

Science Packet: Earth Systems



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Name _____

Team _____

Earth Systems Tentative Pacing Guide

Week	Textbook	Multimedia	Experiments
1= August 23-27	wolfpups.org	Alaska's Geography Alaska's Resources	Mine-a-Pie
2= Aug. 30 to Sept. 3	Features of Earth Ch. 5, lesson 1	Planet Earth	Water Bottle Rockets
3= September 7-10	Moving Continents Ch. 5, lesson 2	Plate Tectonics	Slime
4= September 13-17	Forces that Shape Ch. 5, lesson 4	Volcanos and Earthquakes	Paste with a Taste
5= September 20-24	Rocks and Minerals Ch. 6, lesson 1	Rock Cycle	Jelly Belly Sorting Mineral Identification
6= September 27-30	Quiz on Ch. 5-6 Weather Ch. 7, lessons 1-2	Hurricanes Tornados	
7= October 4-8	Predicting Weather Ch. 7, lessons 3-4	Climate Change	Dry Ice
8= October 11-15	Review	Jeopardy Test Preview Earth Systems TEST (open notes)	

Science Video Assignment: "A Closer Look at Space: Earth"

Name _____ Date _____

Directions Please fill in the blanks based on the information provided in the video. The video is called "A Closer Look at Space: Earth" and it can be accessed on discoveryeducation.com. The login and password are both **northstarstudents**.

1. The Earth moves in two ways. It _____ on its axis and it _____ around the sun.
2. The atmosphere contains layers of _____. Most of Earth's atmosphere contains _____ and _____.
3. The _____ layer of the atmosphere keeps us from being hurt by the strong rays of our sun.
4. The atmosphere protects the Earth from getting too _____ or cold and protects the Earth from getting hit by objects from _____.
5. Rocks are made up of smaller pieces called _____.
6. What are the three types of rocks?
 - a. _____ They were once melted, cooled, and hardened
 - b. _____ They formed from layers of minerals pressed together
 - c. _____ They are when igneous or sedimentary rocks are changed from heat or pressure.
7. What are the three layers of Earth?
 - a. _____ Earth's newest and outside layer
 - b. _____ Earth's thickest layer. It is really hot.
 - c. _____ Earth's hottest layer. It contains liquid rock called magma.

8. What are some examples of different types of landforms?
9. Earth's crust is divided into twelve _____.
10. Movement in the plates can cause changes in landforms and cause earthquakes, mountains, and _____.
11. _____ is always changing the surface of the Earth.
12. Wind and _____ cause weathering and water and _____ can break apart rocks.
13. Erosion is caused by water, _____, other rocks, and _____.
14. Glaciers are large sheets of ice that slowly move across _____.
15. Volcanoes can erupt lava, _____, rock, and gasses.
16. The Earth can also change quickly from earthquakes and storms which can cause _____.
17. Give one example of weathering that you have seen in person or on the news. You may draw a simple picture to complement your description.

Science: Changes Over Time Chapter 5, Lessons 1-2

Name _____ Date _____

1. Earth's water exists in two basic forms: _____ water and fresh water.

More than _____ percent of the water on Earth is salt water. Most of Earth's fresh water exists as _____. page 245

2. What is the definition of a relief map? page 247

3. A topographic map shows _____, the height above or below sea level. You can find elevation by using _____ lines. Contour lines connect places on a map that have the same _____. page 249

4. The _____ and rigid part of the _____ make up what is called the _____. page 250

5. The core is made up of two parts. The _____ core is the molten, or fluid, part of the core. The _____ core is _____.

6. In your words, please explain what is continental drift. page 256

7. Locations where plates move apart are called _____ boundaries.

Locations where plates collide are _____ boundaries. page 260

Sometimes one colliding plate carries part of an ocean floor, and the other carries part of a continent. Then the oceanic plate slides under the continental plate in a process called _____. Some plates simply slide past each other.

The boundary between these plates is a _____ boundary. page 261

Science: Soil Cycle

Chapter 5, Lesson 4 and Soil Presentation

Name _____ Date _____

Page 284

1. _____ is the breaking down of rock into smaller pieces by natural process.
2. _____ weathering (also called _____ weathering) is the breaking down of rock by physical changes. It can be caused by freezing water, moving water, plants, or animals.

Page 285

3. _____ is the breaking down of rock by changes in its chemical composition. _____ and acids are powerful agents of chemical weathering.

Pages 286-287

4. _____ is the picking up and removing of rock pieces and other particles. Particles moved by erosion usually end up in a different place.
5. _____ is the dropping off of particles in another location.
6. What are a few causes of erosion?

Page 290

7. _____ is a mixture of weathered rock, air, water, and _____. Humus is a material made of decayed plant and animal remains.
8. What four things contribute to the formation of humus?
9. Soil begins as _____. The rock, which is the parent material, is _____. Over time, the rock breaks into smaller pieces, forming a thin layer of soil. Plants and animal grow in and on the soil. When they _____, their remains _____ the soil.

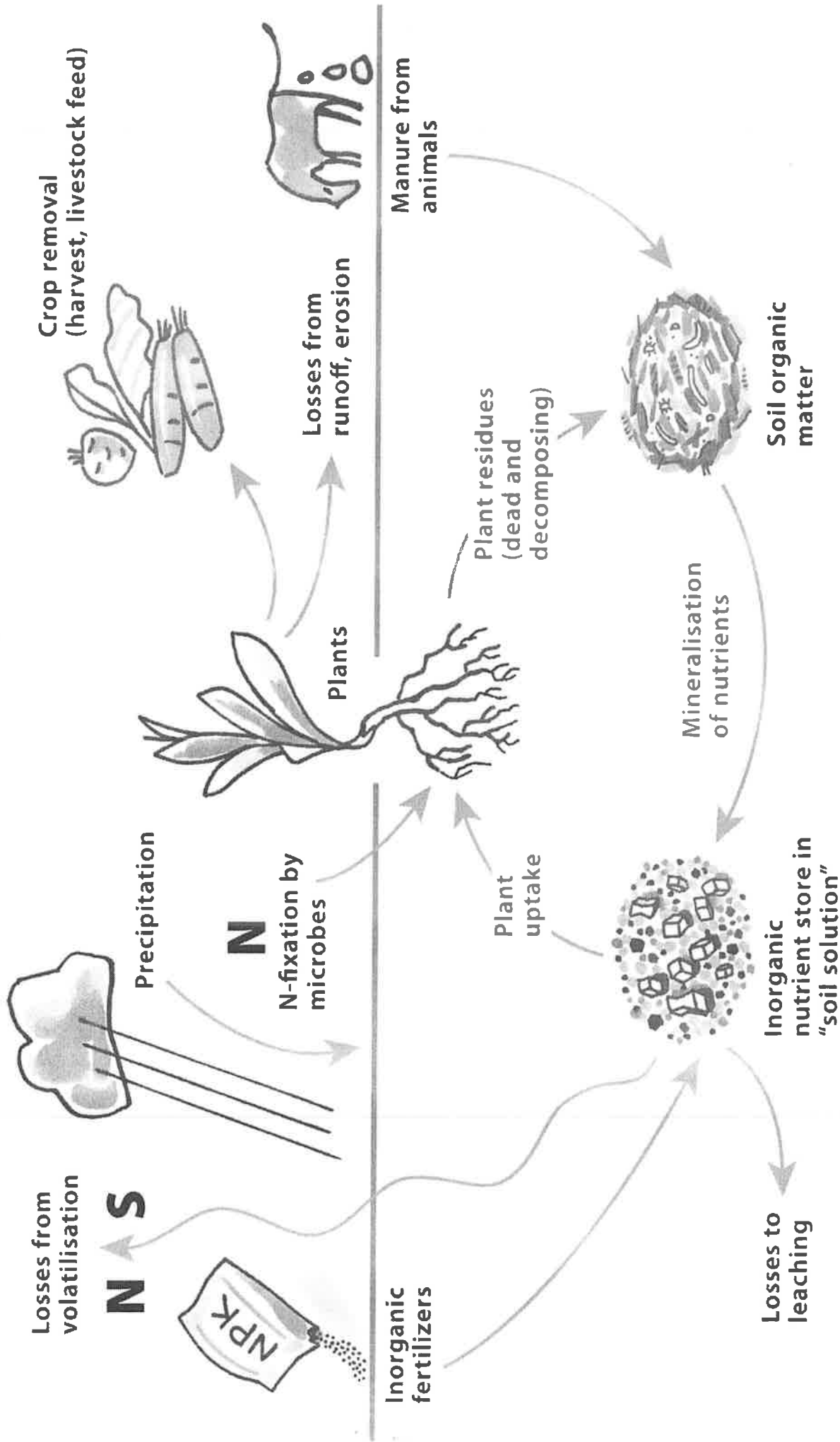
10. All soils have spaces called _____ between the rock fragments. If the pores in the soil are connected, _____ can pass through the soil easily. This soil is said to be _____. If the pores are not connected, or if they are few or no pores, water cannot pass through easily. This kind of soil is _____.
11. Most living things depend either directly or indirectly on soil. Soil is the material that most plants need in order to _____.
12. _____, a vital part of the food web, takes place primarily in the soil and _____ it. People can then grow crops in this enriched soil and continue the cycle.
13. Different _____ need different types of soil as well as different _____ in order to grow well.

14. Soil contains _____ that organisms need to survive. Growing plants use up the minerals from the soil. These minerals are _____ naturally by rain and _____. Decaying plants and _____ also resupply some minerals.

Soil Cycle Presentation: https://prezi.com/e_sbaze03a4r/soil-and-its-formation-cycle/

15. Climate affects the _____ and rate of weathering that will occur.
16. In cooler regions, physical disintegration is more prominent and there is a _____ rate of decay. As a result, colder areas often have more _____, less developed soil.
17. Freezing and _____ of water widens _____ and cavities in rock.
18. List three ways people have impacted Earth's soil.

SOIL NUTRIENT CYCLE



Science: Minerals and Rocks

Chapter 6, Lesson 1

Name _____ Date _____

Page 314

1. _____ are the naturally occurring solid materials of Earth's crust. They are made up of elements. An element is a substance that cannot be _____ into a simpler substance. Rocks usually contain a mixture of _____.
2. Minerals have varying degrees of _____ and they _____ apart in different ways. No two minerals are identical.
3. _____ is the most obvious physical property of a mineral. Color is useful in identification. However, some minerals can be different colors, and different minerals can share the same color.

Page 315

4. The _____ of a mineral is another property that provides a clue to identification... The feel of a mineral depends on the sizes and shapes of the _____ in it.
5. A _____ is a solid that has a structure arranged in orderly, fixed patterns. A crystal's _____ depends on the way its structure is arranged.
6. The way a mineral _____ is another important property. Some minerals tend to break along flat surfaces. This property is called _____.
Cleavage is described by the number of _____, or directions, along which the mineral breaks.

Page 316

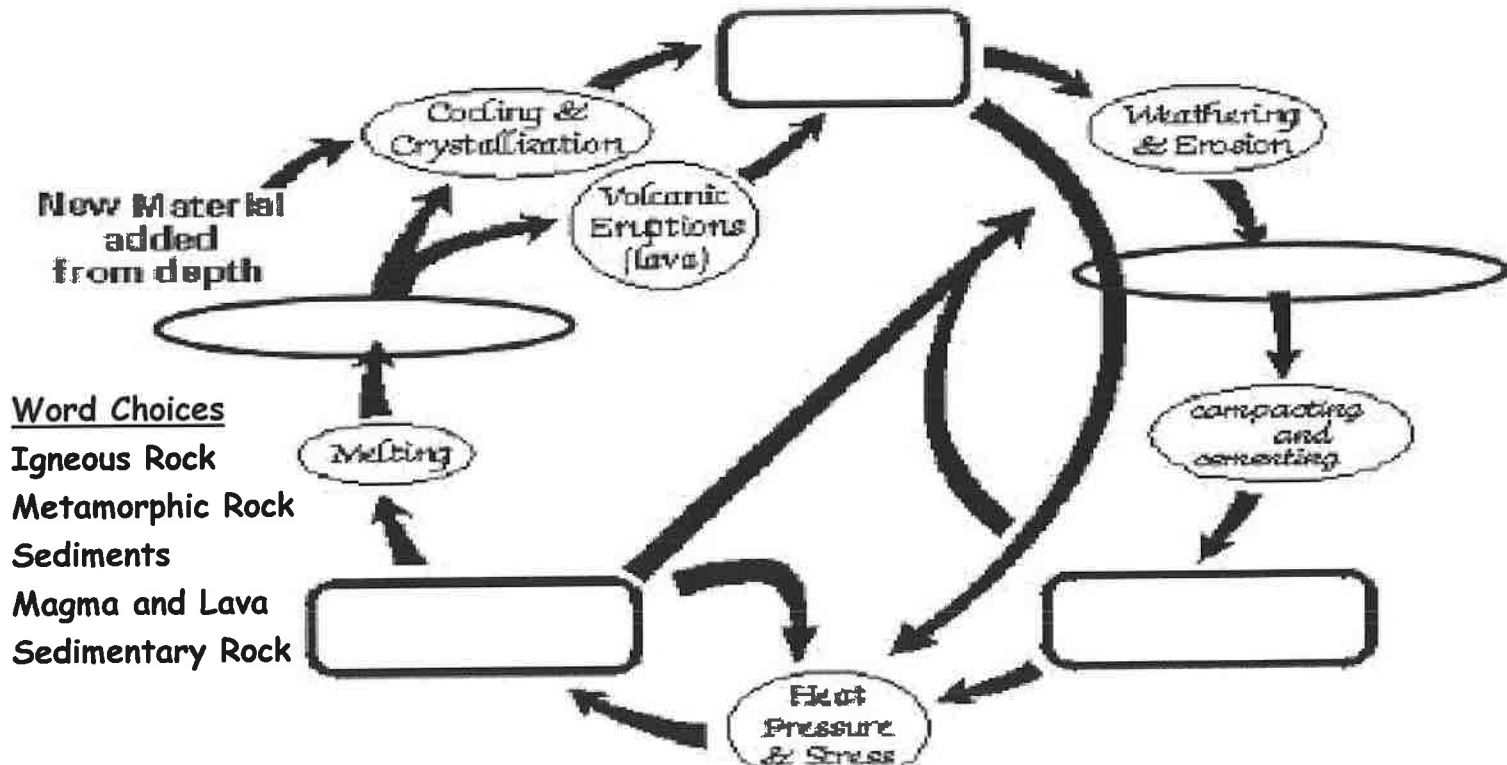
7. _____ is a measure of how well a mineral resists scratching.
8. Friedrich Mohs, a German scientist, devised a scale of _____ to compare minerals to one another. This has come to be known as _____ scale.
9. What are the softest and hardest minerals?

10. _____ is the color of the mark left when a mineral is _____ against a hard, rough surface. The streak is always the same for a particular _____, even when the mineral's surface varies in _____.
11. _____ refers to the way that minerals reflect _____. Minerals with a _____ luster appear shiny, like metal. Minerals with a _____ luster can be described as glassy, pearly, oily, earthy, waxy or silky.
12. Some minerals have other special _____ that can be used to identify them. For example, _____ gives off a garlicky odor when it is heated. Copper is a very good _____ of electricity. _____ attracts elements such as iron, nickel, and cobalt and is a naturally formed _____.

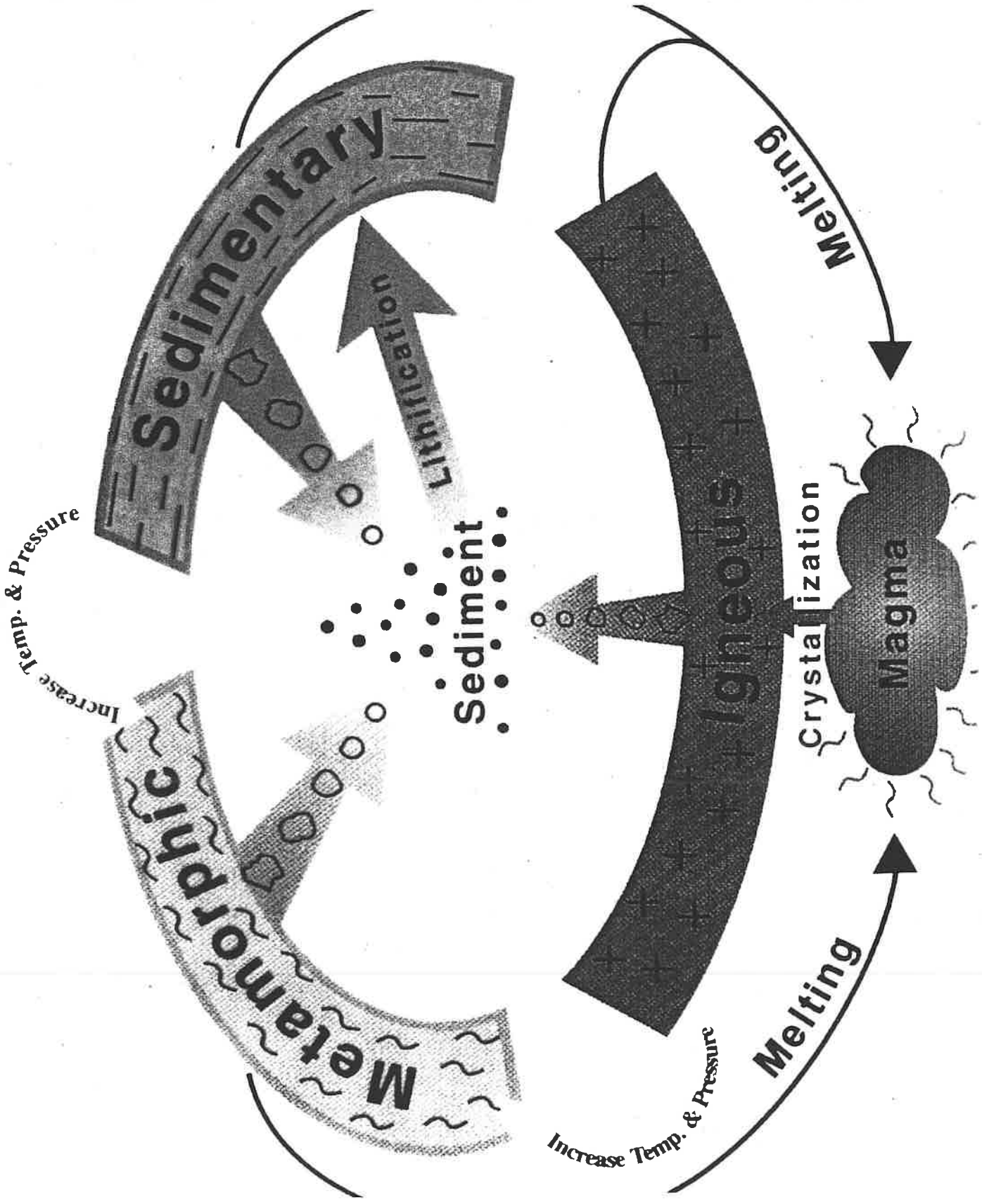
13. In a process known as the _____ cycle, rock can continually _____ from one kind of rock into another over long periods of time.

The Rock Cycle

Complete the chart



- Word Choices
- Igneous Rock
 - Metamorphic Rock
 - Sediments
 - Magma and Lava
 - Sedimentary Rock



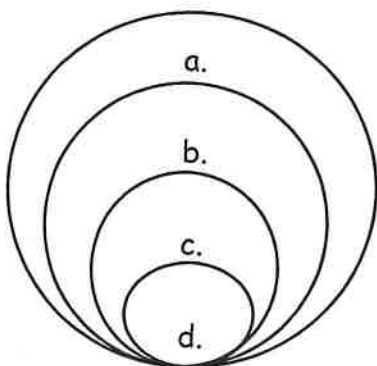
ROCK CYCLE

Science: Weather and Climate
Chapter 7, Lesson 1: The Atmosphere and Weather

Name _____ Date _____

1. What is the definition of atmosphere? page 370

2. Label the four layers of the atmosphere page 371



a. _____ above 80 km (50 miles)

b. _____ 40-80 km (25-50 miles)

c. _____ 11-40 km (7-25 miles)

d. _____ 0-11 km (0-7 miles)

3. What two elements make up 99% of Earth's atmosphere? page 371

_____ and _____

4. At what temperature does water freeze and boil in Fahrenheit, Celsius, and Kelvin?

page 373

Freeze

Boil

_____ Fahrenheit

_____ Celsius

_____ Kelvin

5. What instrument is used to measure wind speed? page 375

Extra Credit

Complete the Inquiry Activity: How can you observe air pressure? page 369

Please complete the activity at home with your parent/guardian's supervision.

Write down the answers to the questions on the back of this page.

Science: Weather and Climate
Chapter 7, Lesson 2: Precipitation and Clouds

Name _____ Date _____

1. What is the difference between evaporation and condensation? page 382

2. Clouds are described as _____, middle or _____, clouds, depending on the _____ at which they form page 384

3. Draw simple pictures of scattered clouds and mostly cloudy. page 384

<u>Scattered Clouds</u>	<u>Mostly Cloudy</u>

4. As _____ falls, it passes through the lower _____ where the _____ determines which form the precipitation will take as it nears the ground. page 386

5. What is the definition of sleet? page 387

6. Thunderstorms begin when intense _____ causes air to rise quickly. This heated air, or _____, cool and forms _____. page 388

7. Where should you take shelter if you hear a tornado warning? page 389

Home _____

Outdoors _____

Extra Credit

Complete the Inquiry Activity: How can you make a model of fog? page 369

Write down the answers to the questions on the back of this page.

Science: Weather and Climate
Chapter 7, Lessons 3-4: Predicting Weather & Climate

Name _____ Date _____

1. What do scientists study to predict weather? page 398

2. Describe how the properties of an air mass depend on the region in which it forms. page 400

3. Explain the steps you should follow to interpret a weather map. page 401
 - a. First look at the _____ and _____.
 - b. Recognize that _____ usually means _____ weather.
 - c. Then look at _____, which always come out of _____.

4. Climate is the _____ weather _____ of a _____ page 408

5. The two main factors that determine climate are _____ and _____ page 410

6. List the main factors that affect climate. pages 410-411

7. _____ changed the location of areas over a long period of time. page 412

Extra Credit

Complete the Inquiry Activity: How can you make a model of fog? page 397 or 407
Write down the answers to the questions on the back of this page.

Let It Rain

Name _____

Background: Different parts of the world receive different amounts of rain. For example, Ketchikan, a town in Southeast Alaska, receives an average of 160 inches (406.4 cm) of rain each year. However, Tucson, Arizona receives an average of only 12.7 inches (32.3 cm) of rain per year. Depending on where you live, it might rain for weeks at a time or it might rain very little. Do you know what causes rain? Rain occurs when water droplets, contained in clouds, become too heavy and numerous and eventually fall to the ground. Rain is one type of **precipitation** - the process through which liquid water returns to the earth. Did you know that you could make it rain in your classroom? Read below to learn how.

Materials:

- Hot water
- Ice cubes
- Large glass jar
- Plate

Activity:

1. Pour 1/2 cup of hot tap water into the jar. **Be careful not to burn yourself!**
2. Cover the jar with the plate and allow to stand for 5 minutes.
3. Place the ice cubes on the plate and observe what happens.
4. Answer the questions below.

Questions:

1. What happens to the water in the jar?
2. Where does condensation occur?
3. Describe how evaporation occurs.
4. How does condensation occur in this experiment?
5. What do you think would happen if you used cold tap water? Try it!

Earth Systems Study Guide

Synopsis

Posted below are the topics for the entire test. To be successful on the test you should complete your Earth Systems packet and bring it with you to the test, as the test is open notes. In addition, you will need your quiz, with corrections, and your Science notebook. The test has 20 multiple choice questions and 10 matching questions. There is one optional short answer extra credit question. Please visit Mr. Kinder's website, wolfpups.org, for links to videos, experiments, and other resources.

Every student has the ability to earn an A on this test if he or she completes the Study Guide and corrects the Earth Systems packet. If you were absent during any lessons please see a friend to copy the notes and/or assignments that you missed.

Multiple Choice Questions

1. What are the three different types of rock?
2. How can geologists identify minerals?
3. What are the steps in the Rock Cycle?
4. What are the three main layers of Earth?
5. What is Moh's Hardness Scale?
6. How have people impacted Earth's soil?
7. What four things contribute to the formation of humus?
8. What is the Soil Cycle?

9. What are the steps in the Water Cycle?
10. What is a water phase change?
11. What is condensation?
12. What are the different types of precipitation?
13. Which layer of the atmosphere contains 99% of all water vapor?
14. What is not a weather variable?
15. At what temperature does water freeze and boil in Celsius?
16. What instrument is used to measure wind speed?
17. What factors impact how clouds form?
18. What causes thunderstorms to form?
19. What is the wind speed of a tornado?
20. What two factors have the greatest impact on climate?

Matching

21. What are minerals?

22. What is plate tectonics?

23. What is decomposition?

24. What is erosion?

25. What is deposition?

26. What is weathering?

27. What is weather?

28. What is a hurricane?

29. What is an air mass?

30. What is climate?

Extra Credit Short Answer Questions

31. Describe how global warming is impacting Alaska. Give specific examples that you've seen or heard about.

STEM Experiment: Mine-a-Pie

Names _____

Synopsis

In this experiment, you and your team, will carefully "mine" a pie for valuable "minerals." You have a budget of \$1000 and you must decide how to use your money to receive the highest possible profit. Since the mining season is limited by the weather, you will have a finite amount of time to mine (ten minutes). Your profit is based on how many valuable minerals you can extract from the mine before the time expires. You will receive substantial monetary penalties (\$200 per incident) if you damage the environment (e.g. get frosting or crumbs anywhere). You may not touch anything except the tools that you purchase. You will complete the Profit Analysis Sheet to determine your overall success.

EXPENSE CHART

You begin the mining season with a \$1000 budget to purchase various mining resources. Complete the following Expense Chart BEFORE you begin mining. The funds that you don't spend are considered profit. You may not make additional purchases after you begin mining.

Resource	Description	Cost	Purchases
Land Lease	Pie	\$300	\$300
Insurance	Only pay \$100 per incident (1/2 normal)	\$250	
Excavator	Fork	\$150	
Loader	Spoon	\$100	
Scraper	Knife	\$50	
Crane	Toothpick	\$50	
Drill	Straw (cost per drilling)	\$50	
		TOTAL EXPENSES	

PROFIT ANALYSIS SHEET

Carefully identify and count the minerals that you extracted.

Resource	Description	Value	Amount Mined	Income
Gold	Corn	\$100		
Coal	Black Beans	\$10		
Jade	Peas	\$50		
Oil	Chocolate Syrup	\$150 per time "oil" was found with a "drill" (straw)		
Diamonds	White Sprinkle Beads	\$200		
			TOTAL INCOME	

How many times did your team have a "spill" (frosting or crumbs)?

Penalties	Expense	Incidents	Fines
Environment incidents	Pay \$200 per incident, or \$100, if you bought insurance		

Total Income _____

Fines _____

Total Expenses _____

Net Profit

REFLECTION

What did your team learn about mining?

What would you do differently if you had a second opportunity to mine?

**Excavator
(Fork)**



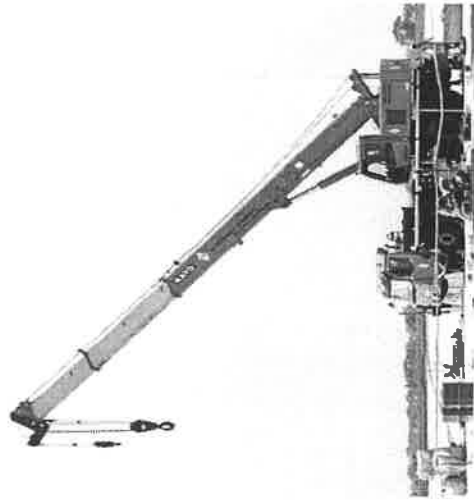
**Loader
(Spoon)**



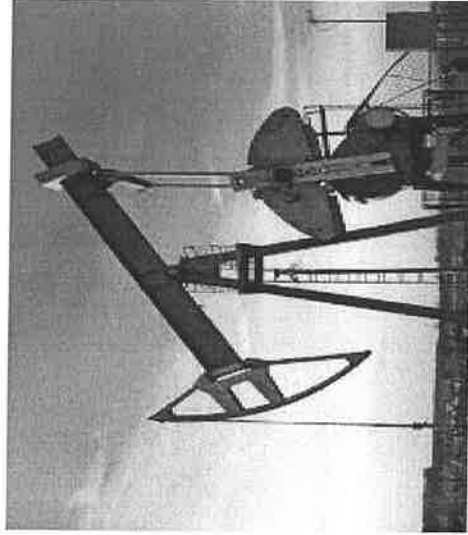
**Scraper
(Knife)**



**Crane
(Toothpick)**



**Drill
(Straw)**



How to Make Slime



Ingredients

Plastic Bowl

Water

Glue Bottle (recommend clear glue)

Borax or Eye Contact Solution and Baking Soda

Directions

1. Pour out the glue into the plastic bowl
2. Fill the empty glue bottle with water and pour it in the bowl and mix
3. Optional: Add food coloring and/or glitter and mix with the glue
4. Borax option
 - a. Heat a cup of water in the microwave for one minute
 - b. Add the Borax to the warm water and stir
 - c. Gradually pour the Borax into the glue bowl and mix
 - i. The more Borax you add the harder the glue will become
5. Eye Contact Solution option
 - a. Add a teaspoon of baking soda to the glue bowl and mix
 - b. Add a tablespoon of Eye Contact Solution to the glue bowl and mix
6. Drain the excess liquid and play with your slime
7. Store your slime in a zip lock bag

Paste with a Taste



Ingredients

Small Plastic Cup

Calcium Carbonate (or crushed TUMS)

Baking Soda

Popsicle Stick

Eye Dropper (or pour small amount at a time)

Water

Optional: Food Dye

Food Flavoring

Artificial Sweetener

Directions

1. Read the "Rocks in Your Mouth" article
2. Pour the calcium carbonate and baking soda into the cup and mix together
3. Use the eye dropper or pour a few drops of water into the cup and mix
4. Apply some of the paste from the cup to the popsicle stick and taste it
5. What do you think about the taste? Would you want to brush your teeth with it?
6. Add food dye and taste it. Does it change the taste?
7. Add food flavoring to the paste and taste it. What do you think now?
8. Add one packet of artificial sweetener and taste it? Is it better?
9. Brush your teeth with the paste for 30 seconds. What do you think?
10. Rinse your mouth out and eat something sweet.

"Paste with a Taste"

Toothpaste history

ROCKS IN YOUR MOUTH

by John Sznopek, USGS

Did you know that the stuff you brush your teeth with contains minerals? The toothpaste we all use every day to brush our teeth contains many different kinds of materials, including, amazingly, crushed rocks. Nevertheless, that's only part of the story. Let's start at the beginning and introduce you to this common household product. Later, we'll come back to those useful rocks.

After we eat foods containing sugar, armies of bacteria living in our mouths convert sugar to acid. This acid can attack our teeth and cause cavities. Brushing our teeth with toothpaste helps to prevent this through mechanical and chemical processes. The most obvious process in brushing is a mechanical action, which cleans the food debris and plaque from our teeth. One of the chemical processes that takes place when you brush your teeth is the neutralization of acid so that it can no longer attack. Yet another chemical process is the removal of stains by a special whitening agent. Chemicals contained in toothpaste may also kill bacteria. Killing bacteria lessens the formation of plaque. The plaque we are talking about is not an award hanging on the wall. This type of plaque is a thin layer on our teeth, which contains pieces of food, saliva and bacteria. If plaque is not removed from our teeth, tartar, also called calculus, eventually forms. Tartar is plaque that has hardened on our teeth. Formation of tartar can then lead to cavities or gum disease, neither of which we want. Toothpaste helps to reduce tartar buildup, but only professional cleaning removes tartar.

When toothpaste was first developed, its only function was to clean teeth. So, its composition was fairly simple. Your grandparents probably remember brushing their teeth with table salt or baking soda. That's really basic. Today, toothpaste does a lot more. It helps prevent tooth decay and gum disease. It also desensitizes and whitens teeth. These modern dentifrices (another name for toothpaste) remove stains and food particles from our teeth, and also have certain desirable physical properties. For example, you would not want the toothpaste to run off the brush and down your arm, so consistency is important. Toothpaste has evolved into quite complex formulas. It has to fulfill many functions, both therapeutic and cosmetic.

Toothpaste is composed of many different ingredients, each having a very special function. Searching for active ingredients led to the use of stannous fluoride. It could be combined safely with toothpaste and prevented tooth decay. Fluoride has been added to drinking water for 50 years and has been available in toothpaste since the 1950s. One of the principal natural sources of fluoride is fluor spar. Fluor spar is a mineral composed of calcium and fluorine. Although fluor spar ore is found worldwide, it is not produced in the United States. China is the world's largest producer of fluor spar ore. Other active ingredients incorporated into toothpaste loosen plaque and prevent its buildup. Additional chemical additives are incorporated in some toothpaste to promote healthy gums.

What keeps toothpaste together? What keeps it smooth, creamy, and prevents it from drying out and becoming hard as a rock? The answer is a humectant. Humectants are a major element in all toothpastes. They help to retain moisture and make toothpaste creamy and squeezable. Glycerin and sorbitol are two common humectants. Glycerin, also called glycerol, is a by-product of soap manufacturing. Sorbitol is found in some berries and fruits. Both glycerin and sorbitol are alcohols that may be synthetically produced. They both mix with water, are odorless, and sweet tasting. Most toothpaste contains glycerin, which acts both as a plasticizer and a moistening agent.

Now, let's use our imaginations to understand the purpose of some other important materials in toothpaste. Picture an ocean, with its sandy beach, foaming surf, and some seaweed, which has washed up on this beach. Each of these represents some components of the toothpaste. When you clean your teeth, the action of rubbing toothpaste against your teeth produces foam similar to that produced at the beach. Brushing activates a detergent called sodium lauryl sulfate. The foam that is generated helps the toothpaste to penetrate and loosen deposits on the surface of your teeth.

Chemicals made from seaweed are used as binders. Binders help the toothpaste maintain its shape as it sits on your toothbrush. Various types of gums, but not the chewing variety, are also used to keep all the ingredients together in a nice blob. Some examples of these gums are xanthan gum and cellulose gum.

Jelly Belly Identification

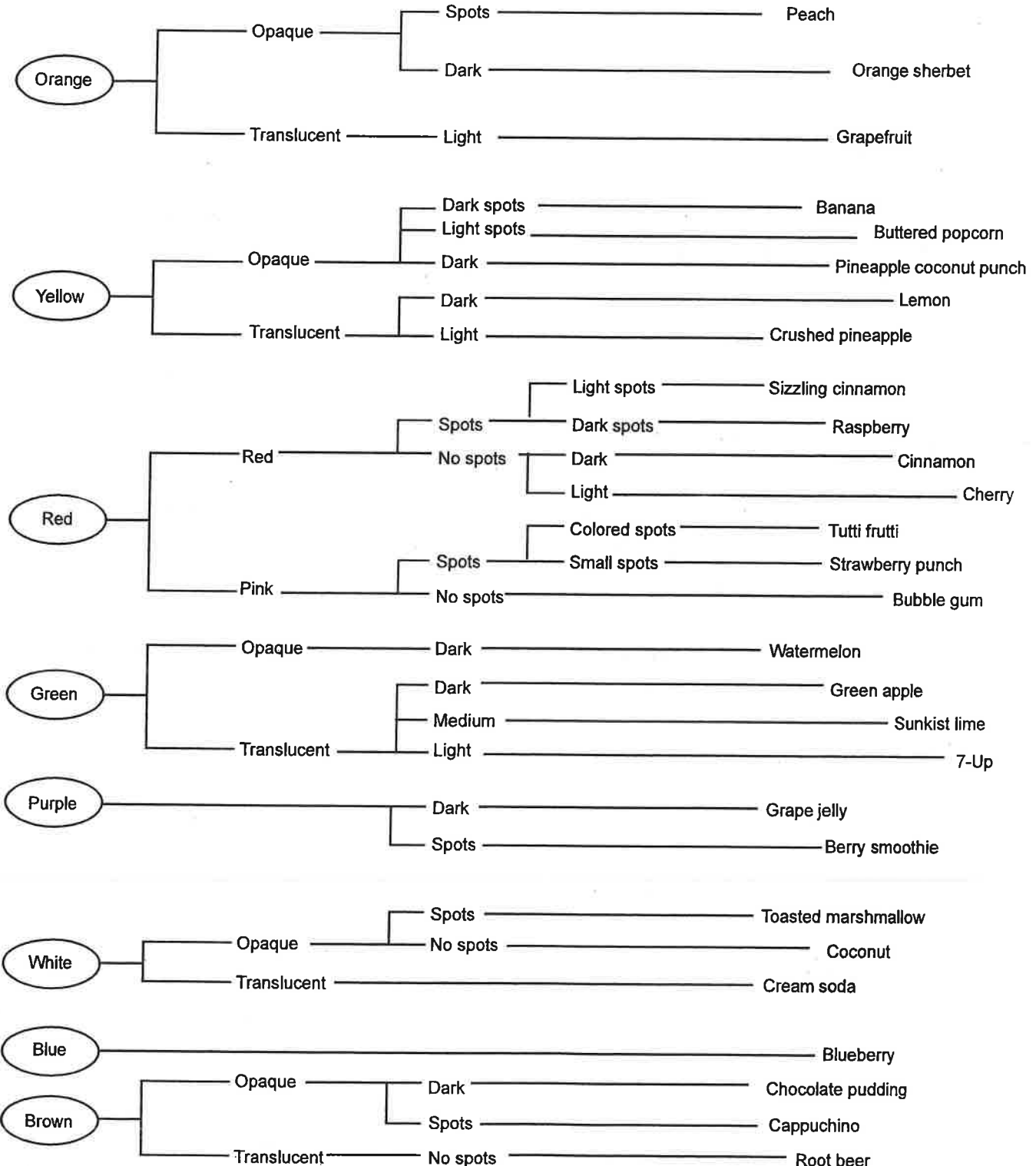
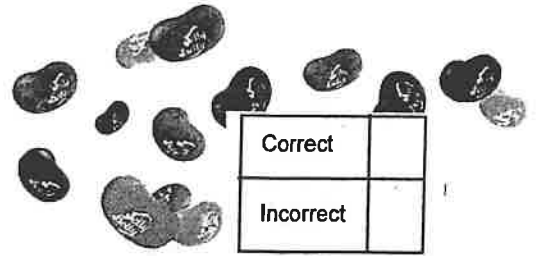
Synopsis

At this station, you will practice rock identification skills using Jelly Bellies. You will use the Jelly Belly Geology Key to sort the Jelly Bellies. Please use the spoon to sort the Jelly Bellies, not your hands, unless you wash your hands first.

Directions

1. Do NOT eat the Jelly Bellies until instructed.
2. Begin by looking at the color of the Jelly Bellies and place them on the Jelly Belly Geology Key.
3. Sort the Jelly Bellies by their translucence. If you can't see any light through the Jelly Belly it is "opaque" and if you can see some light it is "translucent."
4. Continue sorting the Jelly Bellies based on their coloration and markings.
5. After you finish sorting the Jelly Bellies, recheck and adjust any of them as you see fit.
6. Time to eat! Take turns eating the Jelly Bellies to check if your guesses were accurate. Be careful, it is possible some Jelly Bellies have been Beanboozled! 😊

Jelly Belly Geology Key



Mineral Scavenger Hunt

Synopsis

At this station, you are completing a Mineral Scavenger Hunt by answering specific questions about different minerals.

You may use the Rocks Minerals & Ores book or visit the "Minerals" link on Mr. Kinder's website: wolfpups.org. Visit the **Science** link under **Classes**.

Directions

1. To solve the Scavenger Hunt you need to investigate seven different minerals and answer specific questions.
2. When you have answered all the questions, circle the first letter in each answer. Unscramble the circled letters to find out:
What is more valuable than gold? *Hint: It's not a mineral... it's a new currency.*

3. What is the Formula for **Copper**? (write the first one)

4. What is the transparency of **Chrysoberyl**?

5. What is the cleavage of **Platinum**?

6. What is the crystal system of a **Diamond**?

7. What is the hardness scale of **Talc**? (Write out the number as a word)

Unscramble the letters to answer What is more valuable than Gold?

B I _____