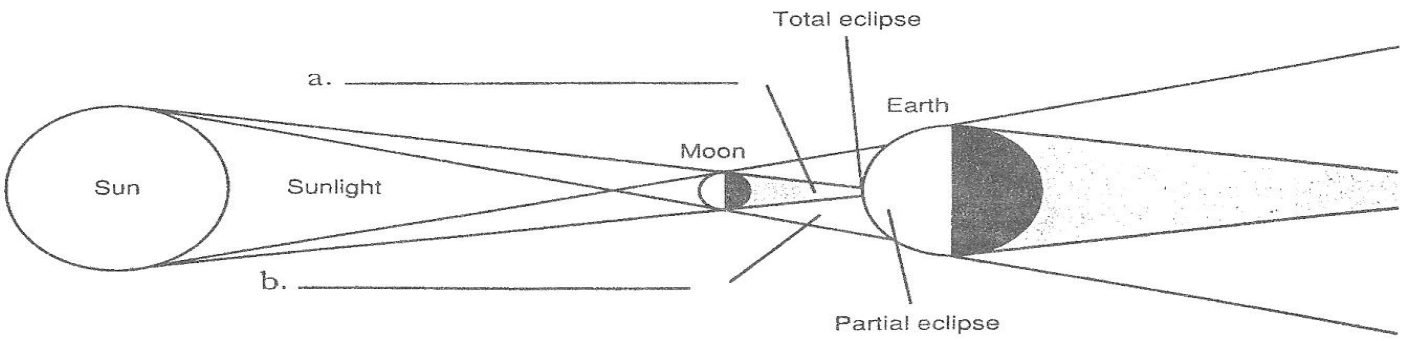
•



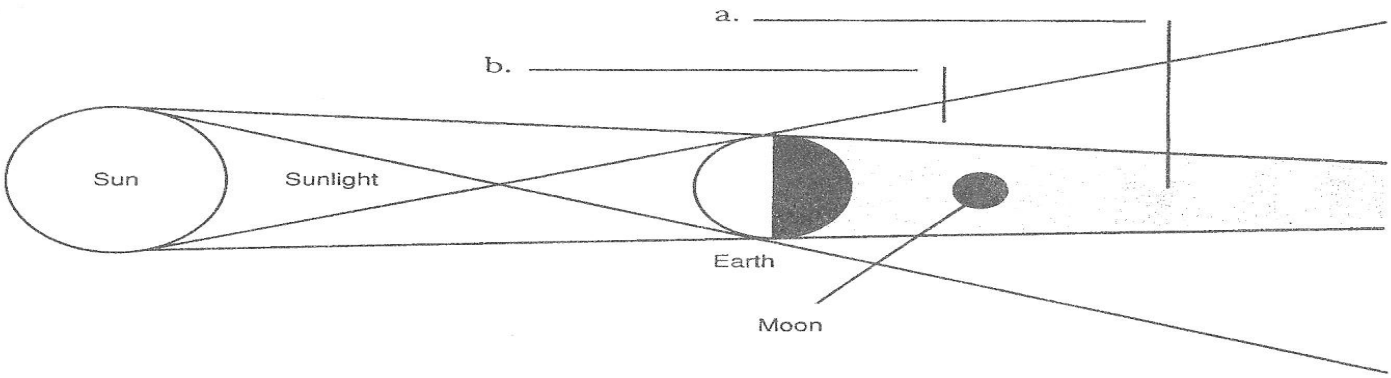




2. _____ eclipse



1. _____ eclipse

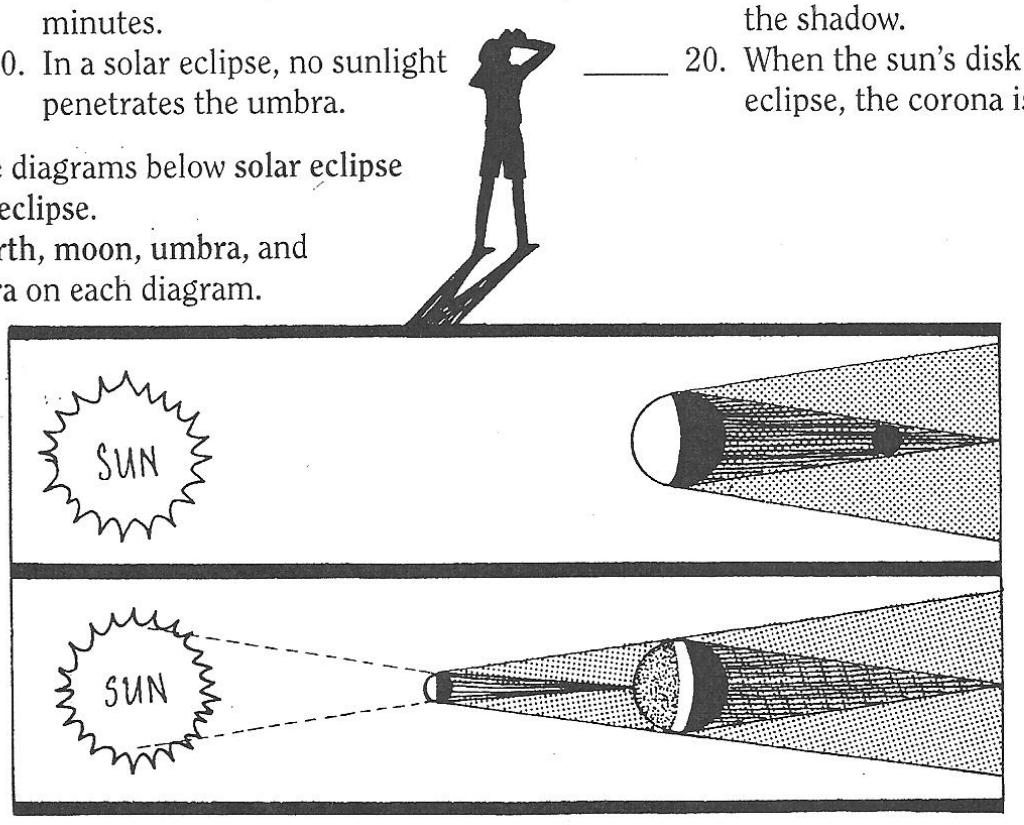


CASTING SHADOWS

Have you ever seen the sun disappear? Or watched an eerie shadow move across the moon? Imagine what it was like for primitive people when the sky suddenly fell dark in the middle of the day! When three celestial objects fall into alignment, some great shadows are the result. These shadows are called eclipses of the moon or sun, and they're pretty spectacular to watch! These eclipse-watchers have written down some information about eclipses. Do they have all their facts straight? Write T (true) or F (false) next to each statement.

_____ 1. A solar eclipse occurs when Earth falls between the sun and the moon.
_____ 2. All eclipses are visible.
_____ 3. All eclipses are total.
_____ 4. The umbra is the inner part of the shadow.
_____ 5. Eclipses of the sun occur 2–4 times a year.
_____ 6. A lunar eclipse occurs when the moon travels through the shadow of Earth.
_____ 7. There are about 2 lunar eclipses a year.
_____ 8. A lunar eclipse can take place only when the moon is full.
_____ 9. A total solar eclipse lasts a few minutes.
_____ 10. In a solar eclipse, no sunlight penetrates the umbra.
_____ 11. A total lunar eclipse occurs when the moon passes through Earth's penumbra.
_____ 12. Partial lunar eclipses occur more often than total eclipses.
_____ 13. A solar eclipse may last over 3 hours.
_____ 14. A total solar eclipse is visible at all spots on Earth.
_____ 15. All lunar eclipses are total.
_____ 16. In a total solar eclipse, the moon completely covers the sun.
_____ 17. Lunar eclipses occur every 3 years.
_____ 18. A lunar eclipse may last over 3 hours.
_____ 19. The penumbra is the outer part of the shadow.
_____ 20. When the sun's disk is covered in an eclipse, the corona is still visible.

Label the diagrams below **solar eclipse** or **lunar eclipse**.
Label **Earth**, **moon**, **umbra**, and **penumbra** on each diagram.



Tides

What causes tides?

•

How frequent do high and low tides occur?

•

•

Two times a month we have special tides called Spring Tides. How are these tides different?

•

•

•

High Tide, Alma, New Brunswick in the Bay of Fundy

Low Tide at the same fishing port in Bay of Fundy

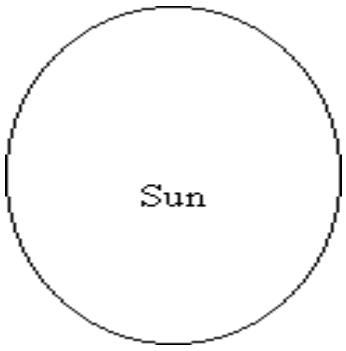
Two times a month we have special tides called Neap Tides. How are these tides different?

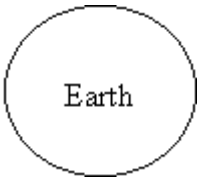
•

•

•

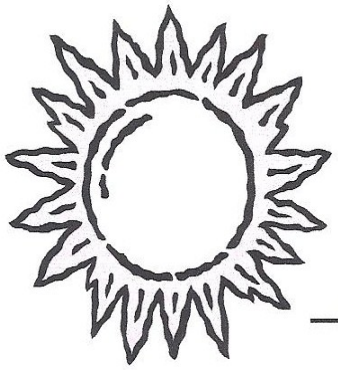
Draw the phases of the moon around the earth below. Label neap tides with an N and spring tides with an S.





Types of Tides

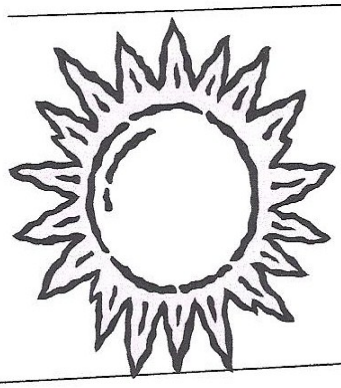
Pictures are not to scale.



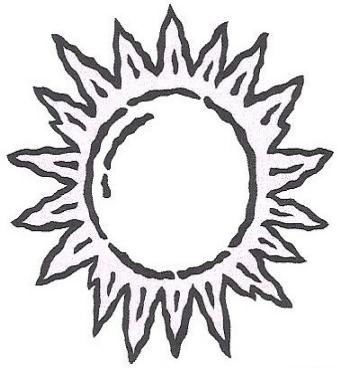
Name the moon phase for each one.

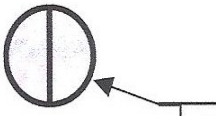
Using a blue crayon, fill in the tides for each one.

Spring or Neap Tide?



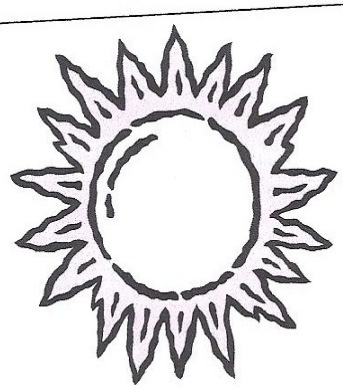
Spring or Neap Tide?



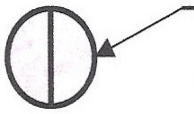


Shade in.

Spring or Neap Tide?



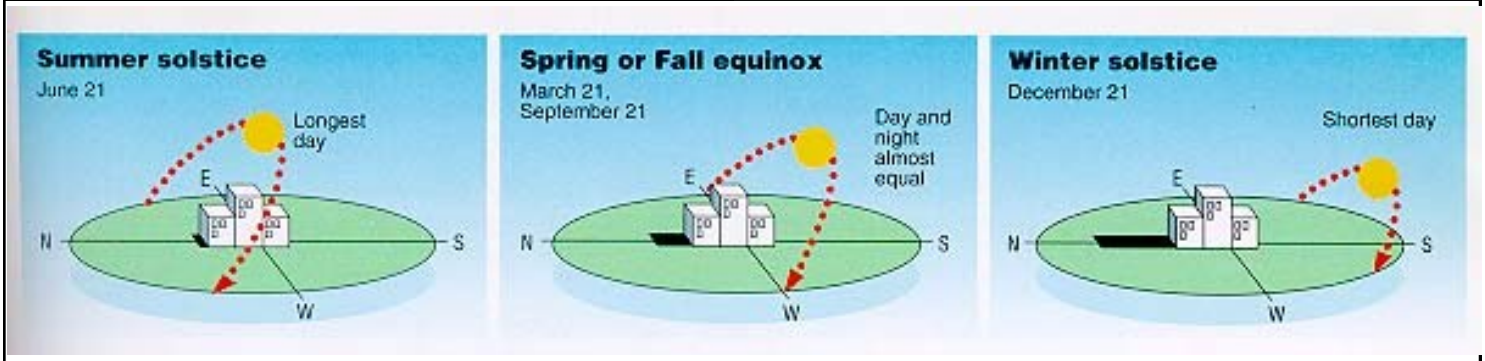
Spring or Neap Tide?



Shade in.

Seasons

Number of Seasons: •	Why seasons occur: • •
Does distance to the sun effect seasons? •	Duration of Seasons: •
Angle of Incidence: •	

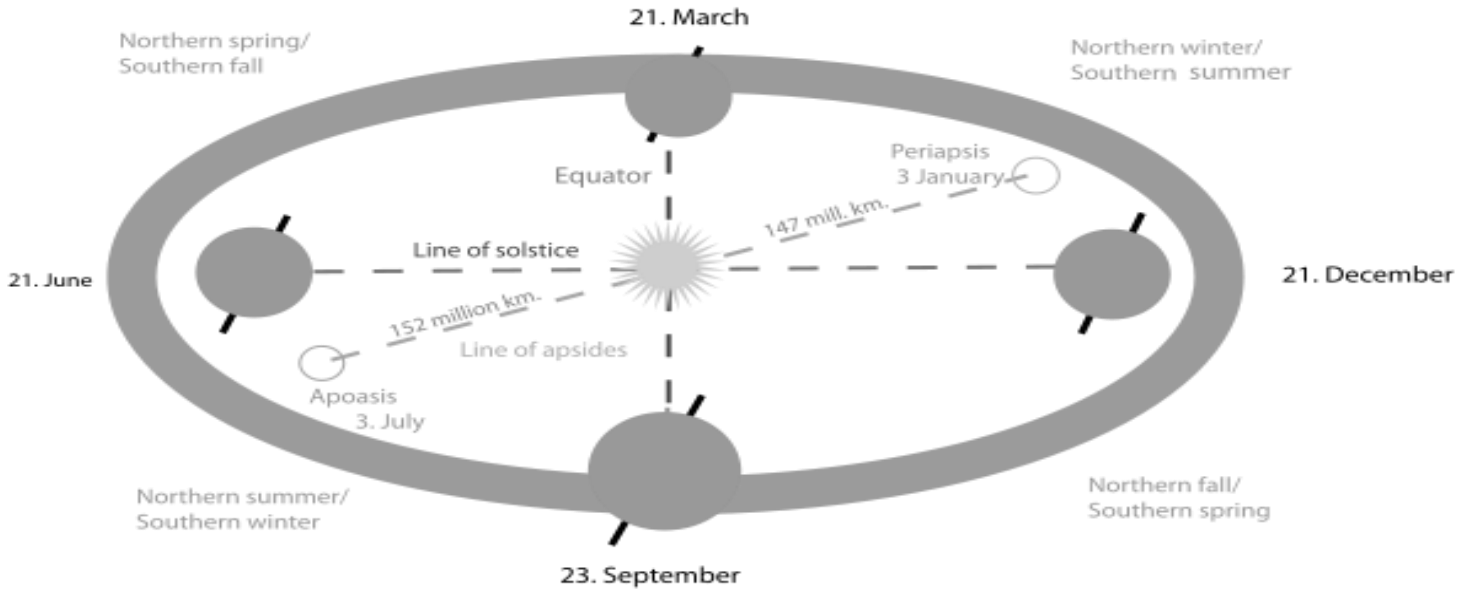


<u>Equinox</u>: The _____ is directly overhead at the _____ at this time.

- Fall -
- Spring -

<u>Solstice:</u> The _____ is directly overhead at _____ north or _____ at this time.

- Winter-
- Summer-



REASONS FOR SEASONS

What's with the seasons? How do they know when to come and go? It all has to do with the movements of Earth in relation to the sun. Here are some reasons. You fill in the blanks to tell what the reason explains.

1. Reason for _____:
   Because Earth is tilted 23½° from a line perpendicular to its orbit, the length of daylight varies and because of the angle at which the sun's energy strikes a given location through the year.

2. Reason for _____ in the Northern Hemisphere:
   Because the Northern Hemisphere is tilted toward the sun for a few months.

3. Reason for _____ in the Northern Hemisphere and _____ in the Southern Hemisphere: Because Earth's tilt is sideways to the sun, and hours of daylight and darkness are the same in both hemispheres on about September 22.

4. Reason for _____ in the Northern Hemisphere:
   Because the North Pole is tilted almost directly toward the sun on about June 21.

5. Reason for _____ in the Southern Hemisphere:
   Because the South Pole is tilted away from the sun on about June 21.

6. Reason for _____ in the Southern Hemisphere:
   Because the Southern Hemisphere is tilted toward the sun for a few months.

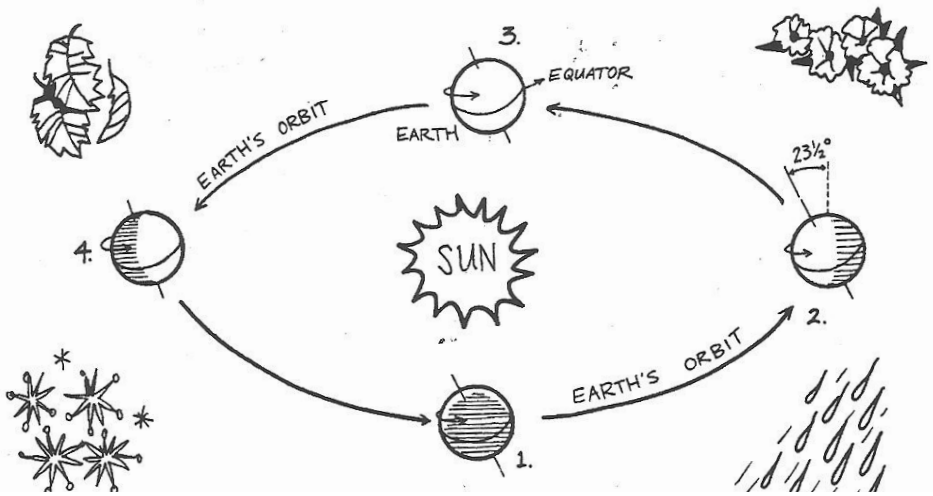
7. Reason for _____ in the Northern Hemisphere:
   Because the South Pole is tilted almost directly toward the sun on about December 21.

8. Reason for _____ in the Northern Hemisphere and _____ in the Southern Hemisphere: Because Earth's tilt is sideways to the sun and hours of daylight and darkness are the same in both hemispheres on about March 20.

9. Reason for _____ in the Southern Hemisphere:
   Because the South Pole is tilted almost directly toward the sun on about December 21.

10. Reason for _____ hours of daylight at the South Pole:
    Because the South Pole is tilted directly toward the sun on about December 21.

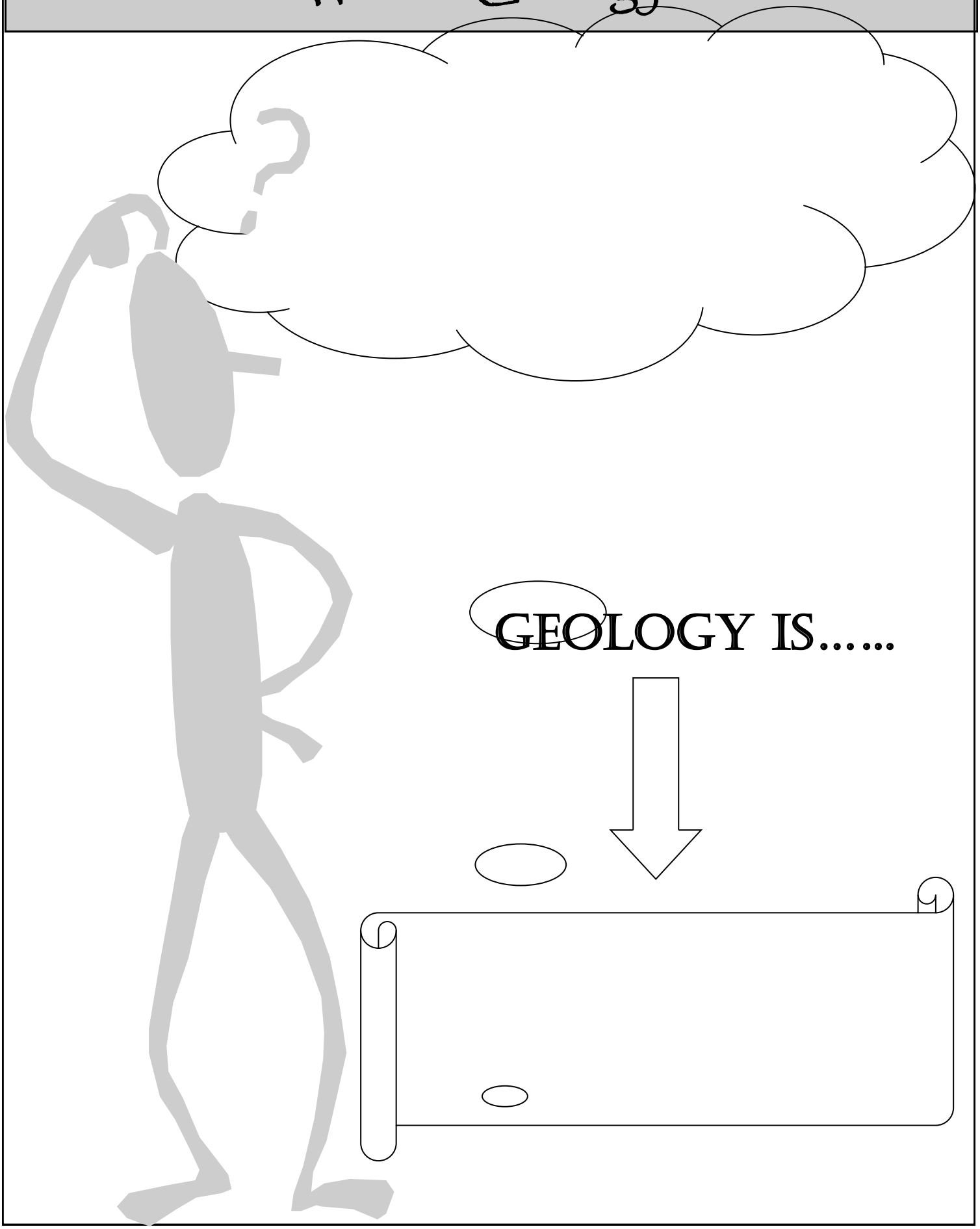
    On the diagram at the right, label winter solstice, summer solstice, fall equinox, and spring equinox for the Northern Hemisphere.



Word Bank:

Summer	Summer Solstice	Spring Equinox	Fall Equinox	Fall Equinox
Summer	Winter Solstice	Spring Equinox	Seasons	Spring Equinox
Summer Solstice	Winter Solstice	Fall Equinox	24	Winter Solstice
Summer Solstice				

What is Geology?



GEOLOGY IS……

Extra Doodle Page

Geologic Time

Chapter:3 Section: 5 Pages: 80-85

Insert Geologic Time Here

EARTH TIME SCALE

For the Earth Time Scale, you will need 5 meters of adding machine tape.

- ☐ Draw a continuous line down the middle of the tape.
- ☐ Draw a line across the **left** end of the tape.
  Label this line: **The Present**.
- ☐ From **The Present** line, draw five more lines exactly one meter apart.
  Label these lines **1 billion years ago, 2 billion years ago, etc.**
- ☐ Plot each **Event** and **Years Ago** from the following list onto the tape.
  (Example: The first event would be placed 60 cm past 4 billion years ago.)
- ☐ Draw in pictures **(10 minimum)** to illustrate the major events.
- ☐ Lightly shade each of the four major Eras a different color.
- ☐ **Label** each of the four Eras.

Event	Years ago	Placement
Earth's beginning????	4.6 billion	60 cm past 4 billion
Oldest microfossils	3.5 billion	50 cm past 3 billion
Oxygen created	2.5 billion	50 cm past 2 billion
End of Precambrian Era	600 million	60 cm from present
Beginning of Paleozoic Era	600 Million	60 cm from present
Trilobites abundant	570 million	57 cm from present
Fish abundant	500 million	50 cm from present
First forest fossils	390 million	39 cm from present
Continents collide forming Pangaea	280 million	28 cm from present
Appalachian Mts. form	280 million	28 cm from present
Trilobites die out	230 million	23 cm from present
Beginning of Mesozoic Era	225 million	22.5 cm from present
Pangaea breaks up	220 million	22 cm from present
forming Gondwanaland & Laurasia	220 million	22 cm from present
Rocky Mts. form	190 million	19 cm from present
Dinosaurs abundant	180 million	18 cm from present
Ancient birds found	160 million	16 cm from present
Gondwanaland separates into Africa & So. America	135 million	13.5 cm from present
Asteroid collision????	66 million	6.6 cm from present
Dinosaurs die out	66 million	6.6 cm from present
Beginning of Cenozoic Era	66 million	6.6 cm from present
First abundant mammals & birds	60 million	6 cm from present
Camels found in North America	20 million	2 cm from present
Ice Age begins - super-large mammals	2 million	2 **mm** from present
Last Ice Age ends	10,000 **years**	**0.01 mm** from present

Extra Hints:

Be Neat!

Use a ruler (SI Please)!

Tape the ends of your timeline down.

Use a variety of resources for your pictures. (Folder, Board, etc.)

Determining the Age of Rocks (and Fossils)

Chapter:3 Section: 2-3 Pages: 64-65 and 70-73

2 Methods:

Relative Dating:	**Absolute Dating:**
Any _____ of determining whether an _____ or _____ is _____ or _____ than other objects or events.	Any _____of measuring the _____ of an event or object in _____.

These methods help geologists determine the age of rocks!

Rock: Naturally occurring solid _____ of one of more _____or organic matter.

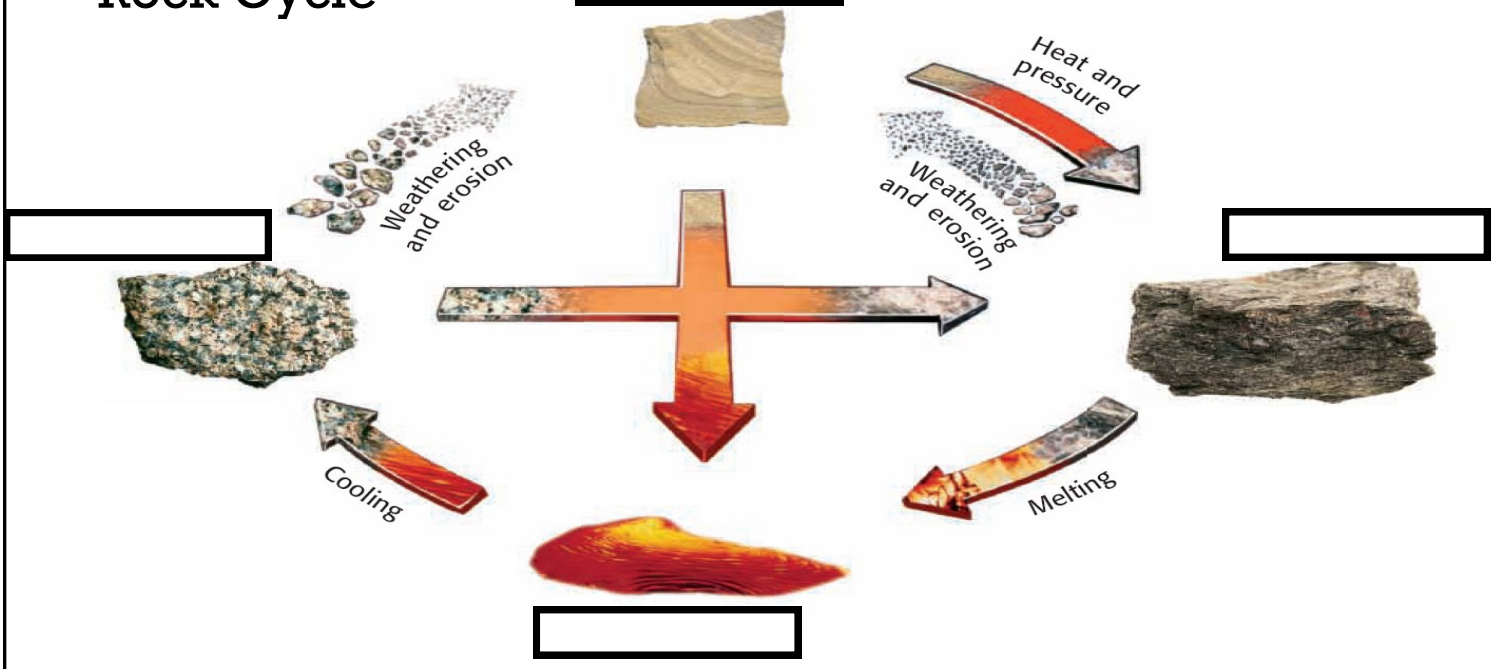
Rock Cycle: Series of _____ in which a rock _____, _____ from one type to another, is _____, and forms _____ by geological processes.

Ways in which rocks change: (Processes)

1. 2.
3. 4.
5. 6.

Chapter:2 Section: 1 Pages: 28-32

Rock Cycle



Complete the missing information.

Sho-Wat-Cha-Kno

The Rock Cycle:

____1. Sediments are transported or moved from their original source by a process called
   a. deposition.
   b. erosion.
   c. uplift.
   d. weathering.

2. Name four processes that change rock **inside** the Earth.

_____

3.Name four processes that shape Earth's **surface**.

_____

4. Give an example of how texture can provide clues as to how and where a rock formed.

_____

5.Explain how rock is continually recycled in the rock cycle.

_____

_____

Relative Dating: Which Came First?

7. List two events and two features that can disturb rock-layer sequences.

_____

_____

8. Explain how physical features are used to determine relative ages.

_____

_____

Absolute Dating: A Measure of Time

_____ 9. Rubidium-87 has a half-life of
   a. 5,730 years.
   b. 4.5 billion years.
   c. 49 billion years.
   d. 1.3 billion years.

10. Explain how radioactive decay occurs.

_____

_____

11.How does radioactive decay relate to radiometric dating?

_____

_____

Inside the Earth

Chapter: 4 Section: 1 Pages: 96-99

Crust:

-
-
-
-

2 Types:

.

.

Mantle:

-
-
-

3 Main Layers:

1. Lithosphere—

.

2. Asthenosphere—

.

.

3. Mesosphere—

.

Core:

-
-
-

Outer Core:

.

.

Inner Core:

-
-

Layers by Composition:

-
-
-

Layers by Physical Properties:

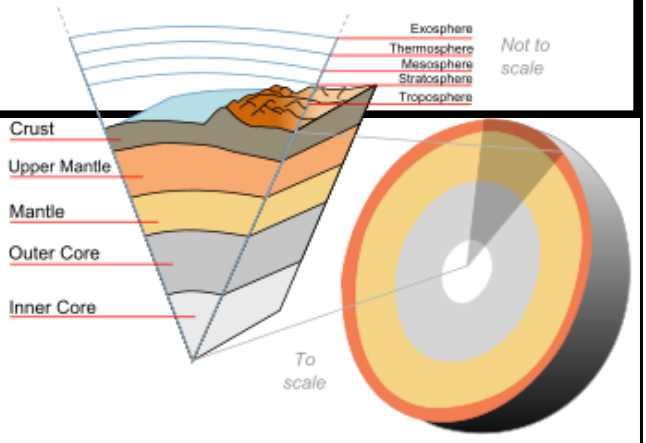
.

.

.

.

.



Earth's Layers Foldable

SHO-WAT-CHA-KNO

Inside the Earth

For each pair of terms, explain how the meanings of the terms **differ.**

1. crust and mantle

_____

_____

2. lithosphere and asthenosphere

_____

_____

_____ 3. The part of the Earth that is molten is the

a. crust. c. outer core.

b. mantle. d. inner core.

4. Identify the layers of the Earth by their chemical composition.

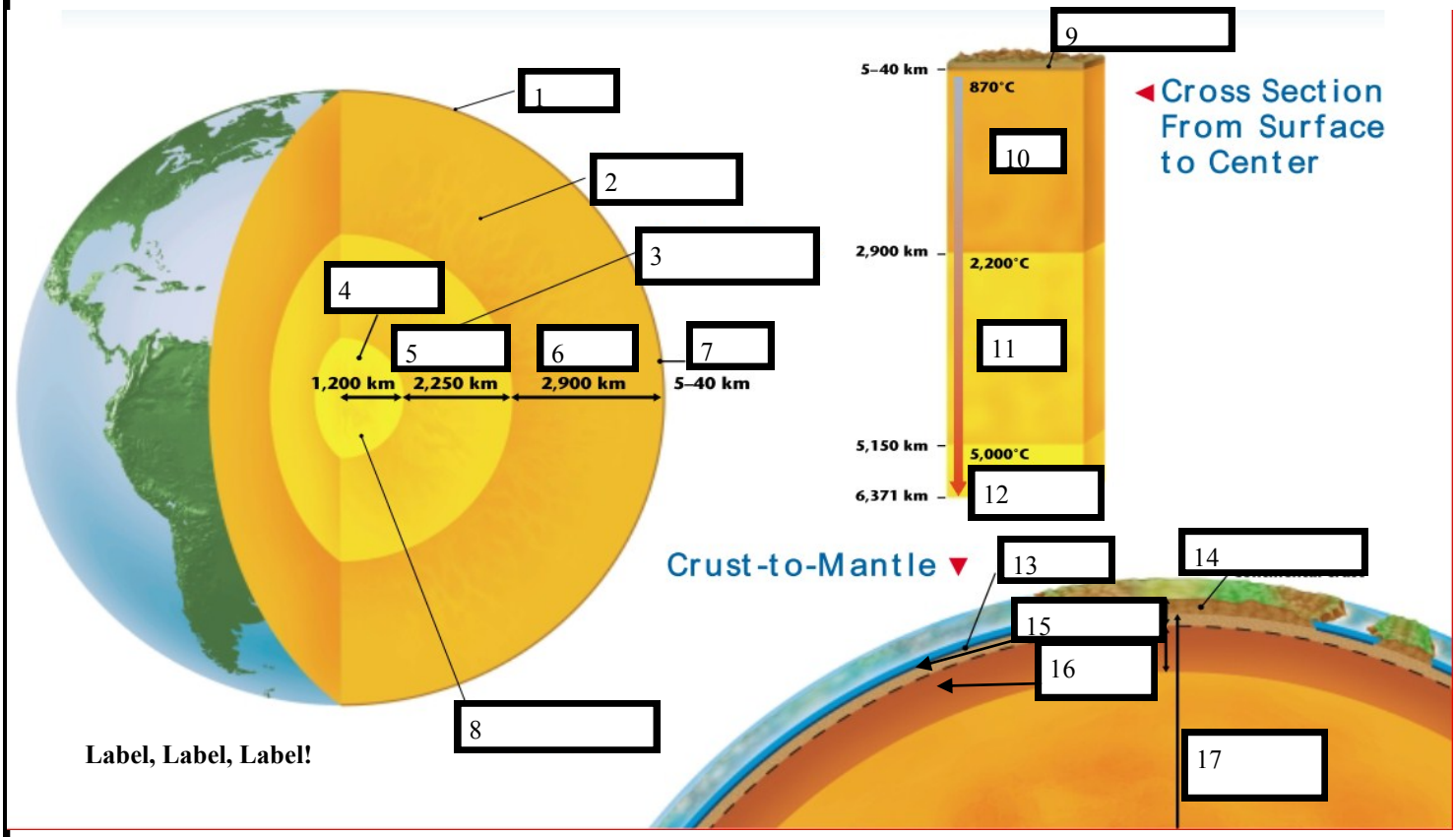
_____

5. Identify the layers of the Earth by their physical properties.

_____

6. Explain the difference between the crust and the lithosphere.

_____

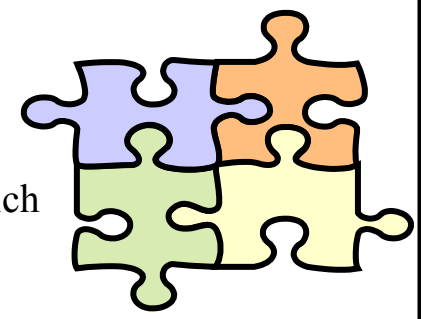


Label, Label, Label!

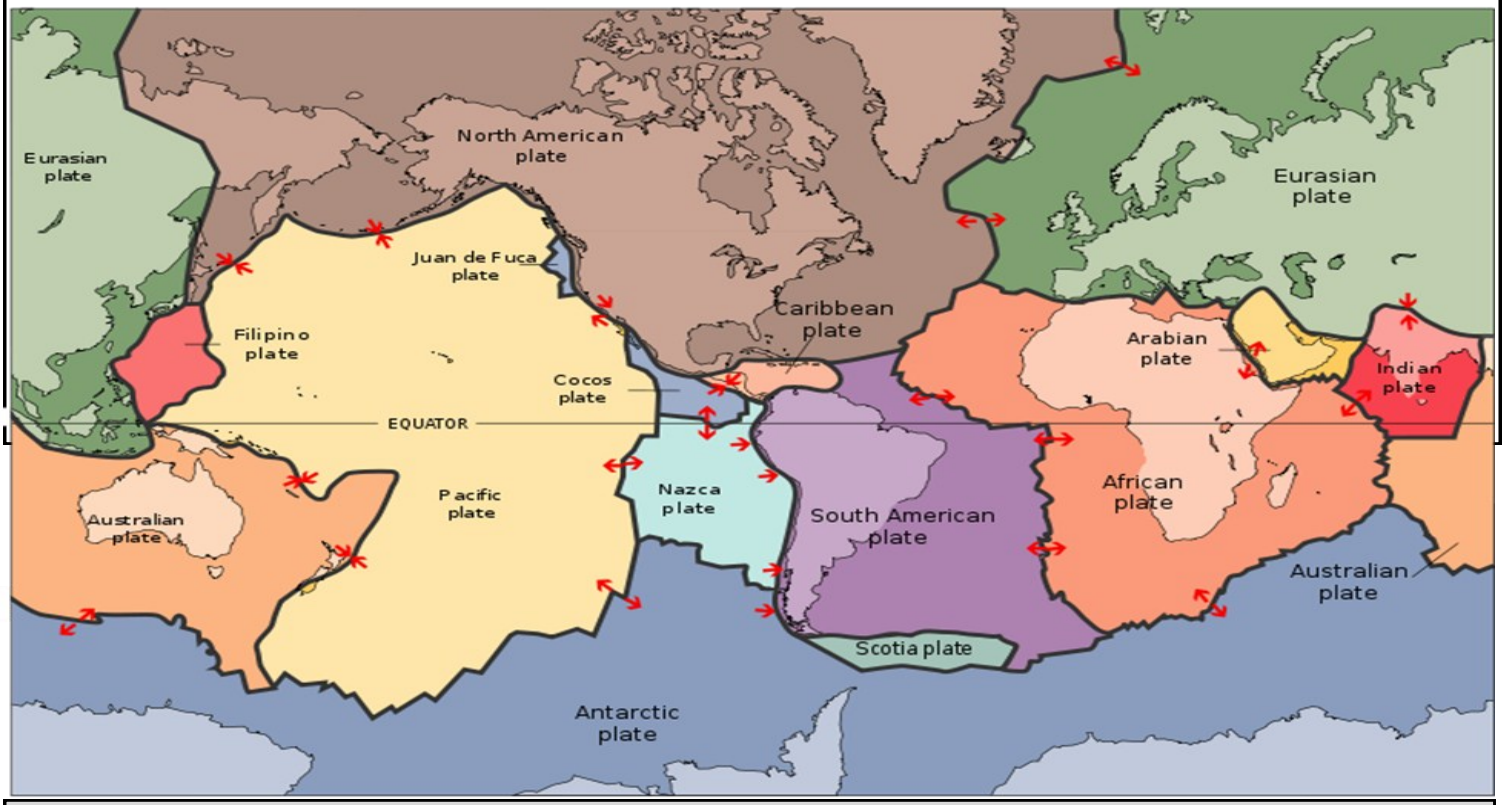
1.	2.	3.	4.
5.	6.	7.	8.
9.	10.	11.	12.
13.	14.	15.	16.
17.			

Tectonics Plates
Chapter: 4 Section: 1 Pages: 100-102

- Tectonic Plate—_____of the _____that _____ around on top of the _____.
- All plates have _____; major (_____) and minor (_____).
- Not all _____ are the same.
  - Some—_____ crust only
  - Some—_____ crust only
  - Some— _____
- Tectonic Plates are made up of _____, which is the crust plus the upper mantle.



- Tectonic Plates—_____, touch_____.
- Tectonic Plates (the lithosphere) _____the layer beneath it, the _____.



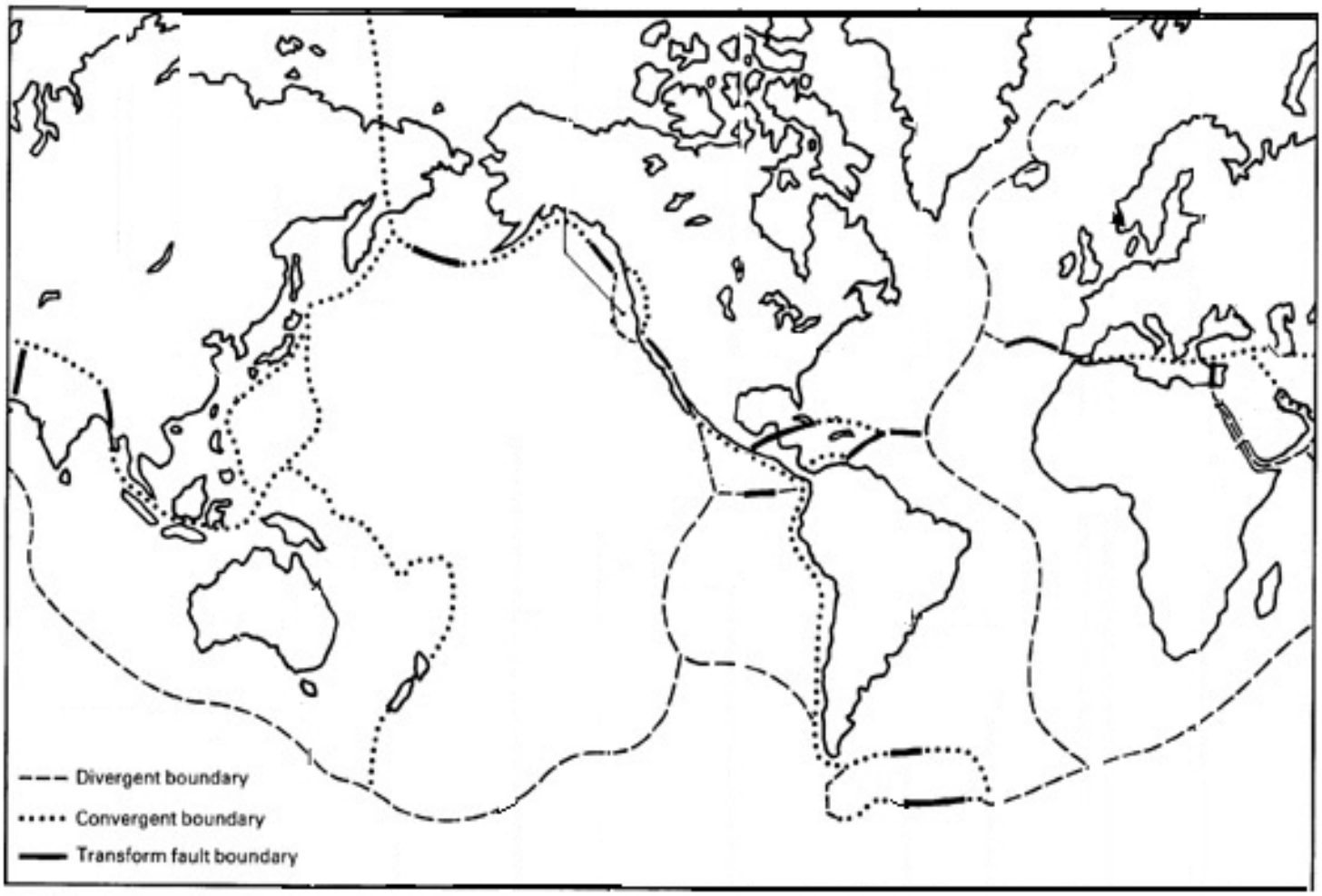
How do we know this is what Earth's Interior Looks Like?

- Geologists measure _____ waves.
- _____ waves travel at different _____ .
- The _____ depends on the _____ and _____ of the material.
- Waves travel faster through _____ than liquids.

Lithospheric Plates

Directions:

1. Label the 7 major plates.
2. Color the 7 major plates.



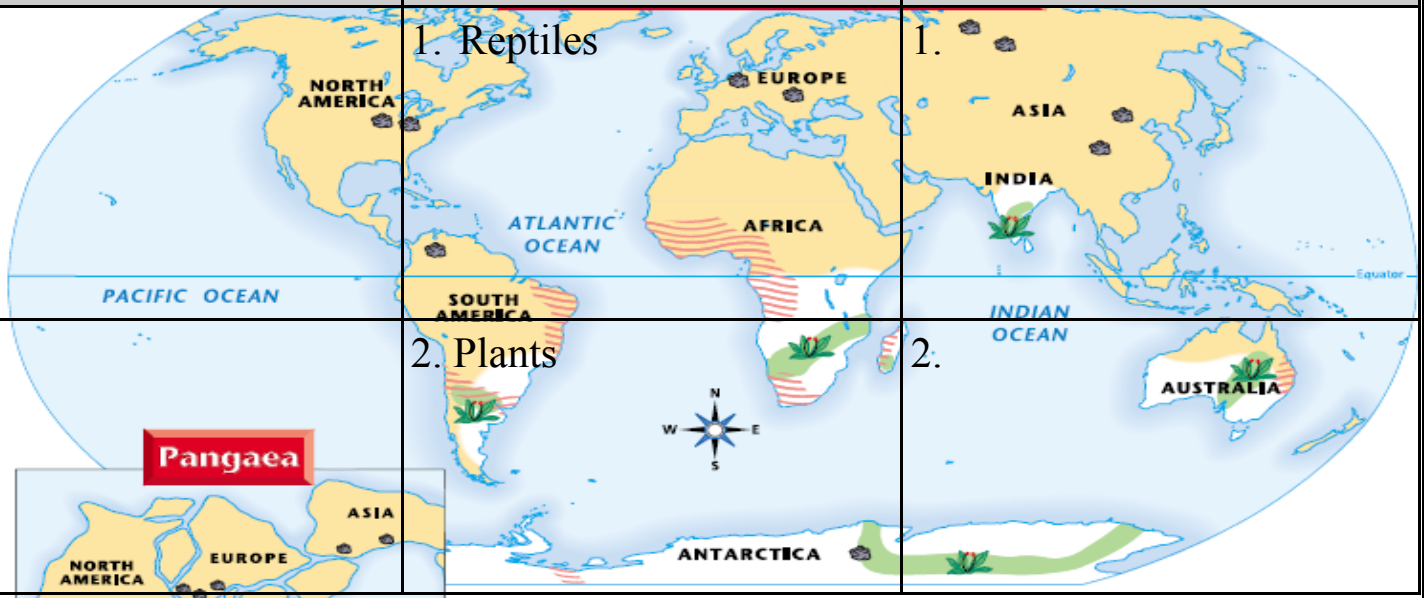
3. Label the 8 minor plates.
4. On what plate is most of the USA?
5. What part of the USA is NOT on that plate? On what plate is it?
6. What plate matches almost perfectly with the Ring of Fire, where most of the world's earthquakes and volcanoes occur?
7. Which plates touch the Mid-Ocean Ridge that runs north and south and is found in the Atlantic Ocean?
8. Which plate is the largest
9. Which plate is the smallest?
10. Which layer of the Earth makes up the plates?
11. Which layer of the Earth do the plates float on?

Continental Drift—Alfred Wegener

Chapter: 4 Section: 2 Pages: 104-105

- Continental Drift—The idea that all _____ had once been _____ together and have since _____ apart.
- Early _____.

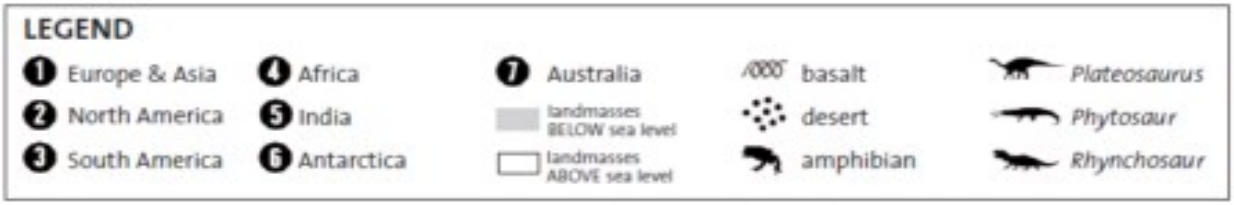
Landforms	Fossils	Climate
1.	1. Reptiles	1.
2.	2. Plants	2.

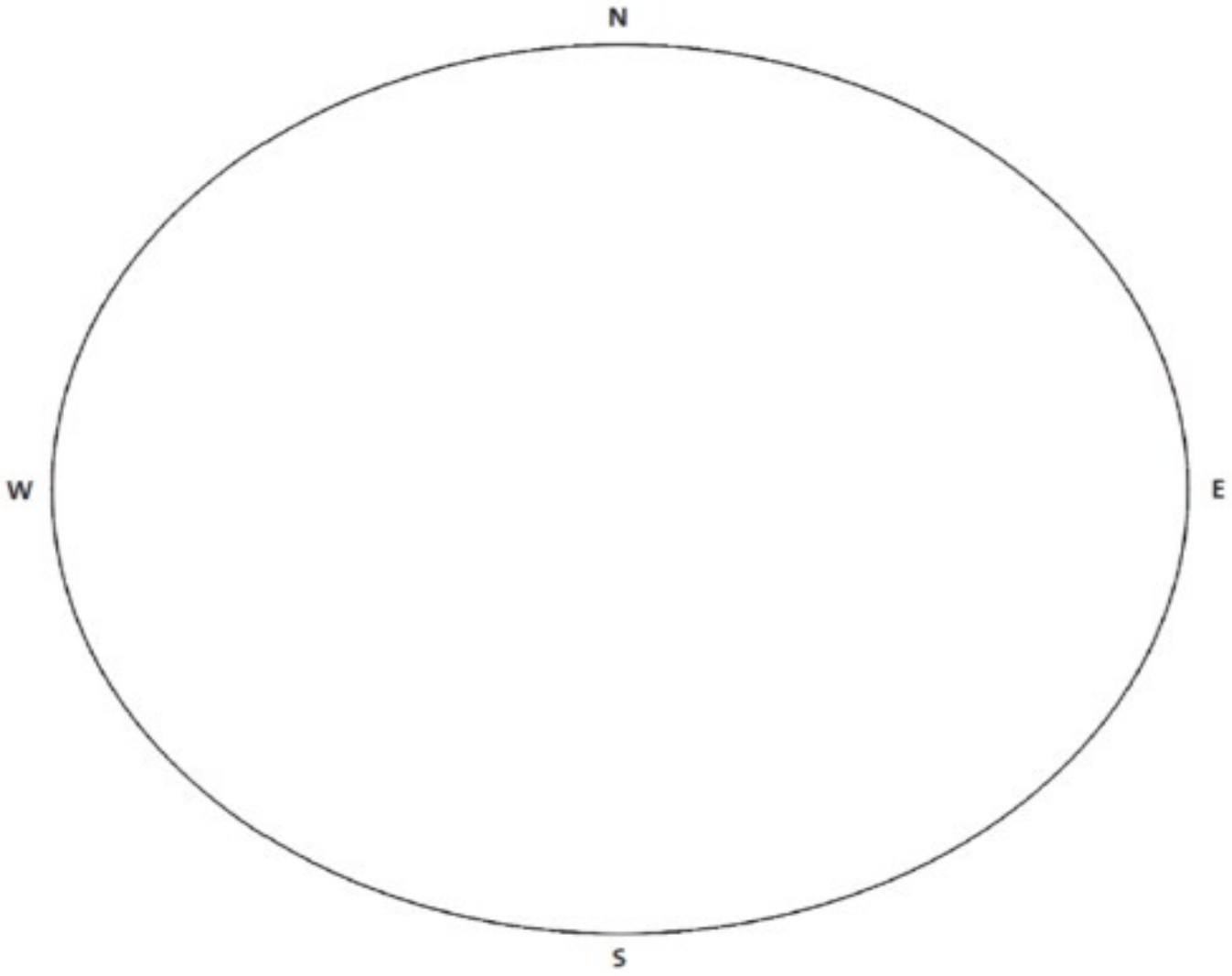


Breakup of Pangaea

- _____ - Name given to the supercontinent—_____ mya
- Broke apart—_____mya
  - _____ —-> _____ and Eurasia
  - _____ —-> Australia, _____, Antarctica, and _____.
- Wegener's idea was _____. He could not explain _____ this was occurred.

Putting the Evidence Back Together





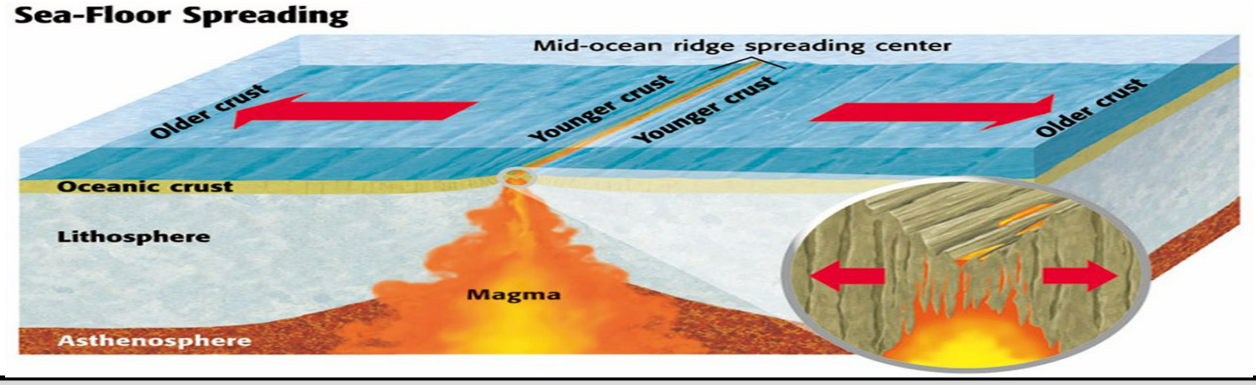
Directions: *Match the descriptions in Column I with the terms in Column II. Write the letter of the correct term in the blank at the left.*

Column I	Column II
_____ 1. reptile fossil found in South America and Africa	a. Pangaea
_____ 2. fossil plant found in Africa, Australia, India, South America, and Antarctica	b. Appalachians
_____ 3. clues that support continental drift	c. continental drift
_____ 4. mountains similar to those in Greenland and western Europe	d. glacial deposits
_____ 5. Wegener's name for one large landmass	e. *Glossopteris*
_____ 6. slow movement of continents	f. *Mesosaurus*
_____ 7. evidence that Africa was once cold	g. fossil, climate, and rock

Sea Floor Spreading —H. Hess

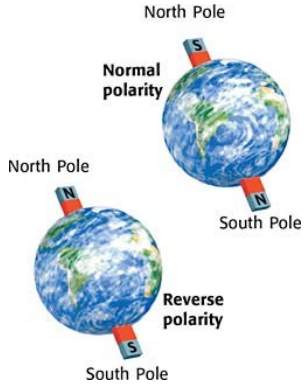
Chapter: 4 Section: 2 Pages: 106-107

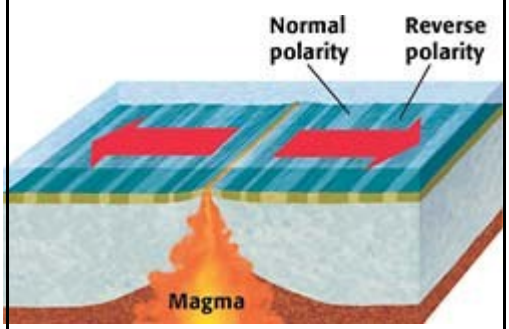
- _____ and other forms of technology helped prove Hess' ideas.
- Discovered the _____ ridge. A very large _____ mountain chain.
- Hess determined that this is where _____ spreading occurs.
- Sea-Floor Spreading is when _____ plates move _____ from each other and _____ moves up and fills in the gap. This is a continuous cycle.
- As new crust is made, _____ crust gets pushed further away from the MOR.



Evidence for Sea-Floor Spreading

Molten Material	Magnetic Stripes	Drilling Samples
• "_____" - a small submersible, found _____ that can only be formed when molten material _____ and hardens very quickly underwater.	• Magnetic North and South Poles have _____ over time. • _____ material contains magnetic material such as Iron. • The material _____ up with the _____ of the magnetic field at that time. • A _____is preserved in the ocean floor, and the pattern is a _____image on each side of the _____	• "_____" - determined the age of rocks. • _____ rocks were found closest to the _____.





SHO-WAT-CHA-KNO

Sea Floor Spreading

Directions: *Find the mistakes in the statements below. Rewrite each statement correctly on the lines provided.*

1. During the 1940s and 1950s, scientists began using radar on moving ships to map large areas of the ocean floor in detail.

2. The youngest rocks are found far from the mid-ocean ridges.

3. The scientist Henry Hess invented echo-sounding devices for mapping the ocean floor.

4. As the seafloor spreads apart, hot saltwater moves upward and flows from the cracks.

5. As the new seafloor moves away from the ridge and becomes hotter, it moves upward and forms still higher ridges.

6. The research ship *Glomar Challenger* was equipped with a drilling rig that records magnetic data.

7. Rocks on the seafloor are much older than many continental rocks.

8. When plates collide, the denser plate will ride over the less-dense plate.

9. Earth's magnetic field has always run from the north pole to the south pole.

10. The magnetic alignment in rocks on the ocean floor always runs from the north pole to the south pole.

Theory of Plate Tectonics—Wilson

Chapter: 4 Section: 3 Pages: 108-111

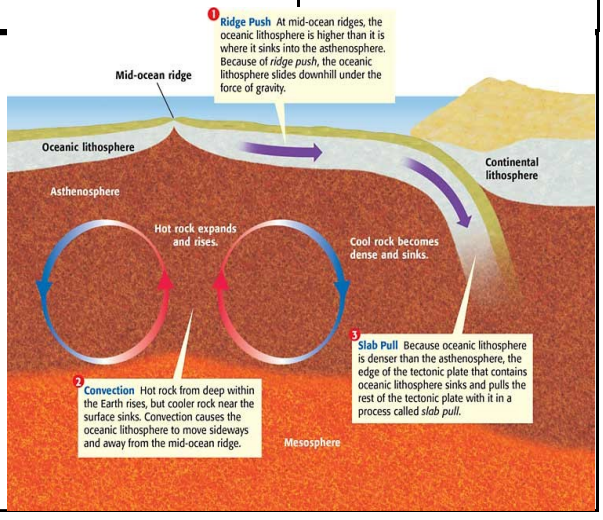
- Plate Tectonics = _____ + _____ + Subduction
- Subduction is the process by which the old ocean floor is _____. It is the _____ process for Sea Floor Spreading.
- The place where two tectonic plates _____ is called a plate _____.
- The type of _____depends on how the tectonic plate is _____ relative to the one beside it.
- _____ may occur at all _____ types of plate boundaries.
- Tectonic plate movement is measured in _____ per year.

Plate Boundaries

Type	Description of Boundary	Direction of Movement	Sketch of Boundary	Examples
Divergent				
Transform				
Convergent Ocean-Ocean				
Convergent Ocean-Continental				
Convergent Continental-Continental				

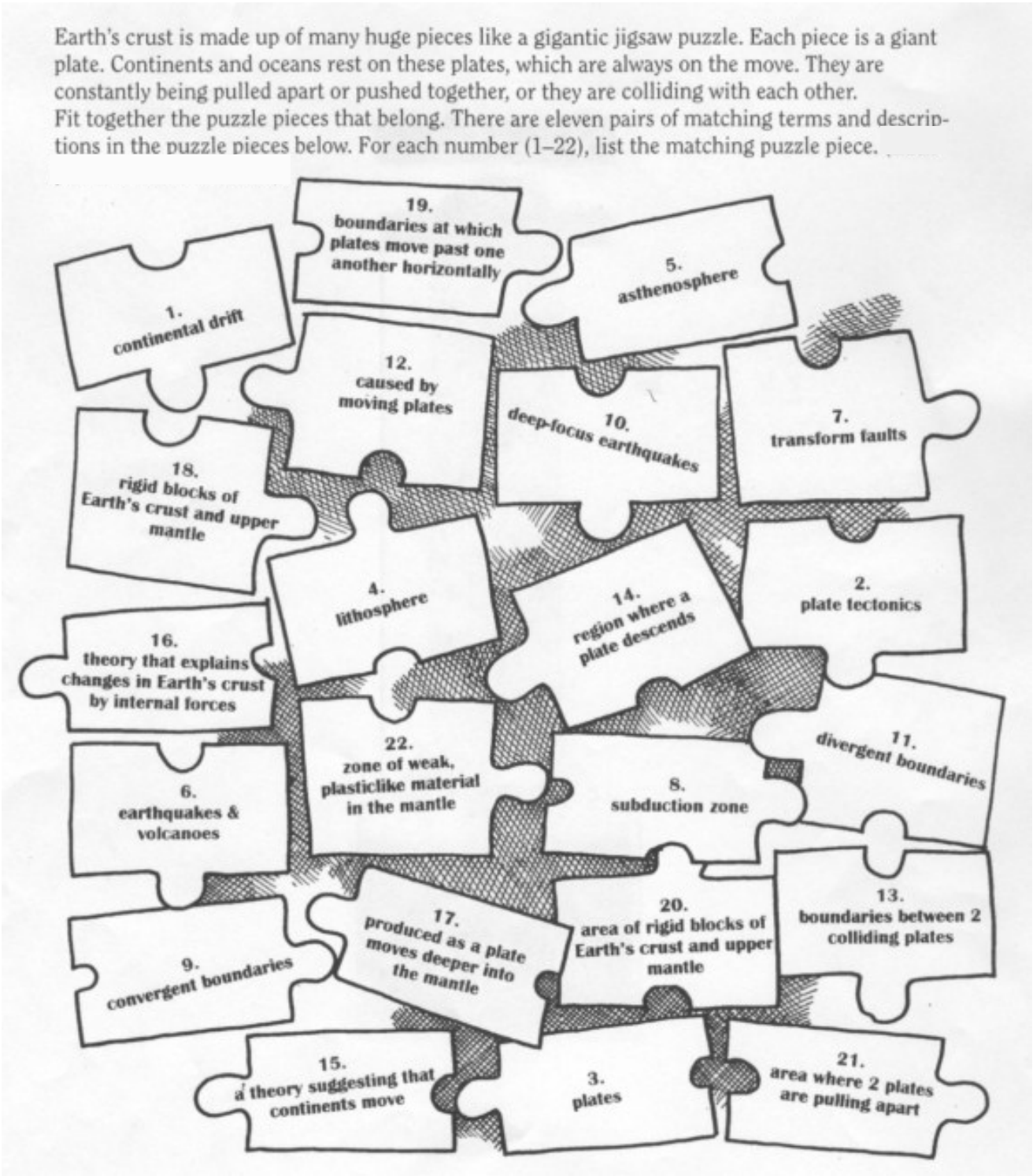
3 Possible Causes of Plate Motion:

1. **Ridge Push**—Occurs at a _____, the oceanic lithosphere is _____ and slides downhill due to _____.
2. **Convection**—Hot rock _____, cool rock _____ causing the lithosphere to move side-ways from the MOR.
3. **Slab Pull**—Oceanic lithosphere is _____, it sinks and _____ the rest of the plate with it.



Giant Plates

Earth's crust is made up of many huge pieces like a gigantic jigsaw puzzle. Each piece is a giant plate. Continents and oceans rest on these plates, which are always on the move. They are constantly being pulled apart or pushed together, or they are colliding with each other.
Fit together the puzzle pieces that belong. There are eleven pairs of matching terms and descriptions in the puzzle pieces below. For each number (1–22), list the matching puzzle piece.



1—_____

2—_____

3—_____

4—_____

5—_____

6—_____

7—_____

8—_____

9—_____

10—_____

11—_____