FIFTH GRADE
6 lessons

5

HELPING HANDS SCIENCE

Joint project
Fremont Unified School District
and Math Science Nucleus

Comments or correction please contact
msn@msnucleus.org

These are suggestions on how to use the materials with your students. The materials are set up so you can easily put out the materials. Make sure the students do not destroy materials. Many times the material can stay in the bag and a hand lens can be used for observation. Please put materials back the way you found them so all children at your school can enjoy them.

These kits have been funded in part by a grant from Fremont Educational Foundation, Lam Research Foundation, Fremont Unified School District, Math Science Nucleus and the many high school volunteers
Curriculum customized for FUSD by MSN

HELPING HANDS SCIENCE (FUSD) - FIFTH GRADE

5

LIFE

Chapter	***Lab description and/or box label***	***Materials***	***Storybooks (on http://msnucleus.org)***
Cells			*The Naked Eye (storybook)* Microscopes (slideshow)
Plant System	5.1 Comparing plants (Life Cycle - Plants 5B)	3 sets of liquidambar, 3 pines, baby's breath, lavender, sage, corn, bean	Plants General(pdf) (slideshow)
Human Body	5.2 Heart Rate (Life Cycle - Human Biology 4B)	Stethoscope	*My Belly Hurts* *Skeletal Hip Hop* *Human Bone Poem (storybook)* Human Biology (slideshow)

EARTH

Water Resources			
Water Cycle	5.3 Properties of Water – surface tension	2 sets of 4 stations (1-pins;2-capillary, plexiglass, closed, straw; 3 – density timers; 4 – penny, dropper Different tubes, pins, density timers, droppers	*Mr. Drippy (storybook)*
Weather			
Solar System	5.4 Meteorites – comparing Earth rocks with tektite	Rocks (granite, basalt, obsidian, sandstone, schist), tektites	*Twelve Labors of Hercules (storybook)* Searching the Universe (slideshow)

PHYSICAL

Atoms and Elements	5.5 Periodic Table –Elements on chart	15 periodic tables	What is Matter (parts) slideshow
Chemical Compounds	5.6 Compounds – Salt looking at NaCl	5 sets of halite crystal, mill feed, blending, granulated, pellets, bakers, medium	Rock Cycle (Slideshow) –beginning part
Matter			

COMPARING PLANTS – FIFTH GRADE
(LIFE CYCLE – PLANTS (5B)

5.1

OBJECTIVES:

Comparing reproduction in a gymnosperm and angiosperm.
Determining male and female plant parts.

VOCABULARY:

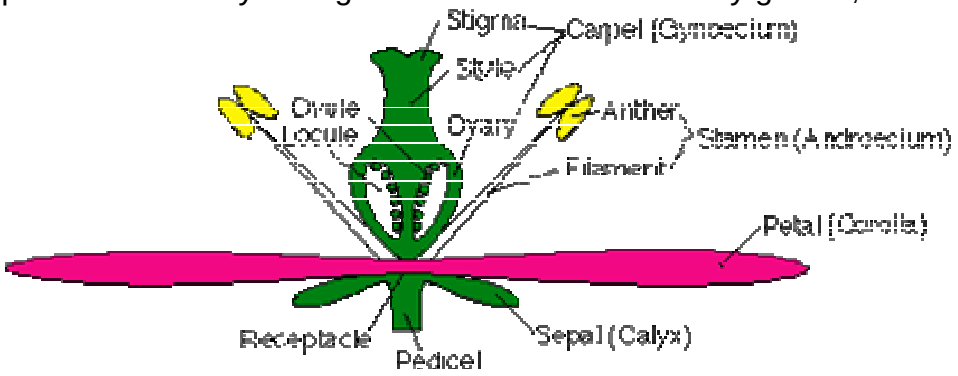
angiosperm
cone
gymnosperm
pollen
pollination
seed
sexual

MATERIALS:

Comparing Plants (Life Cycle - Plants (5B)
hands lens or microscope (Swift GH type)

BACKGROUND:

Gymnosperms are the non-flowering seed plants such as cedar, pine, redwood, hemlock, and firs. Gymnosperms are woody plants that bear "naked seeds." They are called naked because their seeds develop exposed on the upper surfaces of cone scales, such as in pine cones. A pollen grain is carried by wind currents to the appropriate "egg" where the growth of the pollen tubes through this tissue brings the sperm to the egg. Gymnosperms are usually of large size with much secondary growth, the leaves are usually evergreen needles or scales.



Angiosperms have flowers and bear seeds enclosed in a protective covering called a fruit. Angiosperms are the dominant types of plants today. Angiosperms are further divided into monocots and dicots. Monocots have one seed leaf (i.e. corn). Dicots have two seed leafs (i.e., bean). There are at least 250,000 species of angiosperms ranging from small flowers to enormous wood trees. Pollination is accomplished by wind, insects, and other animals. The male part is the pollen grain, and the female part is the ovary. The ovary goes through meiosis to produce an "egg", which is them fertilized by the "sperm" carried by the pollen. The sperm of the male part

travels down the pollen tube in the style. Two sperm enter the micropyle of the ovary. After the process of mitosis, it turns into a seed with an embryo. The seed may be inside a fruit.

PROCEDURE:

1. Discuss how angiosperms and gymnosperms reproduce. You may want to review the different parts of the plants.

2. In angiosperms, the pistil is the female reproductive structure found in flowers, and consists of the stigma, style, and ovary. There are two parts to an angiosperm: a male part and a female part. The male gametophyte consists of 2 or 3 cells contained within a pollen grain; the female gametophyte consists of eight cells contained within an ovule. The stamen is the male reproductive structure of a flower; usually consisting of slender, thread-like filaments topped by anthers, which contain the pollen.

3. In gymnosperms the cone is the female reproductive part and the pollen is the male reproductive part. Pine trees and other gymnosperms produce two types of cones. The male cone is called the pollen cone. The larger female cone is the seed cone. A single tree usually produces both pollen and seed cones. Spore-producing structures are found on the scales of cones.

4. Give students the bags of materials. You should have the students keep the material inside the back and use a hand lens or microscope to look at the material.

5. You may ask student so bring in a flower, seed, or pine cone. This would be excellent to dissect in the lab.

6. You have the following materials in your kit:
   Alder (angiosperm) – this is cone like structure, but its seeds are not naked, it gives the appearance of a gymnosperm, but this is one of the exceptions that all cones are gymnosperm
   Liquidambar (angiosperm) - this is a fruit husk, the seed would be inside; the fruit is green
   Pine (1) – gymnosperm, if you see a slight yellow color these are pollen grains, you need a microscope to look at them
   Pine (2) - gymnosperm, pollen can be seen with a microscope
   Pine (3) - gymnosperm, cone is female part
   Baby's Breath – angiosperm, flower
   Lavender – angiosperm, flower
   Sage – angiosperm, the seeds would be inside the fruit husk
   Corn – angiosperm, monocot, seed
   Bean – angiosperm, dicot, seed

PROBLEM: Can you identify an angiosperm from a gymnosperm?

PREDICTION:

MATERIALS: different flowers, fruits, seeds, cones

PROCEDURE:

1. Draw and label the parts of the plant (be sure to label the parts that are male and female)

CONCLUSIONS:

HEART RATES – FIFTH GRADE

(STETHOSCOPES)

5.2

OBJECTIVES:

Exploring how the circulatory system works. Comparing the pulse of males and females.

VOCABULARY:

arteries
atrium
blood pressure
capillaries
circulatory system
pulse
veins
ventricle

MATERIALS:

watch with a second hand or stop watch stethoscope
Human Biology (use portion on circulatory system) slideshow

BACKGROUND:

A **pulse** is created when the **ventricles** of the heart contract and force blood into the arteries. Each beat of the heart makes an artery stretch thereby causing a pulse within the artery. Blood in the arteries has a much higher pressure than the blood in the veins. Therefore, blood found in the arteries moves much faster than blood found in the veins. That is why it is so difficult to stop an artery from bleeding and why so much blood is lost if an artery is cut.

Blood pressure is a measure of the pressure of the blood on the walls of the arteries. The students should observe the mechanical heart found in the module so they can see a "pulse" in motion.

Digested food and other nutrients that are needed by our bodies are carried to the cells by the blood. The **blood** also carries wastes away from the cells. Blood must be kept moving through the body to accomplish these jobs. This is made possible by the heart. The heart acts as a pump. Blood is carried through tubes called **arteries**, **veins**, and **capillaries**. This entire network of blood is called the circulatory system.

The human heart contains **four chambers**. The upper two are the right and left **atria**. The lower two are the right and left **ventricles**. Arteries carry blood away from the heart and veins carry blood to the heart.

Capillaries connect arteries and veins. The heart is a mechanical device whose function is to pump blood through the body to replenish oxygen lacking blood cells with oxygen. The importance of constant circulation of blood throughout the body cannot be over emphasized, for without blood, life could not be. If blood does not reach the brain for just five seconds an individual loses consciousness; after 15-20 seconds the body begins to convulse; and if such a block lasts for nine minutes, irreparable damage to the brain results.

The strong contraction of the heart muscle forces blood into the arteries in two ways: the first expands the muscular walls of the arteries and the second pushes the blood through the arteries to regions of the body away from the heart. This rhythm makes the arteries expand thereby producing a pulse. In the wrist, the pulse is detected by a throbbing sensation near the surface.

PROCEDURE:

1. The heart is composed of four chambers, two upper chambers, the right and left atria, and two lower ones, the right and left ventricles. Using the worksheet go over the heart with the students, so that when they do the lab exercise they will be able to visualize the heart as it creates a pulse. Point out on the smaller diagram where the heart is located.

2. Go over the parts of the heart on their lab sheet for students to see the different parts.

3. This lab has the students detecting their own pulse rates and calculating the number of beats per minute. They will determine their pulse rates while standing still and after running. Use the picture of the heart to go over the different components of the heart. In the fifth grade boys usually have a higher rate than girls.

4. The purpose of this lab is to determine if boys and girls have a different pulse rates. The students will have to determine the average of the class for both girls and boys and then compare this with the average pulse rate. Use this as a math lab as well. You may want 10 students to do it at a time and then compare the averages.

PROBLEM: Is the pulse rate the same for boys and girls?

PREDICTION:

EXERCISE 1. Find an artery close to the surface of your body (either wrist or neck). Count your pulse for 15 seconds. Have your partner keep watch of the time while you count. Add the number four times (or multiply by four). This will record your pulse rate per minute.

My pulse rate: trial l _____X 4 = _____beats per minute

trial 2 _____X 4 = _____beats per minute

trial 3 _____X 4 = _____beats per minute

sum of trials _____

Average pulse rate (sum of trials divided by 3) = _____

After running in place for one minute, my pulse rate is:_____beats per minute

EXERCISE II. Let's look at the class average and see if there is a difference between the girls' and boys' pulse rate.

Girl name	Pulse	Boy name	Pulse
	AVERAGE:		AVERAGE:

Find the average: add up all the pulse rates under each section and then divide by the number of people in that section.

METEORITE - FIFTH GRADE

5.3

OBJECTIVES:

Comparing meteorites to Earth rocks.
Learning names for meteorites.

VOCABULARY:

Meteor
meteorite
meteoroid
asteroid
tektite
rock

MATERIALS: Meteorite – Fifth, hand lens

BACKGROUND:

A meteoroid is a naturally occurring, relatively small, solid body. Bodies larger than 1 kilometer in diameter are usually called asteroids. Meteoroids and asteroids move quickly, at speeds of greater than 10 km/second, about 58,000 miles per hour!

Meteorite impact crater in the Australian outback

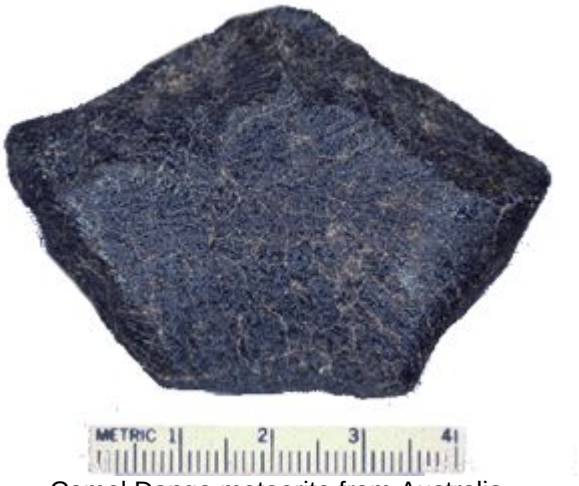
When a meteoroid enters through the Earth's atmosphere, it is slowed by friction with atmospheric molecules. This causes the meteor to heat up. It often glows, and leaves a trail of vaporized material and ionized air behind it. A glowing meteoroid moving through the atmosphere is called a meteor. Meteoroids enter the Earth's atmosphere continuously. Most of these objects, however, are dust to sand sized particles, which burn up, or vaporize high in the atmosphere.

Regmaglygt texture of meteorite from Sikhote Alin, Russia

If a meteor survives its passage through the atmosphere and strikes the Earth's surface, it is called a meteorite. This can happen in two ways. Some meteors disaggregate or explode in the atmosphere, and their remnants fall to the surface. If a meteor travels all the way to the surface, it usually creates a crater. The energy of the meteor compresses the ground where it strikes, forming a hemispherical cavity. In addition, much of the meteor, and some of ground is vaporized.

Material is also ejected from the crater, landing in piles all around it. This material may include bits of the meteor and surface rocks, as well as molten rock formed by the energy of the impact. This molten rock is similar in appearance to terrestrial magma. In some impacts, large blobs of molten rock are flung outward. These strike the surface and quickly cool, forming glassy objects called tektites. Tektites in this scenario are considered primarily melted Earth materials that sprayed upward and outward during an exceptional meteorite impact.

Meteorites and tektites are rare for three reasons. First, much of a meteorite is vaporized during its impact with the surface. Second, after they reach the Earth's surface, meteorites and tektites are subjected to weathering and breakdown. Third, these objects may be buried by the deposition of sand, mud, or other sediment.



Camel Donga meteorite from Australia

Meteorites have three general compositions:

a. Iron meteorites are composed mainly of metallic iron and nickel, often mixed together as an alloy.

b. Stony meteorites contain mainly silicate minerals, such as pyroxene, plagioclase feldspar, and olivine. They also contain minor amounts of metals, particularly nickel and iron alloys. Stony meteorites account for 95% of all meteoritic material.

c. Stony-iron meteorites contain a mixture of silicate minerals and nickel-iron alloy. Stony meteorites are similar to igneous Earth rocks like basalt. Iron meteorites probably resemble the material in the Earth's core.

You may wish to tell the students that their tektite samples are from Thailand, and are about 1.2 million years in age. They came from a crater that has not been found, but was

probably someplace in Cambodia. Tektites from this impact have been found as far away as central Australia.

PROCEDURE:

In this lab the students will compare meteorites with Earth rocks and then see what happens to a meteorite when it hits the Earth's surface.

1. The students have samples of granite, basalt, obsidian, sandstone, and schist from Earth. They also have a small meteorite to use for comparison. This sample is a tektite from Indonesia. Tell students to compare and contrast the samples.

2. In this lab the students will compare samples of tektites with six Earth rocks: granite, basalt, obsidian, sandstone, rhyolite, and schist. They will probably conclude that the tektite is most similar to basalt or obsidian because both samples will be black in color and contain visible minerals. However the composition of tektites is more similar to obsidian. Basalt is actually quite different; the tektites contain much more silica. The rhyolite, granite, sandstone, and schist do not resemble the meteorite at all.

PROBLEM: What type of Earth rocks do meteorites resemble?

PREDICTION:

MATERIALS: samples of granite, basalt, obsidian, sandstone, rhyolite, and schist; tektite, hand lens or microscope, ruler.

EXERCISE 1. Look at your tektite samples. Describe it by using the hand lens.

EXERCISE 2. Describe the different Earth rocks that you have at your station. Describe color, texture, density, size of minerals, or other components you see.

	DESCRIPTION
granite	
basalt	
obsidian	
sandstone	
rhyolite	
schist	

Compare your meteorite to the samples of Earth rocks. Which rocks does it resemble? Explain.

CONCLUSION: Can you tell the type of rock that the meteorite may have come from? What might that suggest about the origin of the meteorite?

WATER CYCLE - FIFTH GRADE

5.4

OBJECTIVES:

Introducing the water cycle.
Analyzing why water is important.

VOCABULARY:

condensation
evaporation
precipitation
water cycle

MATERIALS: Water Cycle – Fifth, Mr. Drippy (Storybook)

BACKGROUND:

Water is our most common natural resource. It is essential to the biology and chemistry of all living things, it plays a major role in shaping the earth and is an active agent in many physical reactions. It is important to most life to keep it clean.

There is plenty of water on Earth, but 97% of this water is saline (contains dissolved salts). Only 3% is fresh and about two thirds of that amount is locked up in polar ice caps and glaciers; about one third can be found as ground water, lakes, and in the atmosphere.

Water exists in three states of matter: solid (ice), liquid (water), and gas (vapor) at normal conditions. Water is a colorless, odorless, tasteless liquid with a melting point of 0° centigrade and a boiling point of 100° centigrade.

Water is a **transparent**, **odorless**, and **tasteless liquid**. It illustrates the three states of matter in normal conditions on Earth including solid (ice), gas (steam), and liquid (water). The form it takes depends upon the temperature. At low temperatures, the **molecules** do not move around as much and form a **crystalline** structure that is rigid (ice). In the liquid state, water molecules move more freely. Water molecules in the form of steam are moving very fast with large spaces between the molecules. Although ice is crystalline, it tends to have the molecules in a rigid structure that is spaced farther than the molecules of liquid water and this is quite important, for if ice were denser, it would sink in water. Imagine what would happen if icebergs grew from the bottom of the ocean instead of floating on the surface.

Another chemical quality of water is that water has a very large **heat capacity**, meaning that it can absorb a great deal of heat without itself becoming extremely hot. This fact makes the oceans large reservoirs of heat that greatly affect the overall weather and climate patterns of the world.

Water's **surface tension** (the ability of a substance to stick to itself) makes it an excellent substance to float heavy objects upon. Water not only sticks to itself, but also to other surfaces, and this allows it to move against gravity, which is very important to plants when

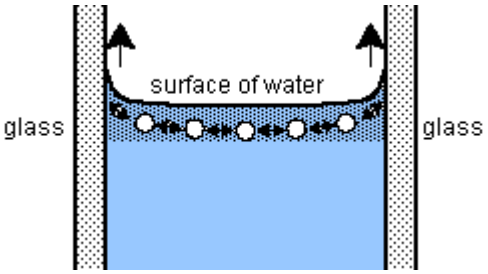
transporting water form the soil to their leaves. This upward motion is known as capillarity or capillary movement.

Water exhibits surface tension. **Surface tension** of water or the ability of a substance to stick to itself makes water an excellent substance to float heavy objects on its surface. The molecules of water on the surface of a calm and quiet pond tend to be drawn into the liquid, so that the liquid surface is taut, like a sheet of rubber drawn over the open mouth of a jar. This tautness is caused by surface tension.

Surface tension is responsible for the shape of liquid droplets. Although easily deformed, droplets of water tend to be pulled into a spherical shape by the cohesive forces of the surface layer. The surface of water can support small objects like a sewing needle until the surface tension is broken. This "skin" on the water aids the growth of mayflies and caddisflies that are attached to the water's surface. However, surface tension can also trap flying insects that accidentally fall into the water and are unable to fly out.

Soaps and detergents help the cleaning of clothes by lowering the surface tension of the water. This allows the water to soak into pores and dirty areas more effectively. Small insects such as the water strider can walk on water because their weight is not enough to penetrate the power of surface tension.

Common tent materials are somewhat rainproof because surface tension of water will bridge the pores in the finely woven material. But if you touch the tent material with your finger, you will break the surface tension and the rain will drip through.



Water can defy gravity as it can "walk" up the sides of a thin tube. The molecule is actually attracted to the side and pulls itself up. It might take a long time to get up a thin capillary tube, but it is working against gravity.

PROCEDURE:

1. Discuss with students the following major points about water or the hydrologic cycle. Draw the diagram of the water cycle.

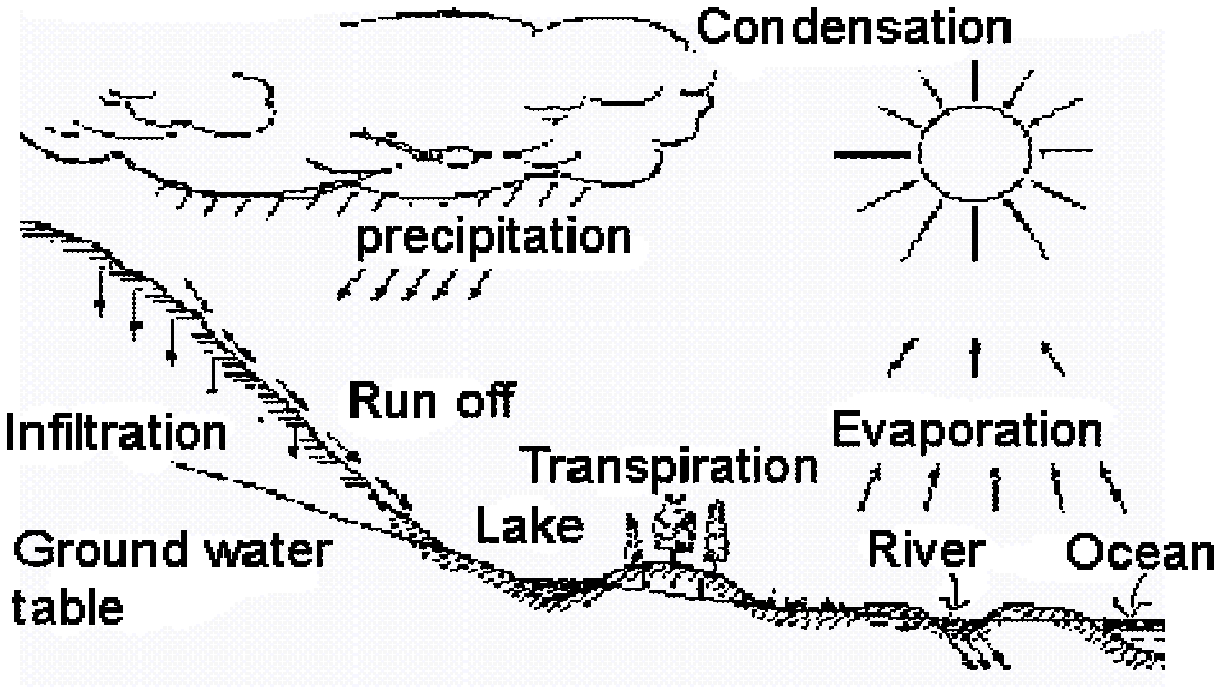
A. Water precipitates from clouds as rain, snow, sleet, or hail to the Earth's surface.

B. Depending on a number of factors such as soil type, slope, moisture conditions, and intensity of precipitation will either infiltrate into the ground or runoff into rivers and streams

C. Virtually no water infiltrates through paved roads and parking lots, so almost all of it becomes urban runoff. Runoff from rivers, and streams is stored in large bodies of water such as lakes, estuaries, and oceans.

D. Water is returned to the atmosphere evaporation from the surface of land or water bodies, or through plants by a process called transpiration.

E. Clouds are formed by condensation of water vapor that evaporated from the land or oceans.



2. Discuss that surface tension is an important property of water. The molecules within the bulk of a liquid are attracted equally in all directions by the surrounding molecules. However, the molecules on the surface of a liquid are attracted only inward and sideways. This unbalanced molecular attraction pulls some of the surface molecules into the bulk of the liquid and a condition of equilibrium is reached when the surface area is reduced to a minimum. The surface of a liquid therefore behaves as if it were under a strain or tension. This force is called surface tension. We may define surface tension as the force which causes the surface of a liquid to contract. A liquid surface acts as if it were a stretched membrane. A steel needle carefully placed on water will float.

3. This lab consists of four stations.

    1. **STATION I.**
    Can a pin float? Give the students a pin, a glass of water, and a piece of paper tissue. Have them experiment to see if the pin will float. Don't give them too many clues, except the definition of surface tension. After a few minutes, illustrate how to float the pin by putting the tissue on the surface of

the water, then laying the pin gently on top, and then allowing the tissue to sink to the bottom of the glass. The pin will float as the tissue drops to the bottom. The students have to be careful not to break the surface tension or else the pin will sink.

2. **STATION 2.**
   One of the reasons why water rises in thin capillary tubes is due to surface tension. Water is brought up to the surface of the soil and to the roots of plants by this action. The thinner the tube the higher it will rise. You may want to use food coloring to help see the rise easier.

   After the students complete the experiments they will realize that capillary action is caused by surface tension and that in a thin capillary tube, the water molecules climb up the sides of the tube because of surface tension.

3. STATION 3.

   Turn the density timer upside down and watch the colored liquid drop. It does that because of surface tension. In this case it is not because of the water molecule, but the surface tension can be applied to most liquids.

   4. STATION 4.

   Using an eyedropper, gently let water drops fall into the center of the penny. Count how many you can put on before the water runs off. (It will be between 20 and 34.) Let the children try this. Their numbers will be lower than yours, and will change depending on whether they are letting the drops fall into the center of the penny or on the edge.

WATER CYCLE - FIFTH GRADE **Name**

PROBLEM: Why can a pin float in water and how can water rise up a thin tube by itself?

PREDICTION:

STATION 1. MATERIALS: pin, glass of water, paper tissue
Try to get the pin to float. Remember the principles of surface tension that your instructor reviewed.

Describe the set-up that allowed the pin to float.

How did surface tension help the pin float?

STATION 2. MATERIALS: clear straw, plexiglass tube, glass capillarity tube, small closed tube, glass of water.
Place the plexiglass tube and the glass capillary tube in a glass of water.

1. Predict in which tube the water level will rise highest. Draw the results.

2. Now put in the plastic straw; observe its water level. Explain the differences in the water levels. Draw the results.

3. Now put the closed tube, open end down in the water. Draw the results. What happens here? Does the reason why this happen have anything to do with the results of #1 and #2?

STATION 3 MATERIALS: density timers
1. Why does the colored liquid fall down?

2. Why are the beads spherical?

STATION 4. MATERIALS: one penny and one dropper
1. Count the number of drops that you can put on a penny. Record _____
2. Describe the shape of the water before it breaks? What causes this?

CONCLUSION:

ELEMENTS (PERIODIC TABLE) - FIFTH GRADE

5.5

OBJECTIVES:

Comparing the properties of different elements
Discovering properties of compounds

VOCABULARY:

compound
element

MATERIALS:

Periodic Table Placemats , Rock Cycle (slideshow,beginning only)

BACKGROUND:

The periodic table lists the elements in order of increasing atomic number. Each element is described by its name, atomic weight, atomic symbol, and atomic number. Elements with similar characteristics are listed in vertical groups called families. The **atomic number** refers to the number of protons per atomic nucleus. **Atomic mass** (weight on many periodic tables) is the combined mass of the protons and neutrons. You can subtract the atomic number from the atomic mass and find the number of **neutrons**.

Elements are composed of small particles called atoms. Atoms are the smallest units of an element that can combine with other elements. Atoms of different elements combine to form compounds. Baking soda (sodium bicarbonate), for example, is made of sodium, hydrogen, carbon, and oxygen. Hydrogen gas, composed of two hydrogen atoms is technically a compound. The chemical formula of a compound lists all the elements that make up the compound and their proportions. The smallest unit of a compound is a molecule.

A physical property of an element or compound is any characteristic that can be observed such as color, odor, density, hardness, or melting point. A chemical property refers to the chemical composition of that substance. For example, silicon (Si) and oxygen (O) make up quartz, silicon dioxide (SiO_2). A physical change occurs when a compound changes state, for example, ice melting to form water. No new elements or compounds are formed. Physical changes require no modification of the internal molecular arrangement of the compound.

Minerals are either composed of one type of **element** (a native mineral) or two or more elements (a **compound**). The characteristics of minerals depend on their constituent elements and compounds. Table salt (the mineral halite) would not have the same properties if either sodium or chlorine were replaced with another element such as silver or potassium. However, the characteristics of elements are not always expressed in minerals; for example, quartz, a hard, glassy mineral, is composed of silicon, which is a lightweight, metallic element, and oxygen, a clear gas.

A chemical change occurs when a new compound is produced as a result of a reaction between two substances. Chemical changes cause permanent changes in the composition of the material, for example wood changes composition when burned to ash.

PROCEDURE:

1. Review the Periodic Table with the students. Ask them to find elements that are used in daily language. For instance: _____ Valley (Silicon); _____ makes strong bones (calcium); _____ helps fight a sore throat (zinc); a coin is named after this element (nickel). See if the students can come up with more examples. This will help you determine the level of your student's knowledge of the elements.
2. You may want to use the Elements – Third Grade kit to review the elements in the kit.
3. Have students answer the questions using the placemat

ANSWERS:

1. gas 11; liquid 4, solid 75; synthetic 22
2. 18, the Roman numerals were an older version
3. 7 periods; 6 Period Lanthanide; 7 Period Actinide
4. forest green: alkali metals; orange: alkaline earth metals; purple: transition metals; blue: other metals; peach: non metals; yellow: noble gases; bright green: metalloids

   Hydrogen is not represented in the color code as a light green, it is unique
5. Copper (Cu); Silver (Ag); Tin (Sn); Antimony (Sb); Mercury (Hg); Gold (Au); Tungsten (W), Iron (Fe), Potassium (K), Lead (Pb), Sodium (Na)
6. Curium (96); Einstenium (99); Fermium (100); Mendelevium (101); Nobelium (102); Lawrencium (103); Rutherfordium (104); Seaborgium (106); Bohrium (107); Meitnerium (109)
7. Mercury (80), Uranium (92); Neptunium (93); Plutonium (94)
8. **Cities:** Holmium (Stockholm in Sweden, 67); Berkelium (97); Yttrium (village in Sweden, 39); **State:** Californium (98); **Country:** Germanium (32); Francium (87), Ruthenium(for Russia, 44); Americium (95); Polonium (84) **Continent:** Europium (63)
9. He, Ne, Ar, Kr, Xe, Rn
10. atomic number

11. 8; cubic, face centered; cubic, body centered; cubic; hexagonal; rhombohedral; tetragonal; orthorhombic; monoclinic

12. Uun, Uuu, Uub

13. yes, but there are exceptions

14. hydrogen, boron, carbon, nitrogen, oxygen, fluorine, neon, silicon and many more (basically, groups 17, 18, 14 (exception germanium)

15. the groups seem to have similar “ballpark” melting and boiling points compared to other groups; some close elements in periods are very similar (i.e. Co, Ni, Cu)

16. transitional metals seem to be denser and right side seems to be lighter.

17. s, p, d, f; the period uses the Noble gas configuration and adds on, each period has similar configuration

18. densest: Osmium (Os, 76) (22.6); lightest: Hydrogen (H,1) (.071)

19. Boiling Pt. Rhenium (Re, 75) 5596 centigrade; Melting Point: Tungsten (W, 74) 3422 centigrade (notice that Carbon does not have a boiling point, some consider some of its isotopes with the highest melting point)…so if you are using a different table, please note there may be a difference

20. Helium (He, 2) -268.9 centigrade

PERIODIC TABLE – FIFTH GRADE

PROCEDURE: Use the Periodic Placemat (Painless Learning) and the readings to answer the following questions. Hint: Use the legends.

1. How many elements are naturally found on Earth?

   Gas _____ Liquid _____ Solid _____

   How many elements are synthetic?

2. How many Groups can you find on the Period Table?

   Why is there more than one designation?

3. How many Periods can you find on the Periodic Table?
   What Period does the Lanthanide Series belong to?
   What Period does the Actinide Series belong to?

4. What do the colors represent (boxes)? List the color and what it represents (Hint: there are 7). Which element does not have a color designation on the legend?

5. List 7 elements whose symbol is not derived from the element name.
   a)
   b)
   c)
   d)
   e)
   f)
   g)

6. List 4 Elements named for a person.
   a)
   b)
   c)
   d)

7. Name 3 elements named for planets.

8. Name the elements named for one city, state, country, and continent.

9. List the elements that do not interact with other elements because they are too "Noble."

10. What one property controls the arrangement of elements?

11. How many crystal structures can be found in the elements? List them.

12. Which three elements are not named as yet (use symbols)? (Hint: Has double "u.")

13. Does the atomic weight increase with the atomic number?

14. List 5 elements that do not end in "ium."
    a)
    b)
    c)
    d)
    e)

15. Do you see any pattern with boiling point and melting point with each of the groups by color?

16. Is there any pattern with density with each of the groups by color?

17. Look at the valence-shell configuration as it increases the atomic number. What 4 letters do you see repeated throughout the table? Is there any relationship with th*e formula?*

18. Which is the densest element? Which is the lightest element? (according to the Peri*odic Table – Painless Learning)*

19. Which element has the highest boiling point and highest melting point? (according to the Periodic Table – Painless Learning)

20. Which element has the lowest boiling point? (according to the Periodic Table – Painless Learning)

COMPOUNDS – SALT - FIFTH GRADE

5.6

OBJECTIVES:

Exploring two elements that form a compound.
Investigating the cubic shape of halite.

VOCABULARY:

atom
compound
element
halite
molecule

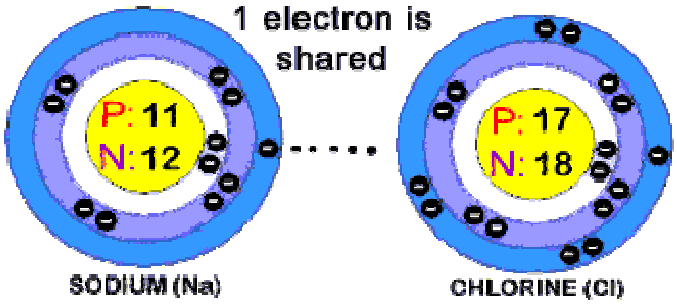
MATERIALS:

Compounds - Salt (salt samples); Rock Cycle (slideshow)

BACKGROUND:

A **compound** consists of two or more different types of atoms that are chemically bonded. Halite, composed of sodium and chlorine, is an example. **Electrons** move around the nucleus of an element in specific and set **orbitals**. There are a finite number of electrons in each of these orbitals.

If an **atom** does not have the full number of electrons in each orbital, it seeks a partner that can "loan" one or more electrons to "fill" its molecular orbital. This is the essential cause of **chemical bonding**. For example, a sodium **ion**, which has a positive charge wants to give up an electron whereas a chlorine ion, which has a negative charge wants to accept an electron. The two elements combine to form an ionic bond (bond formed by the attraction of unlike charges) and thus form the compound, halite. There are several additional types of bonding of molecular orbitals which students will learn in high school.



The type of bonding between atoms and the characteristics of those atoms determines to a large degree how a compound will "appear" when the atoms combine. In halite, the chlorine atom is twice the size of the sodium atom. When the chlorine atoms "nestle" into a "packed" position, the sodium atoms fill in the gaps. This packed position has a cubic structure, which is reflected in the cubic nature of halite. You can demonstrate this by placing small and large plastic beads in a small, cubic, clear, plastic box. Shake the box. If one bead is twice the size of the other, they will pack in a cubic pattern. The large beads represent chlorine (Cl) atoms and the smaller beads represent sodium (Na) atoms.

PROCEDURE:

1. In this lab, the students will look at different specimens of commercial salt from Cargill Salt Company in Newark, California. These can include: mill feed - kiln dried, used for animal feed; blending - vacuum dried, used in food processing; granulated - vacuum dried, used in food processing and table salt; pellets - kiln dried, used as water conditioner; medium - kiln dried, used as water conditioner; bakers - vacuum dried, used in making butter. Kiln and vacuum dried refer to the type of process used to make the salt.

2. Summarize the composition and bonding behavior of halite. You might tell your students that the atoms are "holding hands" and are brought together by an "attractive" force. Draw the following diagram on the board for the students to see this "bonding" , or use the electronic presentation. Explain that since chlorine is twice the size of sodium, when they combine sodium fills in the spaces between the chlorine, forming cubes.

3. The students will try to determine if all types of salt are "cubic." They should use a magnifying glass or a microscope to see the specimens in detail. Have them examine the specimens without taking them out of the plastic bags.

4. Ask students to think about why each type is different. Do not give them too many hints, but have them "guess" the use of each specimen. Have them record their guesses on the lab sheet.

5. As they look at the samples, ask the students to draw the salt crystals. Monitor their progress as they work their way through the samples. Remind them to draw accurate pictures (pencils work best for this exercise).

6. Review their answers, then answer the conclusion together. While all of these samples are composed of halite, only the blending, granulated, and baking (all vacuum dried) specimens are cubic. The mill feed and pellets are not cubic, and the medium is only roughly cubic. This is because the cubic structure can be broken if the process of making the salt crushes the crystals (mill feed) or combines the crystals (pellets).

SALT – COMPOUNDS **NAME** _____

PROBLEM: Are all types of commercially used salt (halite), cubic?

PREDICTION:

PROCEDURE: You have 6 samples of salt from the Cargill Salt Company in Newark, California. They commercially produce salt for food, animals, and water conditioning.

Look at the following examples of salt under a microscope. Draw the shapes you see. State what commercial purpose you think each type may have.

MILL FEED	**BLENDING**
GRANULATED	**PELLETS**
MEDIUM	**BAKERS**

CONCLUSION: Which samples maintain the cubic shape? Why might some samples not have a cubic shape?