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EARTH & SPACE LEVEL ONE
PREVIEW

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Revised Edition

R.E.A.L. SCIENCE ODYSSEY

Earth & Space (level one)

RSO Earth Science and Astronomy

for Grades 1 – 4

R.E.A.L. SCIENCE ODYSSEY - Read • Explore • Absorb • Learn

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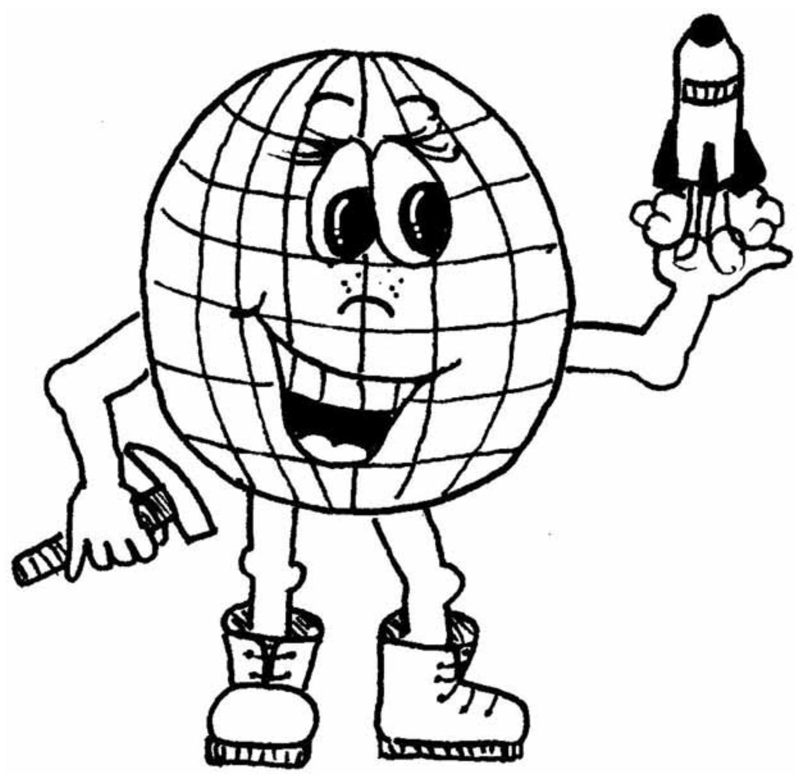

RSO Earth & Space (level one)

Revised Edition - Preview

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WHAT'S INSIDE THIS BOOK?

+Denotes "For My Notebook" lesson page **Denotes lab or activity*

THIS PREVIEW VERSION OF EARTH & SPACE (1) IS INTENDED FOR USE ON A PRINTER THAT PRINTS ON ONLY ONE SIDE OF THE PAPER. BLANK PAGES HAVE BEEN REMOVED FROM THIS FILE. YOU ARE NOT MISSING ANY PART OF THE PREVIEW, EVEN THOUGH YOU MAY NOTICE SOME MISSING PAGE NUMBERS. ONLY BLANK PAGES HAVE BEEN REMOVED.

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Kathleen Desmarais
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AN INTRODUCTION TO R.E.A.L. Science

Used one to two times a week, this book is a complete, rigorous, vocabulary-rich Earth and space science curriculum that needs no supplementation. It is not a collection of labs to do randomly and with no flow from one to the other, nor is it an overwhelmingly long progression of trivial facts to be memorized and forgotten. This course was designed so that even the parent/teacher with little background in science could pick it up and teach science successfully with no need for further organizing or research. This is the story of Earth and space.

This book is a minds-on and hands-on program. If you hate to touch dirt, wouldn't think about letting your child stay out late to look at stars, and have no intention of getting gooey and dirty, RUN NOW! Science is about experimentation, but there are "read-and-report" science curricula for the faint of heart. Are you still here? If so, roll up those sleeves and get ready to delve into the mystery of every rock you encounter.

This book was intended to be used from start to finish, much like a math book; as such, vocabulary and concepts build upon one another. You may encounter words and concepts that you feel the need to review and practice. Feel free to do that if you wish, but understand that vocabulary words are repeated throughout the story sections so your children will hear the same words many times. This is intended to help them learn without having to drill. Having said that, review can be good. Anytime you can use a concept to refer to something you see in real life, your child will benefit greatly. Moving rocks in the yard? How about showing your child the different minerals that make up the rock? No need to know what they are, just point out that they are there. Taking a walk in the country? Point out where you see erosion happening from rain or travelers. Planning a peaceful evening? How about lying under the stars? Look for meteors, planes, and satellites moving by. Use real words for what you see. Science is only a foreign language if it isn't used in real life.

For every notebook page in this book, children will do several lab activities that build upon and reinforce what they have heard. Labs also teach new material, so it is important to try to do all of the labs included. In addition, we have included journaling ideas plus book and Web site suggestions for a complete indoor and outdoor experience, and to provide further opportunity to dig into whatever your child finds most fascinating. You will notice that many labs are infused with age-appropriate math. Science is inherently mathematical with measuring, graphing, and calculating. If your child struggles with the math or with writing the results, don't let the lab papers overwhelm the lesson. The idea is to enjoy science. Much of the learning comes from doing and discussing. Read the questions to the pre-writing child and have him dictate the answers back to you, or if you both find the questions tedious, skip them altogether.

A few words about big words. You know the ones I mean: metamorphic, epicenter, seismology - EEEK! It's enough to make a person drop her science book and run in terror. Now, let me share a few more words with you: How about Tyrannosaurus Rex, Triceratops, and Velociraptor? All very long words that we have learned right along with our 3- and 4-year-olds. Show no fear in the face of these Greek and Latin based words and you too will be referring to "gibbous moons" at your next park day!

GETTING STARTED

1. Have fun. That's number one.
2. If you are a computer person, pull out the Web site list (pp. 16-17) and leave it by your computer so you can look things up as your child shows interest.
3. If you are a book person, pull out the library book list (pp. 13-16) and go over it a few weeks before you do any given section. Leave it in your library book bag or by your computer so you can check on the availability of the books you might want to check out.

4. If you are a nervous "Did I teach my child enough stuff" type of person, go over the "What's the Big Idea?" pages in this book. It will tell you what sorts of things your child should come out of this course knowing. Use it with a grain of salt. Remember, the keys here are exposure and fun.
5. Look ahead to what material you will need for the upcoming week, or year if you're an uber-planner! It could be an inflatable globe, a piece of tagboard, or some sand. All required materials are listed on pages 8-9 for easy reference. Be prepared. A few items may need to be ordered.
6. Read the "For My Notebook" section to yourself once so you know how to pronounce the new words in it. Pronunciation of some potentially unfamiliar words are included right there so you can read them as you go, but you may need to look up something I haven't thought of. I'm sorry I don't know you that well.
7. Curl up under that weeping willow or in front of the fire and read the "For My Notebook" page to your children, even if they can read by themselves. There is one for each major topic. Pause to do whatever it tells you to—look at a globe, find a rock, etc. The notebook pages are written to your child and should be saved in his own notebook. They are purposely short so they will spark curiosity without overwhelming with new vocabulary.
8. Follow the lab activities with a day of nature journaling, reading from the extra reading list, or drawing. Drawing is an important skill for many scientists in the field or lab.
9. Did I mention you should have fun?

THE UNIQUE PAGES IN THIS BOOK

For My Notebook Pages

1. All the student pages have a boxed outline around the material presented. That way it is easy to identify what is for the child and what is for the parent or teacher.
2. The For My Notebook (FMN) pages are the lesson pages that present the majority of new material to the student. They are intended to be read aloud. Some students, who are good readers, may want to read the FMN pages aloud themselves to the parent or class. However orchestrated, these pages are intended to be read aloud and not silently to encourage discussion and questions.
3. New vocabulary words are underlined. You will notice that many of the vocabulary words are not presented with a classic dictionary definition. Instead, the explanation is given in context so it is "felt" rather than memorized. Formal definitions for the vocabulary words are offered in the back of the book.

Lab Sheets

1. The lab sheets are those pages that the student writes on. They also have a boxed outline because they are intended for the student, not the parent/teacher, to complete.
2. The lab sheets not only reinforce the material presented in the FMN pages, but they are also the vehicle through which this course reinforces and formalizes scientific method. On the lab sheets, students will be making hypotheses based on questions formed during the lesson. Students record observations and lab results, and make conclusions based on those results. They will also practice sketching details of their lab experiences, an important process that reinforces observation skills.
3. If you are working with a student who isn't writing yet, then have him dictate the information to be written on the lab sheets. If your student is unable to draw (meaning physically incapable; I'm not referring to artistic abilities), then have him describe in detail his observations as you create them on the lab sheet.

The Instructor Pages

1. The instructor pages contain the supply lists for the labs or activities and procedure instructions.
2. These pages are written for the parent/teacher, but the procedure is often written as if for the student. For example, "Complete the hypothesis portion of the lab sheet," is instruction for the student, not the parent.
3. Most instruction pages include a prompt to read aloud to students. A great deal of course instruction is found in these prompts. If you dislike prompts, then be sure to present the information in your own words.

WHAT'S THE BIG IDEA?

Whenever you study a subject, you have main ideas to learn and little details that are a nice bonus. It's true that science has a lot of new vocabulary and information. There are many challenging words in here that are used because they are the right words; after hearing them over and over, they will "sink in." They are not here for your children to memorize the first time around. Because of this, don't sweat the small stuff.

This outline gives you the big ideas that your children should get from each section and the small stuff that is an added bonus. If you and your children are timid scientists, just have fun as you try to learn the big ideas. If you and your children have a strong science background, work on learning the small stuff as well as the big ideas. Use these difficult words and science concepts gently–not with force–so that your children will enjoy their science experience.

BI = BIG IDEA SS = SMALL STUFF

<u>WEATHER AND SEASONS:</u>

BI = Weather can be measured, compared and graphed.
Some measurable weather features are temperature, precipitation, wind speed, and wind direction.
Earth's seasons are caused by the angle of Earth relative to the Sun.

SS = Water falling from the sky is called precipitation. Water in the air is water vapor.
Wind speed is measured with an anemometer.

<u>THE WATER CYCLE:</u>

BI = Water occurs on the earth in solid, liquid, and gas forms.
Water is cleaned and cycled in nature. This is called the water cycle.
Water is in the air.
The water cycle is powered by the Sun.

SS = The water on the earth now is the same water that has been around since long before the dinosaurs.
The water cycle consists of evaporation, condensation, precipitation, and accumulation.

<u>THE EARTH'S ATMOSPHERE:</u>

BI = Atmosphere is the layer of air around a planet.
There is no air in space.
Even though air is invisible, you can test to see if it is there.

SS = Our atmosphere is in layers. Weather occurs in the bottom layer.
Air has volume (it takes up space).
Air has mass (weight).
Some planets have no air.
Without air there is no weather—no wind, clouds, or precipitation
Air is made mostly of molecules of nitrogen, oxygen, and water.

<u>THE EARTH'S SURFACE:</u>

BI = The earth's surface is always changing.
Even under the oceans, the earth has mountains, trenches, and volcanoes.
The earth's surface is mostly water.

SS = The longest mountain range and the deepest valley are under the ocean.
The water on earth is in three main forms: fresh water, seawater, and polar ice caps.
Although the earth is largely covered with water, most of that water is not suitable for drinking.

THE EARTH'S INTERIOR:

BI = The earth is in layers. Some layers are solid and some are not.
The deeper you go toward the center of the earth, the hotter it gets.

SS = The layers of the earth are the crust, mantle, outer core, and inner core.
The crust is thin and solid. The mantle is semisolid. The outer core is liquid and the inner core is solid.

MINERALS:

BI = Minerals combine to make rocks.
Minerals have characteristics that you can test for.
Minerals form crystals.
We use minerals in almost every part of our daily lives including for our food, clothing, and housing.

SS = Minerals can be identified by their color, streak, luster, hardness, crystal shape, and cleavage.
Minerals are naturally occurring, inorganic solids with a definite crystal structure.

ROCKS AND THE ROCK CYCLE:

BI = Rocks are constantly being recycled and reformed into new rocks. This is called the rock cycle.
You can tell rocks apart by their color and texture and by the color, shape, and texture of the minerals that make up the rock.

SS = The three major rock types are igneous, sedimentary, and metamorphic.
Igneous rocks are melted and cooled.
Sedimentary rocks are pieces of rock broken and then cemented back into new rock.
Metamorphic rock is rock that has been heated and pressed enough to form a new type of rock.

EROSION:

BI = Water, ice, wind, plants, and animals can cause weathering and erosion.
Weathering is the breaking up of rock into small pieces.
The farther a rock is carried by water, the smaller it gets.

SS = What is commonly called erosion is actually weathering, erosion, and deposition.
Weathering breaks rocks apart. Erosion carries the rock parts to a new place.
Deposition occurs when rock parts accumulate in a new place.
After rock pieces are deposited together, they can become new rock.

SOIL:

BI = Soil is often called "dirt."
Soil is made of tiny bits of broken rock, plant and animal material, air, and water.
Without the proper soil, plants cannot grow.
Earthworms are good for the soil.
Without erosion there would be no soil.

SS = There are different types of soil based on the different ingredients and amounts of these ingredients.

THE MOON:

BI = The Moon goes around Earth. Each night the Moon appears to change shape because the side we see is not always the side the Sun is shining on.
The Moon and Earth each spin in place and they each travel around another body.

SS = A rotation is one complete spin on an axis. We call that one day.
A revolution is one trip around another body (like the Sun). One full circle around the Sun is one year.
The same side of the Moon always faces Earth.
The major moon phases are called full, gibbous, quarter, crescent, and new.
It takes about 28 days for the Moon to complete one full cycle (from full moon to full moon or from new moon to new moon).

THE SOLAR SYSTEM:

BI = The Sun is a star.
Our solar system has eight planets.
The planets are Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus, and Neptune.
The closer a planet is to the Sun, the hotter it can be.
Earth is the only planet with everything we need to live.

SS = Each planet has unique characteristics.
Mercury is hot during its daytime and cold at night.
Venus is the hottest planet because of its atmosphere.
Earth has the perfect environment for sustaining life.
Mars is red because of the rust.
Jupiter has huge storms that have been raging for years.
Saturn is famous for its rings. It has more moons than any other planet.
Uranus and Neptune also have rings.
Pluto is the farthest away from the Sun and is a dwarf planet.

SPACE:

BI = Stars form constellations or patterns out in space.
Besides planets, moons, and stars, there are also rocks of various sizes out in space.
The North Pole points to Polaris (the North Star).
You can find Polaris by finding the Big Dipper and following its handle up.
The North Star is always in the same part of the sky. All of the other stars appear to move through the sky at night.

SS = Ancient people named the patterns in the stars after their gods, goddesses, and mythical beasts.
If you lived at the North Pole, Polaris would be directly overhead. You can tell how far away from the North Pole you are by how close to the horizon Polaris is.
Meteoroids are rocks out in space. When these rocks hit the atmosphere and burn up they are called meteors. When they crash into Earth they are called meteorites.
When a meteorite hits Earth (or another body) it can make a crater.

Lab Supply List

Items are listed by unit in the order in which they are first needed. + Means an item will be needed for later labs also. The amounts listed are totals for the entire course. Most items are common household items.
* Means the item requires some explanation. Ordering hints or explanations are given on the next page.

REUSABLE EQUIPMENT / MATERIAL

UNIT		AMOUNT
1+	Clear glass bowls- one large, one small	2
1+	* Thermometer- science type	1
1+	Colored pencils or crayons	
1+	Scissors	
1+	Permanent markers - wide and fine point	
1+	Marbles or Clean pebbles	about 20
1+	Ruler - metric and standard	1
1	Phillips head screwdriver	1
1	Empty thread spool (optional)	1
1	Pen cap- wide enough to go over straw	1
1	Clipboard	1
1	Outdoor thermometer	1
1+	Watch with second hand or stopwatch	1
1	Skewer	1
1+	Table lamp with shade removed	1
2	Drinking glasses, clear- small	2
2+	Heat source (stove, bunsen burner)	1
2	Cookie sheet	1
2+	Sauce pan- medium, heavy duty	1
2+	Stirring spoon	1
2+	Rocks - small and large	
3+	Meter stick	1
3+	Sink	
4+	* Inflatable globe	1
5	Pizza pan or large cookie sheet	1
5	Tablespoon	1
6+	* RSO Rock and Mineral Kit & Streak plate	1
6+	Hand lens (magnifying glass)	1
6	Small piece of glass	about 4 x 4 cm
6	Steel file	1
6	Cooper penny	
6	Strong magnet	1
6	Assortment of metallic items	
6	Measuring cup	1
6+	Clear jar- tall	1
6	Candy thermometer (optional)	1
7	Bucket	
7+	* Triple beam balance or kitchen gram scale	1
7	Measuring spoons	
7+	Plate- large and small	1 each

7+	Baking pan- 8" square, foil lined	1
7	Pumice (optional)	
7+	Kitchen knife	1
7	Cheese grater	1
7	Block of wood- book size	1
7	Oven mitt	2
7	Tongs	1
7	White correction fluid	
8	Funnel	1
8	Jars- large, plastic, water tight	2
8	Freezer	
8	Cardboard	about 3' x 3'
8	Electric fan (or blow dryer)	1
8	Rope	about 3' long
8	Small plastic critters or shells (optional)	3
9	Soil from a garden or humus	¼ cup
9+	Tweezers	1
9	Small margarine container	1
10	Small ball or balloon (tennis ball size)	1
10	Calendar or almanac (with moon phases)	1
10	Dry erase marker	1
10	* Binoculars or telescope (optional)	1
11	Wire cutters	1
11	Ice pick	1
11	Stapler	1
11	Heat lamp or desk lamp	1
11	Water mister	1
11	Rubber gloves	1 pair
11	Color photo of Jupiter (optional)	
11	Flashlight	1
11	Chopstick	1
11	Checkers	minimum of 24
11	Coffee cans	2
11	Sidewalk or blacktop area	
11	Dictionary	1
12	Directional compass	1
12	Rubber band	1
12	Star chart	1
12	Globe	1
12	Flour sifter	1

PERISHABLES

UNIT		AMOUNT
1+	Water	
1+	Ice	
1+	Clear plastic, 2 liter bottle	2
1+	Disposable cups- plastic or wax-coated	5
1	Paper plate- medium, round	1
1+	Tape - regular, wide, masking, & packing	
1	Drinking straws- plastic	2
1	Thin craft foam or tagboard	about 6 x 8 cm
1	Clay or piece of floral foam	about 3 sq. cm
1+	Glue and/or rubber cement	
1	Orange	1
2+	Food coloring - yellow, red	
2+	Table salt	
2+	Plastic wrap/cellophane - clear and red	
3+	Balloons- 6 medium, 1 small	7 total
3+	String- cotton	about 3 meters
4	Adding machine tape	200 cm long
5	Pizza sauce	
5+	Cheddar cheese- shredded, yellow & white	
5	Toothpicks	4
5	Pizza crust - ready-made or homemade	1
5+	Shredded cheese- mozzarella and jack	
5	Tomato slice- large	1
5	Post-it notes	4
6+	Paper plates	4
6+	Table salt- coarse	
6	Pencil lead	
6	Sandpaper	1 piece
6+	Sugar- granulated	4 cups
6	Paper clip	1
7+	Egg carton- dozen size	3
7+	Butcher paper or large sheets	
7	Evaporated milk	⅔ cup
7	Semisweet chocolate chips	1 ½ cups
7	Butter	2 Tbs
7	Miniature marshmallows	2 cups
7	Vanilla flavoring	1 tsp
7	Aluminum foil	
7	Small note pad	1
7+	Newspaper	
7	Cotton balls or tissue paper	
8	Filter paper (coffee filter)	
8	Plaster of Paris	about 1 cup
8+	Seeds: grass and corn or lima bean	
8+	Potting soil	
8	Puffed wheat cereal	about 20 pieces
8	Gravel	½ cup
8+	Sand	½ cup
9	Finely chopped leaves, twigs, grass, weeds	
9	Dead insects and insect parts	
11	Cylindrical potato chip can	1
11	Metal hanger or other stiff wire	1
11	Hot dogs	2
11	Colored cardstock 8 ½ x 11"	10
11	Solar system stickers, trim, etc.	
11	Potted plant- small (optional)	
11	Steel wool	handful
11	White vinegar	½ cup
11	Whole milk	1 cup
11	Dishwashing liquid	
11	Baby powder	
11	Sidewalk chalk	
12	Flour	about 1 lb
12	Chocolate milk powder	¼ cup
12	Newspaper (optional)	

SPECIFIC EQUIPMENT: HINTS AND ORDERING

1. **Thermometer**: A good science thermometer goes down on its own unlike a medical thermometer, which must be shaken down. Some kitchen thermometers will work. You need one to go down to 32° F or 0°C.
2. **Inflatable Globe:** This globe is used in several labs. It gets tossed around so a regular globe won't work.
3. **RSO Rock and Mineral Kit & Streak Plate:** Some Pandia Press vendors listed on our Web site at www.pandiapress.com/ordering offer the R.E.A.L. Science Rock and Mineral kit. The kit may or may not include a streak plate. If you want to put together your own kit, you will need 1- to 2-inch samples of: Talc, Magnetite, Mica, Pyrite, Feldspar, Quartz Crystal, Granite, Basalt, Snowflake Obsidian, Conglomerate, Sandstone, Shale, Marble, Slate, and Schist. Plus, you need a streak plate to test mineral streak color. An unglazed kitchen tile (or even a sidewalk) can serve as a streak plate.
4. A **Triple beam balance** is ideal. It measures mass instead of weight. For this level, a kitchen gram scale will do. If you are wanting to get the best now, get the triple beam balance (from Nasco).
5. **Binoculars:** 7 X 35 is a nice choice to get. I would avoid the $10 ones, but you don't have to spend $100.

Suggested Weekly Schedule - RSO Earth & Space (level one)

The following schedule is suggested for those wishing to complete this course in a 36-week school year, teaching science twice a week (or once a week by combining the two days into one longer science day each week). General supplies needed for each week are listed. Refer to the lesson or supply list for specifics on supplies including quantities. FMN indicates For My Notebook lesson pages.

Week	Day	Lesson / Lab	Supplies Needed for the Week	Dates / Notes
1	Day 1	Weather Changes (FMN)	Science thermometer, Bowls, Water, Ice, Colored pencils	
	Day 2	Thermometer Exploration		
2	Day 1	Make a Rain Gauge	Scissors, Permanent marker, Marbles, 2-Liter bottle, Colored tape, Ruler, Water, Wax-coated disposable cups, Paper plate, Tape, Empty thread spool (optional), Phillips head screwdriver	
	Day 2	Measuring Wind Speed		
3	Day 1	Make a Weather Vane My Weather Journal (start)	Straws, Scissors, Pen cap, Tagboard, Tape, Clay, Metric ruler, Clipboard, Outdoor thermometer, Watch, Glue, Colored pencils, Orange, Skewer, Marker, Table lamp	
	Day 2	The Reasons for the Seasons		
4	Day 1	The Water Cycle (FMN)	Glass, Ice cubes, Heat supply, Cookie sheet, Water, Sauce pan, Stirring spoon	
	Day 2	Water Can Be Solid, Liquid, or Gas		
5	Day 1	Water Cycle in a Bowl	Glass clear bowl, Water, Glass, Food coloring, Salt, Stirring spoon, Plastic wrap, Rock or marble, Scissors, Glue, Colored pencils	
	Day 2	Water Cycle Diagram		
6	Day 1	Air Surrounds the Earth (FMN) Air Takes Up Space	Balloons, Clear glasses, Sink, Water, Paper, Metric ruler, Meter or yard stick, String, Masking tape	
	Day 2	Air Has Mass (Weight)		
7	Day 1	Earth's Surface is Changing (FMN) Earth- The Water Planet	Inflatable globe, Crayons, 3 people, Meter stick or metric ruler, Adding machine tape, Colored pencils	
	Day 2	"Water We're Going to Drink?"		
8	Day 1	What Is Inside the Earth? (FMN)	Pizza pan, Pizza sauce, Shredded cheddar cheese, Tablespoon, Toothpicks, Pizza crust, Shredded mozzarella cheese, Tomato, Crayons, Post-it Notes	
	Day 2	Pizza Crust to Core		
9	Day 1	Rocks Are Made of Minerals (FMN)	Paper plates, Grated hard cheeses (3 different colors), Plastic wrap, Tape, Permanent marker	
	Day 2	Rocks Are Made of Minerals		
10	1 Longer Day	Mineral Identification Minerals- Color and Streak	Mineral samples, Table salt, Pencil lead, Colored pencils, Streak Plate, Hand lens	
11	Day 1	Mineral Hardness	Mineral samples, Table salt, Pencil lead, Cooper penny, Steel nail, Piece of glass, Steel file, Sandpaper, Sample metallic items, Strong magnet, Hand lens	
	Day 2	Mineral Luster and Shape		

Week	Day	Lesson / Lab	Supplies Needed for the Week	Dates / Notes
12	Day 1	Grow Your Own Crystals	Sugar, Pan, Water, Stove, Hand lens, Measuring cup, Candy thermometer (optional), Stirring spoon, Cotton string, Pencil, Clear jar, Paper clip, Plastic wrap (optional), Colored pencils, Scissors, Tape, Salt, Quartz crystal	
	Day 2	Crystals Models		
13	Day 1	The Earth Recycles Rock (FMN)	Bucket, Egg carton, Hand lens, Outside area with lots of rocks	
	Day 2	Going On a Rock Hunt		
14	Day 1	My Rock- A Closer Look	Rocks, Colored pencils, Balance or kitchen gram scale, Metric ruler, Hand lens, Butcher paper	
	Day 2	Rocks Can Be Grouped		
15	Day 1	Igneous Rock Is From Magma	Saucepan, Stove, Measuring spoons, Evaporated milk, Salt, Chocolate chips, Plate, Hand lens, Baking pan, Foil, Stirring spoon, Sugar, Butter, Miniature marshmallows, Vanilla, Knife, Rock samples, Pumice (optional)	
	Day 2	Exploring Igneous Rocks		
16	Day 1	Sedimentary and Metamorphic Rocks	Foil, Crayons, Heat source, Cheese grater, Oven mitt, Tongs, Rock samples, Hand lens	
	Day 2	Exploring Sedimentary Rocks		
17	Day 1	Exploring Metamorphic Rocks	Rock samples, Hand lens, Colored pencils, Notepad, Rock and Mineral Kit, Egg carton, Newspaper, White correction fluid, Fine point marker, Cotton balls	
	Day 2	Rock Cycle Summary Start a Rock Collection		
18	Day 1	The Weather Makes Rocks Weather (FMN)	Timer, Rough rocks, Water, Filter paper, Funnel, Plastic jars with lids, Hand lens	
	Day 2	Water Weathers Rock		
19	Day 1	Ice Weathers Rock	Balloon, Water, Plaster of Paris, Bowl, Stirring spoon, Freezer, Lima bean or corn seeds, Plastic cup, Water, Potting soil	
	Day 2	Living Things Weather Rock		
20	Day 1	Wind Causes Erosion	Cardboard, Masking tape, Floor fan, Puffed wheat cereal, Meter stick, Flat surface, Rope, Plastic jar with lid, Soil, Sand, Gravel, Water, Plastic critters or shells (optional)	
	Day 2	Deposition Creates Layers		
21	Day 1	Soil Is Dirt and Dirt Is Good (FMN) What's the Dirt on Dirt?	Soil from a garden or humus; Hand lens; Tweezers; Clear tape; Plastic container with lid; Sand; Chopped leaves, twigs, grass, and weeds; Dead insects; Water	
	Day 2	Soil Recipe		
22	Day 1	The Moon Is Staring at Us (FMN) The Moon Runs Circles Around Us	Inflatable globe or large ball, Small ball, Dry erase marker, Table lamp, 2+ people, Moon phases chart, Black crayon, Binoculars (optional)	
	Day 2	My Moon Phases Chart		
23	Day 1	The Sun Is the Center of the Solar System (FMN)	Large sheet drawing paper and Colored pencils	
	Day 2	Suns, Planets, Moons		

Week	Day	Lesson / Lab	Supplies Needed For the Week	Dates / Notes
24	Day 1	Make a Solar Oven	Potato chip can, Sharp scissors, Metal hanger, Wire cutters, Ice pick, Hot dogs, Paper plate, Warm and sunny day, Colored pencils, Cardstock, Glue tape or rubber cement, Solar system stickers, Stapler	
	Day 2	Solar System Book		
25	Day 1	Mercury: Too Close For Comfort	Table near electric socket, Metric ruler, Heat or desk lamp, Science thermometer, Colored pencils, Glue	
	Day 2	Mercury Summary		
26	Day 1	Venus Traps Heat	Science thermometer, Glass jar with lid, Sunny day, Colored pencils, Glue, Scissors	
	Day 2	Venus Summary		
27	Day 1	Model Earth Biosphere	2-Liter bottle, Potting soil, Grass seeds, Potted plant (optional), Water mister, Clear Packing Tape, Water, Colored pencils, Glue, Scissors	
	Day 2	Earth Summary		
28	Day 1	Mars: The Red Planet	Steel wool, Bowl, Water, Dish soap, Rubber gloves, Crayons, Colored pencils, Glue, Scissors	
	Day 2	Mars Summary		
29	Day 1	Jupiter's Big Storm	Glass bowl, Whole milk, Red and yellow food coloring, Dishwashing liquid, Color photo of Jupiter (optional), Colored pencils, Glue, Scissors	
	Day 2	Jupiter Summary		
30	Day 1	Saturn: A Dusty Glow	Newspaper, Flashlight, Baby powder, Dark room, Colored pencils, Glue, Scissors	
	Day 2	Saturn Summary		
31	Day 1	Uranus: Mapping With Your Eyes Closed	Egg cartons, Chopstick, Checkers, Sharp pencil, Marker, Colored pencils, Glue, Scissors	
	Day 2	Uranus Summary		
32	Day 1	Neptune Is "Out of Order"	Coffee cans, Rocks, String, Ruler, Sidewalk chalk, Sidewalk or blacktop area, Colored pencils, Glue, Scissors	
	Day 2	Neptune Summary		
33	Day 1	Pluto: Define "Planet"	Dictionary, Colored pencils, Glue, Scissors, Large white drawing sheet	
	Day 2	Pluto Summary The Planet Poem		
34	Day 1	What's Out in Space (FMN)	Metric ruler	
	Day 2	Constellation Dot-To-Dot		
35	Day 1	Finding the North Star	Clipboard, Binoculars, Compass, Red cellophane, Flashlight, Rubber band, Colored pencils, Globe, and Optional star-gazing items: Lounge chair, Blanket, Hot cocoa	
	Day 2	Meteor What?		
36	Day 1	A Greater Crater	Level area, Metal pan, Flour, Chocolate milk powder, Sifter, Newspaper, Large marble, Metric ruler, Long tweezers or tongs, Binoculars, Flashlight, Red cellophane, Rubber band, Star chart, Hot cocoa (optional)	
	Day 2	Be a Night Sky Detective		

ADDITIONAL RESOURCE SUGGESTIONS

+ activity book # highly recommended * literature/fiction

A great grammar-stage book you could use for several sections of this book is *The Usborne First Encyclopedia of Space* (UFES) by Paul Dowswell. It is listed under each associated topic with the appropriate page numbers for that topic.

EXCELLENT RESOURCES FOR GENERAL SCIENCE INFORMATION

The Kingfisher Science Encyclopedia

The Usborne Internet-linked Science Encyclopedia

The Usborne Illustrated Dictionary of Science

GENERAL EARTH AND SPACE SCIENCE

#*The Earth and Sky* (Scholastic: A First Discovery Book) - Gillamard Jeunesse

The Kingfisher Young People's Book of Planet Earth - Martin Redfern

+*Hands-on Earth Science Activities for Grades K-8* - Marvin N. Tolman

+*Primarily Earth* (AIMS Education Foundation) - Evalyn Hoover and Sheryl Mercier

+*How the Earth Works* (Reader's Digest) - John Farndon

#+*Geology Rocks!* - Cindy Blobaum

+*Janice Van Cleave's Earth Science For Every Kid* - Janice Van Cleave

UNIT 1: WEATHER AND SEASONS

+*Science With Weather* (Usborne Science Activities) - Rebecca Heddle and Paul Shipton

+*How The Weather Works* (Reader's Digest) - Michael Allaby

+*Janice VanCleave's Weather* - Janice VanCleave

+*Junior Science Book of Weather Experiments* - Rocco V. Feravolo

**Cloudy With a Chance of Meatballs* - Judith Barrett

#**The Cloud Book* - Tomie de Paola

#*Snow is Falling* (Let's-Read-and-Find-Out series) - Franklyn Branley

#*Down Comes the Rain* (Let's-Read-and-Find-Out series) - Franklyn Branley

What Will the Weather Be Like? (Let's-Read-and-Find-Out series) - Paul Rogers

**The Magic School Bus Inside a Hurricane* - Joanna Cole

#*Weather Words and What They Mean* - Gail Gibbons

#*Flash, Crash, Rumble and Roll* (Let's-Read-and-Find-Out series) - Franklyn M. Branley

by Seymour Simons, the following weather titles - *Weather, Storms, Tornadoes, Hurricanes*

by Seymour Simons, the following seasons titles - *Winter Across America, Autumn Across America*

On the Same Day in March: A Tour of the World's Weather - Marilyn Singer

#*The Reasons For Seasons* - Gail Gibbons

#*Sunshine Makes the Seasons* (Let's-Read-and-Find-Out series) - Franklyn Branley

by Ron Hirschi, the following three titles - *Fall, Spring,* and *Winter*

What Comes in Spring? - Barbara Savage Horton

UNIT 2: THE WATER CYCLE

#**The Magic School Bus Wet All Over* - Joanna Cole

**The Magic School Bus at the Waterworks* - Joanna Cole

A Drop in My Drink - Meredith Hooper

Water, Water Everywhere: A Book About the Water Cycle (Discovery Readers)- Mervin Berger, Gilda Berger

**Water Dance* - Thomas Locker (beautiful, poetic book on the water cycle)

A Drop Around the World - Barbara Shaw McKinney

Water For Dinosaurs and You - Roma Gans

#*Down Comes the Rain* (Let's-Read-and-Find-Outseries) - Franklyn Branley

UNIT 3: THE EARTH'S ATMOSPHERE

#*You're Aboard Spaceship Earth* - Patricia Lauber

Earth, Our Planet in Space - Seymour Simon

#*Air is All Around Us* - Franklyn Branley

Feel The Wind (Let's-Read-and-Find-Out series) - Arthur Dorros

UNIT 4: THE EARTH'S SURFACE

#*Hottest, Coldest, Highest, Deepest* - Steve Jenkins

#*Follow Water From Brook to Ocean* (Let's-Read-and-Find-Out series) - Arthur Dorros

Danger- Icebergs! (Let's-Read-and-Find-Out series) - Roma Gans

Icebergs and Glaciers (Let's-Read-and-Find-Out series) - Patricia Lauber

Iceberg - Roma Gans

#**The Magic School Bus On The Ocean Floor* - Joanna Cole

#*How We Learned the Earth is Round* - Patricia Lauber

#*The Librarian Who Measured The Earth* - Kathryn Lasky

Earthquakes (Let's-Read-and-Find-Out series) - Franklyn Branley

+*Janice VanCleave's Earthquakes* - Janice VanCleave

Volcanoes (Let's-Read-and-Find-Out series) - Franklyn Branley

#**The Magic School Bus Blows Its Top* - Joanna Cole

**Hill of Fire* - Thomas P. Lewis

+*Janice VanCleave's Volcanoes* - Janice VanCleave

How Mountains are Made (Let's-Read-and-Find-Out series) - Kathleen Weidner Zoehfeld

UNIT 5: THE EARTH'S INTERIOR

#*How to Dig a Hole to the Other Side of the World* - Faith McNulty

#**The Magic School Bus Inside The Earth* - Joanna Cole

UNIT 6: MINERALS

#*Learning About Minerals* (Dover Little Activity Books) - Sy Barlowe (A tiny sticker book of minerals)

+*Janice VanCleave's Rocks and Minerals* - Janice VanCleave

#*Rocks and Minerals* (Eyewitness Explorers) - Steve Parker

UNIT 7: ROCKS AND THE ROCK CYCLE

#*Learning About Rocks* (Dover Little Activity Books) - Sy Barlowe (A tiny sticker book of rocks)

+*Janice VanCleave's Rocks and Minerals* - Janice VanCleave

Fossils Tell of Long Ago - Aliki

#**The Big Rock* - Bruce Hiscock

If You Find a Rock - Peggy Christian

**Rocks in His Head* - Carol Otis Hurst

Let's Go Rock Collecting - Roma Gans
**Everybody Needs a Rock* - Byrd Baylor

UNIT 8 & 9: EROSION AND SOIL
Dirt: Jump Into Science - Steve Tomecek
#*Sand* - Ellen J. Prager
#*Sand* - Sally Cartwright
Talkabout Sand - Angela Webb

GENERAL SPACE
+*How The Universe Works* (Reader's Digest) - Heather Couper and Nigel Henbest
#*UFES* - Paul Dowswell
#*The Reader's Digest Children's Atlas of the Universe* - Robert Burnham
Usborne Book of Astronomy and Space - Christopher Maynard
The Night Sky (Usborne Spotter's Guide) - Nigel Henbest and Stuart Atkinson
The Kingfisher Young People's Book of Space - Martin Redfern

UNIT 10: THE MOON
UFES - 30-31 and 56 (The Moon)
#*The Moon Seems to Change* - Franklyn M. Branley
#*What the Moon Is Like* - Franklyn Branley
#*The Moon Book* - Gail Gibbons
The Moon - Seymour Simon

UNIT 11: THE SOLAR SYSTEM
UFES - 32-33 (The Sun), 28-29 (Solar System), 34-43 (The Planets)
#*The Magic School Bus Lost in the Solar System* - Joanna Cole
#**Postcards From Pluto: A Tour of the Solar System* - Loreen Leedy
#*Learning About the Solar System* (Dover Little Activity Books) - Bruce Lafontaine
#*The Planets* - Gail Gibbons
#*The Planets in Our Solar System* - Franklyn M. Branley
by Seymour Simon a number of books which include these titles: *The Sun, The Long View into Space, Mercury, Venus, Mars, Destination Mars, Jupiter, Destination Jupiter, Saturn, Uranus, Neptune, Planets Around the Sun, Our Solar System*

UNIT 12: SPACE (See end of Resource Suggestions for list of field guide suggestions.)
UFES - 48-55 (stars, galaxies), 56-59 (constellations), 44-45 (asteroids, meteoroids, comets)
#*The Magic School Bus Sees Stars - Joanna Cole
The Earth and Sky (Scholastic- A First Discovery Book) - Gallimard Jeunesse and Jean-Pierre Verdet
#*Stargazers* - Gail Gibbons
#*Stars: A New Way to See Them* - H.A. Rey
Stars: A Guide to the Constellations, Sun, Moon, Planets, and Other Features of the Heavens (Golden Guide) - Herbert Spencer Zim
Find the Constellations - H. A. Rey
Stars - Seymour Simon
Galaxies - Seymour Simon

#Night Sky (Eyewitness Explorer) - Carole Stott
#The Night Sky (One Small Square series) - Donald M. Silver
#Which Way to the Milky Way? - Sidney Rosen
The Long Journey From Space - Seymour Simon (comets and meteoroids)
The Universe - Seymour Simon (Nebulas, black holes and other distant space objects)
Comets, Meteors and Asteroids - Seymour Simon

EARTH'S FEATURES

If you are interested in a study of different biomes, I highly recommend the *One Small Square* series. Some of the titles include: *The Night Sky, Seashore, Swamp, Pond, Cave, Backyard, Arctic Tundra, Woods, African Savannah, Cactus Desert, Coral Reef,* and *Tropical Rain Forest*

EARTH'S BEGINNINGS AND THE GEOLOGIC TIME SCALE

Born With a Bang - Jennifer Morgan
The Beginning of Our Earth (Let's-Read-and-Find-Out Science Books) - Franklyn Branley
From Lava to Life: The Universe Tells Our Earth's Story - Jennifer Morgan
#Earthsteps: A Rock's Journey Through Time - Diane Nelson Spickert
#The Pebble in My Pocket: The History of the Earth - Meredith Hooper

FIELD GUIDES

Weather (A Golden Guide) - Paul E. Lehr, R. Will Burnell et. al.
Looking at Rocks (My First Field guide) - Jennifer Dussling
Rocks and Minerals (National Audubon Society First Field Guides) - Margaret W. Carruthers
A Field Guide to Rocks and Minerals (Peterson Field Guides) - Frederick H. Pough
Rocks, Gems and Minerals (A Golden Guide) - Paul Shaffer
Field Guide To The Night Sky (National Audubon Society) - Mark R. Chartrand
Glow in the Dark Constellations: A Field Guide for Young Stargazers - C.E. Thompson
Stars (A Golden Guide) - Herbert Spencer Zim
The Sky Observer's Guide (A Golden Guide) - R. Newton Mayall

WEB SITE SUGGESTIONS

GENERAL EARTH SCIENCE

Everything Earth	www.rocksforkids.com/RFK/howrocks.html
Ask a geologist	walrus.wr.usgs.gov/ask-a-geologist
Many Earth topics	www.windows.ucar.edu/tour/link=/earth/geology/rock_cycle.html&edu=elem

WEATHER AND SEASONS

Terrific site all about weather	www.weatherwizkids.com
Another great weather site	www.wildwildweather.com
Fun interactive weather maker	www.scholastic.com/kids/weather

THE WATER CYCLE

Water cycle story and game	kids.earth.nasa.gov/droplet.html
Color your own water wheel	www.epa.state.il.us/kids/fun-stuff/water-cycle
Water cycle explained	www.coe.ilstu.edu/scienceed/basolo/water/water.htm

THE EARTH'S ATMOSPHERE

Makeup and layers of the atmosphere
www.windows.ucar.edu/tour/link=/earth/Atmosphere/overview.html&edu=elem
Atmosphere intro (challenging) www.ucar.edu/learn/1_1_1.htm
Temperature of atmospheric layers
www.windows.ucar.edu/tour/link=/earth/images/profile_jpg_image.html&edu=elem

THE EARTH'S SURFACE

Drinking water statistics www.epa.gov/region7/kids/drnk_b.htm
Stats on Earth's features www.kidscosmos.org/kid-stuff/kids-earthquakes-models.html

THE EARTH'S INTERIOR

Compares Earth's interior to Mars'
www.kidscosmos.org/kid-stuff/kids-earthquakes-models.html
Cross section of Earth
www.windows.ucar.edu/tour/link=/earth/interior/how_plates_move.html&edu=elem

MINERALS

Pan for gold! www.mii.org/panforgold.html
Mineral info, activities www.sdnhm.org/kids/minerals/index.html
Exploration of minerals
www.windows.ucar.edu/tour/link=/earth/geology/min_intro.html&edu=elem

ROCKS AND THE ROCK CYCLE

Geo mysteries, puzzles www.childrensmuseum.org/geomysteries/mysteries.html
Three major rock types www.fi.edu/fellows/fellow1/oct98/index2.html
Slide show on safely collecting rocks www.fi.edu/fellows/fellow1/oct98/safety/index.html
Rocks and the rock cycle
www.windows.ucar.edu/tour/link=/earth/geology/rocks_intro.html&edu=elem
Diagram of rock cycle
www.windows.ucar.edu/tour/link=/earth/geology/rock_cycle.html&edu=elem

EROSION

Caves are usually formed by erosion too! www.goodearthgraphics.com
Weathering photos facstaff.gpc.edu/~pgore/geology/geo101/weather.htm

SOIL

Lots of good soil info www.blm.gov/nstc/soil/Kids
school.discovery.com/schooladventures/soil/index.html
Solve a soil mystery www.urbanext.uiuc.edu/gpe/case2/case2.html

THE MOON

Answers to moon questions
teacher.scholastic.com/researchtools/articlearchives/space/moon.htm
Awesome moon phases www.niehs.nih.gov/kids/lunar/home.htm

THE SOLAR SYSTEM

Outstanding site for the whole family! library.thinkquest.org/28327/main/cockpit.html
Excellent solar system site kids.nineplanets.org/intro.htm
Great pictures of the planets pds.jpl.nasa.gov/planets
Your age on other planets www.exploratorium.org/ronh/age/index.html
Solar system updates solarsystem.nasa.gov/planets/index.cfm
Learn about our solar system www.kidsastronomy.com/solar_system.htm

SPACE

Outer space definitions www.kidsastronomy.com/deep_space.htm
Online sky maps! 77illinois.homestead.com/files/astro/skypage.html

KEEP A SCIENCE JOURNAL

Nature is beautiful and amazing, but it is not a video game. The action in nature is often far more subtle but well worth looking and waiting for. Destruction, creation, and other amazing changes are all just waiting to be discovered by the observant and patient. Earth science in particular offers some obvious topics for journaling. Keep track of the weather. You will be measuring and studying it in Unit 1. Starting in Unit 9, you will be learning about the Moon and other bodies in space. Get a head start by observing and journaling the interesting things you see in the sky during the day and night. Writing it all down is a skill worth developing. Sketching and saving samples of the common things you find along the way all add up to give you a journal you can be especially proud of and will want to cherish your whole life. For a satisfying nature experience, grab that journal and that pencil, maybe a hand lens (magnifying glass) and a pair of binoculars, and hit the trail, or the backyard, or a park. You don't need to have a plan when you go out, but to get you started, we have provided a few hints as to what might go into a nature journal. These are just ideas to get your creative juices flowing and are in no particular order. Writing in your journal should be like writing to yourself. Don't worry about spelling, sentence structure, or grammar. Now go out, observe, draw, listen, describe, compare–journal! Remember, the more you put into it, the more you will get out of it.

For each journal entry remember to put:
•The date •The weather (temperature, clouds, rain, wind etc.) •Who you went with

AUTUMN:

- Describe everything you can tell about the clouds. Are they puffy or stretched out? Thick or thin? What shapes can you make out? Are they moving quickly or slowly?
- Take some tape and tape a tiny sample of soil (dirt) into your journal. What colors do you see? Is the soil dry or moist? Are the particles in it big or small, sharp or smooth?
- Use your sense of hearing. Close your eyes. What do you hear? What can you hear that is NOT man-made? Write a factual or fictional story about what you hear.
- Find a rock of any kind. Don't disturb it in any way. Draw it. Describe where it is sitting. What kinds of things in nature could move it from where it is?
- Check out the Moon on a clear night. Describe it. Where are the shadows? The craters? Can you see "the man in the Moon"? Some cultures see a rabbit instead. What do you see?
- Pick up two different rocks. Describe them. Compare weight, shape, texture, color. Do they have stripes, spots, or swirls?

- *With adult supervision, visit a stream bed or river. Measure from the edge of the water to the edge of where you can see water has been. Is the river full right now or empty? Is it moving quickly or slowly? Remember where you did this and repeat it again in winter and spring. Describe the air: Is it clear, cloudy or smoggy? Is it moving (windy) or still, hot or cool? Take a deep breath. What is being carried in the air? How does the air feel, smell, taste, look?*
- *Write down all of the ways you know of that animals use rocks. Go outside and watch some. Don't forget to observe the little beasties, too.*

WINTER:

- *Gather snow into a measuring cup. Write down how much snow you have and describe its texture. Bring it inside where it will melt. Measure how much you have after it melts. How much water did you really have? How is this possible?*
- *Make a "rock" band. Place rocks in containers for shaking, brush an old toothbrush against one, and bang a couple together. In your journal, draw the instruments and describe the music you made.*
- *Get up early one morning and watch where the sun rises. DON'T look directly at the sun, EVER! Draw or describe the horizon where the sun rose (over the barn, to the right of the oak tree. .). Repeat this in a week and again in a month. What did you discover?*
- *Finish the sentence "I'm so cold I could . . ." What do you like to do when it is very cold outside?*
- *Describe and sketch the nearest mountains. How far do they go? What are they made of?*
- *What type of extreme weather do you have where you live? Tornadoes? Hurricanes? Blizzards? What precautions do you have to take to stay safe?*
- *Never go out in a thunder storm or sit next to a window when the lightening is close by. On a stormy night, listen to thunder. Use a stopwatch to time how long, in seconds, between the time you see the flash and the time you hear the thunder. Write down this number. This is about how many thousand feet away the lightening is. Watch the lightening. Is it hitting the ground or traveling between clouds? Put your findings in your journal.*
- *Stand in an open area. Measure your shadow morning, noon, and evening. Draw your body clock in your journal. Show where the shadow is at different times of the day.*
- *With adult supervision, revisit the same stream bed or river you visited in the fall. Again, measure from the edge of the water to the edge of where you can see water has been. Compare your measurement to the one you did in the fall. Is there more water now or is there less? Why do you think this might be?*

SPRING:

- *Find a pond or lake. Are there plants growing on top of the water or just on the edges? Why might that be? If there are plants growing in the water, how are they different than the ones growing in soil?*
- *Find a plant growing through a crack in the pavement or in a rock. How is its life different than a plant with room to grow? How is the rock affected? Describe how each might feel.*
- *Dig into the soil very gently. Who is living there? Describe their home. Is the soil moist, dry, loose, or packed?*
- *Take your weather vane to the beach if you live near one or can visit one. Go very early in the morning. Which way is the wind blowing? How hard? Go again in the evening and do the same thing. Explain what you discovered.*
- *Sit outside and list everything you can see that man has made from rocks or minerals, including metals.*
- *Write a story about what life would be like if we had nothing made of minerals or rocks. Describe how your day would be different.*
- *Watch birds flying on a windy day. How does the wind help or hinder their progress?*

- *If you have learned how to find The Big Dipper, find it in the sky at 9 p.m. or so. Describe or draw where it is (over the house, over a particular tree. . .). Leave room on this page or the next to repeat this in a month or more. Is it in the same place? Were you surprised?*
- *With adult supervision, revisit the same stream bed or river you visited in the fall and winter. Again, measure from the edge of the water to the edge of where you can see water has been. Compare your measurement to the ones you did before. What pattern have you seen throughout the year? What do you think causes this pattern?*

SUMMER:

- *Pour a small puddle of water onto the sidewalk. Trace around it with chalk. Draw it in your journal. When you notice it is much smaller than before, draw around it again. Do this several times as the puddle disappears. Finally, copy the puddle "fingerprint" into your journal. Describe where the water went and how.*
- *Make a sand band. Put sand into different shakers—cans, paper towel tubes, paper sacks. What kind of music can you make? How does it sound? Do the different shakers make very different sounds?*
- *Find a rock to draw and color. Draw a line, dividing the paper in half. Draw the rock on the top half of the paper as usual. Now, for the fun part—draw the same rock on the bottom half but hold pencil in between your toes!*
- *Take a straw outside. Blow through the straw onto different types of soil. What type of soil moves the easiest—dry or wet, big or small pieces?*
- *Finish the thought "I'm so hot I could. . ." What do you like to do when it gets very hot?*
- *Describe the soil and rocks near a river or stream. How are they different here than just a few feet away from the water?*
- *Find an animal path in nature. What animals do you think use it? How worn is it? How have the animals contributed to the erosion? Can you see where water has increased the erosion?*
- *Build animals from rocks you find. Glue them together and/or paint them. Write a story about them in your journal.*
- *Did you know that crickets can tell the temperature? Go out in the evening where you can hear crickets. Take a watch with a second hand with you. Single out one cricket and count his chirps for 14 seconds. Write this number down and add 40 to it. This is the temperature in Fahrenheit! Try it with several others and see if they agree. Tell how you think they can do this.*

NAME ______________________________ DATE ___________________

For my notebook

WEATHER CHANGES

How is the weather today? What better way to find out than to go outside? While you are there, look, listen, feel, and smell for weather. Are you back? Now list everything you remember about the weather. Did you see clouds, rain, or snow? Did you hear the wind blowing or thunder crashing? Did it feel hot, cold, or warm? Did you smell rain? There are many more aspects to weather than just how hot it is and many ways to experience it besides just feeling it. Some of the things you can measure about the weather are temperature, humidity (which means how much water vapor is in the air), the direction and speed of the wind, and how much rain or snow is falling.

As you know, weather changes through the year from cold winters to pleasant springs to hot summers and often to windy autumns. Weather also changes from place to place. The higher up a mountain you go, the colder it becomes. Also, the closer you get to the North or South Poles the colder it becomes. Did you know that when it is winter where you live, half of the world is having its summer? You may be dreaming of a white Christmas, but many other people are putting on bathing suits for a refreshing Christmas swim.

No matter where you live, weather will affect almost every part of your life—from the clothes you wear to the games you play. The more you learn about the world's weather, the more prepared you will be for some of the earth's big surprises!

Weather Lab #1: THERMOMETER EXPLORATIONS - instructions

Materials:

- Lab sheets (2 pages), pencil
- Thermometer (weather or science type that will go down without being shaken)
- 2 bowls
- Water
- Ice
- Colored pencils

Aloud: You probably know that a thermometer is used to tell how hot it is, but how does it work? At the bottom is a bulb full of liquid. As this liquid gets hotter, it also gets bigger. The hotter it gets, the more space it needs, so it moves further up the tube. You can tell how hot it is by how far up the tube the liquid goes.

Procedure:

Lab Day- ABOUT 2 HOURS AHEAD:

Fill one bowl with water. Leave out so it can reach room temperature by lab time.

Lab Day- ABOUT 15 MINUTES AHEAD:

Fill a bowl about ½ full of water. Add several ice cubes. Set aside to allow water to cool by lab time.

Lab Day:

**All temperatures should be taken with the reader (the scientist) in the same clothing. The idea is to "feel" the different temperatures. By adding a coat or gloves to go outside the tester is biased. If the weather is severe, have the children wear inside whatever they will need in order to go outside. No fair adding or subtracting clothing.

1. Take thermometer outside. Set it on the ground in the shade and sit with it and with your eyes closed for three minutes. Read the thermometer and record this temperature as well as how your body feels at this temperature on lab page 1, by the picture of the first thermometer.
2. Do the same thing outside in the sunlight. Don't forget to close your eyes. This gives a better feel for the temperature. Record your results on the second thermometer on lab page 1.
3. This time do the test indoors and record on the third thermometer.
4. Now, with your eyes closed, hold the bulb of the thermometer between your hands (gently enough to not break it, of course) for three minutes. Concentrate on how your hands feel. Read the temperature and record your results.
5. For the fourth test, place the thermometer and one hand (or finger, if you just can't stand the cold) into the ice water for as long as you can. Three minutes is a long time to subject your hand to ice so don't overdo it. Remember, crying isn't required to be a good scientist. Leave the thermometer in for three minutes. Record your results.
6. For the last test, place your hand and the thermometer in the room temperature water (eyes closed) and record your results.
7. Color in each thermometer up to the temperature it reached.
8. Turn to lab page 2. Use a different colored pencil to mark a line at the temperature reached for each test. Next to each temperature, draw a line. On that line, write how you (or your hand) felt at that temperature.

Possible Answers:

#1. warmer or hotter

#2. gets hotter

#3. hot cold

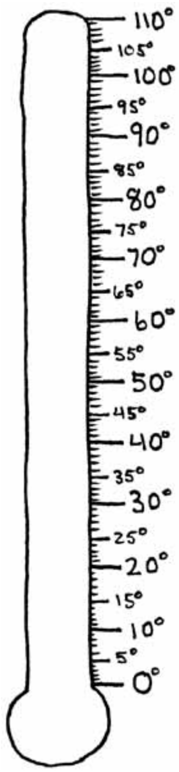
Discussion/Conclusion:

With the exception of water, almost everything gets bigger as it get hotter. This is how a thermometer works.

NAME ______________________________ DATE ___________________

Weather Lab #1: THERMOMETER EXPLORATIONS- p. 1

Outside- Shade



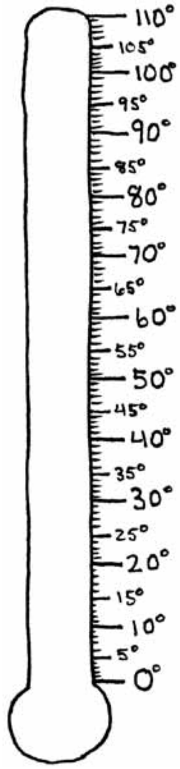
Temp. °F

____

Feels

____

Outside- Sun



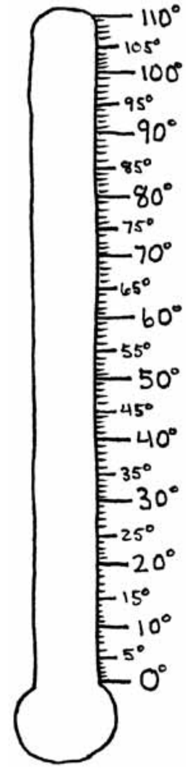
Temp. °F

____

Feels

____

Inside



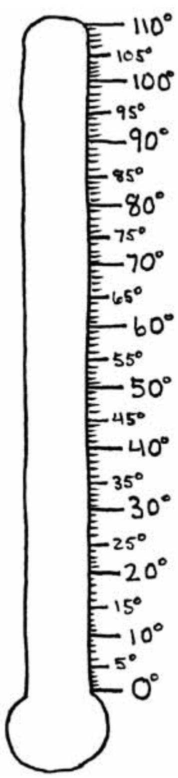
Temp. °F

____

Feels

____

Between Hands



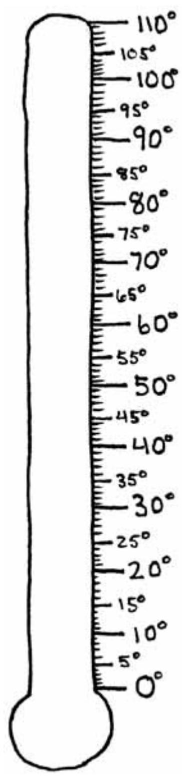
Temp. °F

____

Feels

____

Ice Water



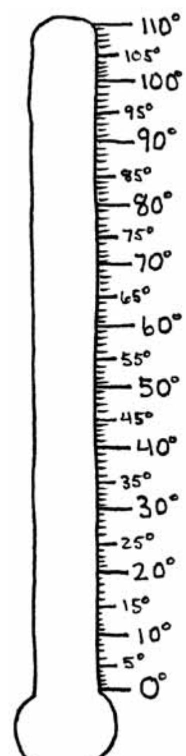
Temp. °F

____

Feels

____

Room Temperature Water



Temp. °F

____

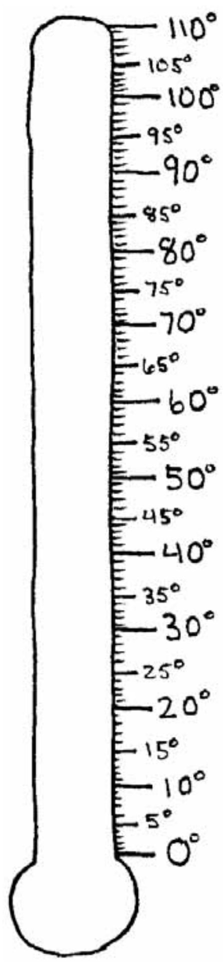
Feels

____

Weather Lab #1: THERMOMETER EXPLORATIONS- p. 2

On the thermometer below, mark the temperatures from the previous page, each in a different color. Directly across from the mark for each temperature, write the word describing how you felt at that temperature.

Write what you felt at each temperature in the space below.



1. As the thermometer's numbers get bigger, I feel ________________________.

2. The liquid in the thermometer gets bigger and pushes up higher in the tube when the temperature ____.

3. Liquid takes up more space when it is ____________________ and it takes up less space when it is ________________________.

Weather Lab #2: MAKE A RAIN GAUGE - instructions

Materials:

- Lab sheet and pattern, pencil
- Clear plastic, 2 liter bottle
- Scissors
- Waterproof, colored tape
- Permanent marker
- Ruler
- Marbles or clean pebbles (one or two handfuls)
- Water

Aloud: When water falls from the sky, whether it is rain, snow, or hail, we call it precipitation. Do you remember that water droplets in the air are called water vapor? When these droplets gather together and become large enough, they are too heavy to stay in the air and that's when they fall as some sort of precipitation. You can find out how much rain is falling by using a rain gauge. A rain gauge gathers the rain that comes out of the air. It has a measuring scale on the side of it so you can see how much rain has fallen. You could buy a rain gauge, but it will be much more fun to measure rain on a gauge you have made yourself. Let's start making our own rain gauge!

Procedure:

1. ADULT: Cut the top off of the plastic bottle below the place where it begins to narrow. Cover cut edge with tape to prevent injuries.
2. At bottom of bottle, above where the bottle narrows, make a straight, horizontal mark, about 1 inch long with the marker. See Diagram #1 on the pattern page (on the back of the lab sheet) for help.
3. From the bottom mark, measure and draw a horizontal line every ½ inch.
4. Add marbles to the bottom of the bottle to just below the first line. This will help keep your bottle from tipping if the wind blows. Fill with water to exactly the bottom line. This is your starting point for measuring rainfall.
5. Put the top of the bottle upside down into the bottom of the bottle. This acts as a funnel for the falling rain, helps keep leaves and debris out, and limits the amount of water that can evaporate back out of the gauge.
6. This rain gauge will be used as you do your weather chart, Lab #5. If you have some rainy days before you get there, you might practice measuring and recording information with the rain gauge. To do this, follow the remaining steps of this lab.
7. Place your rain gauge outside in the open when rain is possible.
8. Complete the hypothesis.
9. In 24 hours, bring it in and measure (in inches or centimeters) from the zero line how much rain has been collected.
10. Empty water out of gauge until it is level with the starting line before putting it back out for the next day. Practice recording the amount of rain predicted and the amount actually collected.
11. Complete lab page.

Conclusion/Discussion:

1. Any kind of water falling from the sky is called precipitation.
2. Precipitation can be measured.

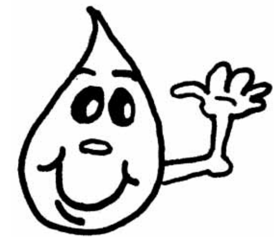
For More Lab Fun:
If you live in an area with snowfall, you can measure that too. Use any container with a flat bottom and straight sides. Measure how much snow has fallen. Move it to a warm area. When the snow has melted, measure again. How much water was actually in the container?

For Your Information:
Water droplets actually gather around tiny particles of dust, smoke, sulfate, or salt. These particles are called condensation nuclei. If air is very clean, it may contain too few condensation nuclei for droplets to form. In this case, air will become very humid.

NAME ______________________________ DATE __________________

Weather Lab #2: MAKE A RAIN GAUGE

HYPOTHESIS:



Can you tell when it will rain? Predict when you think it will rain a lot and when you think it won't rain very much.

1. I think there is a lot of rain when

____

____.

2. I think ______________ inches is a lot of rain.

3. I think there is very little or no rain when

____

____.

RESULTS: For each day you leave your rain gauge out, predict how much rain you think you will see. Write your prediction in the top row in inches. In the bottom row, record how much rain you actually collected.

DAY 1	DAY 2	DAY 3	DAY 4	DAY 5	DAY 6	DAY 7

4. My predictions were CLOSE NOT SO CLOSE

5. I have found it is EASY DIFFICULT to tell how much rain is coming.

Weather Lab #2: MAKE A RAIN GAUGE- pattern

Refer to instructions: Weather Lab #2 for making this rain gauge.

Diagram #1

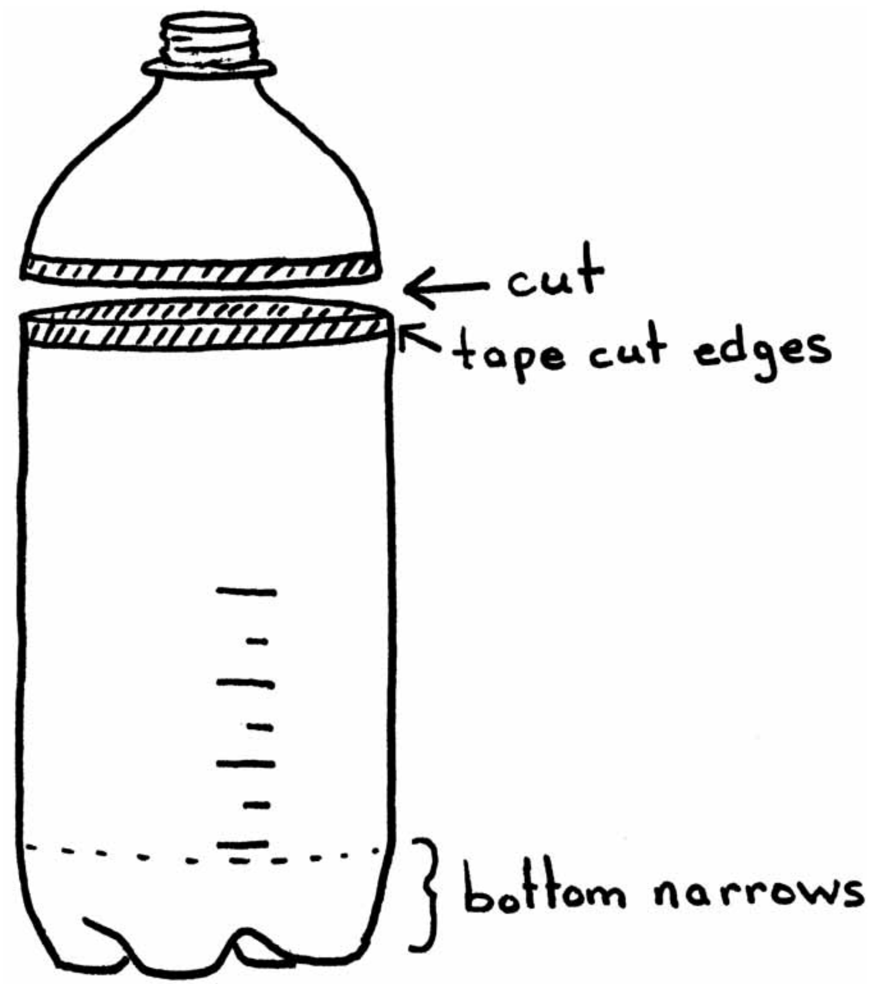
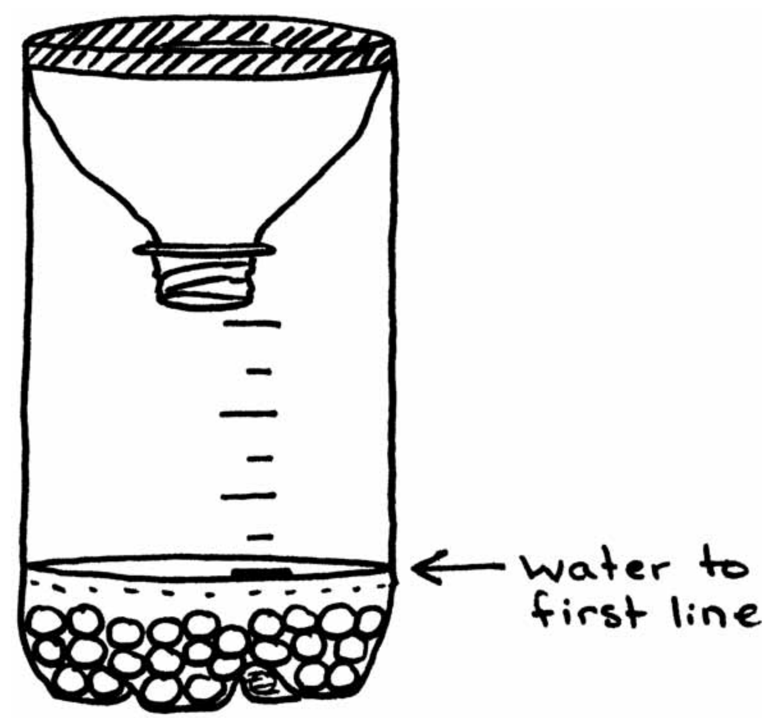


Diagram #2



Weather Lab #3: MEASURING WIND SPEED – instructions

Materials:
- Lab sheet and setup page, pencil
- 4 small plastic or wax-coated disposable cups (It's best to have 3 of one color and 1 of a different color.)
- Medium, round paper plate (sturdy)
- Tape
- Permanent marker – if your cups are all the same color (any color that will show on the cups)
- Phillips head screwdriver (must be phillips head because the shaft must have a round cross section)
- Empty thread spool – optional (helps keep the plate from wobbling)

Aloud: Wind is a very powerful force that can hurt us by tearing apart houses or help us by providing power for those same houses. Over 200 years ago, a scale was created to describe how powerful wind could be. The scale goes from zero, which is basically no wind at all, to twelve which is how strong a hurricane is. Something that measures the speed of the wind is called an anemometer (an-uh-mohm-uh-tr). You will be making your own anemometer to measure how fast the wind is blowing and you will use it to keep track of wind speed where you live.

Procedure:
1. If you have one cup of a different color, skip this step. If not, use the marker to color most of one cup.
2. Lay the plate onto a surface you can punch into. Punch the screwdriver through the plate as close to the center as you can. Turn the plate around on the screwdriver a few times until the plate moves smoothly, but no more. (Too big a hole will make the anemometer wobble when you use it.) Remove the screwdriver.
3. Use the diagram at the back of the lab sheet to help you with this setup. Place the cups around the bottom of the plate as shown in the diagram. Tape them securely in place.
4. Hold the plate, cups on top, and slide the screwdriver back into the hole from underneath. Holding the screwdriver handle, blow on the cups to ensure the plate rotates smoothly. If it wobbles, you can remove the screwdriver and glue or tape an empty thread spool to the underside with the center hole lined up with the hole in the plate. Slide the screwdriver back in through the spool and the plate.
5. Hold your anemometer in the wind, and measure the speed of the wind by counting how many times the different colored cup comes back around in 30 seconds.
6. Complete the lab. Save your anemometer for the weather journal in a future lab.

Conclusion/Discussion:
1. Wind is actually the movement of the atmosphere. There are planets that have no air (no atmosphere) so they have no wind. In fact, they have no weather at all—no rain, clouds, wind, hurricanes, tornadoes, or snow.
2. It is very important for some people to know what the wind speed is. Can you think of people whose jobs rely on knowing wind speed? (pilots, farmers, ship captains, even professional golfers)

For More Lab Fun:
1. After a few times, try to guess how many revolutions you will count just by looking at what things the wind is able to move.
2. Learn about the Beaufort scale (**bo**-frt) for classifying the power of the wind. How does the Beaufort scale relate to your homemade anemometer? How many turns per minute equal each level of the Beaufort scale? Find out by using your anemometer to see the wind blowing each level of the scale.
3. On a country road, test your anemometer out the window of a slowly moving car. Make sure to always wear a seat belt in the car. Hold the anemometer out the window. How many turns per minute does your anemometer make when you are going 5 miles per hour? How many turns for 10 miles per hour?

NAME ______________________________ DATE __________________

Weather Lab #3: MEASURING WIND SPEED

TEST your anemometer by measuring the wind speed for a week.

1. Write the date.
2. Write the number of revolutions (turns) the cups made in 30 seconds.
3. Multiply that number times two to find how many revolutions in one minute.
4. Describe some things that the wind was moving at this speed.

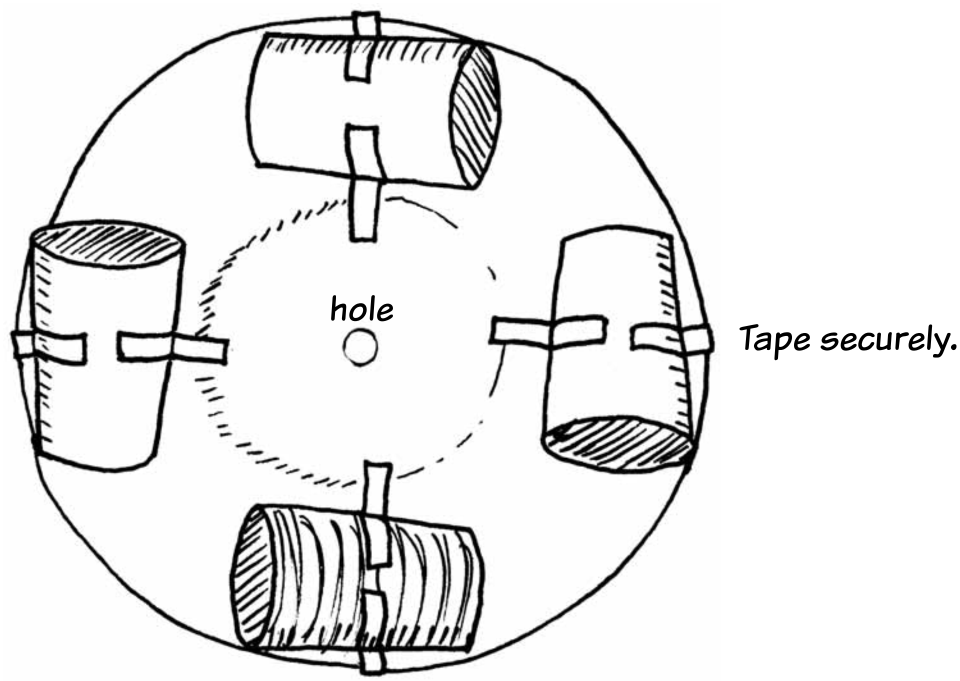
1. DATE	2. REVOLUTIONS IN 30 SECONDS	3. REVOLUTIONS EVERY MINUTE	4. WHAT THE WIND CAN MOVE (smoke, flags, leaves on trees. . .)

5. The slowest wind was ______________ revolutions per minute.

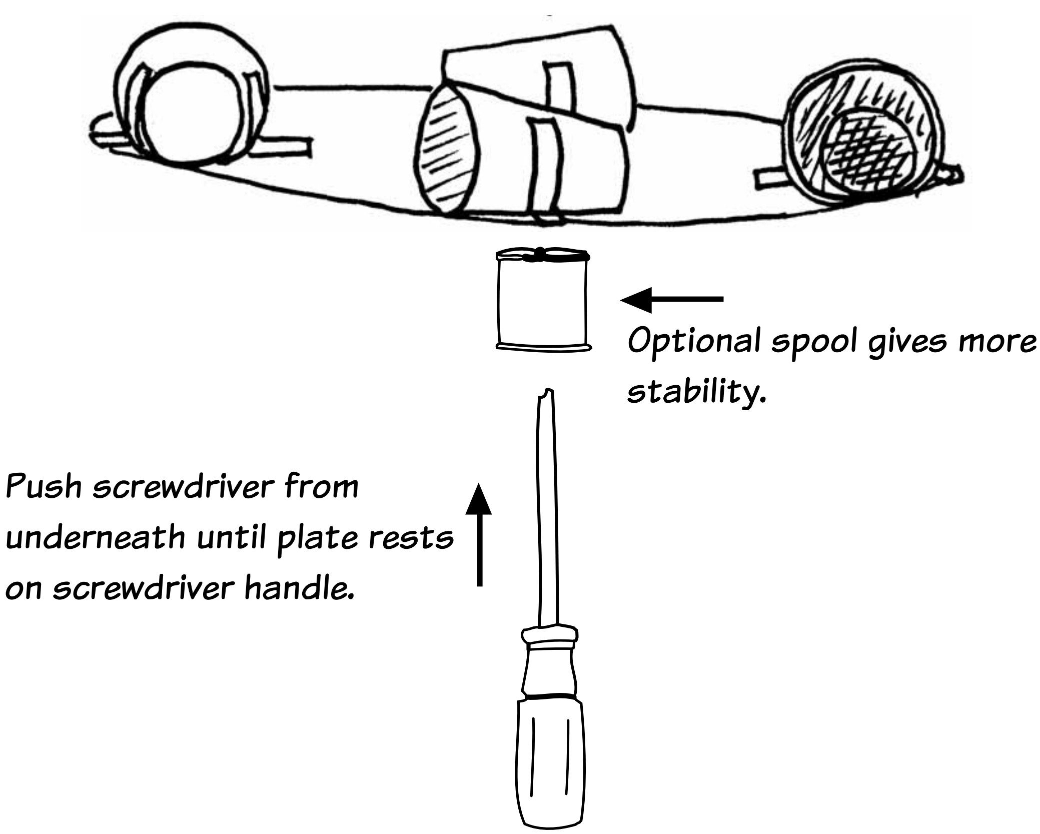
6. The fastest wind was _____________ revolutions per minute. It blew these things around: ____.

Weather Lab #3: MEASURING WIND SPEED - setup

TOP VIEW



SIDE VIEW



Weather Lab #4: MAKE A WEATHER VANE - instructions

Materials:

- Lab sheet, pencil
- 2 drinking straws
- Scissors
- Pen cap (wide enough to go over straw and allow it to spin freely)
- tag board or thin craft foam about 6 cm X 8 cm (craft foam is waterproof so it's better in rainy areas)
- Tape
- Wad of clay or piece of floral foam (about 3 cm square)
- Metric ruler

Aloud: We are ready to measure the amount of rain and wind we get. Now we need to make a device that can tell us where the wind is coming from. Have you ever seen a weather vane on top of somebody's house or barn? You are going to make a simple weather vane today. When the wind blows on a weather vane, it hits the tail of it and pushes it away. That makes the pointer point into the wind and tell us where the wind is coming from. The only trick is to make sure the tail is quite a bit bigger than the pointer.

Procedure:

1. See diagrams on lab page for help with any part of this assembly.
2. Cut slits about 1 ½ cm long into each end of straw #1.
3. Cut your tagboard so you have one piece that is 6 cm X 6 cm square. That is the tail. Decorate it if you want and then slide it into one of the slits in straw #1.
4. Take the second piece of tagboard. It should be 2 cm X 6 cm. Cut it to 2 cm X 2 cm square. Lop off two of the corners so that you have a triangle about 2 cm on each side. This is the pointer. Slide it into the slit in the other end of straw #1.
5. Hold the pen cap vertically and tape straw #1 to the top of the cap. Make sure the straw is running horizontally so that the pen cap and straw together make a "T."
6. Slide the pen cap over straw #2. Stick the bottom of straw #2 into the foam block (or clay) to hold it up.
7. You are now ready to find the direction any wind is coming from. In a very strong wind, sometimes the weather vane will spin a few times, but it should settle down and point to the source of the wind.
8. Save your weather vane so you can use it when you start your weather chart.

Possible Answers:

1. into
2. sail ships, generate electricity, grind grain, pull water out of the ground, fly kites and gliders, . . .

Conclusion/Discussion:

1. Just like certain people need to know how strong the wind is, many professions rely on knowing which direction the wind is coming from. Can you think of any professions that rely on wind direction? (pilot, sailor, weather forecaster, golfer, firefighter, . . .)
2. The direction the wind is coming from can change rapidly, especially in the city. Buildings and the heat coming off of the concrete make wind patterns in the city very complicated.

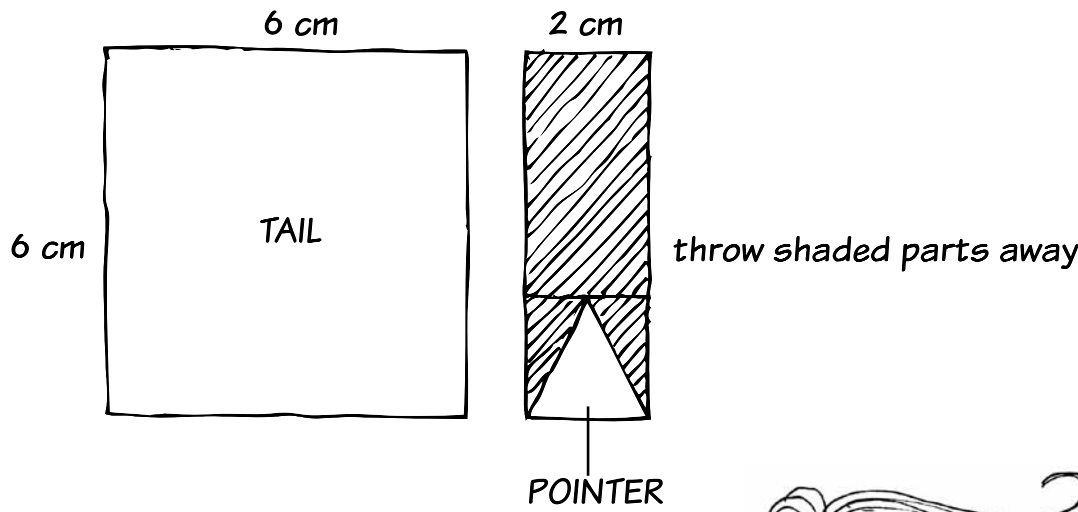
For More Lab Fun:

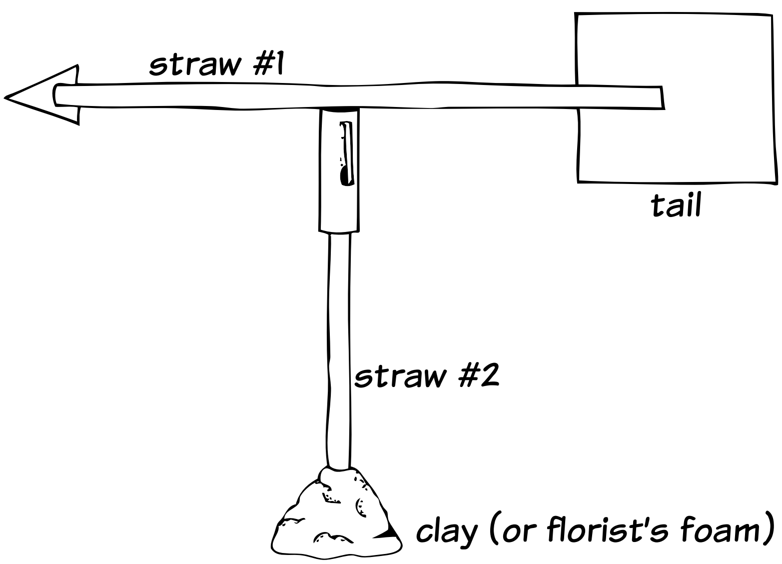
Build a kite and sail it. Do you need to know which direction the wind is coming from in order to get your kite into the air?

NAME ______________________________ DATE __________________

Weather Lab #4: MAKE A WEATHER VANE

Follow these diagrams to help you make your weather vane.





Circle the best answer:

1. Weather vanes point INTO AWAY FROM the wind.

2. People use wind to ____

____

____.

Weather Lab #5: MY WEATHER JOURNAL – instructions

Materials:

- lab sheets (3 pages), pencil (You may need to make several copies of lab pages 1 and 2.)
- clipboard
- scissors
- outdoor thermometer
- watch with second hand
- your own rain gauge, anemometer, and weather vane
- glue
- 7 different colored pencils or crayons

** To parent/teacher: You can spend as much time on the weather journal as your child wishes. The ideal would be to check the weather everyday for a year. Yeah, right. Now, for the rest of us: A realistic option might be to check the weather each day for a month, or once a week for a year (or so). It's also helpful to check at the same time each day or as close to that as possible. As soon as you feel your child has gathered enough dates (10 to 30 readings), is ready to stop, or has seen good weather variation, come back and complete lab pages 3 and 4.

Aloud: You have made some wonderful instruments for measuring weather. Let's use them all together and start gathering some weather data for our area. We will put all the information we gather onto a chart and see how the weather here measures up!

Procedure:

1. Find a nice spot where you can test the weather. You'll want to use the same spot at the same time each day you do this.
2. Fill in the date and the readings for temperature, amount of rain, wind speed, and wind direction. On lab page 2 (Weather Pictures), cut out the picture that best shows the weather. Glue it in the last space of your journal under "general."
3. Once you have gathered weather data for a number of days, compile your results and fill in the graph on lab p. 3.

Conclusion/Discussion:

Weather can change rapidly from day to day as well as from season to season.

For More Lab Fun:

1. Find an RSO pen pal in another area of the state or country. Compare the results from your weather journals.
2. After gathering several days of data, see if you can see any patterns in the weather. Can you predict what kind of weather might happen the next day or week?
3. Visit a weather station. Learn how the experts monitor, chart, and track the weather.
4. Compare the data you gathered to the data reported on the news in your area.

NAME ______________________________

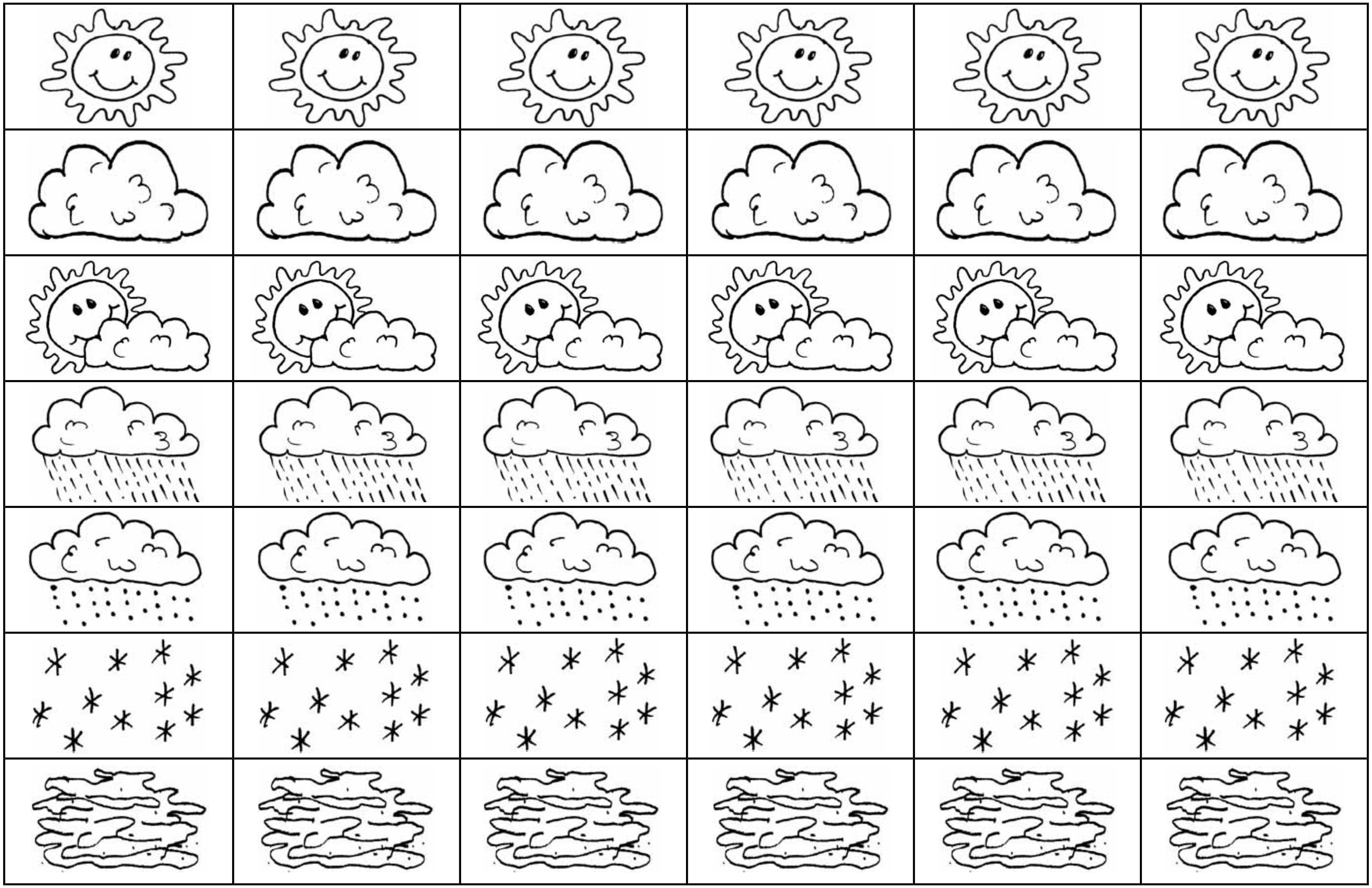
Weather Lab #5: MY WEATHER JOURNAL- p.1

DATE	TEMPERATURE	RAIN	WIND SPEED	WIND DIRECTION	PICTURE

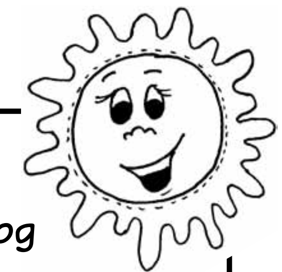
NAME ______________________________

Weather Lab #5: MY WEATHER JOURNAL- p. 2

WEATHER PICTURES: Sunny, Cloudy, Partly Cloudy, Rain, Hail, Snow, Fog



NAME ______________________________ DATE ___________________



Weather Lab #5: MY WEATHER JOURNAL- p. 3

1. I counted this many days of each kind of weather:

____Sunny _____Cloudy _____Partly Cloudy _____Rain _____Hail ____ Snow ____Fog

MY WEATHER GRAPH

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
SUNNY																														
CLOUDY																														
PARTLY CLOUDY																														
RAIN																														
HAIL																														
SNOW																														
FOG																														

2. The most common weather I charted is ______________________________.

3. My favorite kind of weather is _________________________ because ____________________

____.

Weather Lab #6: THE REASONS FOR THE SEASONS - instructions

Materials:

- *Lab sheet, pencil*
- *Orange*
- *Skewer*
- *Marker*
- *Table lamp with shade removed*

Aloud: You learned about many aspects of the weather—from temperature to the amount of rainfall to the direction and speed of the wind. As you know, weather can change from day to day. Every day brings a surprise in the weather. Even though weather is unpredictable, there are patterns to the weather. We know that summer is the hottest time of the year, and that it starts to cool down as we get into autumn. We know that winter is the coldest season, and that in the spring it starts to warm up again as it gets closer to the return of summer. So why do we have seasons like this? You will do an experiment today that will show why our weather changes throughout the year and what makes the seasons.

***In this lab you have to stick a skewer through an orange. This is best done by an adult as a child might push on the skewer from the end and poke it through his hand instead of the orange.*

Procedure:

1. *Place the lamp (the "Sun") in the middle of the table. Plug it in.*
2. *On your orange ("Earth"), make a mark at the very top and bottom of the orange to show the North and South Poles. Next, draw a line around the middle to show the equator. Lastly, make a mark where you live. Poke the skewer through the orange from pole to pole.*
3. *Earth's orbit is at a tilt which always points into the same part of the sky. To duplicate this, choose (or imagine) a tree or other object outside to point Earth's North Pole toward. Throughout this experiment, keep the North Pole (top of the skewer) pointed in that direction. (See lab page 1 for help).*
4. *Darken the room. Hold your Earth with the pole at a tilt, as discussed. Can you see that one half of your Earth is more in the light than the other half? Now, keeping your Earth at the same tilt, go halfway around the Sun (the lamp). Do you see that the other half of Earth is lit up more when Earth is on this side of the Sun?*
5. *Now, do this again, starting at position #1 (see diagram). In this position, the Northern Hemisphere is going to get more sunlight and more heat than the Southern Hemisphere. This will be summer in the north and winter in the south. Stay in this position and spin your Earth so that where you live is closest to your Sun. Is it summer for you or winter? Spin your Earth all the way around. This is one day. Is your day mostly light or dark?*
6. *Move ¼ of the way around the Sun to position #2. Here, the north and south receive an equal amount of sunlight. Continue on to position #3. This is winter in the north and summer in the south. In this position, the North Pole will get no light at all, day or night. Stay in this position and spin your Earth. Can you see that it will remain dark at the North Pole? Go to position #4. Again, each hemisphere will receive an equal amount of light and heat.*
7. *Spin, turn, and orbit to your heart's content, then complete the lab page. On the lab page, put a spot on each picture of Earth where you live. Below each position of Earth, write what season you are in when Earth is there.*

(continued on the back)

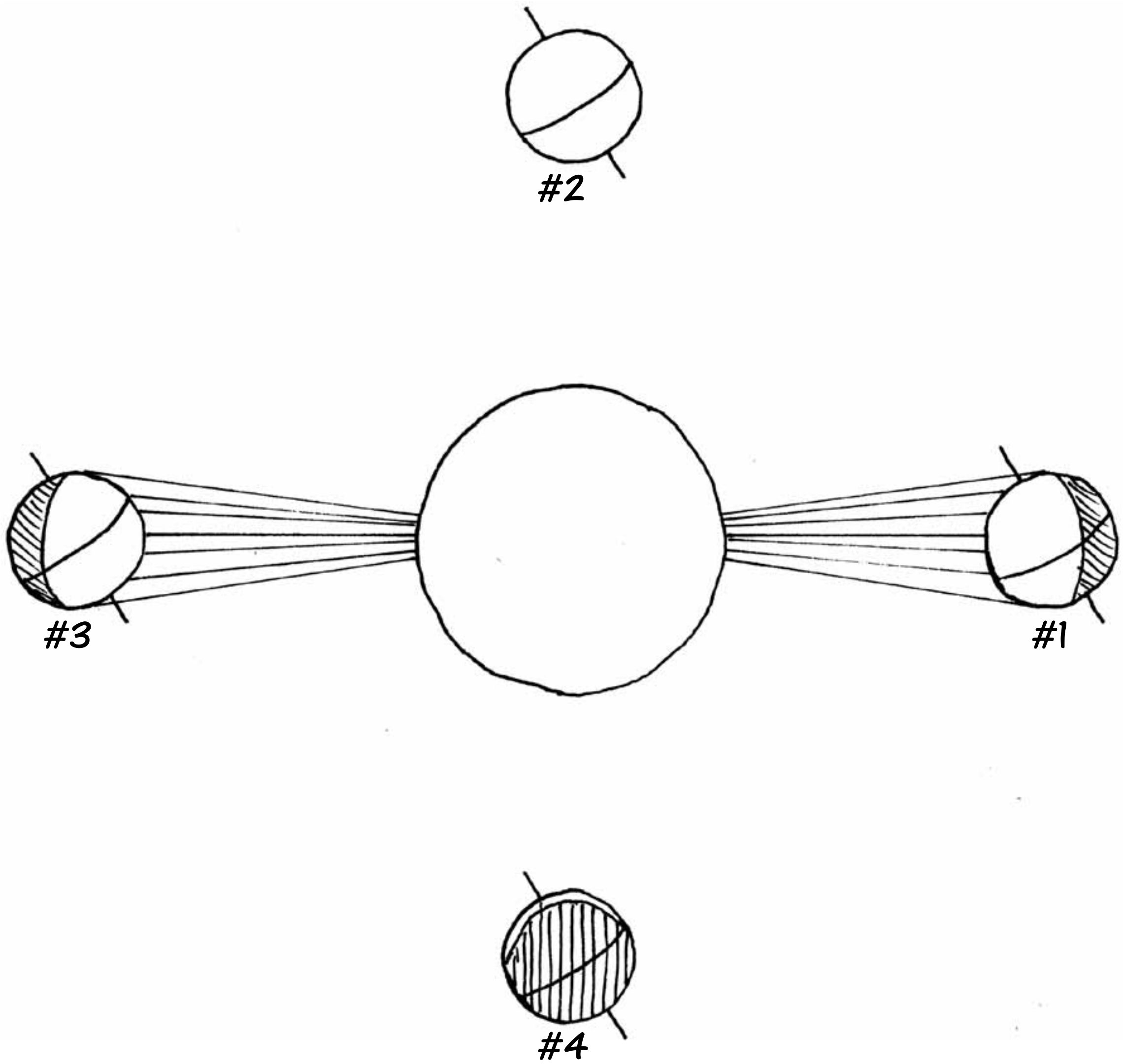
Possible Answers:
1. #1 #3
2. #1 #3
3. #1 #1
4. depends on where you live
5. #2 and #4

Conclusion/Discussion:
1. Our seasons depend on the angle of Earth relative to the Sun. In summer, the Sun is facing us directly. This makes the day longer, so we have more time to soak up light and heat. Because the Sun is facing us more directly, the heat is concentrated into a smaller area.
2. In winter, the day is shorter, so there is less time to soak up heat. Also, the sunlight hits us at an angle so the same amount of heat is spread out over a bigger area.
3. At the North and South Poles, there is no light in the winter. The Sun never comes over the horizon. It gets a dusky glow in the middle of the day, but the Sun never appears. In the summer, the Sun never goes down. The Sun still hits at an angle so it doesn't get hot, but it never gets dark.
4. It is very warm at the equator because it is always in the path of sunlight. It spends the whole year getting relatively direct heat and light. The further away from the equator you get, the more dramatic the seasons become.

For More Lab Fun:
Do this same experiment using an inflatable globe. You can really keep track of the seasons in each location. We used an orange for the lab only because it's easier to keep track of your Earth's tilt when there is a stick through it. If the kids have the tilt mastered, use the globe.

NAME ______________________________ DATE ________________

Weather Lab #6: THE REASONS FOR THE SEASONS



Fill in the blanks below with the position number that gives the right answer.

1. ______ winter in the south ______ winter in the north

2. ______ South Pole gets no light ______ North Pole gets no light

3. ______ days are shorter in the south ______ days are longer in the north

4. ______ I wear shorts ______ I wear a heavy coat

5. ___________ north and south get the same amount of light and heat

NAME ______________________________ DATE ____________________

For my notebook

THE WATER CYCLE

It seems that planet Earth is the great recycler. Right now Earth is busy recycling oxygen, rock, and water. As we will learn later, although we live on a planet covered in water, very little of that water is available for us to drink. So then, how does the earth recycle water? By a process known as the <u>water cycle</u>. Imagine you are a tiny <u>molecule</u> of water hanging out in a mud puddle. You're surrounded by dirt and scum when, all of a sudden, you feel the heat of the Sun lifting you out of the puddle and into the air, leaving behind all traces of soil. Through <u>evaporation</u>, you have just become pure, clean water. You hang out in the air as water vapor, tiny and invisible, but soon you travel higher and higher. It's cooler up high, and you gather together with other water molecules to form small water droplets. This grouping of water molecules is called <u>condensation</u>. There are now so many of you grouped together that you have become too heavy to stay in the air. You fall back to the ground as some type of precipitation—rain, snow, or hail. Where will you end up this time? It's anybody's guess. Maybe in a dog's water dish, a queen's rose garden, or even in the body of a dolphin. You might fall very close to your old home, the mud puddle, or you may have traveled halfway around the world before falling back to the earth. The only sure thing is that wherever you go won't be your last stop. In fact, the water that the dinosaurs drank millions years ago is the same water being recycled again today by the Sun and the earth.

Water Cycle Lab #1: WATER CAN BE SOLID, LIQUID, OR GAS

Materials:

- *Lab sheets (2 pages), pencil*
- *Cookie sheet*
- *Drinking glass*
- *Water*
- *Ice cubes (about 4 cups)*
- *Sauce pan*
- *Heat supply (stove, bunsen burner)*
- *Stirring spoon*

Aloud: How are water and ice different? How are they the same? Do you know they are made of the same stuff—the same molecules? Water on the earth comes in three forms. Very cold water is solid. We call this ice. When water warms up it melts. This is liquid water. When water becomes even warmer, it can go right up into the air as water vapor. Can you see the water in the air all around you? You will find a way to make this water visible. This form of water is called a gas. Today we are going to have fun finding out about water as a solid, a liquid, and a gas. Always remember that no matter what form it is in, all water is made of the same tiny molecules; they are just acting differently.

***Parents: This lab requires the use of a stove to boil water. Use appropriate caution and don't forget—STEAM CAN BURN!*

Procedure:

1. Make sure the glass is completely dry on the outside. Feel it to be sure. Fill it half way with water and add a few ice cubes. Immediately dry it off and feel it again. Set this aside. You will check it again in step 8.
2. *Keep about half of the remaining ice cubes cold. Put the rest in the pan. Play with them: feel them, test them, drop them from the spoon. Describe what solid water feels like, how it pours, moves, etc. Write your observations in the first column on lab page 1.*
3. *Now do the same thing with some liquid water. Feel it, pour it, listen to it. Write down your observations in the second column on the lab page.*
4. *Repeat again with the water vapor in the air. Look for it, feel it. Can you tell it's there? Fill in the third column on the chart for water in gas form. Be honest about your observations.*
5. *With the ice back in the pan, place the pan onto the heat source. Turn heat on low and watch as ice melts. Water is now going from a solid to a liquid.*
6. *Turn heat up under the pan. As water boils, observe the steam going up. This is liquid water changing to a gas and going into the air. This gas is called water vapor. Steam can burn, so stay away from it! Look at it and describe it.*
7. *Hypothesize how to get the water vapor to turn back into a liquid. Hint: What happened to get it to become a gas? How can you reverse that? Try this way: Place the remaining ice cubes onto the cookie sheet. ADULT: Hold this cookie sheet about 45 cm (18") above the boiling water (in the steam). What forms on the bottom of the cookie sheet?*
8. *You can see that water does go into the air, but where does it go? Water stays all around you in the air. You are surrounded by it. Look at the glass that you put water into. What is on the outside of the glass? Where did it come from? Complete #2 on lab sheet page 1. The cold water in the glass has condensed the water that was in the air.*
9. *Complete lab page 2 by drawing a picture of water changing forms.*

(continued on the back)

Possible Answers:

#2. -water -the air -"there is no hole in the cup so it didn't come from there" or "the water in the air around the glass got cold and condensed into water droplets"

#3. solid to liquid- drawing of ice melting
liquid to gas- drawing of water boiling, showing the steam
gas to liquid- drawing of water drops condensing on the bottom of a cookie sheet held over boiling water, or water drops condensing on the outside of a cold glass of water
liquid to solid- drawing of ice cubes

Conclusion/Discussion:

1. There are three states or forms of matter—solid, liquid, and gas. Water on the earth occurs in nature in all three states.
2. Under normal circumstances you can't see water vapor, but you can find it by changing it to a liquid, which is visible. In fact, people and nature can change water back and forth between all three forms.

NAME ______________________________ DATE ___________________

Water Cycle Lab #1: WATER CAN BE SOLID, LIQUID, OR GAS - p. 1

1. This is what I have noticed about water:

	SOLID	LIQUID	GAS
FEELS (how hard it is)			
FEELS (temperature)			
FEELS (between my fingers)			
LOOKS			
SOUNDS (when dropped or poured)			

2. There is ______________________ on the outside of the ice water glass.

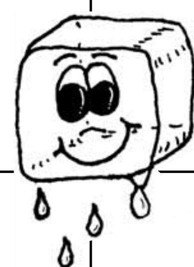
I think it came from ________________________ because _______________

____.

Water Cycle Lab #1: WATER CAN BE SOLID, LIQUID, OR GAS - p. 2

3. People and forces of nature can change water from one state (form) to another. Here are drawings (or explanations) to show how this can happen:

SOLID to LIQUID	LIQUID to GAS
GAS to LIQUID	**LIQUID to SOLID**



Water Cycle Lab #2: WATER CYCLE IN A BOWL – instructions

Materials:
- Lab sheet, pencil
- Large, clear glass bowl
- Clean water
- Small glass (shorter than the bowl)
- Food coloring
- Salt
- Stirring spoon
- Plastic wrap
- Small rock or marble

This lab takes a day or two to see the final result.

Aloud: You have seen water as a solid, a liquid, and a gas. You have also been able to test and make sure there really is water in the air. Today you will put all of this together and make a real, complete water cycle. You will be able to see evaporation, condensation, precipitation, and <u>accumulation</u>. Accumulation is a new word. When water drops find each other and gather together, they are accumulating. I think you will be amazed at how well this system can clean water—the same water enjoyed by ancient people! This is the Sun's energy at work for you.

Procedure:
1. Add about 2" of water to the large bowl. Mix in ½ cup of salt and a few drops of food coloring. Taste the water.
2. Place the empty glass right side up in the center of the bowl.
3. Cover the bowl tightly with plastic wrap. If it doesn't cling well, tape tightly in place.
4. Put a small rock on the plastic wrap directly over the center of the glass. This should make the wrap dip slightly toward the glass but NOT touch it. See diagram on lab page for set up.
5. Set your water cycle in the warmest, sunniest place possible.
6. Answer lab questions #1 – 3.
7. Check in a few hours. What do you see on the plastic wrap?
8. After a day or more, check for water in the cup. Taste it.

Possible Answers: (Your children may have different answers or word things differently)

1. salty . . . colored (blue, green, . . .)
4. water on the plastic wrap
5. clean water in the cup
6. colored . . . salty
7. clear or clear . . . clean, pure
8. it cleans water using the Sun's energy
9. fresh, clean water

Conclusion/Discussion:
1. Encourage your children to explain what happened using the terms evaporation, condensation, precipitation, and accumulation.
2. Discuss how the water looked and tasted in the big bowl and then in the glass. How did this happen? During the water cycle, what is cycled? What is left behind?

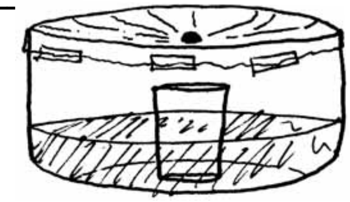
For More Lab Fun:
You can do this same experiment outside without adding water. This is one way to survive in the desert if you become stranded without water. Dig a hole (about 2 feet in diameter and 1 foot deep). Put a cup in the center, cover with plastic, and place rocks at the corners to hold the plastic down. Add a rock in the center of the plastic (over the cup) and check in the morning.

NAME ______________________________ DATE ___________________

Water Cycle Lab #2: WATER CYCLE IN A BOWL

1. The water in the big bowl tastes _________________

   and looks _______________________.



HYPOTHESIS:

2. I think I will see____

____.

3. I think the water will become __________________________________

____.

RESULTS:

4. After a few hours I saw ______________________________________

____.

5. At the end of the experiment I saw ____________________________

____.

6. The water in the bowl looks _____________ and tastes_____________.

7. The water in the cup looks _____________ and tastes_____________.

CONCLUSION:

8. My experiment is like the water cycle because ____________________

____.

9. I see how the Sun takes dirty water and recycles it into ____________

____.

Water Cycle Lab #3: WATER CYCLE DIAGRAM – instructions

Materials:

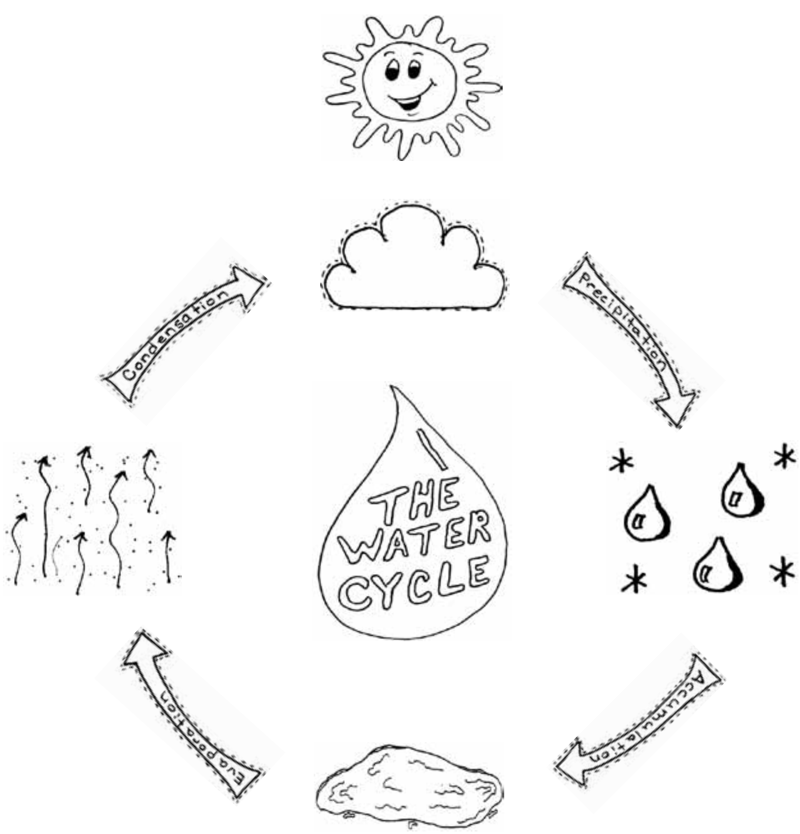
- *Lab sheets (2 pages), pencil*
- *Scissors*
- *Glue (I like the gel type or rubber cement)*
- *Colored pencils*

Aloud: You have learned a lot about the water cycle. You have learned that, powered by the Sun, water can leave a pond and go straight into the air. This is called evaporation. You have also learned that when these tiny drops of water vapor come together in the air, it is called condensation. When they are too heavy to stay in the air, they fall as precipitation. As they fall, they run into streams, puddles, ponds, or rain gauges where they gather together, or accumulate. Today you will take everything you have learned about the water cycle and put together a water cycle diagram.

Procedure:

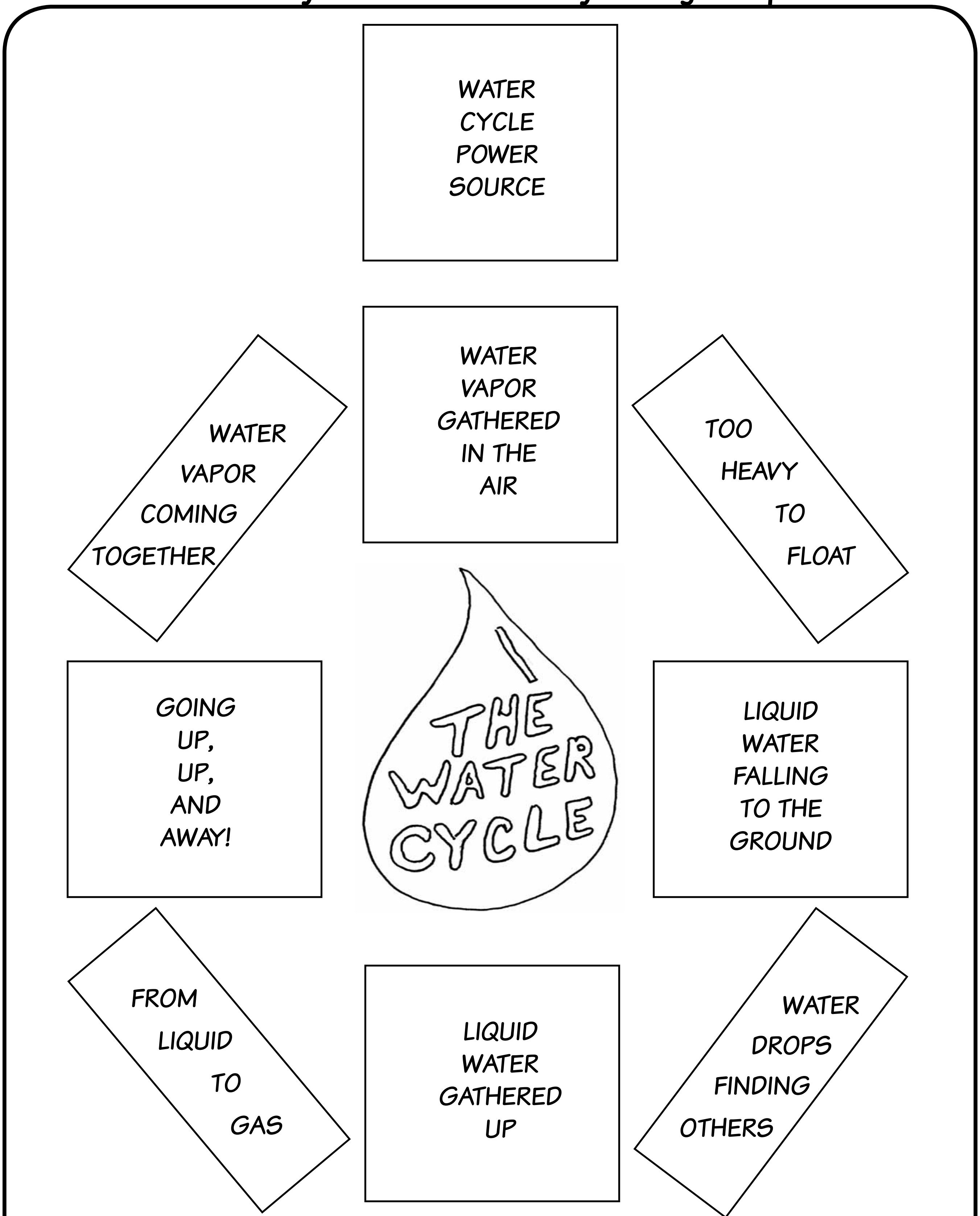
1. *Cut out the water cycle pictures on lab page 2.*
2. *Using the clues in the boxes, glue them onto the diagram on page 1 where you think they will go.*
3. *Color in your finished summary of the water cycle.*

Answers:



NAME ______________________________ DATE ________________

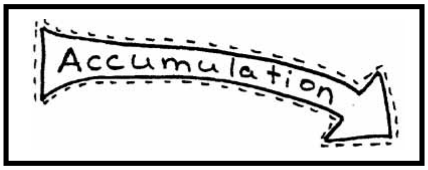
Water Cycle Lab #3: Water Cycle Diagram- p.1

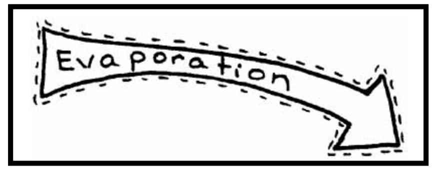


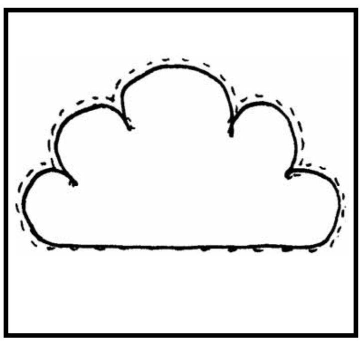
NAME ______________________________ DATE __________________

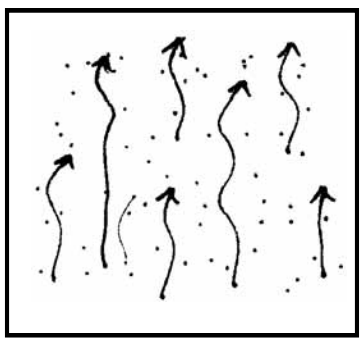
Water Cycle Lab #3: Water Cycle Diagram- p. 2

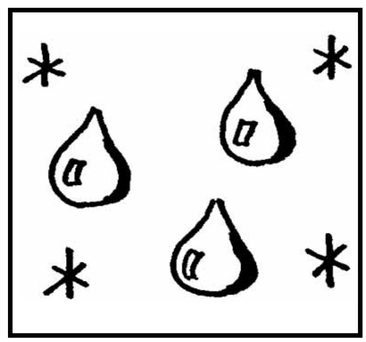
Cut out these pictures and glue them onto lab page #1 in their proper places.

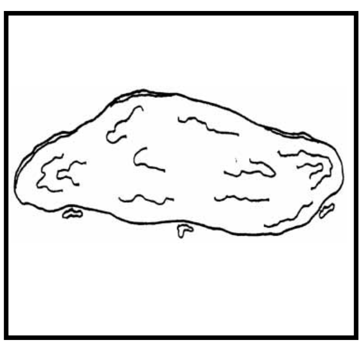


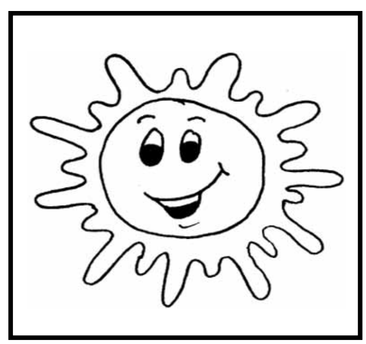












NAME ______________________________ DATE ____________________

For my notebook

AIR SURROUNDS THE EARTH

Have you ever watched the movie *Shrek*? Shrek says that ogres are like onions because they have layers. I think if Shrek knew more about the earth, he would have said, "Ogres are like the earth." The earth has layers that begin right in its very solid core and reach all the way to space. It's not just the land that is layered; our air comes in layers, too. Even though it looks like clouds are very high in the sky, they are only in the very bottom layer of our atmosphere, close to the earth. Atmosphere is a long name for the blanket of air that surrounds our planet. Some planets don't have an atmosphere, and there is no air at all in space. But what is air? Air is made of the same things you're made of—molecules. In fact everything, absolutely everything, from sand to ice cream to your body is made of molecules. Now, there are a lot of different kinds of molecules but they are all way too tiny to see. Air is made mostly of molecules of nitrogen, oxygen, and water. Can you see air? Can you taste it, smell it, hear it, or feel it? Well, no, so how do we know it's here? By using clues. Can you see or smell your heart? Of course not, but clues tell you that it's there. Just like the thumping in your chest tells you that you have a heart, there are clues to tell us air is all around us. Let's be air detectives and find clues that those tiny invisible molecules are really there.

Air Lab #1: AIR TAKES UP SPACE - instructions

Materials:

- Lab sheets (2 pages), pencil
- Balloon
- 2 clear glasses
- Sink or large bowl (deeper than the glasses are tall)
- Water
- Piece of paper

Aloud: Seeing is believing, right? So how can we possibly believe in air? Maybe there really isn't anything surrounding us. Maybe what we call "air" is just empty space. What do you think? Let's experiment and find out.

Procedure:

PART I: BALLOON

1. Hold one empty balloon. Shake it, stretch it, move it, roll it between your hands. How does it feel? Now blow it up and tie it off. How does it feel now? Push on it. Does it "push" back or collapse like it did when it was empty? Does it feel empty, or like something is inside of it?
2. Now untie the balloon while pointing the open end at your hand. Can you feel something coming out of the balloon when you untie it? Could you see what it was?
3. Complete lab page 1.

PART II: PAPER IN GLASS

1. Fill a deep bowl or sink with water.
2. Crumple the paper and push it to the bottom of a glass. Make sure it's tight enough to not fall out when you turn the glass upside down.
3. Predict what will happen when you turn the glass over and submerse it (upside down) in water. Write down your hypothesis (prediction) on lab page 2.
4. With the glass upside down, test your hypothesis by submersing it in water so that the entire glass is under the water. Make sure to hold the glass straight up and not to tip it. Does the water flow into the glass?
5. Pull the glass back out and check the paper for wetness.
6. Complete lab page 2.

PART III: POURING AIR

1. Push one glass underwater right side up, so that the water completely fills the glass. Once it is full of water, turn it over so the opening is facing down.
2. Push the second glass in upside down without tipping it so no water goes into the glass.
3. With the opening of the air-filled glass directly under the opening of the water-filled glass, pour out the air so it flows up into the water glass. Did you ever think you could pour air?

Possible Answers:

#7 air dry

#8 air filled up the space and pushed the water out

#9 air

Conclusion/Discussion:

1. Two things cannot occupy the same space at the same time. If air is taking up a space, nothing else can go into that space.
2. Water will fill any space that is under that water's level, unless something else is already in that space and the water can't get in.
3. All matter is made of tiny molecules that occupy space. Even though it is invisible, air is made of molecules of oxygen, nitrogen, water, and other gasses.

NAME ______________________________ DATE ___________________

Air Lab #1: AIR TAKES UP SPACE - p. 1

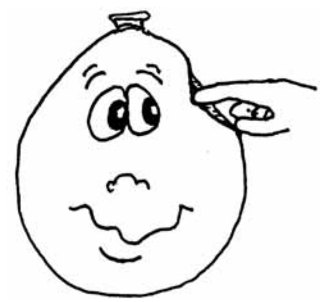
PART I: BALLOON

MY BALLOON EMPTY:

1. Feels ______________________________ and looks

____

____



MY BALLOON FULL:

2. Feels ______________________________ and looks

____

____

____

3. When I squeeze one side of the balloon, the other side ______________

____.

4. When I held the open balloon to my hand,

I felt ____,

and I saw ____.

PART II: PAPER IN GLASS

HYPOTHESIS:

5. When I put the glass underwater, I think the paper inside it will

____.

6. I think the glass will be filled with ______________________________.

RESULTS:

7. The upside down glass was filled with ________________________,

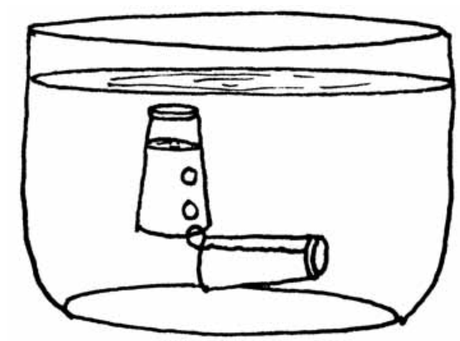
and the paper inside of it was ______________________________.

8. I think water couldn't get into the glass because ________________

____.

PART II SET UP

PART III SET UP



PART III: POURING AIR

9. I could see ________________ flowing from one glass into the other.

10. I DO DO NOT think air is something that takes up space.

Air Lab #2: AIR HAS MASS (WEIGHT) - instructions

Materials:
- Lab sheets (2 pages), pencil
- Meter stick (or yard stick)
- Metric ruler (for measuring)
- 6 balloons of the same size
- About 2 meters of string
- Masking tape

Aloud: How much does nothing weigh? Sounds like a trick question, doesn't it? Obviously if nothing is there, it won't weigh anything, right? We are going to use this idea to show another way we can prove that air is there, even if we can't see it. If you have a cup of water and you add nothing to it, will it weigh the same as before? If you have some balloons and you add nothing to them, will they weigh the same as before? Of course. So, if the weight of the balloons does change, then you know that you did add something, after all.

Procedure:
1. Tie about 30 cm of string to the center of the meter stick. The stick should balance evenly when you hold it up by the string.
2. Tie three strings about 25 cm long onto each end of the meter stick. Use a small piece of tape to tape an empty balloon to the end of each string. You should now have three balloons hanging off each end of the stick. You should be able to hold the meter stick up by the string in the middle and have it balance out evenly. If not, you can slide the string in the middle a little toward the low side until they balance. Once you have them balanced, do the "Before Air" part of the lab.
3. Untape the balloons from one side of the meter stick, saving the tape. Blow up the three balloons, tie them off and tape them back where they came from.
4. Complete the lab as indicated.

Possible Answers:
#2. 6 strings, 6 balloons, 1 meter stick, 6 pieces of tape
#3. DO
#4. goes down
#6. DO NOT
#7. 6 strings, 6 balloons, 1 meter stick, 6 pieces of tape, air
#8. WITH
#9. DOES

Conclusion/Discussion:
Even though you can not see air, you can tell it is there because it has mass (weight). If you had blown nothing into the balloons, the mass wouldn't have changed.

For More Lab Fun:
1. If you have a good, accurate balance, you can weigh the air in a balloon also. Simply weigh the balloon empty, blow it up and tie it off and weigh it again.
2. Sliding the strings back and forth along the meter stick to balance it (and to unbalance it) makes a good physics experiment. Encourage the kids to do this as long as they want. Even though they probably don't understand the physics behind it yet, they are getting valuable knowledge in the fact that it does work and in what direction to go to compensate for differences in weight.

NAME ______________________________ DATE __________________

Air Lab #2: AIR HAS MASS (WEIGHT) - p. 1

BEFORE AIR:

Hold your balance by the string.

1. This is how my balance looks before blowing up the balloons:

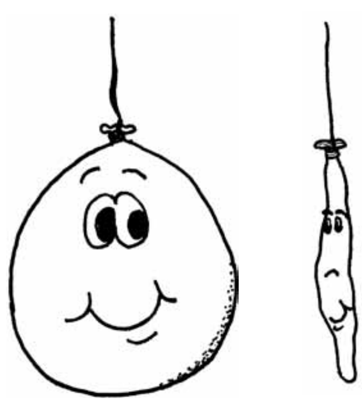
2. These are all of the things that I am holding up by the string (and how many of each):

_____________________________ _________________________________

_____________________________ _________________________________

3. My 6 balloons DO DO NOT balance.

4. When I add weight to one side by pulling slightly on those strings, that side ____.



Air Lab #2: AIR HAS MASS (WEIGHT) - p. 2

AFTER AIR:

5. After blowing up the three balloons on one side, this is how my balance looks:

6. Now my balloons DO DO NOT balance.

7. These are all of the things that I am now holding up by the string (and how many of each): (Circle the one that you weren't holding up the first time you did this.)

_______________ _______________

_______________ _______________

____

8. The side WITH WITHOUT air is heavier.

9. Air DOES DOES NOT have mass (weight).

NAME ____________________________ DATE __________________

For my notebook

EARTH'S SURFACE IS CHANGING

Drain the water from the tub and what do you see? A smooth, flat-bottomed tub. What do you think you would see if you could drain the water out of the earth's oceans? If you are picturing a smooth, flat bottom, you may be surprised. The ocean bottom has mountain ranges, deep trenches, and even volcanoes, just like you see on land! In fact, the longest mountain range on the earth is under the ocean. So is the deepest canyon. The bottom of the ocean is far from a quiet place. There are numerous volcanic eruptions and earthquakes going on under the surface of the ocean. Sometimes these underground earthquakes create gigantic waves called tsunamis. All of this activity above and below the ocean is constantly changing the earth. Mountains are built, valleys are worn, and the very land under our feet moves.

Many of the earth's most dramatic changes are hidden under water. In fact, a very large part of the earth is under water of some kind. What kinds of water cover the earth? One kind is fresh water. We call water that isn't salty "fresh water." Can you think of where you might find fresh water? In lakes, rivers, ponds, and under the ground is where fresh water is found. Saltwater is what you will find in the oceans. It is also called seawater. Another type of water found on the earth is ice. There is a lot of ice in the polar ice caps. These are the big layers of ice surrounding the North and South Poles.

As you can see, planet Earth has a wonderful, ever-changing surface hidden below its own waters.

Earth's Surface Lab #1: EARTH—THE WATER PLANET - instructions

Materials:
- *Lab sheets (2 pages), pencil*
- *Inflatable globe*
- *Crayons or colored pencils (one green and one blue)*
- *3 people (although it can be done with 2 if necessary)*

Aloud: Earth is called "The Water Planet" because it is the only planet with so much liquid water on its surface. We know that a number of Earth's most dramatic features are hiding under its waters. How much of the earth really is covered by water? For your lab today, you are going to answer that question.

Procedure:
1. *Do the hypothesis on lab page 1, question #1. Imagine the chart represents the entire surface of the earth. How many of those sections would be land and how many water? Use a green crayon to color in your guess for land and a blue crayon to color in your guess for water. All twenty sections of the chart should be colored in.*
2. *Two people will toss the inflatable globe back and forth and the other will record the results. Assign a person to be the recorder (or alternate throwers and recorder).*
3. *Have throwers stand one to two meters apart. One person throws the globe to the other. The catcher doesn't move his hands at all after catching. He must look at the tip of his right index finger and report if that tip is touching land or touching water on the globe. Recorder makes a tally mark in the appropriate box on lab page 1, question #2. Catcher should now "stir" the globe up (spin it and turn it randomly). Throw it back to the original thrower who also calls off land or water, depending on where her index finger lands.*
4. *Continue this process for twenty throws. Twenty tallies should be on the tally sheet.*
5. *Count up the tallies for land. Starting on the left of the chart at question #3, color one section green for each land tally you counted. Now count up the tallies for water. Color in that many sections blue. The water tally should be equal to the number of sections remaining.*
6. *For the table in question #4, color five sections in green and fifteen sections in blue. That is the actual proportion of land to water on the earth's surface.*
7. *Complete lab page 2.*

Conclusion/Discussion:
1. *More of the earth's surface is covered by water than by land. How does this affect our lives? What are some good things about having so much water? What are some bad things?*
2. *Picture our planet Earth with no oceans. What would be missing from your life? (seafood, beaches to play on, water sports such as sailing, surfing and scuba diving, etc.)*
3. *Besides the oceans, what other water covers the surface of the earth?*

For More Lab Fun:
Create a travel brochure for an ocean adventure company. What types of water activities will you provide for your guests? Now imagine the oceans have all gone dry. Create another travel brochure for an adventure vacation exploring the newly accessible ocean floors. What will your guests discover and be able to do that they couldn't before?

NAME ______________________________ DATE ___________________

Earth's Surface Lab #1: EARTH—THE WATER PLANET- p. 1

HYPOTHESIS:

1. This is how much of the earth's surface I think is land and how much I think is covered in water:

TEST:

2. These are the tallies from our globe toss experiment:

NUMBER OF TIMES MY RIGHT INDEX FINGER HIT LAND	NUMBER OF TIMES MY RIGHT INDEX FINGER HIT WATER

RESULTS:

3. This graph shows how our globe toss divided the earth's surface between land and water:

4. This is how the earth's surface is really divided between land and water:

Earth's Surface Lab #1: EARTH—THE WATER PLANET- p. 2

5. How many sections of land and water I guessed there would be:

   How many sections we came up with in the globe toss:

   How many parts of land and water there really are on the earth:

LAND	WATER

6. Fill in the two statements below with the word "land" or the word "water."

   I guessed there was more ______________________ than there is.

   I guessed there was less ______________________ than there is.

Earth's Surface Lab #2: "WATER WE'RE GOING TO DRINK?" - instructions

Materials:

- *Lab sheet, pencil*
- *Meter stick (or metric ruler)*
- *200 cm of adding machine tape (cut into two sections that are exactly 100 cm long)*
- *Colored pencils (4 different colors)*

Aloud: Earth has more water on it than any other planet. You learned in the last activity that a large part of the earth is covered with water. We have oceans, lakes, river, underground water, and polar ice caps. With all that water, it would seem that we will never run out of water to drink and water to wash dishes in. Today you are going to do an activity to determine how much of the earth's water can actually be used for drinking.

Procedure:

***Parent note: The numbers below are rounded to make them easier to measure and mark.*

1. *Lay out one adding machine tape. Tell children the tape represents all of the water on Earth. Have them draw a line across it to mark how much of the water they think is unusable for drinking. Label on the proper side of the line "Not Drinkable" and the other side "Drinkable."*
2. *Measure how many centimeters there are on the "Not Drinkable" side and mark it on your lab sheet. Because your tape is 100 cm long, the number of centimeters is the same as the percent of drinkable water. In other words, 40 cm out of 100 cm is the same as 40%. Use this information to finish your hypothesis.*
3. *Lay out the second adding machine tape right below the first. On the second, the children will actually measure out the percentages of drinking water and other waters available on the earth. Have them start by measuring out 97 cm from the left and making a mark with one color. It is important that you have 3 cm of tape left. If the measurements are off a little, adjust so that you end up with your remaining 3 cm to work with. You can cut the tape if there is too much or move your ocean mark back a little if you must. You could, of course, have them measure 3 cm from the right, but it's more dramatic to measure the whole long part while explaining that that is how much of our water is in the oceans. Label this part of the tape "Sea water." It is unavailable for drinking, because salt water actually pulls water away from your body when you drink it. This is a very large section to color in, but you can have the children draw a wavy line along its length to represent ocean waves.*
4. *From the first line, measure another 2.3 cm. Color in this 2.3 cm and label it "ice." This is the amount of water in the polar ice caps. It is unavailable for drinking because it is too expensive and cumbersome to transport. You now have less than 1 cm left.*
5. *From the "ice" line measure .6 cm (6 mm) and make another mark. Color this section in a different color. It's too small to write on, but this is water that is too far underground to access. It is unavailable for drinking. This leaves you with .1 cm (or 1 mm) on your tape. In fact, drinking water is only .02 cm of the line, but that is way too hard to measure and mark without a microscope! Make a mark with your last color right along the extreme edge of your tape. That is the amount of drinking water available on the earth.*
6. *Fill in lab sheet. For the conclusion, have children color Earth as it is now. On the next circle, have them color how it might look if all of the undrinkable water were removed. How different would it be?*

Possible Answers:

3. 97% 4. 2.3% 5. 0.6% 6. 0.1% (actually 0.02%)

Conclusion / Discussion:

Even though about 75% of the earth's surface is water, only about .02% of that is usable for drinking. The vast majority of the earth's water is salt water.

NAME ______________________________ DATE ________________

Earth's Surface Lab #2: "WATER WE'RE GOING TO DRINK?"

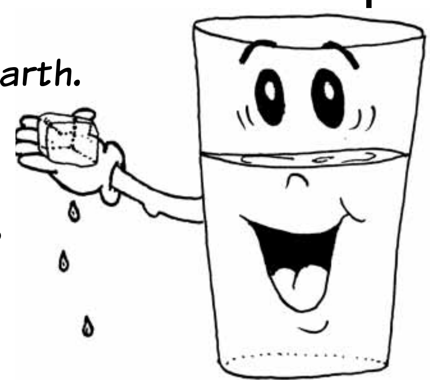
HYPOTHESIS:

1. I think that ______________ cm of the tape will equal undrinkable water.
   (A)

   This is ______________ % of the water on the earth.
   (A)

2. I think that ______________ cm of the tape will equal drinkable water.
   (B)

   This is ______________% of the water on the earth.
   (B)



RESULTS:

3. Percent of ocean water = ______________%

4. Percent of ice water = ______________%

5. Percent of underground water = ______________%

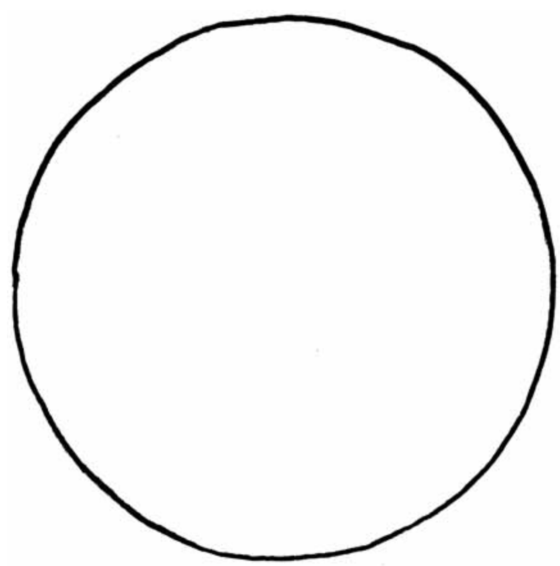
6. Percent of drinkable water = ______________%
   (C)

7. I was off by ______________ – ______________ = ______________%
   (B) (C)

CONCLUSION:

Earth looks like this:

Earth, with all of the undrinkable water taken away, might look like this:



NAME ____________________________ DATE ___________________

For my notebook

WHAT IS INSIDE THE EARTH?

Have you ever dreamed of digging a hole to the very center of the earth? What would you expect to dig through on your way? People have wondered this for many years, and even though we have been all the way to the Moon, we have yet to see inside our own planet Earth. It's amazing, though, that with the help of earthquakes and scientific equipment we have a very good idea what is in there.

Scientists have divided the earth into four basic layers. Imagine traveling to the center. The outside layer, where you live, is called the crust, just like the crust on a loaf of bread. It is a thin layer of soil and rock. The next layer down is the mantle (**man**-tl). The mantle is made of rock so hot that it is only sort of solid. It flows slowly along under the crust. The next layer down is called the outer core. It is so hot there that everything is liquid. The center of the earth is a solid ball larger than the Moon. This deepest section is the inner core. Both the inner and outer cores are probably made of the metals iron and nickel. The inner core is the hottest part yet, so why hasn't it melted into a liquid? Well, the weight of rock and metal from the crust, mantle, and outer core push down so hard that it keeps the inner core squeezed into a solid ball of metal.

It's time to return to the surface, so turn around and head back from the solid inner core through the liquid outer core, through the slowly flowing rock mantle, and finally the thin rock crust. You made it! It must be good to get away from all that hot rock!

Earth's Interior Lab #1: PIZZA CRUST TO CORE - instructions

Materials:

- Lab sheet, pencil
- "What's Inside the Earth" notebook page (for reference)
- Pizza pan or large cookie sheet
- Large pizza crust (ready-made like Boboli, or homemade)
- Pizza sauce
- Shredded mozzarella cheese
- Shredded cheddar cheese
- 1 large, thin tomato slice
- Tablespoon
- Crayons (brown, yellow, orange, and red)
- 4 toothpicks
- 4 Post-It sticky notes

Aloud: Since nobody has been to the center of the earth there are no pictures to see. So today you are going to make your own picture on a pizza! Pretend you have cut planet Earth right in half through the middle and that you are looking at the cut edge. This is called a cross section. Both the real earth and your pizza earth will start at the crust. The earth's crust is so thin that if planet Earth were the size of an apple, the crust would be thinner than the peel on that apple. Because of this, when you put your pizza together, you are going to spread the sauce and first layer of cheese right up to the edge of the crust.

Procedure:

1. Place the pizza crust onto the pizza pan. Preheat oven to temperature indicated on the pizza crust package (usually about 450°).
2. Use the back of the spoon to spread the pizza sauce over the entire pizza, right up to the edge.
3. Sprinkle the mozzarella cheese over the entire pizza, right up to the edge. Make sure you have a nice, solid layer of cheese. The part of this section that shows beyond the other toppings will be the mantle.
4. Sprinkle a thin layer of cheddar cheese in a circle in the middle of the pizza. This circle should be about twice the diameter of your tomato slice and cover less than half of your mozzarella cheese. (See diagram on lab sheet for approximate proportions.) The cheddar cheese represents the liquid outer core.
5. Place your tomato slice in the exact center of the pizza. The tomato represents the solid inner core.
6. Bake for the time indicated for your pizza crust (usually about 8 - 10 minutes).
7. While your earth bakes, label and color in the earth and the pizza diagrams on the lab sheet. Use your "What's Inside the Earth" notebook page to help you.
8. Write "CRUST" on one Post-It, "MANTLE" on another and so on with, "OUTER CORE," and "INNER CORE." Wrap the edge of each Post-It around the top of one toothpick. You will use these to stick to the pizza earth when it is cooked.
9. When the pizza is done, place the toothpick labels where they belong on the pizza.
10. Admire your work, complete the lab sheet and have some fun eating your earthly creation!

Possible Answers:

1. crust	2. mantle	3. outer core	4. inner core	
6. and 7. - solid	8. and 9. - semisolid	10. - semisolid	11. - liquid	12. and 13. - solid

(continued on the back)

Conclusion/Discussion:

1. The closer you get to the center of the earth, the hotter it becomes. The hotter rock becomes, the more liquid it becomes.
2. The closer you get to the center of the earth, the more rock you have pressing down from above. This packs molecules so tightly that it is hard for them to remain liquid, in spite of the high temperature.

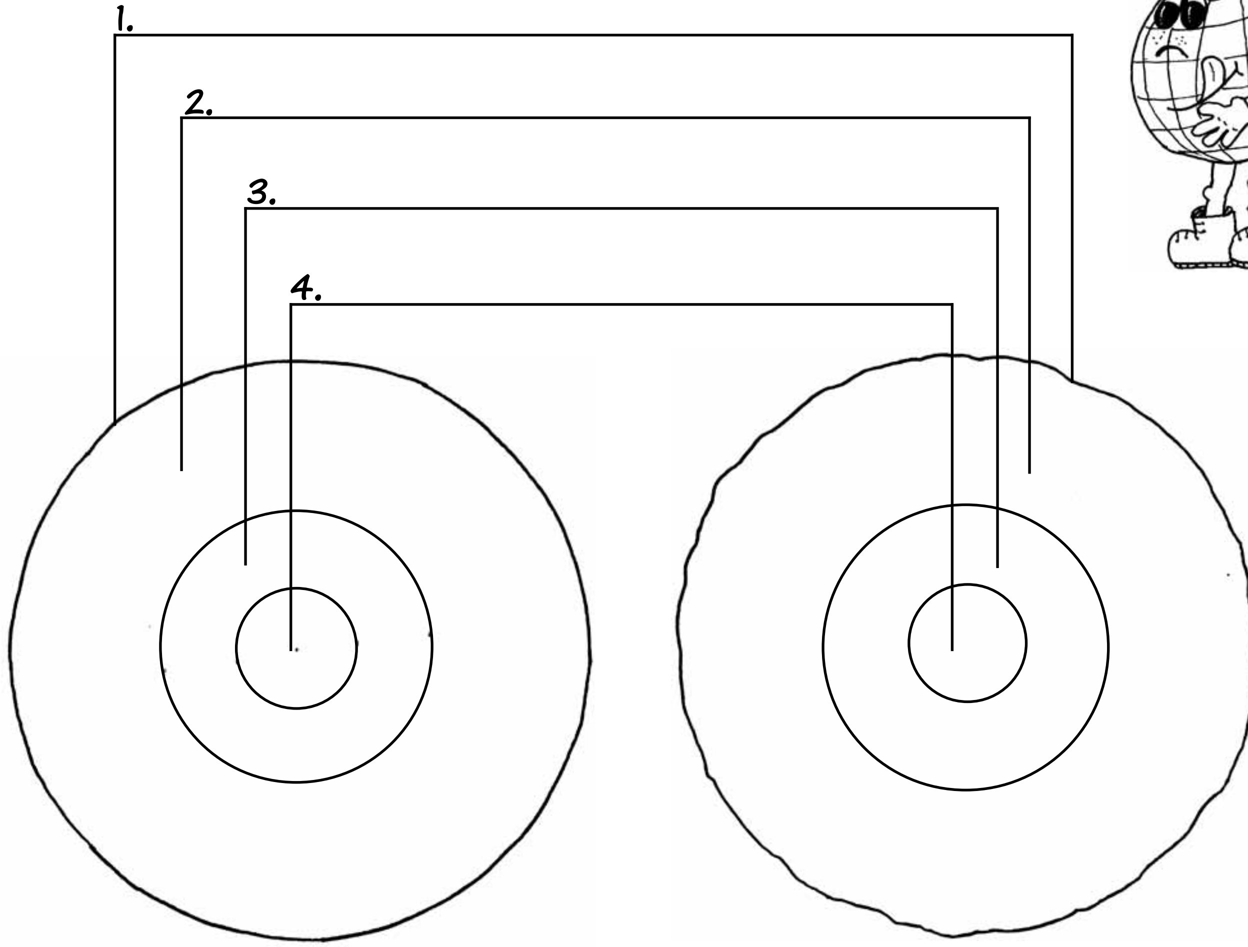
For More Lab Fun:

Cut down the center of an apple and a hard boiled egg. Which is more like the cross section of the earth? Why?

NAME ______________________________ DATE ___________________

Earth's Interior Lab #1: PIZZA CRUST TO CORE

On the lines below label the four layers of the earth.



THE EARTH THE PIZZA

5. Color the diagrams like this:

CRUST – brown (just outline this one)
MANTLE – yellow
OUTER CORE – orange
INNER CORE – red

For the earth and your pizza, tell whether each layer is solid, liquid, or semisolid:

LAYER	THE PIZZA	THE EARTH
CRUST	6.	7.
MANTLE	8.	9.
OUTER CORE	10.	11.
INNER CORE	12.	13.

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