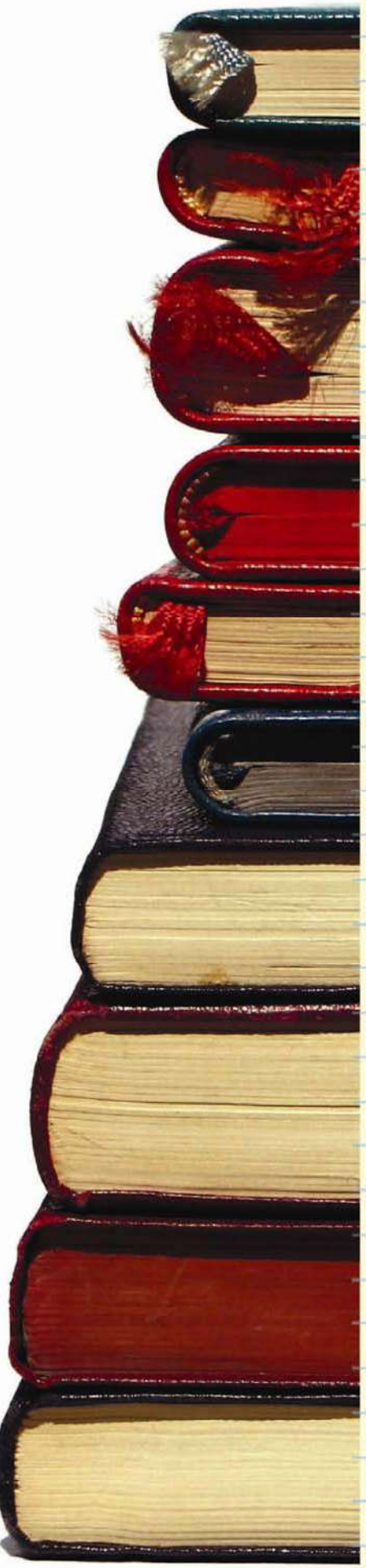


Comprehensive Curriculum

Revised 2008

Grade 8
Science

Louisiana Department of
EDUCATION

Paul G. Pastorek, State Superintendent of Education

Unit 1, Student Safety Contract

Student Safety Contract

PREPARE FOR LABORATORY WORK

- Study laboratory procedures prior to class.
- Never perform unauthorized experiments.
- Keep your lab bench organized and free of apparel, books, and other clutter.
- Know how to use the safety shower, eye wash, fire blanket, and first aid kit.

DRESS FOR LABORATORY WORK

- Tie back long hair.
- Do not wear loose sleeves, as they tend to get in the way.
- Wear shoes with tops.
- Wear lab coats or aprons during all laboratory sessions.
- Wear safety goggles during all laboratory sessions.
- Wear gloves when using chemicals that irritate or can be absorbed through the skin.

AVOID CONTACT WITH CHEMICALS

- Never taste or "sniff" chemicals.
- Never draw materials in a pipette with your mouth.
- When heating substances in a test tube, point the mouth away from people.
- Never carry dangerous chemicals or hot equipment near other people.

AVOID HAZARDS

- Keep combustibles away from open flames.
- Use caution when handling hot glassware.
- When diluting acid, always add acid slowly to water. Never add water to acid.
- Use glycerin and twist slowly at the base when inserting glass tubing through stoppers.
- Turn off burners when not in use.
- When using water baths, please make sure the water is at room temperature.
- Do not bend or cut glass unless appropriately instructed by teacher – keep caps on reagent bottles. Never switch caps.

CLEAN UP

- Consult teacher for proper disposal of chemicals.
- Wash hands thoroughly following experiments.
- Leave laboratory bench clean and neat.
- Clean up all spills and accidents as soon as possible.

IN CASE OF ACCIDENT

- Report all accidents and spills immediately.
- Place broken glass in designated containers.
- Wash all acids and bases from your skin immediately with plenty of running water.
- If chemicals get in your eyes, wash them for at least 15 minutes with an eyewash.

QUESTIONS

- Do you wear contact lenses? YES NO
- Are you color blind? YES NO
- Do you have allergies? YES NO
- If so list specific allergies.

I, _____, agree to (a) Follow the teachers instructions, (b) protect my eyes, face, hands, and body during laboratory, (c) conduct myself in a responsible manner at all times in the laboratory/classroom, and (d) abide by all of the safety regulations specified above.

Signature _____ Date _____

Dear Parent/Guardian:

You should be aware of the safety instructions your son/daughter will receive before engaging in any laboratory work. Please read the list of safety rules above. No student will be permitted to perform laboratory activities unless this contract is signed by both the student and parent/guardian and is on file with the teacher. Your signature on this contract indicates that you have read this Student Safety Contract, are aware of the measures taken to insure safety in the science laboratory/classroom, and will instruct your son/daughter to uphold his/her agreement to follow these rules and procedures in the laboratory/classroom.

Parent's (Guardian's) Signature _____ Date _____

Unit 1, Activity 1, Consumer Challenge One

Consumer Challenge

Student Name _____ Class _____ Date Due _____

THINK ABOUT IT:

1. What product will you test?

   _____

   Complete the chart below. In the headers, write the materials you will need to complete this test. Under each header, write how you can change it (for example, with plant growth). Select ONE item from the list. In this example, the type of water is selected. *Type of water* is the experimental variable, and all others are the same.

EXAMPLE

Plant	Water	Soil	Light	Container
Type	Type Temperature Color Amount	Type Amount	Type Amount Color	Type Size

2. What do you want to find out about this product?

   _____

3. What do you think will happen?

   _____

PLAN IT:

4. Write down the methods that you will use to test. Try to include specific details that you think will be important. You can write the methods as a list of steps; you can also include drawings.

5. What safety issues do you need to address?

DO IT

Use the space below to record the results of your experiment in a table and graph your results. Remember to repeat your experiment twice and record your results as Trials 2 and 3.

6.

Paper Towel Brand Name	**Amount of Water Trial 1**	**Amount of Water Trial 2**	**Amount of Water Trial 3**	**Average Amount of Water**

7. Record at least one thing you think is interesting or important about these experiments (qualitative observations).

Unit 1, Activity 1, Consumer Challenge Two

ANALYZE IT

1. When you wrote your methods, were you able to think of every last import detail? Do you think scientists forget things as well? How did you adapt your experiment when you realized the missing information?

_____

_____

_____

2. How did you ensure your results were reliable?

_____

_____

_____

3. Was replication necessary? Why or why not?

_____

_____

_____

4. What did you learn from observing the effects of different methods on the results?

_____

_____

_____

5. If you tested your question again, how would you change the experiment?

_____

_____

_____

Unit 1, Activity 1, Consumer Challenge Rubric

Consumer Challenge Rubric

Team Members: _____

CATEGORY	4	3	2	1
Question/Purpose	The purpose of the lab or the question to be answered during the lab is clearly identified and stated.	The purpose of the lab or the question to be answered during the lab is identified but is stated in a somewhat unclear manner.	The purpose of the lab or the question to be answered during the lab is partially identified and is stated in a somewhat unclear manner.	The purpose of the lab or the question to be answered during the lab is erroneous or irrelevant.
Experimental Hypothesis	Hypothesized relationship between the variables and the predicted results is clear and reasonable based on what has been studied.	Hypothesized relationship between the variables and the predicted results is reasonable based on general knowledge and observations.	Hypothesized relationship between the variables and the predicted results has been stated but appears to be based on flawed logic.	No hypothesis has been stated.
Safety	Lab is carried out with full attention to relevant safety procedures. The set-up, experiment, and tear-down posed no safety threat to any individual.	Lab is generally carried out with attention to relevant safety procedures. The set-up, experiment, and tear-down posed no safety threat to any individual, but one safety procedure needs to be reviewed.	Lab is carried out with some attention to relevant safety procedures. The set-up, experiment, and tear-down posed no safety threat to any individual, but several safety procedures need to be reviewed.	Safety procedures were ignored and/or some aspect of the experiment posed a threat to the safety of the student or others.
Procedures	Procedures are listed in clear steps. Each step is numbered and is a complete sentence.	Procedures are listed in a logical order, but the steps are not numbered and/or are not in complete sentences.	Procedures are listed but are not in a logical order or are difficult to follow.	Procedures do not accurately list the steps of the experiment.
Variables	All variables are clearly described with all relevant details.	All variables are clearly described with most relevant details.	Most variables are clearly described with most relevant details.	Variables are not described OR the majority lack sufficient detail.
Data	Professional looking and accurate representation of the data in tables and/or graphs. Graphs and tables are labeled and titled.	Accurate representation of the data in tables and/or graphs. Graphs and tables are labeled and titled.	Accurate representation of the data in written form, but no graphs or tables are presented.	Data are not shown OR are inaccurate.

Unit 1, Activity 1, Consumer Challenge Rubric

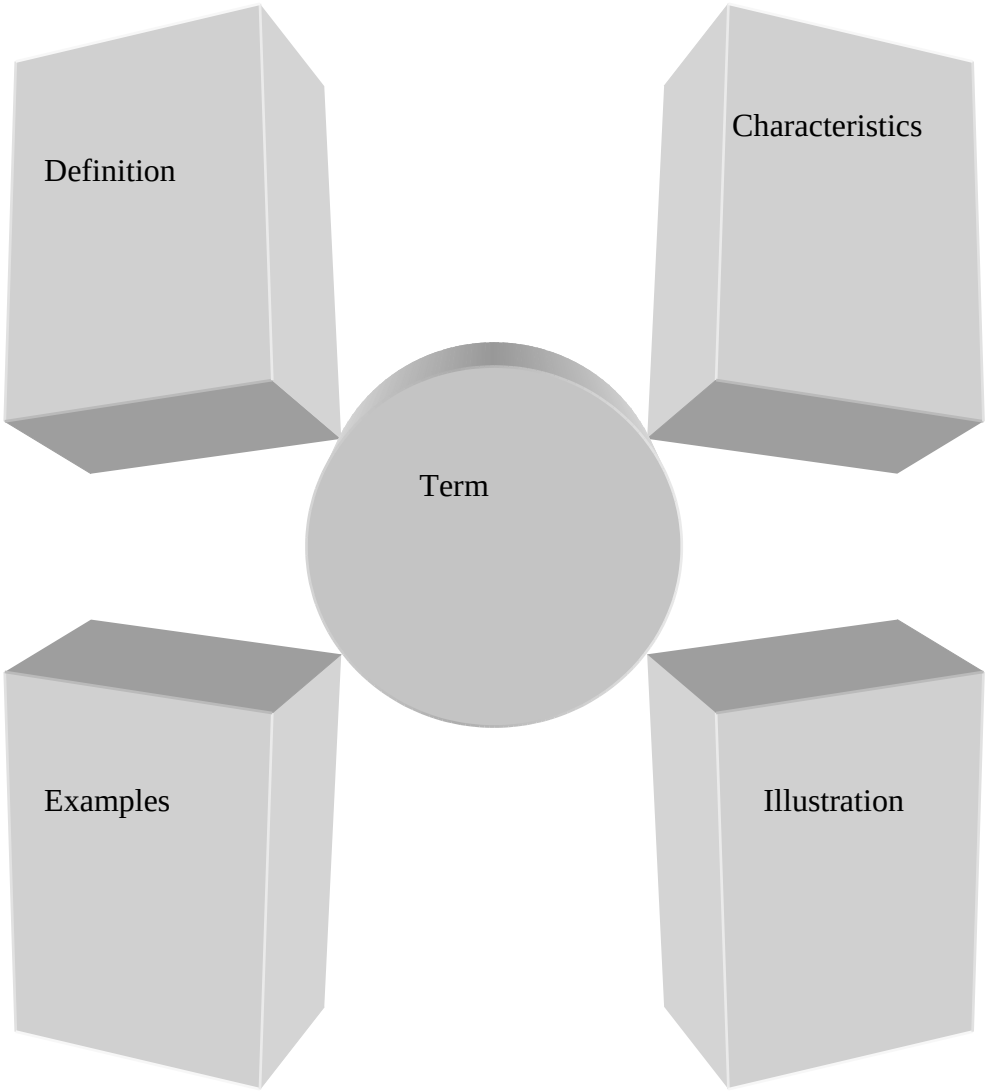
Analysis	The relationship between the variables is discussed and trends/patterns logically analyzed. Predictions are made about what might happen if part of the lab were changed or how the experimental design could be changed.	The relationship between the variables is discussed, and the trends/patterns are logically analyzed.	The relationship between the variables is discussed but no patterns, trends, or predictions are made based on the data.	The relationship between the variables is not discussed.
Conclusion	Conclusion includes whether the findings supported the hypothesis, possible sources of error, and what was learned from the experiment.	Conclusion includes whether the findings supported the hypothesis and what was learned from the experiment.	Conclusion includes what was learned from the experiment.	No conclusion was included in the report OR shows little effort and reflection.
Participation	Used time well in lab and focused attention on the experiment.	Used time pretty well. Stayed focused on the experiment most of the time.	Did the lab but did not appear very interested. Focus was lost on several occasions.	Participation was minimal.

TEACHER COMMENTS:

Rubric Created using RUBISTAR

Unit 1, Activity 2, Vocabulary Self-Awareness Check

Vocabulary Word	-	✓	+	Example	Definition
Atoms					
Proton					
Neutron					
Electron					
Valence					
Shell					
Electron Cloud					
Ion					
Isotope					
Covalent Bonding					
Ionic Bonding					


Definition
Characteristics
Term
Examples
Illustration

Unit 1, Activity 3, Word Grid

	IDENTIFY CHEMICAL SYMBOL	ELEMENT	MOLECULE	COMPOUND	MIXTURE	ION	IONIC BOND
SODIUM							
HYDROGEN							
CHLORINE							
2 - SODIUM CHLORIDE							
AIR							
2 - WATER							
ALUMINUM							
ALUMINUM CHLORIDE							

KEY TERM	IDENTIFY CHEMICAL SYMBOL	ELEMENT	MOLECULE	COMPOUND	MIXTURE	ION	IONIC BOND
SODIUM	*Na*	✓				✓	
HYDROGEN	H_2		✓				
CHLORINE	*Cl*	✓				✓	
2-SODIUM CHLORIDE	*2NaCl*			✓			✓
AIR					✓		
2-WATER	$2H_2O$			✓			
ALUMINUM	*Al*	✓				✓	
ALUMINUM CHLORIDE	*AlCl*	✓					✓

MARK THE BOX THAT APPLIES TO THE ITEM IN THE LEFT-HAND COLUMN.

TEACHER KEY

Unit 1, Activity 3, Observation Table

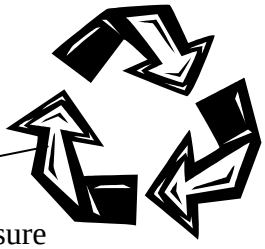
Observation Table

Sample name	Phase of matter	Color	Physical characteristics	Drawing

Igneous

Metamorphic

Melting, Cooling,
and Crystallization

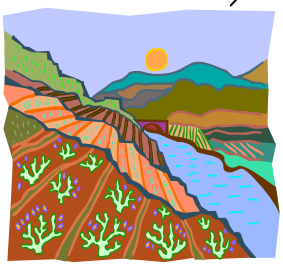


Types of
Rocks

Heat and Pressure

Weathering
and
Cementation
of
Sediments

Sedimentary



Unit 2, Activity 5, Scientific Process Record Sheet

The Scientific Process:

1. Purpose (ask a question that will be answered by the experiment or research)

_____

2. Hypothesis (make a prediction on the outcome of the experiment or research)

_____

3. Procedure (list of materials and steps to perform the experiment or research)

Materials Needed:

Experiment/Research Steps:

4. Observations (record results in written form below or attach a data table and/or graph)

5. Conclusions (Answer the "Purpose" question, compare results to "Hypothesis," and explain why you either did or did not obtain the results you expected.)

_____
_____
_____
_____
_____

Unit 2, Activity 5, Scientific Process Record Sheet

The Scientific Correlation

1. Explain what the two layers of different density liquids represent in relationship to the geology of the Earth:

2. Explain what the heat source is representative of in relationship to the geology of the Earth:

3. Draw and explain the process the movement of the olive oil/red dye mixture from the top layer in the test tube to the bottom layer of the test tube represents in relationship to the geology of Earth:

4. Explain what the gas bubbles from the bottom layer of liquid in the test tube is representative of in relationship to the geology of the Earth:

5. Write a summary that explains your understanding of convection currents and how this relates to the cyclic building and recycling of the land masses of the Earth:

Unit 2, Activity 6, Plate Tectonic Summary Chart

Type of Plate Movement	Draw the Process and Label the Earth's Layers	Explain the Process	New Land Formation	Where in the World It's Happening
Divergent Ocean Plate / Ocean Plate				
Divergent Continental Plate / Continental Plate				
Divergent Ocean Plate / Continental Plate				
Convergent Ocean Plate / Continental Plate				
Convergent Continental Plate / Continental Plate				
Transform Boundaries				
Hot Spot				

Plate Tectonics Model Rubric

Student Names: _____

CATEGORY	4	3	2	1
Content - Accuracy	All 7 required points are accurate and are presented on a poster with the model.	5-6 required points are accurate and are presented on a poster with the model.	3-4 required points are accurate and are presented on a poster with the model.	Less than 3 required points are accurate and are presented on a poster with the model.
Knowledge Gained	Student can accurately answer all questions related to facts in the model and processes used to create the poster.	Student can accurately answer most questions related to facts in the model and processes used to create the poster.	Student can accurately answer about 75% of questions related to facts in the model and processes used to create the poster.	Student appears to have insufficient knowledge about the facts or processes used in the model.
Attractiveness	The model is exceptionally attractive in terms of design, layout, and neatness.	The model is attractive in terms of design, layout, and neatness.	The model is acceptably attractive though it may be a bit messy.	The model is distractingly messy or very poorly designed. It is not attractive.

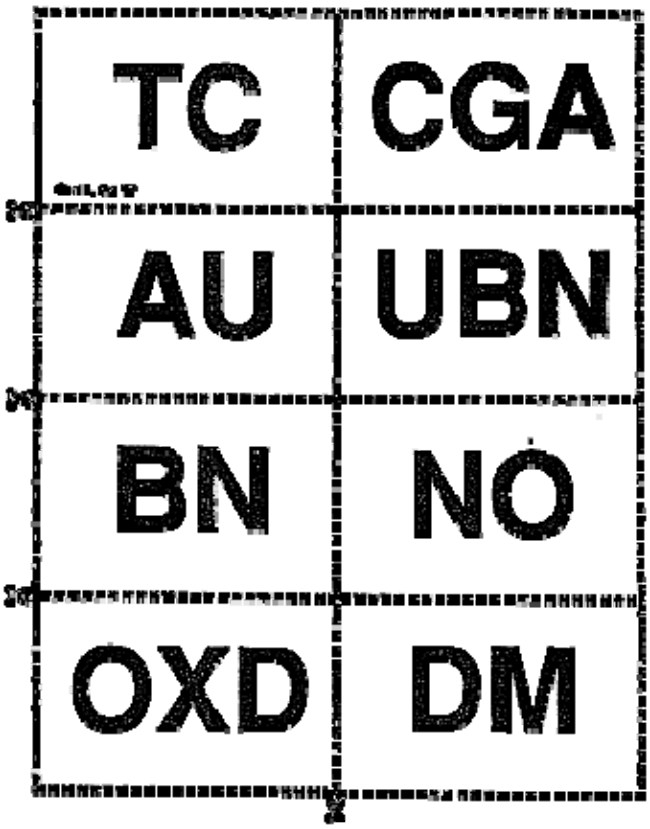
Teacher Comments:

Score: _____

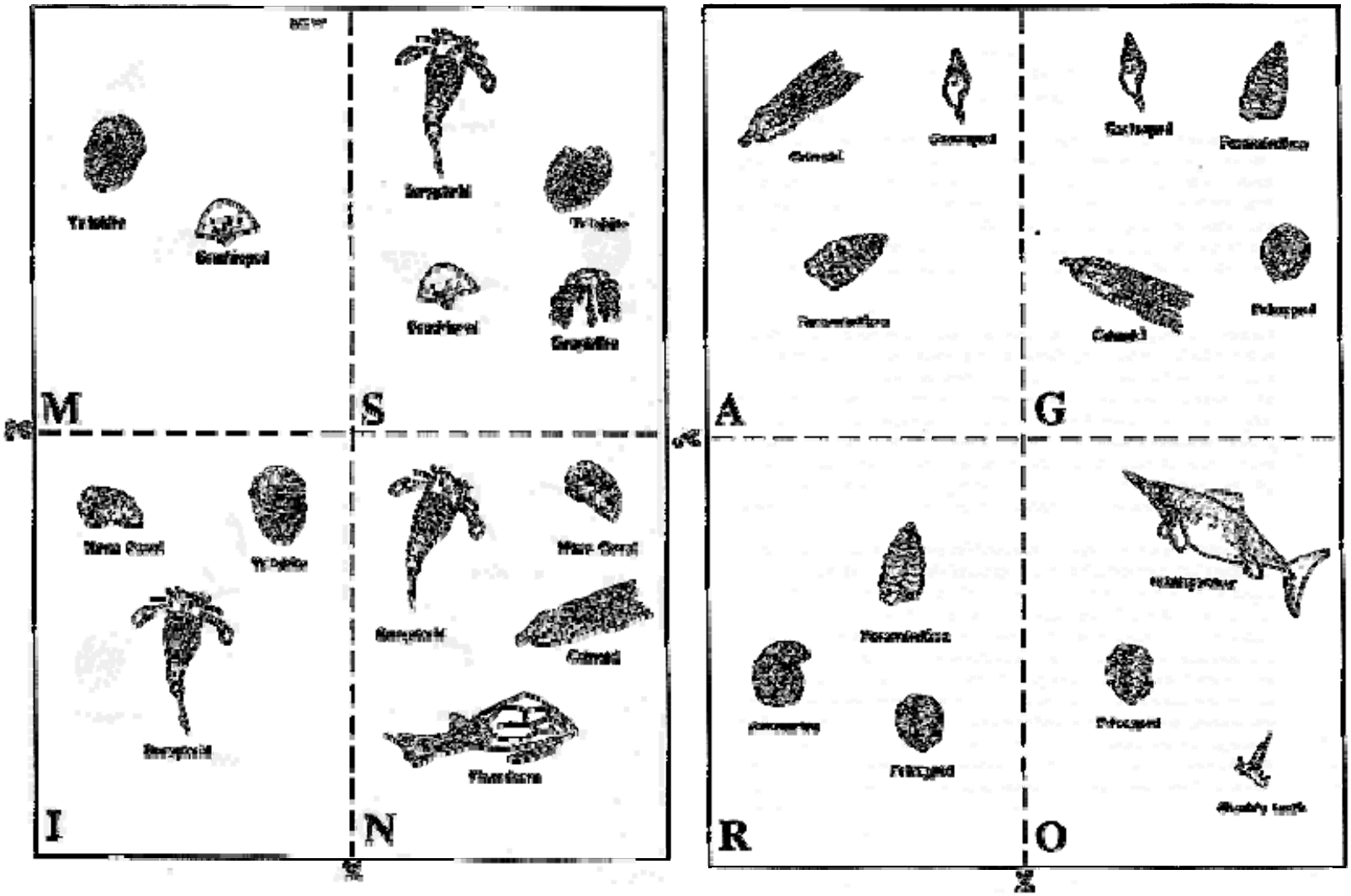
Required 7 points for completion: You must…

1. generate questions that can be answered through investigations,
2. record what materials will be needed to construct a model of a plate tectonic process,
3. construct the model,
4. answer questions,
5. demonstrate how it works,
6. explain how this process causes changes on Earth's surface, and
7. evaluate your model – identify problems in design and make recommendations for improvement.

Rubric created by Rubistar (http://rubistar.4teachers.org)



Adapted with permission from the Denver Science Project at the Colorado School of Mines (http://www.ucmp.berkeley.edu/fosrec/BarBar.html)

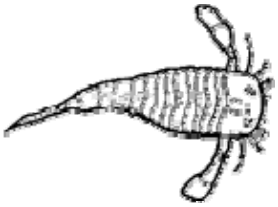


Adapted with permission from the Denver Science Project at the Colorado School of Mines (http://www.ucmp.berkeley.edu/fosrec/BarBar.html)

Sketches of Marine Fossil Organisms (Not to Scale)

NAME: Brachiopod
PHYLUM: Brachiopoda
DESCRIPTION: "Lampshells"; exclusively marine organisms with soft bodies and bivalve shells; many living species

NAME: Trilobite
PHYLUM: Arthropoda
DESCRIPTION: Three-lobed body; burrowing, crawling, and swimming forms; extinct



NAME: Eurypterid
PHYLUM: Arthropoda
DESCRIPTION: Many were large (a few rare species were 5 feet in length); crawling and swimming forms; extinct

NAME: Graptolite
PHYLUM: Chordata
DESCRIPTION: Primitive form of chordate; floating form with branched stalks; extinct

NAME: Horn coral
PHYLUM: Coelenterata (Cnidaria)
DESCRIPTION: Jellyfish relative with stony (Cnidaria)(calcareous) exoskeleton found in reef environments; extinct

NAME: Crinoid
PHYLUM: Echinodermata
DESCRIPTION: Multibranched relative of starfish; lives attached to the ocean bottom; some living species ("sea lilies")

Adapted with permission from the Denver Science Project at the Colorado School of Mines (http://www.ucmp.berkeley.edu/fosrec/BarBar.html)

NAME: Placoderm
PHYLUM: Vertebrata
DESCRIPTION: Primitive armored fish; extinct

NAME: Foraminifera (microscopic type)
PHYLUM: Protozoa (Sarcodina)
DESCRIPTION: Shelled, amoeba-like organism

NAME: Gastropod
PHYLUM: Mollusca
DESCRIPTION: Snails and relatives; many living species

NAME: Pelecypod
PHYLUM: Mollusca
DESCRIPTION: Clams and oysters; many living species

NAME: Ammonite
PHYLUM: Mollusca
DESCRIPTION: Squid-like animal with coiled, chambered shell; related to modern-day Nautilus

NAME: Icthyosaur
PHYLUM: Vertebrata
DESCRIPTION: Carnivore; air-breathing aquatic animal; extinct

NAME: Shark's tooth
PHYLUM: Vertebrata
DESCRIPTION: Cartilage fish; many living species

Adapted with permission from the Denver Science Project at the Colorado School of Mines (http://www.ucmp.berkeley.edu/fosrec/BarBar.html)

1. Which fossil organisms could possibly be used as index fossils?

2. Name three organisms represented that probably could not be used as index fossils and explain why.

3. In what kinds of rocks might you find the fossils from this activity?

4. State the Law of Superposition and explain how this activity illustrates this law.

5. Provide an explanation of how the evolutionary development of life forms is inferred from this fossil record.

Unit 3, Activity 1, Who's On First Fossils Key

1. Which fossil organisms could possibly be used as index fossils? *The graptolite, placoderm, ammonite, ichthyosaur, and shark's tooth could possibly be used as index fossils since they are found in only one layer. Technically, however, given only this set of strata, one cannot say that the shark's tooth and ichthyosaur could be used as index fossils because we do not know if they continue in younger rock layers above this set of strata.*

2. Name three organisms represented that probably could not be used as index fossils and explain why. *The brachiopod, crinoid, eurypterid, foraminifera, gastropod, horn coral, pelecypod, and trilobite could probably not be used as index fossils since they overlap more than one stratum.*

3. In what kinds of rocks might you find the fossils from this activity? *Marine sedimentary rocks such as limestone, shale, and sandstone might contain fossils similar to those depicted in this activity.*

4. State the Law of Superposition and explain how this activity illustrates this law. *In a "normal" horizontal sequence of rocks, the oldest rock layers will be on the bottom with successively younger rocks on top. This activity illustrates this law because when the cards are placed in the correct order, the vertical stack shows the oldest fossils in a rock layer in the bottom of the stack and the youngest fossils in rock stratum on the top.*

5. Provide an explanation of how the evolutionary development of life forms is inferred from this fossil record. *Each rock layer tells scientists what kinds of organisms lived. Based on the evidence in this rock sequence, the kinds of organisms inhabiting Earth's waters have changed over time, from simple to more complex. As a result of these changes, many organisms became extinct.*

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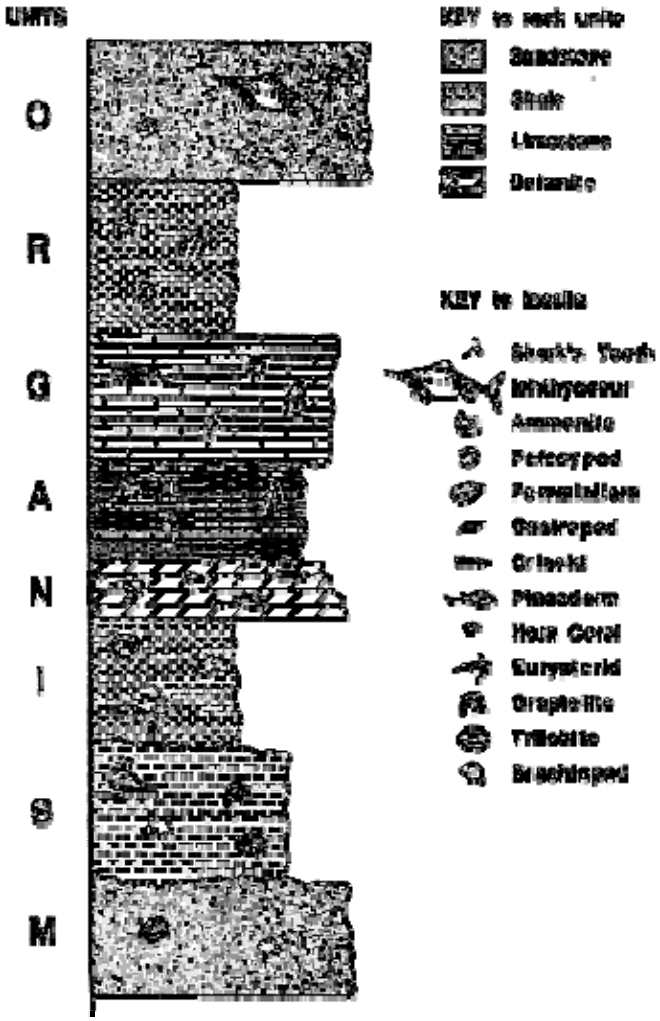
Unit 3, Activity 1, Who's On First Fossils Key



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Unit 3, Activity 2, Getting to the Core of it

You have just received a sample from Antarctica's seafloor under the sea-ice. It is your job to observe and determine all the scientific information you can from this sample. You will take a core from two samples (one at a time) and answer the following questions in your learning log.

1. Describe the color of your seafloor sample. Be specific

2. Describe the surface features of your sample.

3. Draw a picture of any surface features you see on your samples.

4. If this was an actual seafloor sample, what physical processes could have caused the textures or features you are seeing?

5. How many layers does your core sample contain?

6. Draw a picture to scale showing the layers of your core sample; label and measure the thickness of layers in millimeters, as well as color and texture of layers. Write the letter "A" by the layer(s) or feature(s) that may have formed first, a "B" by the second oldest letter, etc. so that that "A" is on the bottom and each layer(s) or feature(s) above are labeled with sequencing letters.

7. Which layers were made first and why? The outmost layer would be the surface and the youngest area of deposit.

8. Draw a picture to scale showing the layers of your core sample; label and measure the thickness of layers in millimeters, as well as color and texture of layers. Again, write the letter "A" by the layer(s) or feature(s) that may have formed first, a "B" by the second oldest letter, etc. so that that "A" is on the bottom and each layer(s) or feature(s) above are labeled with sequencing letters.

9. Compare the two core samples and list any similarities or differences from your first core sample. Include the thickness of the top layers, colors, textures, number of layers, sizes of layers, softness, hardness, etc.

10. Would a core sample from Antarctica be important to the study of plate tectonics? Why?

11. Where would be the best place to study an Antarctic seafloor core sample...in Antarctica or in a technical lab at a university? Explain your answer.

12. What would account for the samples being different if they were both from Antarctica?

Unit 3, Activity 2, Getting to the Core of it Answers

1) Describe the color of your seafloor sample: *Have the students observe the exact color of the surface. Is it light brown color, dark brown, etc.? Have them define in word variations to more distinctly describe what they are seeing.*

2) Describe the surface features of your sample: *Is it smooth, wavy, lined, bumpy, speckled, etc.? Can they see different colors integrated into the surface?*

3) Draw a picture of any surface features you see on your sample: *Have them label features.*

4) If this was an actual seafloor sample, what physical processes could have caused the textures or features you are seeing? *Show real pictures of different surfaces.*

5) How many layers does your core sample contain? *This will vary, depending on the candy bar.*

6) Draw a picture to scale showing the layers of your core sample; label and measure the thickness of layers in millimeters, as well as color and texture of layers. *Students should write the letter "A" by the layer(s) or feature(s) that may have formed first, a "B" by the second oldest layer, etc. so that that "A" is on the bottom and each layer(s) or feature(s) above are labeled with sequencing letters.*

7) Which layers were made first, and why? The outmost layer would be the surface and the youngest area of deposit. *The stratigraphy (the order of the layers) would grow older as they go down the straw, towards the bottom. This would generally be true, barring any unusual events, like earthquake faulting or magma (liquid rock) intrusion.*

8) Draw a picture of the second core sample showing any layers and surface features; record the number and thickness of layers in millimeters, as well as color and texture of layers. *Students should write the letter "A" by the layer(s) or feature(s) that may have formed first, a "B" by the second oldest layer, etc. so that that "A" is on the bottom and each layer(s) or feature(s) above are labeled with sequencing letters (the same as #6).*

9) Compare the two core samples and list any similarities or differences from your first core sample. *Unless the student got an identical core sample in the exchange, there should be some change. Compare the thickness of the top layers, colors, textures, number of layers, sizes of layers, softness, hardness, etc.*

10) Would a core sample from Antarctica be important to the study of Earth's geologic history? Why? *A core sample would be very important to the study of geologic history! Most of our science observations have been of surface features. To have a better understanding of the processes that formed the Antarctic features, seeing the subsurface would be very important. There are also many unanswered questions the scientists are trying to find answers for: How fast, how large and how frequent are the changes in the Antarctic region? A thick blanket of ice covers 98% of Antarctica. Accessing the rock history underneath the ice reveals another time in history. As a result, we know that*

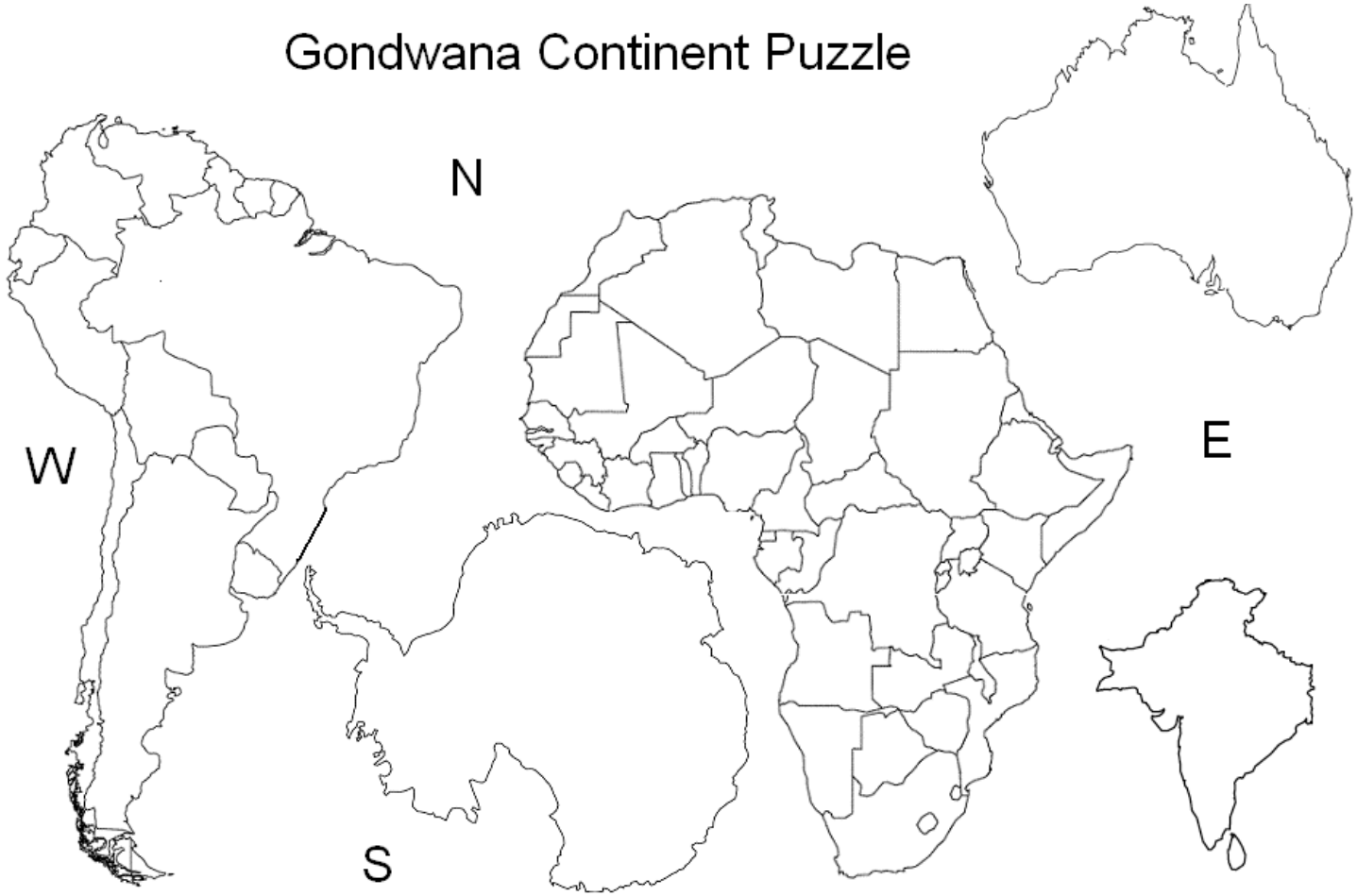
Unit 3, Activity 2, Getting to the Core of it Answers

Antarctica was not always the cold continent it is today. Antarctica has evolved from subtropical to polar over the past 60 million years.

11) Where would be the best place to study an Antarctic seafloor core sample...in Antarctica or in a technical lab at a university? Explain your answer.
Actually, a case could be made for both sites: The university lab would probably have better, more sensitive science equipment available since equipment sent to Antarctica is somewhat limited to space/cost/sensitivity factors. Studying the sample in Antarctica would allow the scientist to observe the actual site and surroundings of the core sample. Was this sample typical of the rest of the terrain or an unusual occurrence?

12) What would account for the samples being different if they were both from Antarctica? *The core samples may have been taken from different sites or different places on the continent. Remember, one sample does not necessarily translate to the whole continent being like the sample.*

Note: A good story for an example is the "The Blind Men and the Elephant" wherein the blind men all feel a different part of the elephant and think they know what the whole elephant is like.



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(http://www.usoe.k12.ut.us/curr/science/core/earth/lessons/pdfFiles/gndwapzl.pdf)

Unit 3, Activity 3, Gondwana Student Instructions

Gondwana is the name given to a supercontinent that is believed to have existed in the past. The continent later broke up into modern Africa, South America, Australia, Antarctica, and India. Students will reconstruct Gondwana using the evidence that supports this idea showing the changes which have occurred, showing the movement of continents over time in this activity. The idea of continental movement is based on evidence seen through geologic history.

1. Fossils of a Mesosaurus (260 mya) were found on the eastern tip of South America. Label this location "A."
2. Ancient coral reefs were found at the southern tip of South America. Label this location "B."
3. Draw an arrow pointing from east to west in the southern most part of Brazil. This arrow represents the direction that ancient glaciers moved (320 mya).
4. Ancient coral reefs were found along the narrow strip of land of Antarctica. Label this location "B."
5. Coal beds (248 mya) were found along the southern coast of Antarctica. Label this location "C."
6. Petrified palm trees were found along the eastern coast of Antarctica. Label this location "D."
7. Draw an arrow pointing north on the north coast of Antarctica. This arrow represents the direction that ancient glaciers moved.
8. Draw an arrow pointing west in South Africa. This arrow represents the direction that ancient glaciers moved.
9. Fossils of a Mesosaurus were found in Nigeria. Label this location "A."
10. Rare sedimentary rocks were found in Kenya. Label this location "X."
11. Petrified palm trees were found along southwestern edge of India. Label this location "D."
12. Rare sedimentary rocks were found in the northernmost part of India. Label this location "X."
13. Coal beds were found along the southern coast of Australia. Label this location "C."
14. Cut out the continent outlines.
15. Glue the continents together on a piece of paper matching the labeled areas of one continent with another continent.

MEASURING GEOLOGIC AGE WITH RADIOACTIVE DECAY/ HALF-LIFE

The process of radioactive decay of certain elements found in some rocks can be used to determine the _____ geologic age. The order rock layers are formed allows for _____ dating. Radioactive decay occurs in the nucleus of the atom. During the process, energy is released and a new element, called a daughter element, is formed. Each radioactive element has its own half-life. Half-life is the time it takes for half of the atoms of the radioactive (parent) element to change into another element (daughter element).

Strategy: A scientist has discovered a new isotope. She wants to use the isotope to date dinosaur bones in her lab. The bones are 100 million years old.

Procedure: Record answers on notebook paper.

1. Place 100 radioactive (parent) paper disks with the "X" surface facing up inside the box. Have your 100 pieces of daughter disks nearby.
2. Pick up the box and shake it GENTLY for 5 seconds. Hold the lid on tightly!
3. Open the box. Take out all of the radioactive (parent) disks that have flipped over, AND replace that with the same number of daughter disks. This step is important because students must be reminded of the Law of Conservation of Mass (atoms are neither created nor destroyed). Determine the number of radioactive (parent) disks left in the box by subtracting the number of radioactive (parent) disks removed from the number in previously (shake 0 = 100). Record this in your data chart.
4. Repeat the procedure steps # 3-5 until all the radioactive (parent) disks are replaced with daughter disks.
5. Graph the number of radioactive (parent) disks in the box before each shake vs. the number of shakes.

GRAPHING CALCULATOR STEPS:

1. Clear your home screen by pressing the **CLEAR** button.
2. Press the **STAT** button and highlight **EDIT**, **1: Edit**. Press **ENTER**.
3. In list L1, place the total number of shakes. Example: 1 **ENTER**; 2 **ENTER**, 3 **ENTER**
4. In list L2, place the number of cereal in the box beside each shake number.
5. Press the **2nd** button; then press the **Y=** button to go to the **STAT PLOT**.
6. Select **1:** and press **ENTER**.
7. Move the cursor using the arrows to highlight the **ON** button by pressing **ENTER**.
8. Move the cursor to **Type:** and highlight the histogram (bar graph).
9. Move the cursor to the **X list:** and insert **L1** by pressing the **2nd** button and then the number **1**.
10. Move the cursor then to the **Freq:** and insert **L2** by pressing the **2nd** button and then the number **2**.
11. Press the **Y=** button and make sure the "**Y**"s are clear by pressing the **CLEAR** button where there is text.
12. Press the **GRAPH** button for display.

Unit 3, Activity 5, Radioactive Decay/Half-life Conclusion

Conclusion:

1. The radioactive (parent) disks represent the _____

2. The daughter disks represent the _____
3. The time it takes for half of the disks to flip is called the *half life*. What is the half-life of the new isotope?

_____

4. If the answer to #3 is in millions of years, will this isotope be able to date the dinosaur bones? Why or why not?

_____

5. Take your calculator and divide 10 in half (by 2). Divide that number in half. Continue this process 8 more times. What happens to the number?

_____

6. Based on your results from #5, explain why in nature, the amount of radioactive (parent) material can never run out.

_____

_____

_____

7. Strontium-90 has a half-life of 28.8 years. If you start with a 10-gram sample of strontium-90, how much will be left after 115.2 years? Justify your answer.

_____

_____

_____

Unit 3, Activity 5, Radioactive Decay/Half-life Chart

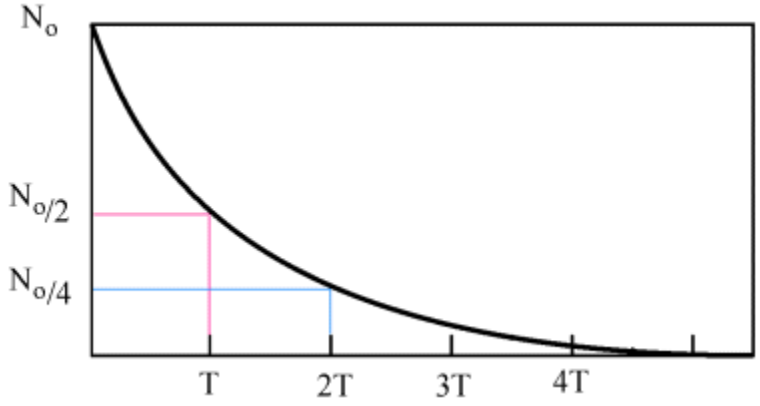
Shake Number	Radioactive (Parent) Disks before shake # in box – # removed
0	**100**
1	
2	
3	
4	

Unit 3, Activity 5, Radioactive Decay/Half-life Student Sheet Answer Key

ANSWERS TO BACKGROUND INFORMATION FOR TEACHER

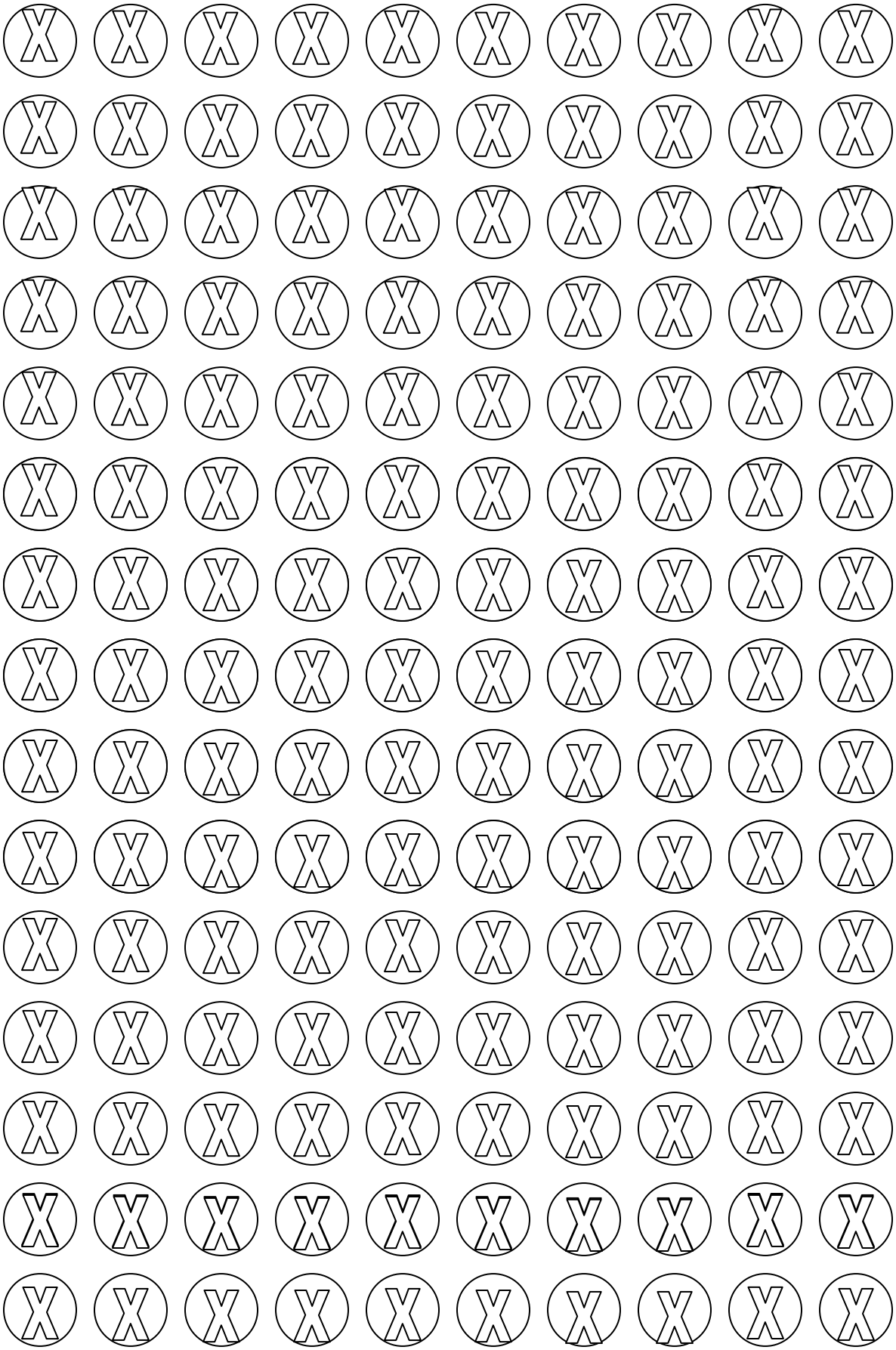
The process of radioactive decay of certain elements found in some rocks can be used to determine the ___*absolute*_____ geologic age. The order rock layers are formed allows for __*relative*____ dating. Radioactive decay occurs in the nucleus of the atom. During the process, energy is released and a new element, called a daughter element, is formed. Each radioactive element has its own half-life. Half-life is the time it takes for half of the atoms of the radioactive (parent) element to change into another element (daughter element).

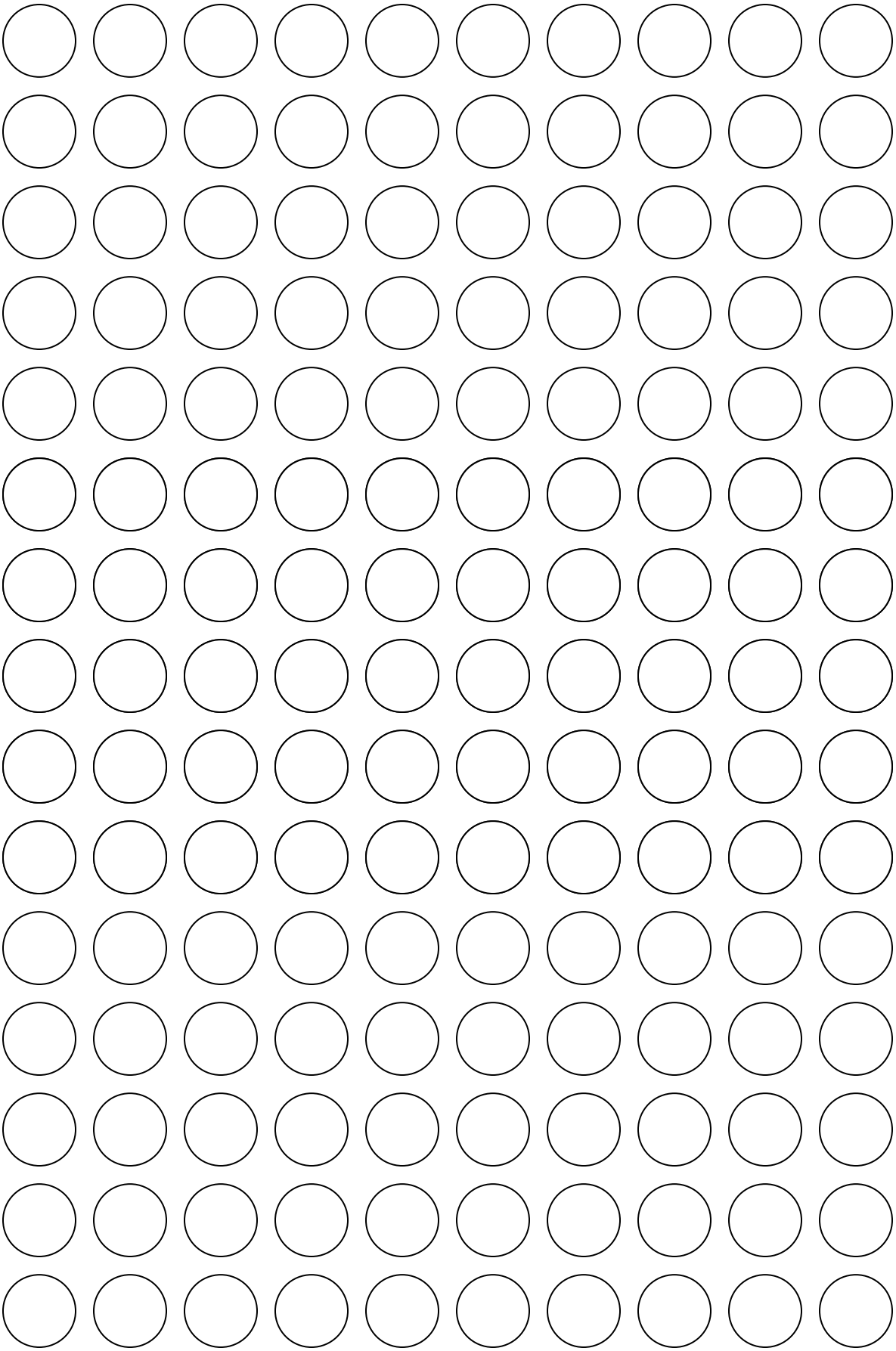
Student graphs should resemble the graph below, where N is the number of radioactive materials, and T is the number of shakes.



Conclusion:

1. The radioactive (parent) disks represent the *parent isotope*
2. The daughter disks represent the *daughter isotope*
3. The time it takes for half of the disks to flip is called the *half life*. What is the half-life of the new isotope? *Answers will vary but should be similar. The first toss will be the half-life.*
4. If the answer to #3 is in millions of years, will this isotope be able to date the dinosaur bones? Why or why not? *No. because each flip is equal to 1 million years, and the dinosaurs' bones are 100 million years old.*
5. Take your calculator and divide 10 in half (by 2). Divide that number in half. Continue this process 8 more times. What happens to the number? *The number never reaches zero.*
6. Based on your results from #5, explain why in nature, the amount of parent material can never run out. *The parent material is reduced by half each time; therefore, the parent material is always present. This also can be visualized by cutting a piece of paper in half continually.*
7. Strontium-90 has a half-life of 28.8 years. If you start with a 10-gram sample of strontium-90, how much will be left after 115.2 years? Justify your answer. *0.624 grams – the number of half lives = the time divided by the half-life. 115.2 divided by 28.8 is 4; 4 half lives of 10 grams is 0.624.*





Uranium 235 to Lead-207

Rock letter	Light (radioactive parent)	Dark (daughter)	Key to number of half-lives $T_{1/2}$ x # = age	Uranium 235 to Lead-207
A	100	0		
B	50	50		
C	25	75		
D	12.5	87.5		
E	6.25	93.75		

Carbon-14 to Nitrogen-14

Rock letter	Light (radioactive parent)	Dark (daughter)	Key to number of half-lives $T_{1/2}$ x # = age	Carbon-14 to Nitrogen-14
A	100	0		
B	50	50		
C	25	75		
D	12.5	87.5		
E	6.25	93.75		

Uranium-238 to Lead-206

Rock letter	Light (radioactive parent)	Dark (daughter)	Key to number of half-lives $T_{1/2}$ x # = age	Uranium-238 to Lead-206
A	100	0		
B	50	50		
C	25	75		
D	12.5	87.5		
E	6.25	93.75		

Rock letter	Light (radioactive parent)	Dark (daughter)	Key to number of half-lives $T_{1/2}$ x # = age	Uranium 235 to Lead-207 $T_{1/2}$ = 704,000,000	Carbon-14 to Nitrogen-14 $T_{1/2}$=5,730	Uranium-238 to Lead-206 $T_{1/2}$=4,600,000,000
A	100	0	0	Near the Present	Near the Present	Near the Present
B	50	50	1	704,000,000	5,730	4,600,000,000
C	25	75	2	1,408,000,000	11,460	9,200,000,000
D	12.5	87.5	3	2,112,000,000	17.190	13,800,000,000
E	6.25	93.75	4	2,816,000,000	22,920	18,400,000,000
F	3.125	96.875	5	3,520,000,000	28,650	23,000,000,000

More radioactive elements can be used so that every student participates, thus creating more scenarios.

Unit 3, Activity 6, Louisiana Fossils

The common name of the fossil is given with the epoch in which it lived in parentheses.

Plant Fossils

1. Petrified Palm Wood -State Fossil (Miocene and Oligocene)
2. Buried Forests (Pleistocene and Holocene)
3. Tree Molds (Pleistocene)

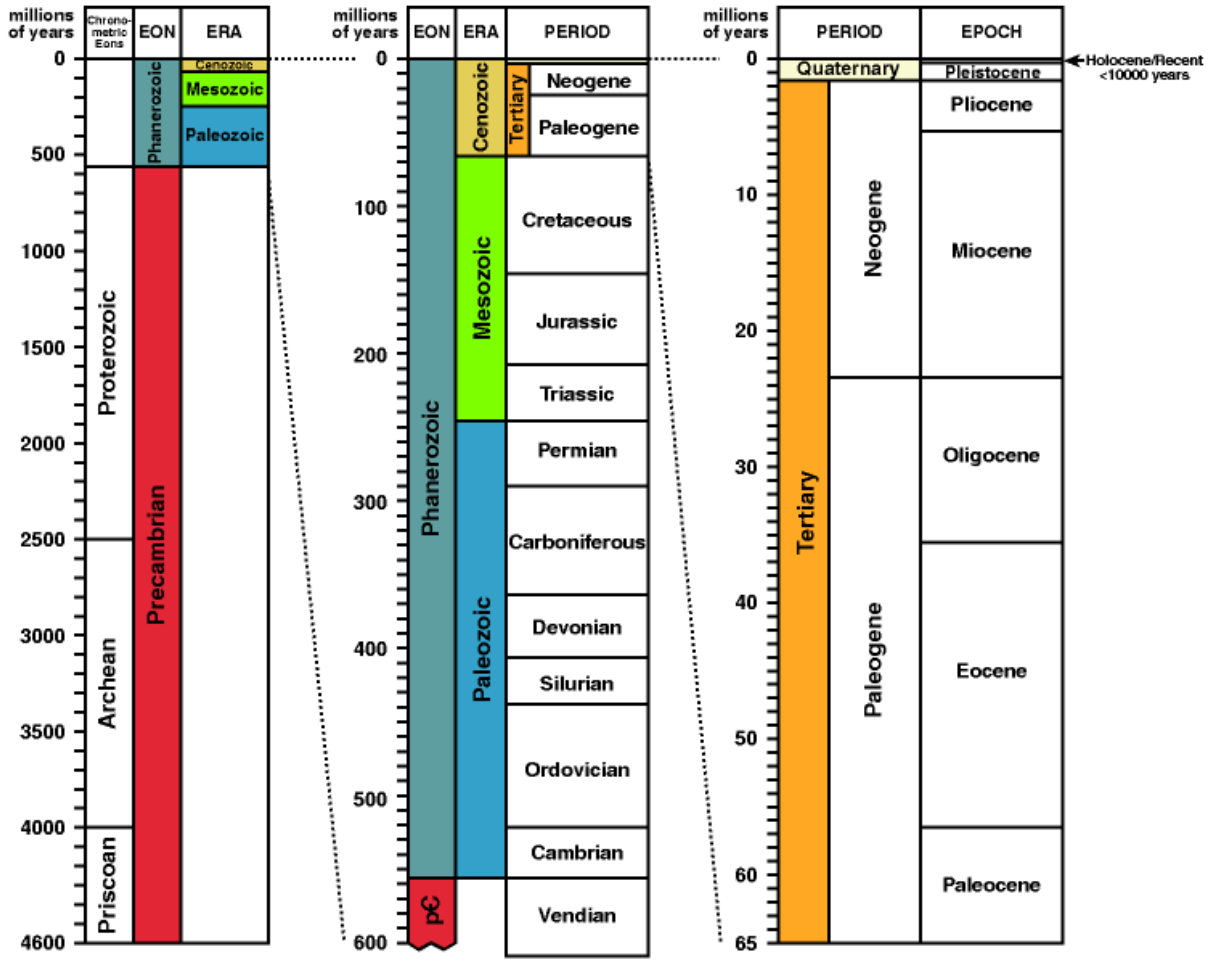
Invertebrate Fossils

1. Loess Fossils and Loess - Land and freshwater mollusks (Pleistocene)
2. Marine fossils found within outcrops within northern and central Louisiana (Oligocene and Eocene)

Vertebrate Fossils

1. Mastodon (Pleistocene)
2. Mammoths (Pleistocene)
3. Bears (Pliocene)
4. Horses (Pliocene)
5. Ancestral elephants (Miocene)
6. Bird tracks (Oligocene)
7. Sharks teeth (Oligocene)
8. Primitive whales (Eocene)
9. Basilosaurus (Eocene)

"Louisiana Fossil Page" (http://members.cox.net/pyrophyllite/lafossil1.html) is adapted with permission from Paul V. Heinrich.



Timeline by Dr. Andrew MacRae http://www.intersurf.com/~chalcedony/timescale.html

Unit 4, Activity 1, Vocabulary Self-Awareness Chart

Vocabulary Word	-	✓	+	Example	Definition
Erosion					
Deposition					
Meander					
Topography					
Contour					
Index Contour Line					
Hachure					
Elevation					
Depression					
Relief					
Oxbow lakes (cutoffs)					

Pan	10 cm		20 cm	
	45°	**10°**	**45°**	**10°**
Pan A				
Pan B				
Pan C				
Pan D				
Pan E				
Pan F				

Data and Observations Table		
	Start	**Next day**
Iron (II) Sulfate, $FeSO_4$		
Copper strip		

TODAY'S DATE: _____ DUE DATE: _____

Students often use the terms *weathering* and *erosion* as one concept. As a means to address this misconception, you will construct and present 3-D models representing objects in motion using the three major types of erosion (wind, water, and glacial). You will present…

1. the characteristics of -
2. the major contributors to -
3. specific vocabulary describing -
4. the effects on our Earth produced by-
5. preventative measures taken for-

The rubric describes in detail the total number of points you can acquire. Notice that YOU give yourself and your group members a score. These four scores will be averaged together to find the final group participation grade.

You will have four days of class time to work on this project – plus any after school hours that may be needed.

Unit 4, Activity 5, Erosion Project Rubric

Name: _____ _____ **5 pts**

Type of Erosion: _____ _____ **5 pts**

Visual _____ **35 pts**
- Can be seen from back of room (**5 pts**)
- Clearly represents effects on Earth (**15 pts**)
- Vocabulary words labeled and described (**10 pts**)

Presentation _____ **35 pts**
- Familiar with material (note cards may be used) (**10 pts**)
- Good eye contact (**5 pts**)
- Time limit (5 min minimum) (**5 pts**)
- Interaction with visual presentation (**5 pts**)
- Well organized, rehearsed, and interesting (**10 pts**)

Group Participation

Write the names of your group members (including yourself) and rate their effort on the project on a scale of 1 to 10 (1 represents only breathing – 10 dictates a fabulous job).

1	2	3	4	5	6	7	8	9	10
only breathing			ehh, helped some					fabulous job	

_____ ____

_____ ____

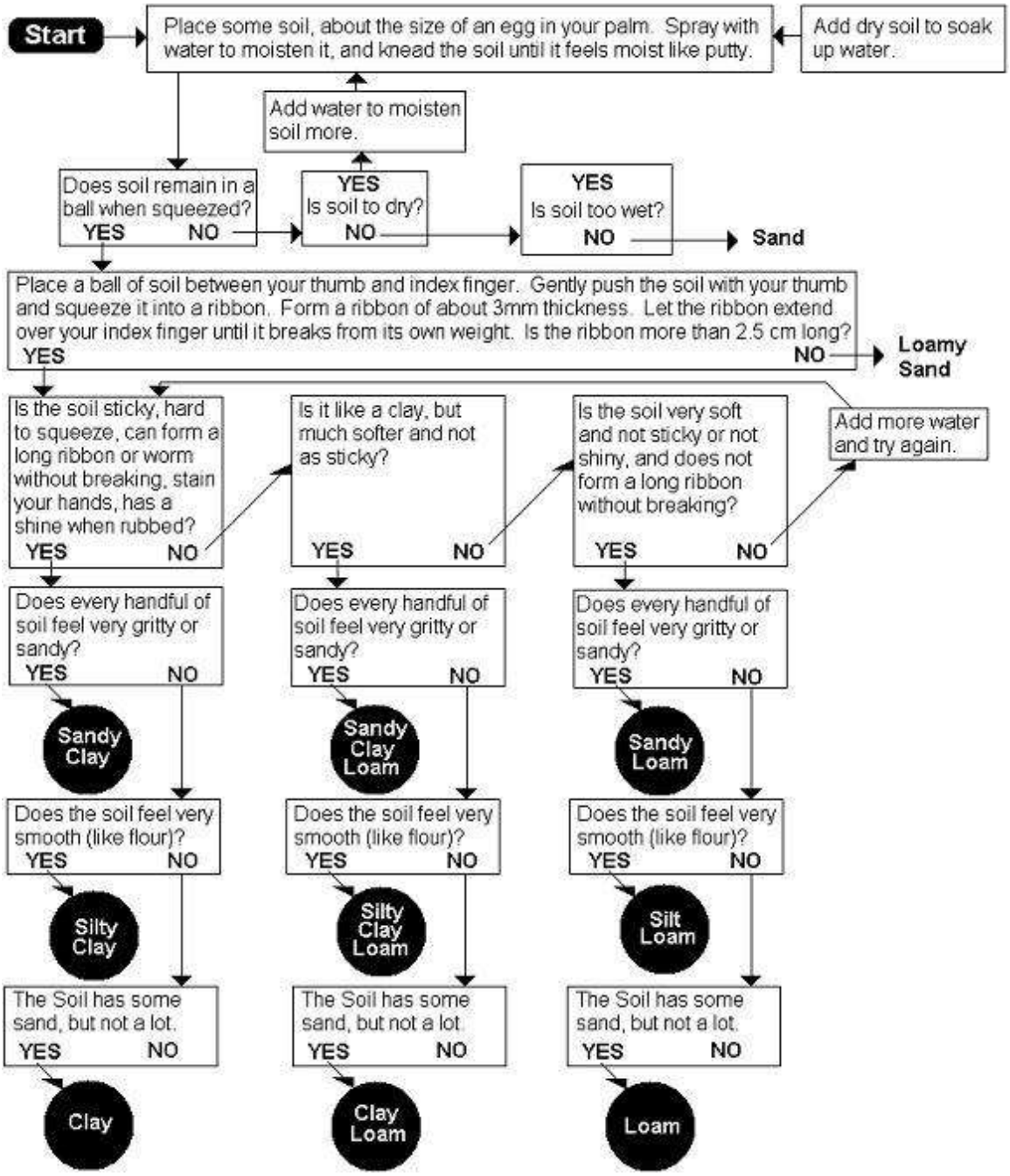
_____ ____

_____ ____

(**10 pts**) What did you learn from this project? _____

_____

_____



USDA website: http://soils.usda.gov/sqi/assessment/files/CT_instructions.pdf

Questions:

1. Based on the soil samples used, do more plant species prefer to grow in acidic soils or alkaline soils?

2. Using the information gathered, do you think you can now predict whether a soil will be acidic or alkaline by looking at the types of plants growing in the area? Why or why not?

K What I Know	W What I Want to Know	L What I Learned

Ocean Depth Data Sheet	
Distance from U.S. (kilometers)	Depth (meters)
0	0
160	165
200	1800
500	800
800	4600
1050	5450
1450	5100
1800	5300
2000	5600
2300	4750
2400	3500
2600	3100
3000	4300
3200	3900
3450	3400
3550	2100
3600	1330
3700	1275
3950	1000
4000	0
4100	1800
4350	3650
4500	5100
5000	5000
5300	4200
5450	1800
5500	920
5600	180
5650	0

Story Writing: Water Cycle Story Chain

Teacher Name: _____

Student Name: _____

CATEGORY	4	3	2	1
Accuracy of Facts	All facts presented in the story are accurate.	Almost all facts presented in the story are accurate.	Most facts presented in the story are accurate (at least 70%).	There are several factual errors in the story.
Requirements	All of the written requirements (8 stages of water cycle) were met.	Almost all (6-7) the written requirements were met.	Most (4-5) of the written requirements were met but several were not.	Many requirements (less than 3) were not met.
Spelling and Punctuation	There are no spelling or punctuation errors in the final draft. Character and place names that the author invented are spelled consistently throughout.	There is one spelling or punctuation error in the final draft.	There are 2-3 spelling and punctuation errors in the final draft.	The final draft has more than 3 spelling and punctuation errors.
Creativity	The story contains many creative details and/or descriptions that contribute to the reader's enjoyment. The author has really used his/her imagination.	The story contains a few creative details and/or descriptions that contribute to the reader's enjoyment. The author has used his/ her imagination.	The story contains a few creative details and/or descriptions, but they distract from the story. The author has tried to use his/her imagination.	There is little evidence of creativity in the story. The author does not seem to have used much imagination.

Score _____

Unit 5, Activity 1, Water Cycle Story Chain Example

Student 1: The heat from the Sun found the drop, warmed it, and evaporated it into water vapor.

Student 2: When the vapor got cold, it changed back into it a liquid (the process is condensation).

Student 3: After a while, our drop combined with other drops to form a bigger drop and fell to the Earth as precipitation.

Student 4: The drop lands in an urban area, hits my house's roof, goes down the gutter and my driveway to the curb.

Student 5: It runs down the curb into a storm sewer and ends up in a small creek.

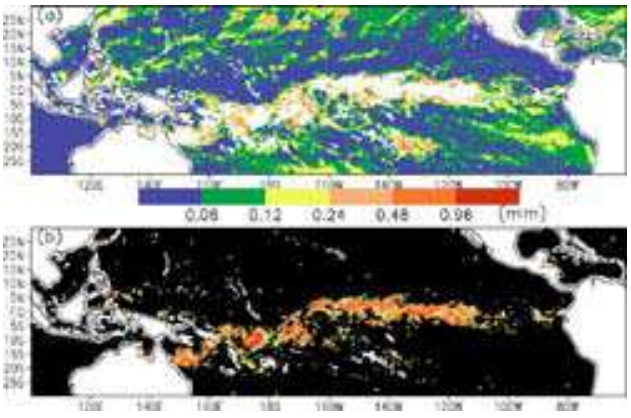
Student 6: The creek flows into a larger river, and the drop begins its journey towards the ocean.

Student 7: There the drop finds itself being warmed by the Sun again.

The chain continues through the entire cycle.

NASA PREDICTS MORE TROPICAL RAIN IN A WARMER WORLD

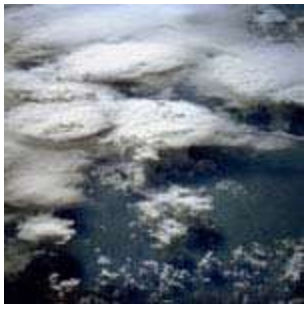
February 10, 2004- (date of web publication)



As the tropical oceans continue to heat up, following a 20-year trend, warm rains in the tropics are likely to become more frequent, according to NASA scientists.

In a study by William Lau and Huey-Tzu Jenny Wu, of NASA's Goddard Space Flight Center, Greenbelt, Md., the authors offer early proof of a long-held theory that patterns of evaporation and precipitation, known as the water cycle, may accelerate in some areas due to warming temperatures. The research appears in the current issue of Geophysical Research Letters.

The study cites satellite observations showing the rate that warm rain depletes clouds of water is substantially higher than computer models predicted. This research may help increase the accuracy of models that forecast rainfall and climate. The rate water mass in a cloud rains out is the precipitation efficiency. According to the study, when it comes to light warm rains, as sea surface temperature increases, the precipitation efficiency substantially increases.



Computer climate models that predict rainfall have underestimated the efficiency of warm rain. Compared to actual observations from NASA's Tropical Rainfall Measuring Mission (TRMM) satellite, computer models substantially underestimate the precipitation efficiency of light rain. The findings from this study will provide a range of possibilities for warm rain efficiency that will greatly increase a model's accuracy.

"We believe there is a scenario where in a warmer climate there will be more warm rain. And more warm rain will be associated with a more vigorous water cycle and extreme weather patterns," Lau said.

The process that creates warm rain begins when water droplets condense around airborne particles and clouds are created. The droplets collide, combine, and grow to form raindrops. The raindrops grow large and heavy enough to fall out as warm rain. The study claims, for each degree rise in sea surface temperature, the rate a cloud loses its water to moderate-to-light warm rainfall over the tropical oceans increases by eight to 10 percent.

Cold rains are generally associated with heavy downpours. They are generated when strong updrafts carry bigger drops higher up into the atmosphere, where they freeze and grow. These drops are very large by the time they fall. Once updrafts take these large drops high enough, and freezing takes place, the process of rainfall is more dependent on the velocity of the updraft and less on sea surface temperatures. Since the process of condensation releases heat, warm rains heat the lower atmosphere. More warm rains are likely to make the air lighter and rise faster, creating updrafts producing more cold rain.

The study found warm rains account for approximately 31 percent of the total global rain amount and 72 percent of the total rain area over tropical oceans, implying warm rains play a crucial role in the overall water cycle. Light warm rains appear to occur much more frequently, and cover more area, than cold rains, even though they drop less water per shower. The total precipitation from all types of warm rains accounts for a substantial portion of the total rainfall.

In a warmer climate, it is possible there will be more warm rain and fewer clouds. If the amount of water entering into clouds stays constant and rainfall efficiency increases, then there will be less water in the clouds and more warm rains.

More study is needed to better understand the relationship between increased warm-rain precipitation efficiency and a rise in sea surface temperatures and to determine how cold rain might be affected by an increase in warm rain and a decrease in cloud water amounts.

NASA's Earth Science Enterprise is dedicated to understanding the Earth as an integrated system and applying Earth System Science to improve prediction of climate, weather, and natural hazards using the unique vantage point of space.

NASA article NASA PREDICTS MORE TROPICAL RAIN IN A WARMER WORLD can be found at
http://www.nasa.gov/centers/goddard/news/topstory/2003/1224rainfall.html

Unit 5, Activity 3, World Climate Data Table

Place	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Cairo, Egypt Avg. Temp ^{o}C												
Sitka, Alaska Avg. Temp ^{o}C												
City Choice _____ Avg. Temp ^{o}C												
Cairo, Egypt Avg. Precipitation												
Sitka, Alaska Avg. Precipitation												
City Choice _____ Avg. Precipitation												

In this activity, you will explore how the tilt of the Earth's axis results in different amounts of solar radiation at different times of the year, causing seasons.

OBJECTIVES

In this experiment, you will

- monitor simulated warming of a city or location by the Sun in the winter
- monitor simulated warming of a city or location by the Sun in the summer
- interpret your results and compare them with other students/groups

MATERIALS

globe of the earth
masking tape
metric ruler
thermometer
stop watch/timer
thermometer
lamp with 100-watt bulb
ring stand and utility clamp
20-cm length of string

PROCEDURE

1. Fasten the lamp to a ring stand, and position the globe with the North Pole tilted away from the lamp.
2. Position the bulb at the same height as the Tropic of Capricorn.
3. Find your city or location on the globe.
4. Tape the thermometer to the globe with the bulb of the thermometer at your location.
5. Check to make sure the globe is turned for winter data collection (the hemisphere will tilt away from the lamp).
6. Use the 20-cm length of string to position your location on the globe 20 cm from the bulb.
7. Turn on the lamp at the same time you start the timer.
8. Record the initial temperature the data table to the right.
9. After 5 minutes, record the final temperature.
10. Turn off the lamp.
11. Move the globe to the opposite side of the lamp.
12. Position the globe for summer (the hemisphere will tilt toward the lamp) data collection.

	Tilted Away (^oC)	**Tilted Toward (^oC)**
Final Temperature		
Initial Temperature		
Temp. Difference		

13. Use the string to position your location on the globe 20 cm from the bulb.
14. Let the globe and thermometer cool to the beginning temperature that you recorded in Step 8.
15. When the globe and thermometer have cooled, repeat steps 8-10 to begin data collection for the summer season.

DATA ANALYSIS

1. Based on the data, draw the tilt of Earth's axis in relation to the Sun for both the summer and winter seasons in the Northern Hemisphere.

2. How does the temperature change for summer compare to the temperature change for winter? Explain your answer.

3. What would happen to the temperature changes if Earth were more tilted than 23.5 degrees?

4. What would happen to the temperature changes if Earth were located at a different distance from the Sun? Describe how it would change.

Unit 5, Activity 4, 'Tis the Season with Answers

DATA ANALYSIS

1. Based on the data, draw the tilt of Earth's axis in relation to the Sun for both the summer and winter seasons in the Northern Hemisphere.
Drawings should show Earth tilted toward the Sun during the summer and tilted away during the winter (for the Northern Hemisphere). The distance between Earth and the Sun for both drawings should appear to be the same.

2. How does the temperature change for summer compare to the temperature change for winter? Explain your answer.
The summer's temperature change is greater than that of the winter because it receives direct sunlight from the Sun (lamp). Winter receives indirect sunlight, which results in cooler temperatures.

3. What would happen to the temperature changes if Earth were more tilted than 23.5 degrees?
Earth would experience higher temperatures closer to the poles – possibly melting the polar ice caps – during the summer season. More of Earth will experience 24 hours of daylight. During winter, extreme temperature will result, refreezing the polar ice caps and possibly more of the oceans. More of Earth will experience 24 hours of darkness.

4. What would happen to the temperature changes if Earth were located at a different distance from the Sun? Describe how it would change.
A closer orbital path would increase the overall temperatures just as a larger orbital path would lower the overall temperatures. If Earth even had an extreme oval (elliptical) orbit, traveling sometimes very near to the Sun, the oceans would have boiled and sometimes very far from it, they would have frozen. Earth is located in the most advantageous position for life as we know it to exist.

The following text is a portion of an article on forecasting thunderstorms from Weather.com, which can be found at http://www.weather.com/encyclopedia/thunder/forecast.html:

Step 1: Reading: Students take turns reading aloud a few passages of a text to one another. Each reader chooses when to pass the reading to the next student. Decide when the group has read enough and is ready for the next step, a summarization.

Forecasting Thunderstorms
Thunderstorm forecasting is very similar to the forecasting used to predict tornadoes. Three times daily, a severe weather outlook is issued on a nationwide basis indicating whether conditions are either favorable or unfavorable for thunderstorms to develop in specific regions of the United States.

To forecast thunderstorms, meteorologists use a variety of data. Surface and upper air observations are studied to find areas of low level moisture and instability and to determine how winds aloft might influence storm development.

Satellite imagery is used to help track the movement of weather systems that might generate thunderstorms. Forecasters scan computer model data to help determine where favorable areas for thunderstorm formation might be located further out in time. Radar and satellites are used to track the storms once they do form.

Most thunderstorms pose the threat of heavy downpours. gusty winds, and cloud-to-ground lightning. Sometimes, however, atmospheric conditions become favorable for particularly dangerous thunderstorms to form. These severe thunderstorms are defined as producing one or more of the following: hail 3/4 of an inch in diameter or greater, wind gusts to 58 mph or more, or a tornado.

Step 2: Summarizing: Provide a summary of the section just read or choose a student to offer a summary. Improve the summary by adding missing elements or voicing thoughts on the passage. The following is an example of a summary from above: *Forecasting thunderstorms is done three times a day, using a variety of data such as surface and upper air observations. Satellites help track weather movement that might develop into thunderstorms once they do form. Most thunderstorms bring heavy rain, wind, and lightning, but some produce large hail, wind gusts up to 58 mph, and even tornadoes.*

Step 3: Clarifying: If a student is unclear about something or does not fully understand, the group does its best to help. Encourage students to voice individual confusions or

questions, which the group then addresses. After clarifying and answering questions move to step 4.

Step 4: Stating Outcomes: Students should reflect back on the reading, seeking some learning outcomes. This might be done by completing one of the phrases, I learned…, I was surprised…, I'm beginning to wonder…, I rediscovered…. Each student in the group should share one at a time; students should pick one of the phrases above to complete, using the text they just read; then other students should take a turn adding what outcomes they can find for themselves.

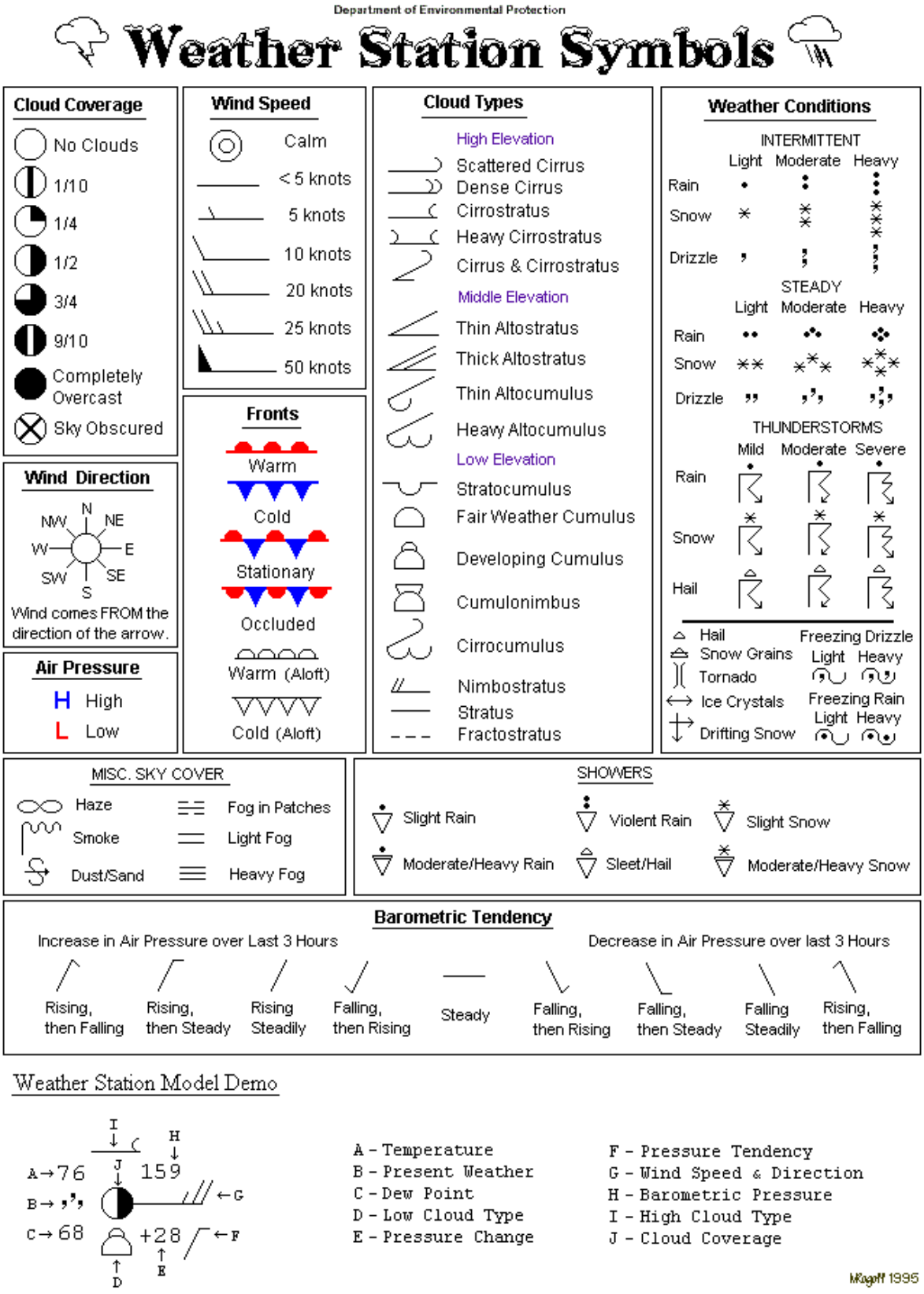
Advance to the next passage to read, and the four-step process is repeated.

Unit 5, Activity 5, Daily Weather Observation Log

Daily Weather Log:
Keep records of daily weather conditions using weather instruments provided or created.

DAY	TIME	TEMP.	PRECIP.	AIR PRESSURE	HUMIDITY	WIND SPEED	WIND DIRECTION	CLOUD COVERAGE
1								
2								
3								
4								
5								
6								
7								
8								
9								
10								
11								
12								
13								
14								

TIME – Record the time the data is collected.
TEMP. – Record temperatures in both Celsius and Fahrenheit.
PRECIP. – Record total amount of precipitation and indicate the type of precipitation you have observed (rain, sleet, snow, etc.).
AIR PRESSURE – Record the air pressure and indicate if it has raised or dropped since the last reading.
HUMIDITY – Record the percent humidity.
WIND SPEED – Record the wind speed (knots). Use the Beaufort Wind speed scale.
WIND DIRECTION – Record the wind direction.
CLOUD COVERAGE – Record the amount of clouds in the sky using the symbols on the back of this page.



Weather Station Model Demo

A - Temperature
B - Present Weather
C - Dew Point
D - Low Cloud Type
E - Pressure Change
F - Pressure Tendency
G - Wind Speed & Direction
H - Barometric Pressure
I - High Cloud Type
J - Cloud Coverage

Magoff 1995

NJDEP http://www.state.nj.us/dep/seeds/wssym.htm

Prediction:

Questions:

Clarifications:

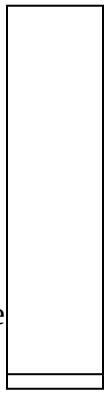
Summary Statement:

Was the prediction confirmed? **YES** **NO**

Details:

THE ATMOSPHERE

Procedure



1. Measure 10 cm from one edge of the adding machine tape. Draw a horizontal line across the width of the paper (see side figure). This is Earth. Color Earth BROWN to represent land.

2. The first layer of Earth's atmosphere, the **troposphere**, extends 12 km above Earth's surface. Using a scale of 1millimeter (mm) for 1 km draw the troposphere "line" above the Earth's surface line. Label the inside of this section "troposphere." Draw a small plane to indicate that this is the area in which airplanes fly. Draw a cumulus cloud with a lightning bolt to indicate this is where weather occurs. Use a pencil to draw a land features at the top of the Earth line. The temperature decreases as the elevation increases. Draw a blue arrow pointing down to indicate a drop in temperature.

3. The **tropopause** is located at the top of the troposphere. Write the word "tropopause" on top of the troposphere line. The temperature remains fairly constant in the tropopause. This layer separates the troposphere from the stratosphere. The jet stream is located here. These are very strong winds that blow eastward. Draw arrows to indicate the presence of the jet streams.

4. The second atmospheric layer, the **stratosphere**, extends 50 km above Earth's surface. Using the same scale draw a line above the Earth's surface line. Label this layer "stratosphere." The temperature increases in the stratosphere as the elevation increases. Draw a red arrow pointing up to indicate an increase in temperature. At the top of the stratosphere is the stratopause; the temperature remains fairly constant here. Write the constant temperature in the stratosphere layer.

5. The third layer of the atmosphere, the **mesosphere**, extends 80 km (50 miles) from Earth's surface. Measure, draw, and label this layer. This is the coldest layer, so draw a thermometer to represent the very cold weather. The temperature drops in this layer to about -100 °C (212 °F). Draw a blue arrow pointing down to indicate a drop in temperature. The mesopause is at the top of the mesosphere; the temperature remains fairly constant here.

6. The fourth layer of atmosphere, the **thermosphere**, begins about 700 km (430 miles) above Earth's surface. Measure, mark, and label this layer. The temperature increases as the elevation increases. Draw a red arrow pointing up to indicate an increase in temperature. When meteoroids enter Earth's atmosphere, they enter the thermosphere, which is extremely hot. A meteoroid falling through Earth's atmosphere is called a *meteor*. A meteor compresses air in front of it and the air heats up, thus heating the meteor. Draw and label a meteor.

7. A thin region in the thermosphere, called the **ionosphere**, contains charged atoms. The ionosphere is the lower part of the thermosphere. It extends from about 100-300 km (62 to 100 miles). Label the ionosphere and draw + and - signs to represent those atoms (Remember, this is not a layer, just a region in the thermosphere.). At this level, gas particles absorb ultraviolet and X-ray radiation from the Sun. The particles of gas become electrically charged (ions). Radio waves are bounced off the ions and reflect waves back to Earth; this generally helps radio communication. However, solar flares can increase the number of ions and can interfere with the transmission of some radio waves.

8. The **exosphere** is the upper part of the thermosphere. It extends to about 800 km (500 miles). Air is very thin here, and the gases continue to get thinner and thinner and drift off into space. This is the area where satellites orbit the Earth. Put **XX** to represent satellites in this layer.

9. Draw or label the following in your picture under the correct atmospheric layer:

    a. Molecules of ozone – 24 km
    b. Auroras (Northern Lights)—350 km
    c. Gemini spacecraft—300 km

Unit 5, Activity 6, Atmosphere Layers Analysis

Using your model of Earth's Atmosphere layers, answer the following questions.

1. What is the correct order of atmospheric layers from bottom to top?

2. Which layer of the atmosphere contains the ozone layer?

3. In which layer do auroras (e.g., northern lights) occur?

4. Does the temperature increase or decrease with altitude in the

   troposphere? _____ stratosphere? _____

   mesosphere? _____ thermosphere? _____

5. What is the approximate height of the

   tropopause? _____

   stratopause? _____

   mesopause? _____

6. What is the basis for dividing the atmosphere into four layers?

7. How does solar energy influence the atmosphere?

Unit 5, Activity 6, Atmosphere Layers Analysis with Answers

Using your model of Earth's Atmosphere layers, answer the following questions.

1. What is the correct order of atmospheric layers from bottom to top?
troposphere, stratosphere, mesosphere, thermosphere. The ionosphere and exosphere are regions in the thermosphere.

2. Which layer of the atmosphere contains the ozone layer?
stratosphere

3. In which layer do auroras (e.g., northern lights) occur?
thermosphere contains the ionosphere

4. Does the temperature increase or decrease with altitude in the troposphere? __*decrease*___ stratosphere? ___*increase*_____ mesosphere? _*decrease*____ thermosphere? __*increase*_____
5. What is the approximate height of the tropopause? *12 km (at the top of the troposphere)*

   stratopause? ____*50 km*_____
   mesopause? ____*700 km*_____
6. What is the basis for dividing the atmosphere into four layers?
Each atmosphere changes in temperature

7. How does solar energy influence the atmosphere?
The Sun provides energy that warms Earth. This heat is transferred between Earth's surface and the atmosphere by means of radiation, convection, and conduction.

Unit 5, Activity 6, The Atmosphere Layers Rubric

CATEGORY	4	3	2	1	Weight for Each Category	Score
Labels	Every item that needs to be identified has a label. It is clear which label goes with which structure.	Almost all items (90%) that need to be identified have labels. It is clear which label goes with which structure.	Most items (75-89%) that need to be identified have labels. It is clear which label goes with which structure.	Less than 75% of the items that need to be identified have labels, OR it is not clear which label goes with what item.	X5 (up to 20 points available)	
Drawing - details	All assigned details have been added. The details are clear and easy to identify.	Almost all assigned details (at least 85%) have been added. The details are clear and easy to identify.	Almost all assigned details (at least 85%) have been added. A few details are difficult to identify.	Fewer than 85% of the assigned details are present, OR most details are difficult to identify.	X5 (up to 20 points available)	

Unit 5, Activity 8, Raft Writing

Work in pairs to write the following RAFT:

R – Role (role of the writer): meteorologist
A – Audience (to whom or what the RAFT is being written): elementary students
F – Form (the form the writing will take, as in letter, song, etc.): information brochure
T – Topic (the subject focus of the writing): tornado and hurricane information

Using the publication software program, you will design and print an information brochure that compares and contrasts hurricanes and tornadoes. Your brochure must include the following information:

1. Anatomy – Include the different "structural components" that make up a tornado and hurricane.
2. Rating Scale – What are the names of the scales used to measure the intensity of hurricanes and tornadoes?
3. Technology – how has technology changed the way hurricanes and tornadoes are studied. Explain why present technology cannot answer all questions regarding hurricanes.
4. Human Impact – How have tornadoes and hurricanes impacted human lives?
5. What preventative measures are in place to ensure human safety?

Use the following websites to help conduct your research:
The Discovery Channel http://dsc.discovery.com/convergence/tornado/tornado.html (tornadoes)

The Weather Channel http://www.weather.com/ready/tornado/index.html (tornadoes)
http://www.weather.com/newscenter/specialreports/hurricanes/inside/index.html (hurricanes)

Forces of Nature ThinkQuest
http://library.thinkquest.org/C003603/english/tornadoes/index.shtml (tornadoes)

National Geographic
http://www.nationalgeographic.com/forcesofnature/interactive/index.html?section=h (hurricanes)
http://www.nationalgeographic.com/forcesofnature/interactive/index.html?section=t (tornadoes)

Unit 6, Activity 2, Vocabulary Self-Awareness Chart

Vocabulary Word	+	✓	-	Example	Definition
Gravity					
Inertia					
Force					
Motion					
Mass					
Weight					
Acceleration					
Speed					
1st Law of Motion					

2nd Law of Motion					
3rd Law of Motion					

Unit 6, Activity 4, Reciprocal Teaching: Teacher Notes

Teacher Notes:
Reciprocal teaching highlights four comprehension processes: summarizing, questioning, clarifying, and predicting. Because emphasis is on understanding these processes, students will need many exposures to all comprehension processes.

1. Begin by introducing summarizing. Share several short sections at the beginning of a text taken from the teacher-selected reading material and write a summary statement with the class. Talk out loud about your summary thinking as you work with students. Put the statements on the board for analysis and revision. Next, have students work in groups of four to read a short section of text and generate a summary statement. Write the various statements on the board and work with the class to select the best one.
2. Follow this process for each of the remaining comprehension processes that comprise reciprocal thinking: questioning, clarifying, and predicting. For example, state a prediction about the section of text about to be read and write it on the board. After reading the section, direct students' attention to the prediction and discuss how accurate it was and how it helped guide thinking while reading. Then, for the next short section, have students make predictions. Ask questions aloud while reading to focus attention on important information and ideas about the content; then have students ask questions. Finally, demonstrate how you use the text to clarify confusing points or ideas and then ask students to do the same thing with a new section of text.
3. After modeling the comprehension processes of reciprocal teaching, have students work in their groups of four, with each one taking responsibility for one of the comprehension processes as in summarizer, questioner, clarifier, and predictor. Assign the next section of text about the content and tell students to interact while reading with each student, taking the lead to model and guide the others in the comprehension process over which he/she is responsible. Students should use the Discussion Guide for Reciprocal Teaching to help them fulfill their roles.
4. Monitor students groups by moving throughout the room. Provide extra support and modeling for groups having difficulty with the reciprocal processes,

Unit 6, Activity 4, Reciprocal Teaching: Discussion Guide

Reading _____ Date: _____

Prediction:

Questions:

Clarifications:

Summary Statement:

Was the prediction confirmed? YES NO

Details:

Unit 7, Activity 1, Vocabulary Self-Awareness Chart

Vocabulary Word	-	✓	+	Example	Definition
Ellipse					
Rotation					
Revolution					
Solar eclipse					
Lunar eclipse					
Retrograde					
Gravity					
Mass					
Weight					
Stellar Luminosity					
Nebula					
Black hole					
Supernova					
White Dwarf					

Unit 7, Activity 1, This Little Corner Rubric

Student Name: _____

CATEGORY	4	3	2	1
Graphic Organizer	Graphic organizer or outline has been completed and shows clear, logical relationships among all topics and subtopics.	Graphic organizer or outline has been completed and shows clear, logical relationships among most topics and subtopics.	Graphic organizer or outline has been started and includes some topics and subtopics.	Graphic organizer or outline has not been attempted.
Quality of Information	Information clearly relates to the main topic. It includes several supporting details and/or examples.	Information clearly relates to the main topic. It provides 1-2 supporting details and/or examples.	Information clearly relates to the main topic. No details and/or examples are given.	Information has little or nothing to do with the main topic.
Model-specific	Diagrams and illustrations are neat, accurate, and add to the reader's understanding of the topic.	Diagrams and illustrations are accurate and add to the reader's understanding of the topic.	Diagrams and illustrations are neat and accurate and sometimes add to the reader's understanding of the topic.	Diagrams and illustrations are not accurate OR do not add to the reader's understanding of the topic.
Report-specific	All paragraphs include an introductory sentence, explanations or details, a concluding sentence, no spelling or mechanical errors, and add to the reader's understanding of the topic.	Most paragraphs include an introductory sentence, explanations or details, a concluding sentence, 1-2 spelling or mechanical errors, and add to the reader's understanding of the topic.	Paragraphs included related information but were typically not constructed well, had 3-4 spelling or mechanical errors, and sometimes added to the reader's understanding of the topic.	Paragraphing structure was not clear and sentences were not typically related within the paragraphs and do not add to the reader's understanding of the topic.

SCORE _____

Unit 7, Activity 2, Word Grid Example

Solar System Object	Star	Inner Planet	Outer Planet	Dwarf Planet	Retrograde Revolution	Rock	Gaseous	Satellite	Comet	Asteroid
Sun										
Mercury										
Venus										
Earth										
Moon										
Mars										
Jupiter										
Saturn										
Uranus										
Neptune										
Pluto										
Titan										
Juno										
Borrelly										
Hale-Bop										
Ceres										
Eris										
Europa										
Phobos										

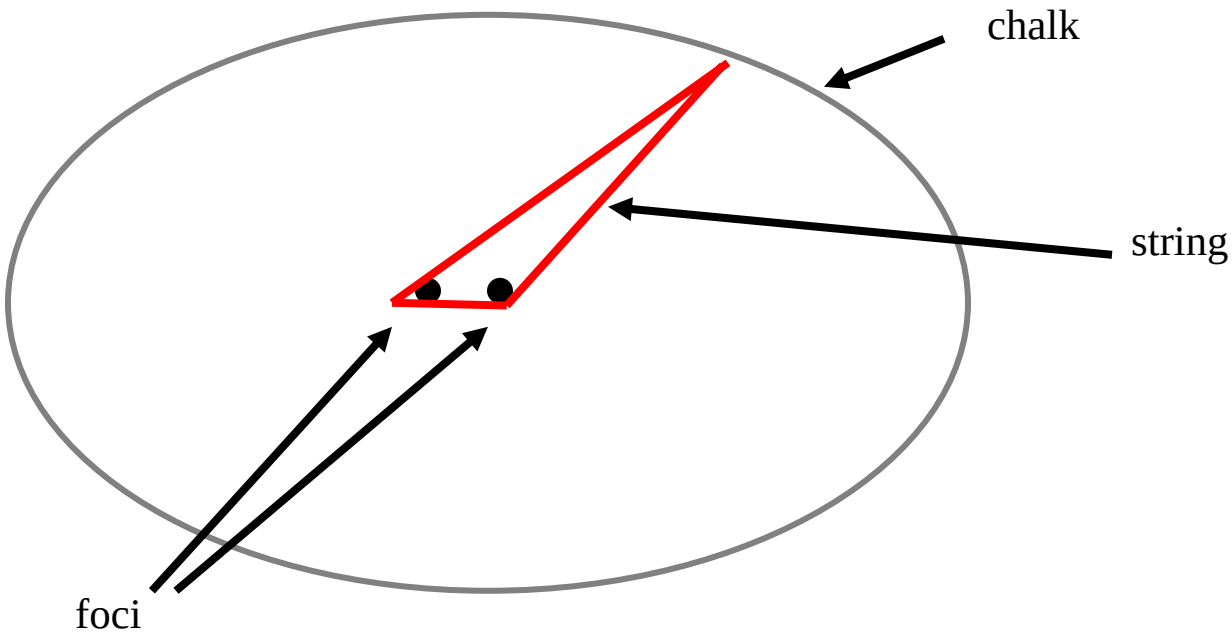
Solar System Object	Star	Inner Planet	Outer Planet	Dwarf Planet	Has Atmosphere	Retrograde Revolution	Rock	Gaseous	Satellite	Comet	Asteroid
Sun	X										
Mercury		X			X		X				
Venus		X			X		X				
Earth		X			X		X				
Moon							X		X		
Mars		X			X						
Jupiter			X		X			X			
Saturn			X		X			X			
Uranus			X		X	X		X			
Neptune			X		X			X			
Pluto				X			X				
Titan					X				X		
Borrelly										X	
Hale-Bop										X	
Ceres				X			X				X
Eris				X			X				X
Europa					X		X		X		
Phobos							X		X		

Unit 7, Activity 3, Mission/Project Rubric

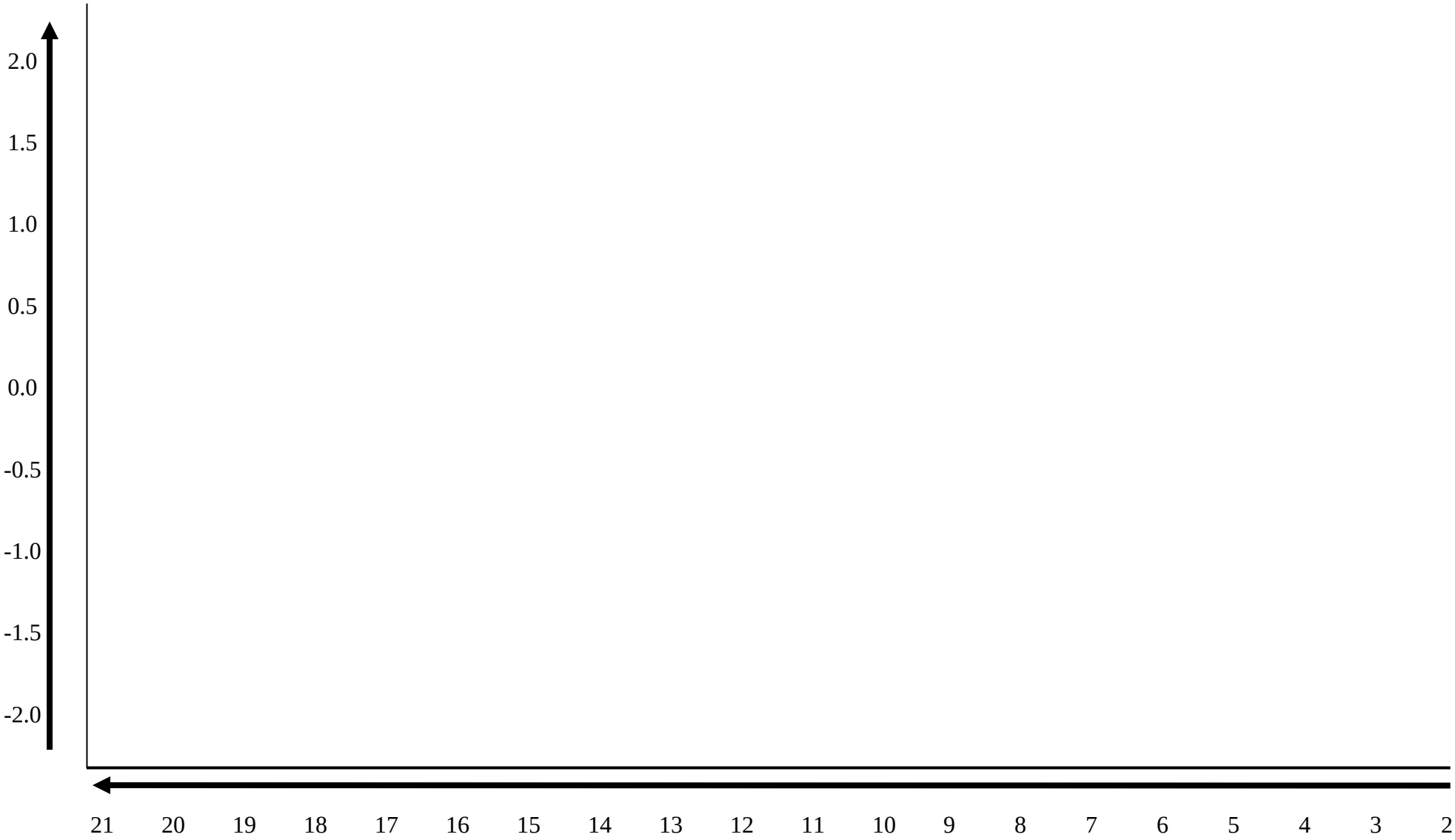
Student Name: _____ Planet _____

CATEGORY	4	3	2	1
Content-Accuracy	All content throughout the mobile is accurate. There are no factual errors.	Most of the content is accurate, but there is one piece of information that might be inaccurate.	The content is generally accurate, but one piece of information is clearly flawed or inaccurate.	Content is typically confusing or contains more than one factual error.
Effectiveness	Mobile includes all material needed to gain a comfortable understanding of the mission/project.	Project includes most material needed to gain a comfortable understanding of the material but is lacking one or two key elements.	Project is missing more than two key elements.	Project is lacking several key elements and has many inaccuracies.
Creativity	Creativity of mobile does not detract from text or other graphics.	Creativity of mobile somewhat detracts from text or other graphics.	Creativity of mobile mostly detracts from text or other graphics.	Creativity of mobile makes it difficult to see text or competes with other graphics on the mobile.
Originality	Mobile shows considerable originality and inventiveness. The content and ideas are presented in a unique and interesting way.	Mobile shows some originality and inventiveness. The content and ideas are presented in an interesting way.	Mobile shows an attempt at originality and inventiveness.	Mobile is a rehash of other people's ideas and/or graphics and shows very little attempt at original thought.

SCORE _____


chalk
string
foci

Make a scatter plot graph. Color the points according to the data collected from the HR Star Data BLM. Place the colored point at the intersection of the star's temperature and absolute magnitude. Add the necessary titles and axes label.



Unit 7, Activity 9, HR Star Data

Hertzsprung - Russell Diagram

Key Concepts

Ejnar Hertzsprung, a Danish astronomer, and Henry Norris Russell, an American astronomer, were independently comparing magnitudes (luminosity or brightness) and spectral classes of stars which involve the star's surface temperature, which determines the color of the star. Hertzsprung and Russell both realized that a great deal of information could be gained when making these comparisons. Together they created a diagram which is called the Hertzsprung - Russell Diagram or H-R Diagram.

At about 3,000 Kelvins (K = °C + 273.15), stars emit primarily red light, so they appear red. As the temperature increases, the amount of yellow light increases, so these stars appear yellow. At still higher temperatures, the stars also begin to also give off green blue light. The presence of red, yellow, green, and blue creates what we know as white light, and the stars appear white. At the highest temperatures, the relative proportion of blue light increases further, and the star looks blue.

Why then, when you look at stars visible at night, do they appear white? The fact that you only see them as white is due to the limited color response of your eyes at low light levels. Your eyes respond to the brighter light of the Sun and you recognize the color yellow. (Remember, you should never stare directly at the Sun). When stars are photographed or viewed with instruments which respond to color, the star's color is visible.

Below is a list of nearby and bright stars. READ THE FOLLOWING DATA AND ARRANGE IT IN A DATA TABLE MADE ON NOTEBOOK PAPER. INCLUDE STAR NAME, ABSOLUTE MAGNITUDE, TEMPERATURE (K), DISTANCE FROM EARTH, AND STAR COLOR. THEN USE THE DATA TO CONSTRUCT YOUR OWN H-R DIAGRAM.

Astronomers have compiled the following facts about these stars: the **Sun** has an absolute magnitude of -0.03, a temperature of 5,840 K, and a distance of 8 light minutes from Earth; **Achemar** has an absolute magnitude of 0.51, a temperature of 21,000 K. and a distance of 114 light years; **Adhara** has an absolute magnitude of 1.52, a temperature of 20,000 K, and a distance of 652 light years; **Aldeberan** has an absolute magnitude of 0.86, a temperature of 5,800 K, and a distance of 68 light years; **Alpha Centauri** has an absolute magnitude of -0.01, a temperature of 5,940 K, and a distance of 4.3 light years; **Alpha Crucis** has an absolute magnitude of 0.87, a temperature of 21,000 K, and a distance of 390 light years; **Altair** has an absolute magnitude of 0.77, a temperature of 10,000 K, and a distance of 16 light years; **Antares** has an absolute magnitude of 0.92, a temperature of 3,000 K, and a distance of 250 light years; **Arcturas** has an absolute magnitude of -0.06, a temperature of 4,000 K and a distance of 35.9 light years; **Bellatrix** has an absolute magnitude of 1.67, a temperature of 20,000 K, and a distance of 457 light years; **Beta Centauri** has an absolute magnitude of 0.63, a temperature of 21,000 K, and a distance of 290 light years; **Beta Crucis** has an absolute magnitude of 1.28, a temperature of 20,150 K, and a distance of 490 light years; **Betelgeuse** has an absolute magnitude of 0.41, a temperature of 2,900 K C, and a distance of 490 light years;

Unit 7, Activity 9, HR Star Data

Canopus has an absolute magnitude of -0.72, a temperature of 7,000 K, and a distance of 98 light years; **Capella** has an absolute magnitude of 0.05, a temperature of 6,000 K, and a distance of 45.7 light years; **Caster** has an absolute magnitude of 1.61, a temperature of 10,000 K, and a distance of 45.7 light years; **Deneb** has an absolute magnitude of 1.26, a temperature of 10,500 K, and a distance of 1,630 light years; **Fomalhaut** has an absolute magnitude of 1.15, a temperature of 10,600 K, and a distance of 23 light years; **Pollux** has an absolute magnitude of 1.16, a temperature of 4,050 K, and a distance of 35 light years; **Procyon** has an absolute magnitude of 0.37, a temperature of 6,900 K, and a distance of 11.2 light years; **Regulas** has an absolute magnitude of 1.3, a temperature of 20,500 K, and a distance of 84.8 light years; **Rigel** has an absolute magnitude of 0.14, a temperature of 2,100 K, and a distance of 900 light years; **Shaula** has an absolute magnitude of 1.63, a temperature of 20,500 K, and a distance of 313 light years; **Sirius** has an absolute magnitude of -1.47, a temperature of 10,000 K, and a distance of 8.6 light years; **Spica** has an absolute magnitude of 091, a temperature of 20,000 K, and a distance of 300 light years; **Vega** has an absolute magnitude of 0.04, a temperature of 11,000 K and a distance of 26.5 light years.

Data from http://www.astro.washington.edu/labs/clearinghouse/homeworks/hrdiagram.html#brightstars

Using this key determine the color of each star and add it to the data table.

Color	Temperature (K)	Color	Temperature (K)
Blue	Greater than 10,100	White	7,100-10,000
Yellow-White	6,100-7,000	Yellow	4,400-6,000
Orange	3,040-4,400	Red	Less than 3,040

Unit 7, Activity 9, HR Diagram Simulation

To explore more about the evolution of stars, go to the HR Diagram Simulator at http://www.astro.ubc.ca/%7Escharein/a311/Sim/hr/HRdiagram.html.

1. First, click the button labeled "100" one time to add one hundred stars to your diagram. The linear grouping that you see is called the Main Sequence.

a) Generally speaking how does the temperature of the blue stars compare to that of the red stars?

b). Generally speaking, how does the luminosity of the blue stars compare to that of the red stars?

2. Now click on an individual blue star and write down its mass and main-sequence lifetime.

3. Do the same for a red star.

4. Explain in general terms the relationship between mass and main-sequence lifetime.

5. To start the simulation, click on the button labeled "Evolve."

a) Which stars leave the main sequence first?

b) The stars change color as they leave the main sequence. What does this change indicate?

c) Why do you think these changes take place?

6. Start the simulation again, but this time click on an individual star and observe its luminosity as the simulation progresses.

a) How does luminosity change as the star leaves the main sequence?

b) Why do you suppose this?

Unit 7, Activity 9, HR Diagram Simulation with Answers

To explore more about the evolution of stars, go to the HR Diagram Simulator at http://www.astro.ubc.ca/%7Escharein/a311/Sim/hr/HRdiagram.html.

1. First, click the button labeled "100" one time to add one hundred stars to your diagram. The linear grouping that you see is called the Main Sequence.

a) Generally speaking how does the temperature of the blue stars compare to that of the red stars? *Blue stars are hotter.*

b). Generally speaking, how does the luminosity of the blue stars compare to that of the red stars? *Blue stars are brighter.*

2. Now click on an individual blue star and write down its mass and main-sequence lifetime. *Answers will vary*

3. Do the same for a red star. *Answers will vary.*

4. Explain in general terms the relationship between mass and main-sequence lifetime.

More massive stars have shorter lifetimes than less massive stars.

5. To start the simulation, click on the button labeled "Evolve."

a) Which stars leave the main sequence first? *Blue stars*

b) The stars change color as they leave the main sequence. What does this change indicate? *As stars travel through their lifetime, their color changes.*

c) Why do you think these changes take place? *This indicates a decrease in temperature.*

6. Start the simulation again, but this time click on an individual star and observe its luminosity as the simulation progresses.

a) How does luminosity change as the star leaves the main sequence? *The luminosity gets brighter.*

b) Why do you suppose this?

Stars burn gases in their cores, converting chemical elements into heavier elements through a process called nuclear fusion. The core's size increases and the star gets brighter; as the core continues to increase, the star will become a red giant.

VELCRO	RELATED INFORMATION
YEAR DISCOVERED	Early 1940's
WHO DISCOVERED IT?	Swiss inventor-George de Menstral
WHY WAS IT DEVELOPED?	His dog's coat and his pants were covered with cockleburs. His inventor's curiosity led him to study the burrs under a microscope, where he discovered their natural hook-like shape. This was to become the basis for a unique, two-sided fastener—one side with stiff "hooks" like the burrs and the other side with the soft "loops" like the fabric of his pants. The result was VELCRO® brand hook and loop fasteners, named for the French words "velour" and "crochet."
WHAT IS IT USED FOR TODAY?	Today, this hook and loop invention ranges from the standard fastening tapes of woven and knit construction to custom-designed specialty fasteners.
RESOURCE	"Velcro.com," webmaster@velcro.com, http://www.velcro.com/ABOUT/history.html, November 21, 2007.

Pollutant Found	Observation Method	Point Pollutant	Non-Point Pollutant	Explanation of WHY this is classified as a pollutant

Unit 8, Activity 6, Linkert Scale Example

Decide whether these activities can be easily corrected or a solution found. Please rate how strongly you agree or disagree with each of the following statements by placing a check mark in the appropriate box.

1. = strongly disagree
2. = somewhat disagree
3. = somewhat agree
4. = strongly agree

1	2	3	4	ACTIVITY
Strongly Disagree	Somewhat Disagree	Somewhat Agree	Strongly Agree	A. Agricultural runoff into streams and rivers
Strongly Disagree	Somewhat Disagree	Somewhat Agree	Strongly Agree	B. Fertilizer runoff into streams and rivers from golf courses, subdivisions
Strongly Disagree	Somewhat Disagree	Somewhat Agree	Strongly Agree	C. Clear-cutting timber in forests
Strongly Disagree	Somewhat Disagree	Somewhat Agree	Strongly Agree	D. Saltwater intrusion into a nearby cypress swamp
Strongly Disagree	Somewhat Disagree	Somewhat Agree	Strongly Agree	E. Increasing dependency upon petroleum products

Unit 8, Activity 6, Human Impacts/Activities Links

Agricultural runoff into streams and rivers
Managing Farm Runoff
http://www.ewg.org/node/22570
Link between agricultural runoff and massive algal blooms in the sea
http://www.eurekalert.org/pub_releases/2004-12/su-rdd120804.php

Southeast Rivers and Streams > Threats to Biodiversity
http://www.worldwildlife.org/wildplaces/sers/threats.cfm
Louisiana Agriculture
http://nonpoint.deq.louisiana.gov/wqa/agriculture.htm

Fertilizer runoff into streams and rivers from golf courses, subdivisions
Land Use & Water Quality
http://www.wnrmag.com/stories/1998/aug98/golf.htm
Urban runoff
http://nonpoint.deq.louisiana.gov/wqa/urbanrunoff.htm
Managing Land for Clean Water
http://www.crjc.org/managingland.htm

Clear-cutting timber in forests
The Clear-cutting Controversy - Myths and Facts
http://www.wvu.edu/~agexten/forestry/clrcut.htm
Protection of Louisiana Cypress Forests
http://louisiana.sierraclub.org/pdf/Cypress_Press_Release2.pdf
Clear-cutting cypress trees
http://www.bestofneworleans.com/dispatch/2007-08-14/cover_story.php

Saltwater intrusion into a nearby cypress swamp
Coastal Wetlands
http://www.saveourlake.org/wetlands.htm#cypress
Saving Cajun Country
http://science.nasa.gov/headlines/y2002/01nov_coast2050.htm

Increasing dependency upon petroleum products
From A Carbon Economy to a Mixed Economy: A Global Opportunity
http://www.gcrio.org/CONSEQUENCES/vol4no1/carbonecon.html
Science Week - EARTH SCIENCE: ON HYDROCARBON RESERVOIRS
http://scienceweek.com/2004/sc040123-2.htm
What Is Petroleum and History of Oil
http://lsa.colorado.edu/essence/texts/petroleum.htm

What you can do to clean the air.
http://www.epa.gov/air/actions/
What is being done about pollution?
http://www.epa.gov/earth1r6/6sf/pdffiles/0600576.pdf
US EPA Sites by State
Choose Additional Information
http://www.epa.gov/superfund/sites/query/queryhtm/npldel.htm#Louisiana

Newsletter Rubric

CATEGORY	4	3	2	1
Content - Accuracy	All facts are accurate.	1 or 2 inaccurate or off topic facts.	3 or 4 inaccurate or off topic facts.	5 or more inaccurate or off topic facts.
Spelling and Proofreading	No spelling or grammar errors remain after one or more people read and made corrections.	No more than 2 spelling or grammar errors remain after one or more people read and made corrections.	No more than 3 spelling or grammar errors remain after one or more people read and made corrections.	Several spelling or grammar errors remain in the final copy.
Graphics	Graphics are in focus, are well-cropped, and are clearly related to the topic.	Graphics are in focus and are clearly related to the topic.	80-100% of the graphics are clearly related to the topic.	More than 20% of the graphics are not clearly related to the topic.
Purpose	90-100% of the information establishes a clear purpose and demonstrates a clear understanding of the topic.	85-89% of the information establishes a clear purpose and demonstrates a clear understanding of the topic.	75-84% of the information establishes a clear purpose and demonstrates a clear understanding of the topic.	Less than 75% of the information establishes a clear purpose and demonstrates a clear understanding of the topic.
Interest	The information contains facts, figures, and/or word choices that make it exceptionally interesting to readers.	The information contains facts, figures, and/or word choices that make it interesting to readers.	The information contains some facts or figures but is marginally interesting to read.	The information does not contain facts or figures that might make it interesting to read.
Attractiveness & Organization	There is exceptionally attractive formatting and well-organized information.	There is attractive formatting and well-organized information.	The formatting is somewhat attractive and information is well-organized.	Formatting and organization are confusing to the reader.
Contributions of Group Members	Each person in the group has contributed at least two parts and one graphic without prompting from teachers or peers.	Each person in the group has contributed at least one part and one graphic with a few reminders from peers.	Each person in the group has contributed at least one part with some minimal assistance from peers.	One or more students in the group required quite a lot of assistance from peers before contributing.

Score _____