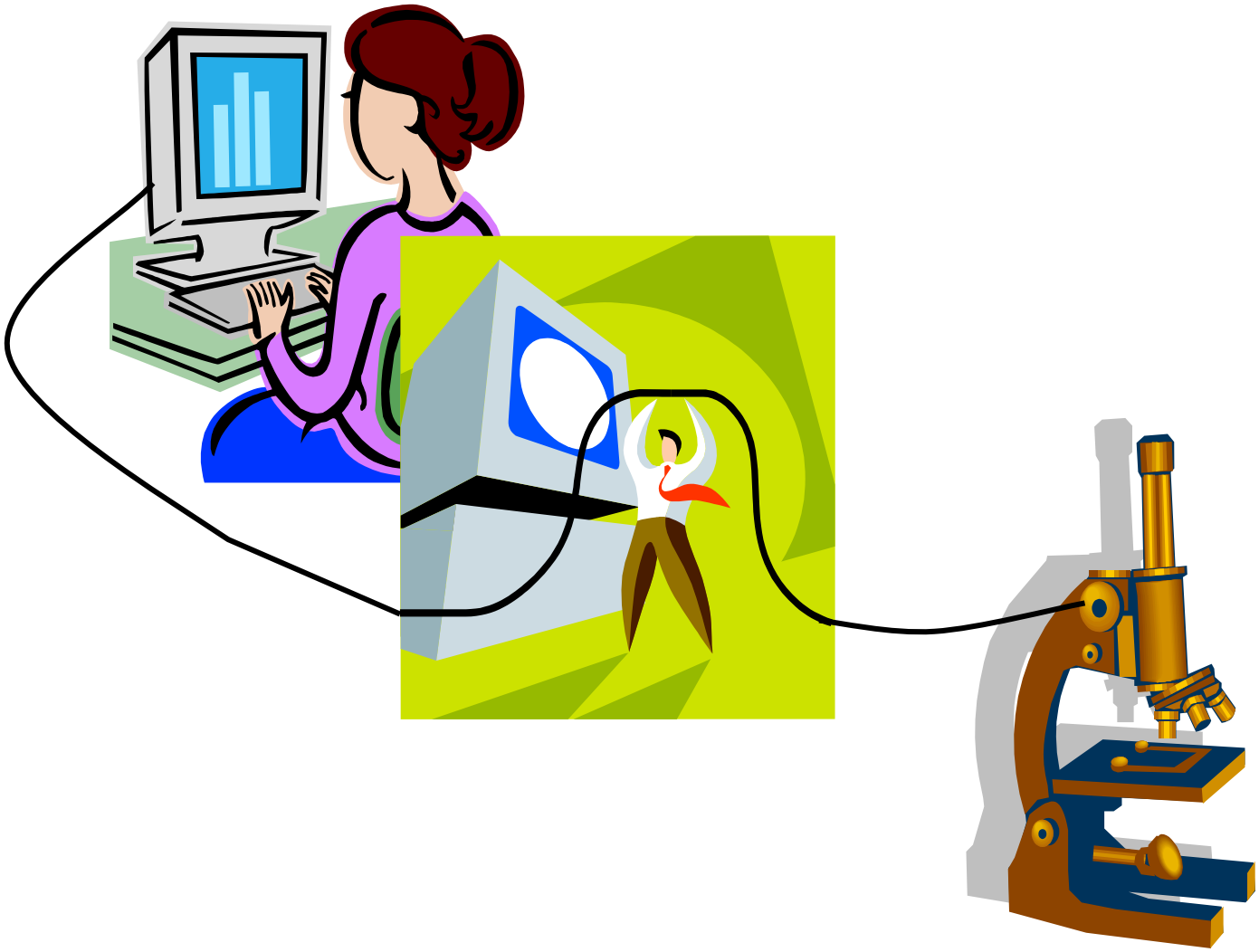
VIRTUAL LAB MANUEL



Seventh Grade Science

Dr. Skelton, Room 132

Ms. Henman, Room 101

Name: _____ Period: _____Date: _____

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Name: _____ Period: _____Date: _____

EXPLORING AND CLASSIFYING LIFE: HOW ARE LIVING THINGS CLASSIFIED INTO GROUPS?

Today most scientists classify all living organisms into six major groups, called kingdoms. These six kingdoms are Archaebacteria, Eubacteria, Protista, Fungi, Plant, and Animal. Each of the six kingdoms has a unique set of characteristics that identify its members. These characteristics include the number of cells, whether or not those cells have nuclei, the organism's ability to move from place to place (locomotion), and whether the organism makes its own food or obtains it from other organisms (nutrition).

A kingdom may share one or more of these characteristics with other kingdoms, but the set of characteristics that defines each kingdom is unique. For example, members of both the Plant and Animal kingdoms have many cells with nuclei, but only animals have all these characteristics of the Animal kingdom; they move from one place to another, eat food for energy, and have many cells with nuclei.

In this Virtual Lab you will classify organisms into kingdoms based on their physical and behavioral characteristics.

OBJECTIVES:

Compare and contrast the six kingdoms of living things according to their physical and behavioral similarities and differences.

PROCEDURE:

1. **Click and drag an organism from the upper right of the screen down to the magnifying glass. The organism's common name, a larger picture of the organism, and information about the organism appears. Open the Table and record the organism's number of cells, type of cells, locomotion, nutrition, and scientific name.**
2. **Click a kingdom name to see information about the kingdom. Use this information to classify the organism you selected into it kingdom. Click the kingdom name again to remove the information from the kingdom's sorting area.**
3. **Click and drag the organism to the kingdom where you think it belongs. Click the Check button to see if you have classified the correctly. If a yellow highlight appears around the organism, reexamine the organism and the kingdom characteristics and move the organism to another kingdom.**
4. **When you have correctly classified an organism, record its kingdom and characteristics in the following Table. Some organisms do not have common names.**
5. **Classify the other four organisms in the same way. Some kingdom sorting areas may remain empty while others contain multiple organisms.**
6. **Open the journal (or use the journal questions in this lab manual) and complete the journal questions.**

Name: _____ Period: _____Date: _____

	Scientific Name	Common Name	Number of Cells	Tupe of Cell(s)	Nutrition	Kingdom
Organism 1						
Organism 2						
Organism 3						
Organism 4						
Organism 5						

Name: _____ Period: _____Date: _____

EXPLORING AND CLASSIFYING LIFE: HOW ARE LIVING THINGS CLASSIFIED INTO GROUPS?. ***JOURNAL***

1. Many people organize books, videos, and CD's on their homes to make it easier to find what they're looking for. Describe another type of classification system you have seen or used.

Answer: _____

_____

_____

_____

2. How are animals and plants different? How are they the same? Be specific.

Answer: _____

_____

_____

_____

_____

3. Working as an assistant in a laboratory, you discover an organism that you believe might be a new species of plant or fungus. What are some differences between plants and fungi, and what clues might help you classify this organism.

Answer: _____

_____

_____

_____

_____

Name: _____ Period: _____Date: _____

CELLS; "HOW DO ANIMAL AND PLANT CELLS WORK?

Cells are the smallest functional units of living things. Cells make energy, proteins, and other important substances for organisms. All cells contain individual parts called organelles that perform various tasks. Cells help living things carry on all the important life processes, such as movement, reproduction, growth, and digestion.

The activities within cells might be compared to those in a factory that operates 24 hours a day making dozens of different products. Just as a factory operates inside a building, a cell functions within a structure called the cell membrane. Materials that are needed to make specific products are brought into the structure. Finished products are moved out. Similarly, nutrients are absorbed into the cell, and waste products are released. Each of the many types of structures and organelles in a cell carries out a particular set of functions.

In this Virtual Lab you will investigate the functions and names of animal and plant cell parts.

OBJECTIVES:

- **Describe the functions of various animal cell parts.**
- **Describe the functions of various plant cell parts.**
- **Compare and contrast animal and plant cells.**
- **Discuss how living cells are similar to factories.**

PROCEDURE:

1. **Select a cell part by clicking it. The Clue box will tell you what goes on in that part of the "factory".**
2. **Click the up and down arrows in the Name box to find the name of the selected cell part.**
3. **Click the up and down arrows in the Structure/Function box to find the description of the selected cell part.**
4. **Click the Check button to see whether your selections match. If they do, the cell part will be labeled. If not, reexamine your choices and try again. Open the Table and record the name of the cell part in the appropriate column.**
5. **Repeat these steps to identify and label all the parts of the animal cell.**
6. **Click the plant button and identify and label all the parts of the plant cell.**
7. **After you have completed the Table, answer the questions in the Journal page.**

Name: _____ Period: _____Date: _____

Structure/Function	Animal Cell Structure	Plant Cell Structure
Outer Boundary of the Cell		
Contains Genetic Material (DNA)		
Long, Uncoiled Strands of DNA		
Watery, Gel-like Substance		
Channels That Move Materials		
Site of Protein Synthesis		
Package and Move Proteins		
Produce Energy		
Digest Wastes		
Storage Centers		
Rigid, Outer Cellulose Cover		
Site of Photosynthesis		

Name: _____ Period: _____Date: _____

CELLS; "HOW DO ANIMAL AND PLANT CELLS WORK?

1. How do animal and plant cells work?

Answer: _____

_____

_____

_____

2. How are cells similar to a factory or business? List five similarities.

Answer: _____

_____

_____

_____

_____

3. How are animal and plant cells similar? How are they different? Explain.

Answer: _____

_____

_____

_____

_____

Name: _____ Period: _____Date: _____

CELLS; "HOW DO ANIMAL AND PLANT CELLS WORK?

4. A solar cell is a device that collects energy from the sun to make electricity. What part of a plant cell is most similar to a solar cell?

Answer: _____

_____

_____

_____

5. Why is the nucleus considered to be the "boss" of the cell?

Answer: _____

_____

_____

_____

_____

6. Exploring the South American rain forest, a scientist discovers a mysterious organism and brings it back to the lab for further study. What cell characteristics should the scientists examine to tell whether the organism is an animal or plant? Why?

Answer: _____

_____

_____

_____

_____

Name: _____ Period: _____Date: _____

CELL PROCESSES; "UNDER WHAT CONDITIONS DO CELLS GAIN OR LOSE WATER?"

A cell membrane permits some materials to pass through while keeping other materials out. Such a membrane is called selectively permeable membrane. Under normal conditions, water constantly passes in and out of this membrane. This diffusion of water through a selectively permeable membrane is called osmosis. Like other substances, water diffuses from a region of higher concentration to a region of lower concentration. When the transfer of water molecules in and out of a cell reaches the same rate, a state of equilibrium is reached.

If the concentration of water molecules is greater outside a cell, then the solution is hypotonic to the cell. Water will move into the cell by osmosis. The pressure against the inside of the cell membrane will steadily increase. If the pressure becomes great enough, the cell membrane will burst.

A solution is isotonic to the inside of the cell when there is the same concentration of water molecules on the inside and outside of the cell membrane. To maintain equilibrium, water molecules move into and out of the cell at the same rate.

Suppose a living cell is placed in a solution that has a higher salt concentration than the cell has. Such a solution is hypertonic to the cell, because there are more salt ions and fewer water molecules per unit volume outside the cell than inside. Water will move from the region of higher water concentration (inside the cell) to the region of lower water concentration (outside the cell). The selectively permeable membrane does not allow salt ions to pass into the cell. The cell shrinks as the cell loses water.

In this Virtual Lab you will place a red blood cell, and Elodea Cell, and a Paramecium in hypotonic, isotonic, and hypertonic solutions. You will examine how and why these cells gain or lose water in the different solutions.

OBJECTIVES:

- **Describe the process of osmosis.**
- **Observe the movement of water through cell membranes during the process of osmosis.**
- **Compare and contest three osmotic states: Hypotonic, isotonic, and hypertonic.**

PROCEDURE:

1. **Select one of the three cells pictured at the top of the screen and drag it into one of the beakers.**
2. **Observe the process of osmosis. Determine whether water, represented by animated blue arrows, moves into, stays in equilibrium, or moves out of the cell. Observe what happens to the shape and size of the cell.**
3. **Record your observations in the Table.**
4. **Move the cell to a different beaker or choose a different cell. Observe the process of osmosis again and record your observations in the Table.**
5. **Repeat this activity with all three cells and all three solutions. Use your Journal page to compare your observations.**

Name: _____ Period: _____Date: _____

	Red Blood Cell: Net Water Move-ment In/Out	Red Blood Cell: Appearance of Cell	Elodea: Net Water Movement In/Out	Elodea: Appearance of Cell	Paramecium: Net Water Movement In/Out	Paramecium: Appearance of Cell
Hypotonic Solution						
Isotonic Solution						
Hypertonic Solution						

Name: _____ Period: _____Date: _____

CELL PROCESSES; "UNDER WHAT CONDITIONS DO CELLS GAIN OR LOSE WATER?"

1. Under what conditions do cells gain or lost Water?

Answer: _____

_____

_____

_____

2. Did water move into the cell or out of the cell while it was surrounded by hypotonic solution?

Answer: _____

_____

_____

_____

_____

3. In which direction did the water move through the cell membrane when the cell was surrounded by the hypertonic solution?

Answer: _____

_____

_____

_____

_____

Name: _____ Period: _____Date: _____

CELL PROCESSES; "UNDER WHAT CONDITIONS DO CELLS GAIN OR LOSE WATER?"

4. Compare and contrast what happens to an animal, a plant, and a Paramecium cell in a hypotonic, and isotonic, and a hypertonic solution.

Answer: _____

_____

_____

_____

5. Could Elodea or Paramecium from a freshwater lake be expected to survive if transplanted into the ocean? Explain.

Answer: _____

_____

_____

_____

_____

6. If you were to grill a steak, would it be better to put salt on it before or after you cooked it? Explain why, in terms of osmosis.

Answer: _____

_____

_____

_____

_____

Name: _____ Period: _____Date: _____

CELL PROCESSES; "UNDER WHAT CONDITIONS DO CELLS GAIN OR LOSE WATER?"

7. Why does salad become soggy and wilted when the dressing has been on it for a while? Explain why, in terms of osmosis.

Answer: _____

_____

_____

_____

8. An effective way to kill weeds is to pour salt water on the ground around the plants. Explain why the weeds die, using the principles discovered in this Virtual Lab.

Answer: _____

_____

_____

_____

_____

9. Under what conditions do cells gain or lose water?

Answer: _____

_____

_____

_____

_____

Name: _____ Period: _____Date: _____

CELL REPRODUCTION; "WHAT IS THE ROLE OF DNA AND RNA IN PROTEIN SYNTHESIS?"

The genetic material of all living things is made of a molecule called deoxyribonucleic acid, or DNA. The traits of an organism are determined by the genetic code contained in its DNA.

Every cell in an organism's body contains DNA which is unique to that organism. The DNA molecule is made up of two twisted strands of sugar and phosphate molecules attached to each other by nitrogen bases-adenine (A), guanine (G), cytosine (C), and thymine (T). The four nitrogen bases always bond in the following way: adenine pairs with thymine, and guanine pairs with cytosine. The pairs of nitrogen bases from bridges between the two strands of the DNA molecule. The sequence of the bases on the DNA molecule is an organism's genetic code.

DNA contains the information for building amino acids. The order of nitrogen bases in DNA determines the type and order of amino acids in a protein. There are twenty different amino acids, but DNA contains only four types of bases. A sequence of three bases, called a triplet code, forms a code for a single amino acid.

Proteins are long chains of amino acids. Different proteins have different functions which determine the structure and function of an organism.

Ribosome's in the cytoplasm are sites where proteins are made. Because the genetic code for a protein is in the DNA in the nucleus of a cell, the code must be moved from the nucleus to the cytoplasm.

Before DNA moves from the nucleus to the cytoplasm, the code is transcribed into a messenger RNA (mRNA) molecule. The mRNA molecule is formed by free nitrogen bases attaching to nitrogen bases on an unwound segment of DNA. The nitrogen bases of RNA bond in the same way as in DNA except uracil (U) takes the place of thymine (T). Then the mRNA breaks away from the DNA and carries the genetic information to a ribosome in the cytoplasm.

The ribosome is where the genetic information in the mRNA is converted into a sequence of amino acids that make up a protein. This process is called translation. Transfer RNA (tRNA) brings amino acids to the ribosomes so they can be assembled into proteins. The nitrogen bases of the tRNA pair with the appropriate nitrogen bases of the mRNA. The amino acids on the tRNA bond to adjacent amino acids, break off from the tRNA, and form a protein molecule.

In this Virtual Lab you will build a mRNA molecule by pairing free nitrogen bases in the nucleus with nitrogen bases on an unwoven strand of DNA. Then you will examine how a mRNAS molecule is translated into a protein molecule.

<u>OBJECTIVES:</u>

- **Describe the structure and function of the DNA molecule.**
- **Explain how the genetic information in the DNA molecule is transcribed into mRNA**
- **Explain how mRNA is translated into a specific sequence of amino acids in a protein molecule.**

Name: _____ Period: _____Date: _____

CELL REPRODUCTION; "WHAT IS THE ROLE OF DNA AND RNA IN PROTEIN SYNTHESIS?"

PROCEDURE:

1. **Observe the unwoven DNA molecule. One of the DNA strands is exposed, showing a sequence of nitrogen bases.**
2. **Click the legend button for information about how nitrogen bases pair.**
3. **Build a mRNA molecule by pairing up free nitrogen bases in the nucleus with the nitrogen bases on the exposed strand of DNA. Start at the top where there is a blinking dot. Determine which free nitrogen base pairs up with the nitrogen base on the DNA. Drag a free nitrogen base to its corresponding nitrogen base on the DNA. If you chose the correct nitrogen base, the bases will bond. Continue pairing all of the bases.**
4. **When you have finished building the mRNA molecule, watch the animation of the mRNA carrying the genetic information from the nucleus to a ribosome in the cytoplasm. As nitrogen bases on tRNA pair with nitrogen bases on mRNA, amino acids link together. A protein molecule is formed.**
5. **Click the Show Labels button to see labels of the major structures involved in protein synthesis.**
6. **Enter your data in the Table. Starting with the first amino acid in the protein molecule, record the amino acid number. Record the mRNA triplet code (three nitrogen bases) that corresponds to the amino acid. The mRNA triplet code for the first amino acid consists of the first three nitrogen bases on the mRNA molecule.**
7. **Using the mRNA code, deduce the DNA code. Use the legend if you need assistance. Record your data in the Table.**
8. **Using the mRNA code, deduce the tRNA code. Remember that RNA is different from DNA in that it contains uracil (U) in place of thymine (T). Record your data in the Table.**
9. **Click the reset button to synthesize another protein**
10. **Complete the Journal questions.**

Name: _____ Period: _____Date: _____

Amino Acids	aa#	DNA Code	mRNA Code	tRNA Code
Amino Acids				
Amino Acids				
Amino Acids				
Amino Acids				
Amino Acids				
Amino Acids				
Amino Acids				
Amino Acids				
Amino Acids				
Amino Acids				
Amino Acids				
Amino Acids				

Name: _____ Period: _____Date: _____

CELL REPRODUCTION; "WHAT IS THE ROLE OF DNA AND RNA IN PROTEIN SYNTHESIS?"

1. Describe the appearance and structure of DNA.

Answer: _____

_____

_____

_____

2. What is the function of DNA?

Answer: _____

_____

_____

_____

_____

3. What is the function of mRNA?

Answer: _____

_____

_____

_____

_____

Name: _____ Period: _____Date: _____

CELL REPRODUCTION; "WHAT IS THE ROLE OF DNA AND RNA IN PROTEIN SYNTHESIS?"

4. What is the function of tRNA?

Answer: _____

_____

_____

_____

5. Describe a protein molecule

Answer: _____

_____

_____

_____

_____

6. In what part of the cell is a protein molecule made?

Answer: _____

_____

_____

_____

_____

Name: _____ Period: _____Date: _____

CELL REPRODUCTION; "WHAT IS THE ROLE OF DNA AND RNA IN PROTEIN SYNTHESIS?"

7. Why do you think there are equal amounts of cytosine and guanine and equal amounts of adenine and thymine in the DNA of a cell?

Answer: _____

_____

_____

_____

8. What might happen if there were an extra nitrogen base in the middle of the mRNA code or if there were a nitrogen base deleted from the mRNA code?

Answer: _____

_____

_____

_____

_____

9. Summarize how DNA directs the making of a protein.

Answer: _____

_____

_____

_____

_____

Name: _____ Period: _____Date: _____

DIGESTION, RESPIRATION, AND EXCRETION; "HOW DO PARTS OF THE RESPIRATORY SYSTEM WORK TOGETHER?"

Respiration includes all the mechanisms involved in getting oxygen to the cells of the body and getting rid of carbon dioxide. The respiratory system is made up of a pair of lungs, a series of passageways, and a sheet of smooth muscle called the diaphragm.

Breathing is an important part of respiration. It is usually an involuntary process. It is controlled by the chemistry of the blood interacting with a part of the brain that sends signals to the rib muscles and the diaphragm. In response, these muscles contract and the rib cage rises, beginning the process of inhalation. As the space in the chest cavity increases, a vacuum forms. Air rushes into the lungs because the air outside the body is under more pressure than the air inside the lungs.

Air enters the body through either the nose or the mouth. It passes to the pharynx, moves past the epiglottis, and flows through the larynx. Air then travels down the trachea, the passageway that leads to the lungs. During swallowing, the epiglottis covers the trachea to prevent food and liquids from getting into the air passageways.

The trachea divides into two narrow tubes called bronchi. Each bronchus branches into structures in the lungs where oxygen from the air and carbon dioxide from the blood are exchanged.

The trachea and bronchi are lined with cilia to prevent unwanted airborne particles such as dust, bacteria, and pollen from reaching the lungs. The cilia constantly beat upward in the direction of your throat, where foreign material can be expelled or swallowed.

When a person exhales, the muscles over the ribs relax, and the ribs drop down in the chest cavity. The diaphragm relaxes and returns to its resting, dome-shaped position. The relaxation of these muscles decreases the volume of the chest cavity, putting pressure on the air and forcing most of it out of the lungs.

In this Virtual Lab you will examine major structures and functions of the respiratory system and then sequence the steps of inhalation in the human body.

<u>OBJECTIVES:</u>

- **Identify the major structures and functions of the respiratory system.**
- **Sequence the steps of inhalation.**

<u>PROCEDURE:</u>

1. **Click each respiratory structure-Nasal Cavity, Pharynx, Larynx, Trachea, Lungs, and Diaphragm- to examine its function in the respiratory system.**
2. **Sequence each structure used in inhalation by dragging a number next to it.**
3. **Click the check button to check your work after you have sequenced all six structures. If a structure is sequenced incorrectly, the number next to it is highlighted yellow. Drag the number away and click the name of the structure to reexamine its function. Then drag a different number to it.**
4. **When all the steps are sequenced correctly, you will see an animation of the processes of inhalation and exhalation.**
5. **Complete the Diurnal questions.**
6. **Click the Reset button to start over.**

Name: _____ Period: _____Date: _____

DIGESTION, RESPIRATION, AND EXCRETION; "HOW DO PARTS OF THE RESPIRATORY SYSTEM WORK TOGETHER?"

1. How does the diaphragm work to change air pressure in the lungs, and as a result, cause breathing?

Answer: _____

_____

_____

_____

2. List the structures of the respiratory system in the order that they function for inhalation. Briefly describe each structure's function.

Answer: _____

_____

_____

_____

_____

3. While you were investigating the inhalation sequence, did you change the order of any of the steps you initially selected? If so, which steps did you re-arrange, and why?

Answer: _____

_____

_____

_____

_____

Name: _____ Period: _____Date: _____

DIGESTION, RESPIRATION, AND EXCRETION; "HOW DO PARTS OF THE RESPIRATORY SYSTEM WORK TOGETHER?"

4. Which structures of the respiratory system trap and eliminate harmful substances from the air, such as dust, smoke, pollen, and bacteria? Describe how these structures filter air as it is inhaled.

Answer: _____

_____

_____

_____

Name: _____ Period: _____Date: _____

CIRCULATION AND IMMUNITY; "HOW DOES THE BODY PROTECT ITSELF AGAINST FOREIGN SUBSTANCES?"

The ABO blood grouping system illustrates the concept of immune response by demonstrating how a living tissue, blood, reacts in the presence of a foreign substance-another blood type.

Bolld types are genetically determined. The most common blood grouping system is the ABO system. In this system, blood is classified into four types: A, B, AB, and O.

Differences in blood types are determined in the ABO system by the presence of absence of marker proteins, called antigens, on the cell membranes of the red blood cells. Antigens are chemicals that stimulate an immune response in the blood. The letters A and B stand for the type of antigen present on the red blood cells. Thus, blood type A has A antigens; blood type B has B antigens; blood type AB has both A antigens and B antigens; and blood type O has no antigens.

In addition to antigens, blood also contains proteins called antibodies. These antibodies destroy or neutralize foreign substances, such as pathogens, that enter the body. Antibodies are located in blood plasma, or the liquid part of blood. They recognize and react to the presence of foreign antigens by locking onto them like matching pieces of a jigsaw puzzle.

Each type of blood contains antibodies for the antigens it does not have itself. Thus, type A blood has B antibodies; type B blood has A antibodies; type AB blood has no antibodies; and type O bolld has both A and B antibodies.

Knowing which blood types are compatible is critical before giving blood transfusions. If a person receives an incompatible blood transfusion, an immune response is triggered. The antibodies in the recipient's blood destroy the foreign red blood cells. The red blood cells clump together, cutting off blood flow through the blood vessels and capillaries.

In this Virtual Lab you will examine how the body protects itself against foreign substances. You will prepare a slide of patient's blood and add Anti-A and Anti-B serum to determine which blood types in the ABO blood grouping system are compatible for transfusions.

<u>OBJECTIVES:</u>

- **Explain how blood is classified in the ABO blood grouping system.**
- **Discuss how the immune system reacts to incompatible blood types.**
- **Explain why blood types must be checked before transfusions are given.**

<u>PROCEDURE:</u>

1. **Click the arrow to scroll through the poster and examine the blood types.**
2. **Click the View Immune Response button to learn how incompatible blood transfusions cause an immune response. Click the hand pointing right to advance through the steps of the immune response. Click the hand pointing left to go back a step. Click the Show Blood Types button to return to the poster of blood types.**
3. **Choose a test tube of patient's blood to identify its blood type as A, B, AB, O. Click the pipette bulb in the test tube to transfer two drops of blood to the microscope slide. (if blood is already on the slide and you want to start over or examine the blood of another patient, click the Clean Slide button.)**

Name: _____ Period: _____Date: _____

CIRCULATION AND IMMUNITY; "HOW DOES THE BODY PROTECT ITSELF AGAINST FOREIGN SUBSTANCES?"

PROCEDURE (continued):

4. **To determine the type of antigens and antibodies present in the blood, add serum to the slide. Click the pipette bulb in one of the flasks of serum. Repeat this step using the other type of serum.**
5. **Observe the results and use the poster of blood types to determine which types are compatible with the serum that was added.**

- **If the drop of blood on the slide clots, then the blood and the serum are incompatible.**
- **If nothing happens to the drop of blood on the slide and there is no clotting, then the blood and the serum are compatible.**

6. **Given the results of adding both types of serum to the blood, determine the patient's blood type. Click and drag the appropriate test tube label –A, B, AB, or O-to the test tube of patient's blood. (Note: Yon can only label the test tube containing the blood that is currently on the slide.)**
7. **Click the Check button.**

- **If you incorrectly determined the patient's blood type, the test tube label will be highlighted. Use the poster of blood types, examine the data on the microscope slide, and try again.**
- **If you correctly determined the patient's blood type, a small microscope slide of the data will appear below the test tube of blood. Record the data in your table.**

8. **Repeat this procedure to determine the blood types of the other patients.**
9. **Complete the Journal questions**
10. **Click the Reset button to get a different set of blood samples.**

Name: _____ Period: _____Date: _____

Patient	Reaction When Anti-A-Serum Added	Reaction When Anti-B-Serum Added	Blood Type
1			
2			
3			

Name: _____ Period: _____Date: _____

CIRCULATION AND IMMUNITY; "HOW DOES THE BODY PROTECT ITSELF AGAINST FOREIGN SUBSTANCES?"

1. Why is it important to know a person's blood type before giving him or her a transfusion?

Answer: _____

_____

_____

_____

2. What are antigens and antibodies? How are they involved in the body's response to incompatible blood?

Answer: _____

_____

_____

_____

_____

3. Describe the immune response that occurs when an individual receives a transfusion of incompatible blood.

Answer: _____

_____

_____

_____

_____

Name: _____ Period: _____Date: _____

CIRCULATION AND IMMUNITY; "HOW DOES THE BODY PROTECT ITSELF AGAINST FOREIGN SUBSTANCES?"

4. People with blood type O are considered to be universal donors. That is, they can donate blood to all other blood types. Using your knowledge of blod types and the immune system, explain why this is true.

Answer: _____

_____

_____

_____

5. Peope with type AB blood are considered to be universal recipients. That is, they can receive blood from all other blood types. Explain why this is true using your knowledge of blood types and the immune system.

Answer: _____

_____

_____

_____

_____

Name: _____ Period: _____Date: _____

INTERACTIONS OF LIVING THINGS; "HOW IS ENERGY TRANSFERRED THROUGH A COMMUNITY OF ORGANISMS?"

The organisms in an ecosystem interact with one another, and with the abiotic factors of the environment, in various ways. Abiotic factors are the nonliving characteristics of the environment. One examples of abiotic factors include temperature and rainfall. A desert ecosystem's abiotic factors include a small amount of rainfall, and warm daytime and cool nighttime temperatures. A temperate forest's abiotic factors include an average amount of rainfall and wide temperature range.

Some of the most important interactions among species in an ecosystem community involve feeding. All living things need food for energy. When one organism consumes another, energy is transferred from the organism that is eaten to the organism that eats it. Most of the energy an organism takes in is released as heat. Only about 10 percent of the energy available at one level of a food chain transfers to the next.

A food chain is often used to describe this transfer of energy through a biological community. Most food chains have four or five links, with each link representing a feeding step. Organisms are place into a food chain according to their energy source. There are five levels in a food chain: producers, first-order consumers, second-order consumers, third-order consumers, and decomposers.

Producers obtain energy from the Sun or from chemicals in the environment. Plants, bacteria, and protests are examples of producers. First-order consumers, or herbivores, obtain energy by eating producers. Rabbits, geese, and termites are examples of first-order consumers. Second-order consumers, or carnivores, obtain energy by eating herbivores. Examples of second-order consumers include wolves, spiders, and frogs. Third-order consumers, or top carnivores, obtain energy by eating other carnivores. Lions, falcons, and killer whales are examples of third-order consumers. Decomposers deed at all levels of a food chain, obtaining energy by breaking down the decaying bodies and wastes of other organisms. Examples of decomposers include mushrooms and molds.

In this Virtual Lab, you will examine various organisms and determine their placement in a five-link food chain.

<u>OBJECTIVES:</u>

- **Determine an organism's plce in a five-link food chain.**
- **Explain how, and in what sequence, energy is transferred through different communities of organisms.**
- **Define abiotic factors and give examples of them.**

<u>PROCEDURE:</u>

1. **Click the Video button. Watch the video and observe how energy moves through a biological community. Write you observations in your Journal.**
2. **Click a stack of cards to examine five organisms from an ecosystem. The organisms are part of a desert or temperate forest community, and each organism is part of a five-level food chain.**
3. **Drag a card to the information display area in the upper right part of the screen. Click the appropriate tab along the top of the display area to read information about the organism. Use this information to determine the organism's place in the food chain.**
4. **Drag the card to its proper place in the food chain.**

Name: _____ Period: _____Date: _____

INTERACTIONS OF LIVING THINGS; "HOW IS ENERGY TRANSFERRED THROUGH A COMMUNITY OF ORGANISMS?"

PROCEDURE (continued):

5. **Repeat steps 3 and 4 with the remaining organisms**
6. **To check your work, click the Check button. If an organism is sequenced incorrectly, it will be high-lighted in red. Re-examine the organism's habitat, energy, and fact information, and then re-sequence the organism.**
7. **When you have correctly sequenced each organism in the food chain, record the organisms' names and placement in the Table.**
8. **Click the Reset button to construct a new food chain. Each organism may belong tn more than one food chain.**
9. **Complete the Journal questions.**

Name: _____ Period: _____Date: _____

	Desert of Temperate Forest?	Producer	First-order Consumer	Second-Order Consumer	Third-Order Consumer	Decomposer
Food Chain 1						
Food Chain 2						
Food Chain 3						
Food Chain 4						
Food Chain 5						
Food Chain 6						
Food Chain 7						
Food Chain 8						
Food Chain 9						
Food Chain 10						
Food Chain 11						
Food Chain 12						
Food Chain 13						
Food Chain 14						

Name: _____ Period: _____Date: _____

INTERACTIONS OF LIVING THINGS; "HOW IS ENERGY TRANSFERRED THROUGH A COMMUNITY OF ORGANISMS?"

1. Would you be likely to find a food chain containing 10 links? Why?

Answer: _____

_____

_____

_____

2. What are abiotic factors? How do abiotic factors affect organisms in an ecosystem?

Answer: _____

_____

_____

_____

_____

3. What's the difference between a producer and a consuber? Where do producers belong in a food chain?

Answer: _____

_____

_____

_____

_____

Name: _____ Period: _____Date: _____

INTERACTIONS OF LIVING THINGS; "HOW IS ENERGY TRANSFERRED THROUGH A COMMUNITY OF ORGANISMS?"

4. What is a decomposer? Why are decomposers important to ecosystems?

Answer: _____

_____

_____

_____

5. Describe a food chain for a temperate forest community that contains at least four links. Use the following organisms: grizzly bears, oak trees, mice, squirrels, deer, robins, foxes, mushrooms, grass plants, and grasshoppers. Identify the level of each organism in the food chain.

Answer: _____

_____

_____

_____

6. Why ae there fewer top carnivores than herbivores in most land ecosystems?

Answer: _____

_____

_____

_____

_____

Name: _____ Period: _____Date: _____

INTERACTIONS OF LIVING THINGS; "HOW IS ENERGY TRANSFERRED THROUGH A COMMUNITY OF ORGANISMS?"

7. Are people producers or consumers? Explain your answer.

Answer: _____

_____

_____

_____

8. Grizzly bears are top carnivores in some North American ecosystems. What do you think might happen to a community of organisms if grizzly bears suddenly became extinct?

Answer: _____

_____

_____

_____

_____

Name: _____ Period: _____Date: _____

CONSERVING RESOURCES; "WHEN IS WATER SAFE TO DRINK?"

Suppose you were hiking along a stream or lake and became very thirsty. Do you think it would be safe to drink the water? In many cases, it wouldn't. Each source of fresh water on or beneath Earth's surface is affected by contaminates. Though the sources of these contaminants are varied, all can make water unfit to drink if they are allowed to increase beyond safe limits. The most common water contaminants are:

Acidity:
The pH scale is a measure of acidity in water and other substances. Water with a pH reading of zero to six, or acidic water, is unsafe to drink and can corrode metal pipes. The most significant environmental impact of a high or low pH level is that it can magnify the effect of other contaminants.

Bacteria:
Coliform bacteria and other microorganisms are found in the fecal matter of warm blooded animals and humans. This bacteria is most commonly found in lakes, rivers, and ponds, but can seep into groundwater supplies. When coliform bacteria are present in your drinking water, your risk of contracting a water-born illness is increased.

Metals:
Copper and iron are two of the more common metal contaminants found in water supplies. An overabundance of copper and iron can cause water to be discolored and foul-tasting. Liver damage can also be traced to unsafe levels of metallic contaminants in water. Most copper and iron contaminants enter the water supply through rusty and corroded pipes. However, metallic contaminants can also enter groundwater through erosion as the water travels through layers of rock and minerals.

Nitrates:
Nitrates are a form of nitrogen found in animal wastes, chemical fertilizers, and food preservatives. Found in both surface water and groundwater, nitrates enter the water supply through surface runoff from farms and from leaking household septic tanks. Nitrates pose little threat to humans, but an overabundance of nitrates can kill fish and other aquatic creatures.

Pesticides:
Pesticides and herbicides are manufactured chemicals that are used to kill weeds, molds, and insects. Carbofuran and alachlor are examples of common herbicides used in agriculture. Surface runoff can introduce pesticides and herbicides into the water supply. In concentrated amounts these substances can cause a number of health problems, including anemia, and liver and kidney disorders.

In this Virtual Lab, you will test a variety of water samples. Then you will determine how to treat the water samples to make them safe to drink.

OBJECTIVES:
- **Define types of water contaminants.**
- **Determine which type of contaminants are common to lake water, city water, well water, rural water and mountain water.**
- **Identify treatments that remove contaminants from drinking water.**

Name: _____ Period: _____Date: _____

CONSERVING RESOURCES; "WHEN IS WATER SAFE TO DRINK?"

PROCEDURE:

1. **Click the right and left arrows to select a body of water to analyze.**
2. **Click Test to test the water sample.**
3. **Look at the results of the water analysis to identify which contaminants exceed the safe range.**
4. **Click the tabs to find information on how to treat each contaminant.**
5. **Enter the contaminant and treatment information in the Table.**
6. **Click Go To Treatment to go to the treatment screen.**
7. **Use the information in the Table and click the wheels on the valves to add chemicals or additives to the water sample.**
8. **Click the Treatment Switch to start treating the water. The Safe/Unsafe Sign will indicate whether the water is safe to drink.**
9. **If the water is safe to drink, use Return to Lab to go to the lab screen and test another water sample.**
10. **If the water is unsafe to drink, check your information and treat the water sample again.**
11. **When you have tested and treated all the water samples, use your completed Table to completer the Journal questions.**

Name: _____ Period: _____Date: _____

Water Sample	Acidity pH	Metals (mg/L)	Coliform Bacteria (ml)	Pesticides Herbicides (mg/L	Nitrates (mg/L)	Types of Contamination	Treatment
City							
Lake							
Mountain							
Rural							
Well							

Name: _____ Period: _____Date: _____

CONSERVING RESOURCES; "WHEN IS WATER SAFE TO DRINK?"

1. What contaminants were found in the surface water samples? What contaminants were found in the groundwater samples?

Answer: _____

_____

_____

_____

2. Why might groundwater and surface water have different contaminants?

Answer: _____

_____

_____

_____

_____

3. Generally, farmers do not farm and industries do not build factories on the sides of mountains in remote wilderness areas. These aeas are usually not highly populated by people. What might explain the high nitrate level in the mountain water in this study?

Answer: _____

_____

_____

_____

_____

Name: _____ Period: _____Date: _____

CONSERVING RESOURCES; "WHEN IS WATER SAFE TO DRINK?"

4. What is pH level, what are it characteristics, and how does it contribute to pollution? What chemicals are used in treating low pH levels?

Answer: _____

_____

_____

_____

5. Water in an old building, tested recently, showed high copper and iron content, and low pH levels. A water reading taken 20 years before showed low pH levels, but only minimal traces of copper and iron. If none of the new buildings on the same street showed signs of metallic contaminants, but all reported lower than normal pH readings, how might these readings be explained

Answer: _____

_____

_____

_____

_____

Name: _____ Period: _____Date: _____

ATOMS, ELEMENTS, AND THE PERIODIC TABLE; "HOW CAN A MOLECULAR MODEL BE BUILT?"

Scientists use a system to classify matter based on its chemical structure. Elements are substances in which all the atoms are alike. Compounds are made up of two or more elements that are chemically combined. Many common materials are compounds. For instance, water is a compound that is made up of hydrogen and oxygen atoms.

Many compounds are made up of molecules. A molecule is two or more atoms chemically bonded to each other. It is the smallest particle of substance that has all the properties of that substance.

A molecule of water contains 2 hydrogen atoms chemically bonded to 1 oxygen atom. The chemical makeup of water can be expressed in a chemical formula: H_2O. The number 2 placed to the lower right of the chemical symbol H (for hydrogen) is called a subscript. It indicates that there are two atoms of hydrogen in a molecule of water. When a chemical symbol has no subscript, it means there is only o ne atom of that element in the molecule. There is no number to the right of the chemical symbol O (for oxygen); therefore, a molecule of water contains 1 atom of oxygen.

Many of the physical and chemical properties of a molecule are determined by its shape. The 3-dimensional shapes of molecules can be pictured by using molecular models. To make a model of a molecule, you need to know two things: Its chemical formula and how its atoms fit together.

In this Virtual Lab, you will build molecular models of various elements and compounds, given their chemical formulas. For some molecules, there is more than one way to build a model.

In a molecular model, bonds always connect two atoms; they do not attach to other bonds.

OBJECTIVES:

- **Explain what a molecule is.**
- **Explain what a compound it.**
- **Construct a model of a molecule based on its chemical formula.**

PROCEDURE:

1. **Click the Information button to learn about the structure of molecules.**
2. **Choose a molecule from the Molecule pull-down menu.**
3. **Drag atoms and bonds from the Atoms and Bonds clone pads to build a structural model of the molecule you chose.**
4. **Click the Check button to check your model.**
5. **If your model is correct, you can click the 3-D Model button to see a three-dimensional model of the molecule.**
6. **Record your findings in the Table**
7. **Repeat steps 1-6 and build models of five different molecules.**
8. **Complete the Journal questions.**

Name: _____ Period: _____Date: _____

Molecule Name	Number of Hydrogen Atoms	Number of Oxygen Atoms	Number of Nitrogen Atoms	Number of Carbon Atoms

Name: _____ Period: _____Date: _____

ATOMS, ELEMENTS, AND THE PERIODIC TABLE; "HOW CAN A MOLECULAR MODEL BE BUILT?"

1. What is an element?

Answer: _____

_____

_____

_____

2. What is a compound?

Answer: _____

_____

_____

_____

_____

3. What is a molecule?

Answer: _____

_____

_____

_____

_____

Name: _____ Period: _____Date: _____

ATOMS, ELEMENTS, AND THE PERIODIC TABLE; "HOW CAN A MOLECULAR MODEL BE BUILT?"

4. What is the difference between a molecular formula and a molecular model?

Answer: _____

_____

_____

_____

5. Describe the process you used to build a model. What did you do first? Second?

Answer: _____

_____

_____

_____

_____

6. Did you create a model that looked different from the model shown when you clicked the 3-D Model? If so, how was it different?

Answer: _____

_____

_____

_____

_____

Name: _____ Period: _____Date: _____

ATOMS, ELEMENTS, AND THE PERIODIC TABLE; "HOW CAN A MOLECULAR MODEL BE BUILT?"

7. What hypotheses could you propose about the relationship between the position of a type of atom in a molecule and the number of bouds that the atom forms? Explain your thinking.
Answer: _____ _____ _____ _____

Name: _____ Period: _____Date: _____

SUBSTANCE, MIXTURES, AND SOLUBILITY; "WHAT IS THE pH OF COMMON SOLUTIONS?"

The pH of a solution is a measurement of how acidic the solution is. One way to measure pH is to use pH paper. When pH paper is dipped into a solution, its color changes. This color can be compared to a color key on which the different colors indicate degrees of acidity. The pH color key also assigns a numeric value to the pH of a solution. The range of pH values is from 0 to 14. A solution that is acidic has a pH below 7. A solution that is neutral has a pH of 7. A solution that is basic has a pH above 7.

In this Virtual Lab you will use pH paper to determine the pH of common solutions. By first predicting and then testing the pH of various solutions, you will decide whether the solutions are acidic, neutral, or basic.

OBJECTIVES:

- **Predict the pH value of common solutions.**
- **Use pH paper to determine the pH value of common solutions.**
- **Determine whether a common solution is acidic, neutral, or basic.**

PROCEDURE:

1. **Open the Table and record the names of solutions you will test. Predict the pH value of each solution, and record your predictions in the Table.**
2. **Use pH paper to test the first solution. Click and drag the paper into the test tube, then match its color on the scale of pH values. Use the up and down arrows on the pH Value Counter to indicate the pH value of the solution.**
3. **Use separate strips of pH paper to test each of the other solutions and determine its pH. Use the up and down arrows of the pH Value Counters to indicate the pH values of these solutions. Enter the information in the Table.**
4. **When all the pH values are entered, click the Check button to evaluate your answers. If the pH value of a solution is incorrect, the pH value is highlighted yellow. Use pH paper to test the solution again. Use the up and down arrows on the pH Value Counter to enter the answer. Then click the Check button again.**
5. **Record the correct pH value in the Table. Then, use the scale of pH values to determine whether the solution is acidic, neutral, or basic. Record this information in the Table.**
6. **After you have recorded the data in the Table, complete the Journal questions.**
7. **Click the Reset button to test a new set of solutions.**

Name: _____ Period: _____Date: _____

Solution	Predicted pH Value	Actual pH Value	Type of Solution

Name: _____ Period: _____Date: _____

SUBSTANCE, MIXTURES, AND SOLUBILITY; "WHAT IS THE PH OF COMMON SOLUTIONS?"

1. What facts did you use to predict the pH values of the solutions? How did your predicted pH values for each of the common solutions compare with the actual pH values of those solutions?

Answer: _____

_____

_____

_____

2. Of the six solutions you tested, which one was the most acidic? Which one was the most basic? Which one was the closest to neutral?

Answer: _____

_____

_____

_____

_____

3. Milk of magnesia is sometimes used as a remedy for an "acid stomach". Would you expect the pH of milk of magnesia to be less than 7, more than 7, or 7? Why?

Answer: _____

_____

_____

_____

_____

Name: _____ Period: _____Date: _____

SUBSTANCE, MIXTURES, AND SOLUBILITY; “WHAT IS THE PH OF COMMON SOLUTIONS?”

4. What are some real-world applications in which pH is a important factor?
Answer: _____ _____ _____ _____

Name: _____ Period: _____Date: _____

MOTION AND MOMENTUM; "HOW DOES HORIZONTAL MOTION AFFECT VERTICAL MOTION?"

Anything that is thrown or shot through the air is called a projectile. Because Earth's gravity and their own inertia, projectiles follow a curved path.

When you throw a ball, the force from your hand gives the ball horizontal motion. When you let go of the ball, gravity begins to pull it down, giving it vertical motion. Vertical motion is perpendicular to Earth's surface. The ball has constant horizontal velocity, but increasing vertical velocity. The ball's horizontal and vertical motions are completely independent of each other.

In the Virtual Lab, you will use a launcher to give motion to a ball. You will use what you know about motion to calculate where the ball will land.

OBJECTIVES:

- **Explain the effect of gravity on horizontal velocity.**
- **Calculate distance given velocity and time.**
- **Explain that horizontal and vertical motion are independent of each other.**

PROCEDURE:

1. **Click the Video button. Watch the animation.**
2. **On the activity screen, the tension indicator of the ball launcher is set at zero meters/second. The ball will have no horizontal velocity.**
3. **Click Launch to time the vertical drop of the ball in seconds. Record the data in the Table in the Time Column. Enter the velocity in the Table.**
4. **Click the Calculator button. Using the formula d = vt, enter the distance in the Table. Close the Table.**
5. **Drag the ball back to the launcher, reset it, and try the activity again, using a different launch height and tension.**
6. **Predict where the ball will land. Remember to calculate distance. Record your prediction in your Journal. Place the bell on the predicted landing spot.**
7. **Click the Launch button. Observe the path of the ball. Record your observations in your Journal.**
8. **Continue to predict in your Journal the distance the ball will go, using different launch heights and velocities. Enter each set of data in the Table.**
9. **Use the data you collected to complete the Journal questions.**

Name: _____ Period: _____Date: _____

Velocity (m/s)	Time (s)	Distance (m)

Name: _____ Period: _____Date: _____

MOTION AND MOMENTUM; "HOW DOES HORIZONTAL MOTION AFFECT VERTICAL MOTION?"

1. What is your predicted landing spot for the ball?

Answer: _____

_____

_____

_____

2. What does the shape of the graph imply?

Answer: _____

_____

_____

_____

_____

3. How accurate was your first prediction?

Answer: _____

_____

_____

_____

_____

Name: _____ Period: _____Date: _____

MOTION AND MOMENTUM; "HOW DOES HORIZONTAL MOTION AFFECT VERTICAL MOTION?"

4. What is the general method/rule/formula for calculating where the ball will land?

Answer: _____

_____

_____

_____

5. How did analyzing the data in your table help you predict where the ball would land?

Answer: _____

_____

_____

_____

_____

Name: _____ Period: _____Date: _____

FORCE AND NEWTON'S LAWS; "WHAT IS NEWTON'S SECOND LAW OF MOTION?"

Force is a push or pull on an object. Net force is the difference between two opposing forces. Newton's second law of motion states that if a net force acts on an object, the object will accelerate in the direction of the force. Acceleration is a change in velocity. It can be either positive (speeding up) or negative (slowing down).

If an object is not moving, the net force on it must be zero. A force that we all experience is gravity. A notebook setting on a desk is being pulled down by the force of gravity. At the same time, it is being pushed up by the force of the desktop. The force of gravity is equal to the force of the desktop, so the net force on the notebook is zero. If an elbow pushes the notebook off the desk, the force of gravity is no longer balanced by the force of the desktop, and the notebook accelerates as it falls to the floor.

The formula for calculating a force on an object is:

F = ma

F = force
m = mass, and
a = acceleration

Mass is the amount of matter contained in an object. Mass does not change with changes in gravity.

In the previous example, F refers to the force of gravity on the notebook, also known as its weight; m is the mass of the notebook; and a is the acceleration of the object caused by the force of gravity.

The acceleration of any object falling to the surface of Earth is 9.78 meters per second per second, or 9.8 m/s^2. This means that at the first second, the object will be laffing with a speed of 9.8 m/s. At 2 seconds, the object will be falling at the rate of 19.6 m/s; at 3 seconds, it will be falling at the rate of 29.4 m/s, ond so on.

If the mass of the notebook is 0.5 kg, and the acceleration is 9.8 m/s^2, the force (weight) of the notebook can be calculated using the formula F = ma:

$F = 0.5\ kg \times 9.8\ m/s^2 = 4.9$

The Newton (N) is the measurement used to describe an omount of force. In the example above, F = 4.9 N. Therefore, 4.9 $kg.m/s^2$ = 4.9 N

In this Virtural Lfab you will investigate the relationship between mass, accelerating, and force by experimenting with falling objects of various masses under a range of gravitational conditions.

OBJECTIVES:

- **Relate Newton's second law of motion to the effect of gravity on falling objects.**
- **Determine the effect of mass on the acceleration rate of falling objects.**
- **Observe the effect of gravitational conditions on the rate at which objects of identical mass fall.**
- **Given mass and acceleration, compute force**

Name: _____ Period: _____Date: _____

FORCE AND NEWTON'S LAWS; "WHAT IS NEWTON'S SECOND LAW OF MOTION?"

PROCEDURE:

Note: This activity assumes there are no atmospheric resistance, pressure, or temperature effects.

1. **Click the arrow under Location 1 and select a planet to test. Click the arrow under Object 1 and select an object to test. Open the Table and record the gravitational rate of acceleration for this location and the mass of the object.**
2. **Select the second planet and object under Location 2 and Object 2. Open the Table and record the gravitational rate of acceleration for this location and the mass of the object.**
3. **Click the Drop button and observe the two objects as they fall. Click the Drop button again to see the objects fall again. The lines following a lalling object indicate the object's relative position during each second of acceleration.**
4. **Using the mass and acceleration data displayed on the monitors, calculate the force (weight) of both objects. Record your results in the Table.**
5. **Repeat the above steps two more times with other objects and locations. Click the Reset button to clear the screen.**
6. **Complete the Journal questions.**

Name: _____ Period: _____Date: _____

Test	Location	Acceleration (m/s^2)	Object	Mass of Object (kg)	Weight of Object (N)
1					
2					
3					
4					
5					
6					

Name: _____ Period: _____Date: _____

FORCE AND NEWTON'S LAWS; "WHAT IS NEWTON'S SECOND LAW OF MOTION?"

1. According to Newton's second law of motion, a net force on an object will cause it to accelerate. How does Newton's law relate to the force of gravity?

Answer: _____

_____

_____

_____

2. How does the force of gravity affect the rate of acceleration?

Answer: _____

_____

_____

_____

_____

3. Describe what happens when objects of different mass are dropped under the same gravitational conditions.

Answer: _____

_____

_____

_____

_____

Name: _____ Period: _____Date: _____

FORCE AND NEWTON'S LAWS; "WHAT IS NEWTON'S SECOND LAW OF MOTION?"

4. Describe what happens when objects of different mass are dropped under the same gravitational conditions.

Answer: _____

_____

_____

_____

5. What is weight? What is mass? How are mass and weight different?

Answer: _____

_____

_____

_____

_____

6. Based on your experience with the experiments, how does mass affect weight?

Answer: _____

_____

_____

_____

_____

Name: _____ Period: _____Date: _____

FORCE AND NEWTON'S LAWS; "WHAT IS NEWTON'S SECOND LAW OF MOTION?"

7. What othe conclusions can you draw from the data you collected in your table?
Answer: _____ _____ _____ _____

Name: _____ Period: _____Date: _____

ENERGY AND ENERGY RESOURCES; "WHAT ARE THE RELATIONSHIPS BETWEEN KINETIC ENERGY AND POTENTIAL ENERGY?"

Energy is the ability to cause change. Energy exists in many forms. Some of these forms include radiant, electrical, chemical, thermal and nuclear energy. Kinetic energy is energy in the form of motion, such as in a bouncing ball. Potential energy is stored energy. The amount of potential energy and object has depends on its position or condition.

In the Virtual Lab you will learn about the relationship between potential energy and kinetic energy by swinging a pendulum and observing bar and wave graphs as they illustrate its energyh. For the purposes of this activity, assume that there is no friction or air resistance.

OBJECTIVES:

- **Distinguish between kinetic and potential energy.**
- **Recognize that energy can change from one from to other form with no loss of total energy.**

PROCEDURE:

1. **Click the Video button. Watch the video about potential and kinetic energy. Observe the point at which the clock pendulums and the swings are at their highest and lowest kinetic and potential energy. Record your observations n your Journal.**
2. **Click the weight at the end of the pendulum arm and drag it to the desired height.**
3. **Click the Swing button.**
4. **Observe what happens to the bar and wabe graphs as the pendulum swings, and record the data in your Journal. The arrow on the pendulum alwas points in the direction of its motion.**
5. **Click the Pause button to stop the pendulum at different points in its swing. Observe the potential and kinetic energy on the graphs at each stopping point. Record this information in the Table.**
6. **To return the pendulum to the center position, click the Reset button.**
7. **When you have collected data for a number of stopping points, make some observations about the relationship between potential and kinetic energy and record them in your Journal. Be sure to include your observations about the sum of potential and kinetic energy at each stopping point.**

Name: _____ Period: _____Date: _____

Potential Energy (J)	Kinetic Energy (J)

Name: _____ Period: _____Date: _____

ENERGY AND ENERGY RESOURCES; "WHAT ARE THE RELATIONSHIPS BETWEEN KINETIC ENERGY AND POTENTIAL ENERGY?"

1. When do you think the clock pendulums and the swings were at their highest and lowest kinetic and potential energy? Why?

Answer: _____

_____

_____

_____

2. What happens to the total energy of the pendulum as it swings? What determines the maximum total energy of the pendulum?

Answer: _____

_____

_____

_____

_____

3. How are potential energy and kinetic energy related?

Answer: _____

_____

_____

_____

_____

Name: _____ Period: _____Date: _____

ENERGY AND ENERGY RESOURCES; “WHAT ARE THE RELATIONSHIPS BETWEEN KINETIC ENERGY AND POTENTIAL ENERGY?”

4. How does energy change from potential energy to kinetic energy?

Answer: _____

_____

_____

_____

Name: _____ Period: _____Date: _____

WAVES, SOUND, AND LIGHT; "WHAT ARE SOME CHARACTERISTICS OF WAVES?"

When a rhythmic disturbance passes through a medium such as a solid, liquid, or gas, a wave is formed. For example, vibrations that disturb the air create sound waves. An earthquake creates wave disturbances that pass through earth and solid rock. Water waves are ripples that travel over water, disturbing the water's calm surface. In each case, a wave travels through the medium because when one area of the medium is disturbed, it "pushes" against neighboring areas, which in turn push their neighboring areas. As the reaction continues, the wave travels away from the place where the disturbance occurred. The speed at which the wave travels through the medium depends on the properties of the medium.

Waves have three measurable characteristics: amplitude, frequency, and wavelength. The amplitude of a wave determines the magnitude of the disturbance. Amplitude is determined by measuring from the wave's rest position to its maximum height. The crest of a wave is the point of maximum disturbance above the rest position, and the trough of a wave is the point of maximum disturbance below the rest position. The amplitude measured to the crest is the same as that measured to the trough.

The frequency of a wave is a measure of how quickly or slowly the wave pattern is repeated. Scientists measure frequency by watching a single point and counting the number of wave crests that pass by it each second.

The wavelength of a wave is the distance between a point on one wave to the identical point on the next wave, such as from crest to crest or from trough to trough.

<u>OBJECTIVES:</u>

- **Identify characteristics of waves.**
- **Discover the relationship between wavelength and the frequency of a wave.**
- **Relate the amplitude of a wave to the magnitude of disturbance of a medium.**

<u>PROCEDURE:</u>

1. **Select a speed and a size for the plunger.**
2. **Click the Start Plunger button to start the plunger generating waves.**
3. **Click the Step button repeatedly to stop the wave and see each step of its motion. Click the Play button to return to normal motion.**
4. **Using the grid, measure the wave's amplitude and wavelength. Using the timer, measure the frequency of the wave. Record your measurements in the Table. Click the magnifying glass to see a detailed view of the wave.**
5. **Repeat steps 1 through 5 for various combinations of speed and size. Record your findings in the Table.**
6. **Answer the Journal questions.**

Name: _____ Period: _____Date: _____

Plunger Speed	Plunger Size	Amplitude (cm)	Wavelength (cm)	Frequency (waves per sec.)

Name: _____ Period: _____Date: _____

WAVES, SOUND, AND LIGHT; "WHAT ARE SOME CHARACTERISTICS OF WAVES?"

1. How does the size of the ball on the plunger affect the amplitude of the waves?

Answer: _____

_____

_____

_____

2. What effect, if any, does increasing the speed of the plunger have on the frequency of the waves?

Answer: _____

_____

_____

_____

_____

3. What effect, if any, does increasing the speed of the plunger have on the wavelength of the waves?

Answer: _____

_____

_____

_____

_____

Name: _____ Period: _____Date: _____

WAVES, SOUND, AND LIGHT; "WHAT ARE SOME CHARACTERISTICS OF WAVES?"

4. What is the relationship between the frequency and the wavelength of a wave?

Answer: _____

_____

_____

_____

5. What effect, if any, does frequency have on the amplitude of a wave?

Answer: _____

_____

_____

_____

_____

6. What relationship exists between the amplitude of a wave and amount of disturbance in the water?

Answer: _____

_____

_____

_____

_____

Name: _____ Period: _____Date: _____

ELECTRONICS AND COMPUTERS; "HOW CAN A DECISION TREE BE USED TO GENERATE BINARY NUMBERS?"

A computer collects and stores information in its memory, which contains thousands of tiny circuits. These circuits have switchers with two positions: open (off) or closed (on). Recall that a switch must be closed for current to flow. All computer information is processed with combinations of just two numbers, zero and one, representing these situations. This is called a *binary number sys*tem. Each 0 (off) or 1 (on) represents one binary digit and is called a *bit*.

In the Virtual Lab, you will work with binary numbers. You will use a decision tree to generate a unique, three-digit binary number for each of eight musical instruments. A *yes* answer to a question will generate a binary digit *1*. A *no* answer to a question will generate a binary digit *0*. A decision tree is one method that can be used to replace a concept with a code that a computer can understand.

OBJECTIVES:

- **Recognize that discrete elements of a set can be represented using binary numbers.**
- **Demonstrate how a decision tree can be used to generate a unique binary number for each element in a set.**

PROCEDURE:

1. **Choose a musical instrument and drag it to the top of the decision tree.**
2. **Read the question at the top of the activity screen. Then, click the YES button or the NO button to answer the question.**
3. **After the question has been answered correctly, the first digit of the binary code for the instrument is displayed at the bottom of the screen.**
4. **Continue this process until you have generated the three-digit binary code for the instrument. Enter this data in the Table.**
5. **Click the Musical Note button at any time during the activity to hear a sample of sounds played by the instrument you selected.**
6. **To see an enlarged view of an instrument, drag it to the top of the decision tree and click the Magnifying Glass button.**
7. **Generate a three-digit binary code for the other instruments.**
8. **Complete the Journal questions.**

Name: _____ Period: _____Date: _____

Musical Instrument	Binary Number

Name: _____ Period: _____Date: _____

ELECTRONICS AND COMPUTERS; "HOW CAN A DECISION TREE BE USED TO GENERATE BINARY NUMBERS?"

1. How do you think a computer could use the binary numbers you generated in this activity to sort the musical instruments into those with ttrings and those without?

Answer: _____

_____

_____

_____

2. Why do you think it takes three binary digits to represent the eight distinct instruments?

Answer: _____

_____

_____

_____

_____

3. If you had 16 different elements to represent, how many binary digits would you need?

Answer: _____

_____

_____

_____

_____

Name: _____ Period: _____Date: _____

START AND GALAXIES; "HOW DOES THE CHEMICAL COMPOSITION OF STARS DETERMINE THEIR CLASSIFICATION?"

Scientists Ejnar Hertzsprung and Henry Russel were astronomers in the early 1900's. Their research led them to determine that there was a pattern to the relationship among the color, temperature, and brightness of stars. Their H-R diagram shows how stars fall into categories, with most stars failing into a diagonal band at the center. This region is called the Main Sequence, and about 90 percent of all stars fall into this category.

Part of the H-R diagram concerns spectral class which is one way to classify stars. Stars are identified as being in the O - M. Class O stars at one end of the diagram are bluish-white, and may have surface temperatures of 20,000K. M stars at the other end of the scale are reddish, and may have surface temperatures of 3500K.

Dark-line spectra are produced when cooler gases in a star's atmosphere absorb wavelengths of light that are specific to an element. By comparing the dark-line spectra of a star to the spectra of an element, we can determine if the star contains that element.

Another part of the H-R diagram shows brightness. Absolute brightness is one way to measure the actual amount of light given off by a star.

In this Virtual Lab you will study the chemical composition of a star and collect data about its absolute brightness and spectral class. Then you will categorize it using the H-R diagram.

OBJECTIVES:

- **Compare the spectra produced by unknown stars to spectra of known substances on Earth to determine the chemical composition of the stars.**
- **Determine the placement of unknown stars in the H-R diagram based on analysis of its bright-line/ dark-line spectra and its spectral analysis.**

PROCEDURE:

1. **Choose a star by clicking the arrow under Star and selecting a letter. You will see spectrum for that star.**
2. **Determine what elements are present in the star. Select an element by clicking the arrow under element. You will see a spectrum for that element. Click and drag the line of sight tool (it looks like a rectangle) across the two spectra to see if the star contains the corresponding lines from the spectra in the element. Record your data in the Table.**
3. **Record the star's brightness and relative temperature in the Table.**
4. **Click the spectral Class button. Determin the star's place in the H-R diagram. Record the star's spectral class letter in the Table. Place the star n the H-R diagram and click Check.**
5. **Record the H-R diagram location and the star color in the Table.**
6. **Place all the stars in the diagram and complete the Table. Click Reset to get new stars.**
7. **Answer the Journal questions.**

Name: _____ Period: _____Date: _____

Star	Elements Present	Brightness	Temperature (K)	Spectral Class Letter	H-R Diagram Location	Star Color
A						
B						
C						
D						
E						

Name: _____ Period: _____Date: _____

START AND GALAXIES; "HOW DOES THE CHEMICAL COMPOSITION OF STARS DETERMINE THEIR CLASSIFICATION?"

1. What is known about stars that are placed on the left side of the H-R Diagram?

Answer: _____

_____

_____

_____

2. What is known about stars that are placed toward the top of the H-R Diagram?

Answer: _____

_____

_____

_____

_____

3. What is known about stars that are placed toward the bottom of the H-R Diagram?

Answer: _____

_____

_____

_____

_____

Name: _____ Period: _____Date: _____

START AND GALAXIES; “HOW DOES THE CHEMICAL COMPOSITION OF STARS DETERMINE THEIR CLASSIFICATION?”

4. How does the chemical content of a star affect its position on the H-R Diagram?

Answer: _____

_____

_____

_____

5. How does the brightness of a star affect its position on the H-R Diagram?

Answer: _____

_____

_____

_____

_____

Name: _____ Period: _____Date: _____

MINERALS; "HOW CAN MINERALS BE DEFINED BY THEIR PROPERTIES?"

Minerals can be found almost anywhere. Some are used to make things we use every day, like pots and pans and bicycles. Even though there are over 4000 kinds of minerals, they all share five characteristics:

1. **Minerals are formed by natural processes. Minerals can solidify from a magma, precipitate out of a solution, or form as a solution evaporates.**
2. **Minerals are inorganic, which means they are not alive and never were.**
3. **Minerals are solids.**
4. **Every mineral has its own distinct chemical composition.**
5. **A mineral's atoms are arranged in a repeating pattern that is unique to that mineral.**

Although all minerals share common characteristics, each mineral has its own unique physical properties. Appearance, color, luster, cleavage/fracture, streak color, and hardness are some of the physical properties used to identify a mineral. When identifying a mineral, it is important to examine all the properties of the mineral. For example, to differentiate between the minerals gold and pyrite, physical properties besides color and appearance would have to be tested.

In this Virtual Lab, you will examine physical properties of various minerals. You will identify mystery minerals by performing scientific tests.

<u>OBJECTIVES:</u>

- **Identify minerals by testing them for key properties.**

<u>PROCEDURE:</u>

1. **Click the Video button. Watch the slide show to learn about the properties of minerals.**
2. **Select a mystery mineral from the tray. Click and drag it to the test plate.**
3. **Click the toolbox to see the available tools.**
4. **Conduct one of the four tests on the mystery mineral. Click the magnifying glass. Drag it over the mystery mineral to test the mineral's luster, color, and cleavage/fracture. Open the Table and record your test results.**
5. **Open the toolbox and click the streak plate. Drag the mystery mineral over the streak plate to test the streak color. Record your test results in the Table.**
6. **Open the toolbox and click the piece of glass. Drag the mystery mineral over the piece of lass to test the mineral's hardness. Record your test results in the table.**
7. **Open the toolbox and click the fingernail scratch tool. Drag the mystery mineral over the fingernail scratch tool to test the mineral's hardness. Record your test results in the Table.**
8. **Click the reference cards. Use the left and right arrows to page through the cards. Compare the data you collected to descriptions of the minerals shown on the reference cards. Determine the identity of the mystery mineral. Click the arrow on the front of the test plate. Select the name of the mystery mineral. Click Check.**
9. **Test other mystery minerals and record the results in the Table.**
10. **After testing several minerals, complete the Journal questions.**
11. **Repeat the activity several times. Click the Reset button to see a new set of mystery minerals.**

Name: _____ Period: _____Date: _____

Mineral / Test	Result
Mineral A Luster	
Mineral A Cleavage/Fracture	
Mineral A Color	
Mineral A Streak Color	
Mineral A Hardness	
Mineral B Luster	
Mineral B Cleavage/Fracture	
Mineral B Color	
Mineral B Streak Color	
Mineral B Hardness	
Mineral C Luster	
Mineral C Cleavage/Fracture	
Mineral C Color	
Mineral C Streak Color	
Mineral C Hardness	
Mineral D Luster	
Mineral D Cleavage/Fracture	
Mineral D Color	
Mineral D Streak Color	
Mineral D Hardness	
Mineral E Luster	
Mineral E Cleavage/Fracture	
Mineral E Color	
Mineral E Streak Color	
Mineral E Hardness	

Name: _____ Period: _____Date: _____

MINERALS; "HOW CAN MINERALS BE DEFINED BY THEIR PROPERTIES?"

1. For each mineral you tested, which test was most helpful in identifying that particular mineral?

Answer: _____

_____

_____

_____

2. For each mineral you tested, which test was least helpful in identifying that particular mineral?

Answer: _____

_____

_____

_____

_____

3. Why is streak color more reliable than mineral color as an identifying characteristic?

Answer: _____

_____

_____

_____

_____

Name: _____ Period: _____Date: _____

MINERALS; “HOW CAN MINERALS BE DEFINED BY THEIR PROPERTIES?”

4. Why do you think some minerals are easier to identify than others?
Answer: _____ _____ _____ _____

Name: _____ Period: _____Date: _____

ROCKS; "HOW ARE ROCKS CLASSIFIED?"

All rocks can be divided into three categories: Igneous, metamorphic and sedimentary. These categories describe how the rocks were formed.

The word i*gneous* comes from a Latin word that means "out of fire". Igneous rocks form when magma (hot, melted rock from beneath Earth' surface) hardens.

The word *metamorphic* comes from a Latin word that means 'change form". Metamorphic rocks can form when igneous, sedimentary or other metamorphic rocks undergo changes in heat and pressure.

The word *Sedimentary* comes from a Latin word that means "settling". Sedimentary rocks can form when loose material or sediments settle and become pressed or cemented together.

In this Virtual Lab you will watch a presentation that describes how igneous, metamorphic, and sedimentary rocks are formed and explains their different characteristics.

Then you will classify and identify mystery rocks by performing scientific tests.

<u>OBJECTIVES:</u>

- **Classify rocks according to their origins (igneous, metamorphic, or sedimentary).**
- **Identify different types of igneous, metamorphic and sedimentary rocks.**

<u>PROCEDURE:</u>

1. **CLICK THE Video button. Watch the presentation to learn about igneous, metamorphic, and sedimentary rocks. Observe how rocks are formed and compare their different characteristics.**
2. **Click and drag a rock sample to the test plate.**
3. **Drag the magnifying glass over the rock sample to determine whether it is igneous, metamorphic, or sedimentary. Review the presentation if you need more help.**
4. **Take the rock to the appropriate Rock Testing Lab by clicking the door you want to enter. Only the door to the correct lab will open. Use your Journal to record how you determined the correct testing lab.**
5. **<u>Igneous Rock Testing Lab:</u> Drag the magnifying glass over the rock sample to get a closer-up view. Click the posters on the wall to get specific information about igneous rocks. Use the left and right arrows to page through the information on the posters.**
6. **Metamorphic Rock Testing Lab: Drag the magnifying glass over the rock sample to get a closer-up view. Click the posters on the wall to get specific information about metamorphic rocks. Use the left and right arrows to page through the information on the posters. Remove the magnifying glass from the rock sample. Drag the rock sample over the piece of glass.**
7. **<u>Sedimentary Rock Testing Lab:</u> Drag the magnifying glass over the rock sample to get a closer-up view. Click the posters on the wall to get specific information about sedimentary rocks. Use the left and right arrows to page through the information on the posters. Then click the 5% HCl Solution bottle to place a drop of HCl on the rock sample. If no reaction occurs after the hydrochloric acid is dropped on the rock, the result is negative. Write your observations in your Journal.**
8. **Open the Table and compare your observations about your rock sample to the data in the Table. Determine the identity of the mystery rock.**
9. **Click the door to return to the Main Lab. Click the arrow on the front of the test plate. Select the name of the mystery rock. Click Check.**
10. **Repeat the activity several times. After testing various rocks, complete the Journal questions.**

Name: _____ Period: _____Date: _____

ROCKS; "HOW ARE ROCKS CLASSIFIED?"

1. For each rock sample you tested, how did you decide which testing lab to use?

Answer: _____

_____

_____

_____

2. What observations did you make about your rock samples?

Answer: _____

_____

_____

_____

_____

3. How did you identify your rock samples?

Answer: _____

_____

_____

_____

_____

Name: _____ Period: _____Date: _____

ROCKS; “HOW ARE ROCKS CLASSIFIED?”

4. When you find a rock on your own, what steps can you take to identify it?
Answer: _____ _____ _____ _____

Name: _____ Period: _____Date: _____

FORCES SHAPING EARTH; "HOW DO GLACIERS SHAPE THE LAND?"

A glacier is a mass of snow and ice that moves slowly downhill due to its weight. Glaciers erode the land they pass over, carrying eroded material along and depositing it to form new landforms.

In addition to glacier deposition, glacier erosion changes large areas of Earth. It results when glaciers move over land, forcefully pushing loose materials out of their path. Glaciers weather and erode rock and soil that is not loose. Erosion also occurs when glacial ice melts and seeps into cracks in rocks. The water in these cracks refreezes, expands, and fractures the rock into pieces. As the glacier flows over the loosened particles, it lifts out the rock pieces and carries them down slope. With the pieces of rock embedded in the bottom and sides of the ice, the base of the glacier is like a sheet of sandpaper scraping against the rock it travels across. When rock is gouged deeply by dragged rock fragments, parallel marks are left behind. These marks indicate the direction the glaciers moved.

There are two main types of glaciers: Continental glaciers and valley glaciers. Both types of glaciers are capable of altering the physical landscape by erosion and deposition, but each type has a different effect on land. Continental glaciers are huge masses of snow and ice. They level the land and cover most of the terrain they travel across. They cover much larger areas of land than valley glaciers, which have more of a carving effect on the valleys through which they move. Valley glaciers flow down mountain slopes and through valleys previously occupied by steams.

In this Virtual Lab you will examine and identify landforms shown in photographs taken for various locations in the world.

<u>OBJECTIVE:</u>

- **Identify landforms produced by valley glaciers and by continental glaciers.**

<u>PROCEDURE:</u>

1. **Examine landforms made by continental glaciers and valley glaciers by clicking the corresponding file tab. Click the labels on the diagram to obtain information about each landform.**
2. **Examine the photograph taken from Site 1. Click the Clue button to obtain information about the landform(s) circled on the photograph.**
3. **Using the landform diagrams on the file cards, determine what type of landform is shown in the photograph.**
4. **Click the Landform arrow and select the landform shown in the photograph.**
5. **Click the Check button. If the landform you selected is not the landform shown in the photograph, reexamine the diagrams on the file cards and try again.**
6. **When you have correctly identified the landform shown in the photograph, read the travel notes to find out where the photograph was taken. Record this information in the Table.**
7. **Click another site file tab to get a different photograph. Repeat the Virtual Lab until yo have identified the landforms shown in the photographs taken from all six sites.**
8. **Complete the Journal questions.**

Name: _____ Period: _____Date: _____

Site	Location Name	Landform Identified
1		
2		
3		
4		
5		
6		

Name: _____ Period: _____Date: _____

FORCES SHAPING EARTH; "HOW DO GLACIERS SHAPE THE LAND?"

1. How is a glacier similar to a river?

Answer: _____

_____

_____

_____

2. How are continental glaciers different from valley glaciers? What are some differences in how these two types of glaciers effect the land?

Answer: _____

_____

_____

_____

_____

3. What kind of terrain and landforms would indicate the prior existence of a valley glacier?

Answer: _____

_____

_____

_____

_____

Name: _____ Period: _____Date: _____

FORCES SHAPING EARTH; “HOW DO GLACIERS SHAPE THE LAND?”

4. What kind of terrain and landforms would indicate the prior existence of a continental glacier?
Answer: _____ _____ _____ _____

Name: _____ Period: _____Date: _____

EARTHQUAKES AND VOLCANOES; "HOW DOES MAGMA'S COMPOSITION AFFECT A VOLCANO'S ERUPTION?"

Volcanoes are powerful displays of Earth in action. Scientists have determined that three forces within Earth can create a volcano. Volcanoes can occur where two of Earth's plates converge, or rub together. Volcanoes can also occur where two plates diverge, or move apart. Hot spots, areas in Earth's mantle that are hotter than neighboring areas, are also the sites of volcanoes.

There are three different forms of volcanoes. The form of a volcano depends on the composition of its magma and the amount of water vapor and other trapped gasses. These two things control the force of a volcano's eruption.

Shield volcanoes have sides with gentle slopes. They are made of basaltic lave. Cinder cone volcanoes have steep sides. They are made of tephra, lava cooled into different size pieces. Composite volcanoes have steep sides and are made of silica-rich lave and tephra. Their eruptive forces vary.

In the Virtual lab you will explore some volcanoes in the United States to learn about their composition and their eruptive force.

OBJECTIVE:

- **Explore different forms of volcanoes.**
- **Explain the effect of magma composition on the eruptive force of a volcano.**
- **Predict the eruptive force of a volcano.**

PROCEDURE:

1. **Click the Video button. Watch the video about volcanoes.**
2. **Click A, B, or C on the map of the United States to select a volcano you want to investigate.**
3. **Click the Form Reference button to review the three different forms of volcanoes.**
4. **Click the arrow below Volcano Form to select the form of the volcano shown. Record the form you selected in the Table.**
5. **Click the arrow below Silica Content to select the content of silica in the magma. Record your selection in the Table.**
6. **Click the arrow below Water Content to select the content of water in the magma. Record your selection in the Table.**

If you have selected the correct volcano form and silica and water content of the magma, and arrow displays below Eruptive Force. If no arrow displays, review your choices and adjust your selections.

7. **Click the arrow below Eruptive Force to select the force of the volcanic eruption. Record your selection in the Table.**
8. **Click the Erupt button. If you have selected the correct Eruptive Force, watch the volcano erupt. If no eruption occurs, adjust your eruptive force selection. Record your observations in your Journal.**
9. **Click the Map button to return to the main screen and select another volcano to explore.**

Name: _____ Period: _____Date: _____

Volcano	Type of Volcanic Occurrence	Volcano Form	Silica Content	Water Content	Eruptive Force
A					
B					
C					

Name: _____ Period: _____Date: _____

EARTHQUAKES AND VOLCANOES; “HOW DOES MAGMA’S COMPOSITION AFFECT A VOLCANO'S ERUPTION?”

1. How do you think the location of a volcano affects the magma composition?

Answer: _____

_____

_____

_____

2. Which magma composition causes the most violent volcanic eruptions? Why?

Answer: _____

_____

_____

_____

_____

3. Describe how magma composition and the resulting eruption affect the form of a volcano.

Answer: _____

_____

_____

_____

_____

Name: _____ Period: _____Date: _____

CLIMATE; "HOW CAN LOCATION BE IDENTIFIED BY THEIR CLIMATE AND TOPOGRAPHY?"

Maps can show many different kinds of data. You may be most familiar with maps that show longitude and latitude and help you to accurately locate a place. However, you can do more with a map than simply find a location. Maps can give you information about the different factors that affect a location. Data you might find on some maps include: Annual precipitation records, nearby ocean currents, and information about the topographical and climatic features.

In this Virtual lab you will determine the location of a mystery place by reading clues and investigating them using different kinds of maps.

OBJECTIVES:

- **Identify locations in North and South America by examining clues about each location's climatic and topographic features.**
- **Interpret different types of maps**

PROCEDURE:

1. **Read the clue. Decide what kind of map would help you and click that type. Click the right arrow to see the next clue.**
2. **Click the Mark button. Click a dot on a map to make a location. Click the dot again to remove the mark.**

Note: Mark locations that may be possible choices, based on revealed clues. Conversely, mark locations that can be eliminated based on revealed clues.

3. **When you think you know the answer, click the Check button then click the location.**
4. **Click the new Location button to receive clues for a different location among the ones you have. Click Reset to get a whole new set of locations.**

Name: _____ Period: _____Date: _____

CLIMATE; "HOW CAN LOCATION BE IDENTIFIED BY THEIR CLIMATE AND TOPOGRAPHY?"

1. Describe a physical map. What topographical information is displayed in a physical map?

Answer: _____

_____

_____

_____

2. Describe a surface temperature regions map. Describe the temperature trends across the continents.

Answer: _____

_____

_____

_____

_____

3. How does latitude affect climate?

Answer: _____

_____

_____

_____

_____

Name: _____ Period: _____Date: _____

CLIMATE; "HOW CAN LOCATION BE IDENTIFIED BY THEIR CLIMATE AND TOPOGRAPHY?"

4. How do topographical features such as mountains, large bodies of water, and large cities affect climate?

Answer: _____

_____

_____

_____

5. Why do so many climates exist in North and South America?

Answer: _____

_____

_____

_____

_____

6. How do ocean currents affect the climate of coastal regions?

Answer: _____

_____

_____

_____

_____

Name: _____ Period: _____Date: _____

CLIMATE; "HOW CAN LOCATION BE IDENTIFIED BY THEIR CLIMATE AND TOPOGRAPHY?"

7. Compare and contrast the topographic and climatic features of two or more locations you identified.

Answer: _____

_____

_____

_____

8. Locate your hometown on the different maps. What do you think are some of the factors that affect your climate?

Answer: _____

_____

_____

_____

_____

Name: _____ Period: _____Date: _____

CLUES TO EARTH'S PAST; "HOW CAN FOSSIL AND ROCK DATA DETERMINE WHEN AN ORGANISM LIVED?"

Fossils ae the remains, imprints, or traces of organisms that were once alive. By studying fossils, scientists can learn where, when, and how those organisms lived.

Fossils are usually found in sedimentary rocks. This is because the intense pressure and heat that create igneous and metamorphic rocks often destroy fossils.

Scientists use special fossils, called *index fossils*, to date rocks. Index fossils are from species that existed on Earth for relatively short periods of time and were abundant and widespread. Index fossils found in a sedimentary rock layer can be used to help date the layer.

Another way scientists might determine the age of a rock layer is by using the principle of superposition. This states that in undisturbed layers of rock, the oldest rocks are on the bottom and the youngest rocks are towards the top. However, layers of rock do not always remain undisturbed. A fault could cause rock layers to overturn. In this case, scientists use relative dating to determine the order of events and the relative age of rocks by looking at the position of rocks in a sequence. Relative dating does not indicate the exact age o f rock layers. It does indicate, however, that a layer is younger than the layers below it and older than a fault cutting through it.

Besides using index fossils, superposition, and relative dating, scientists also use a more precise method, called *absolute dating*, to date rocks. Absolute dating uses the radioactive decay of radioactive isotopes of minerals in rocks to determine the age of the rock. When a radioactive isotope (parent material) decays, it forms a new isotope, a daughter product. The half-life of a radioactive element is the time it takes for half of its atoms to decay into the daughter product. After two half-lives, one fourth of the original isotope's atoms remain and three-fourths have turned into the daughter product. After three half-lives, only one eight of the original isotope's atoms still remain. After many more half-lives, a very small amount of the original parent isotope remains.

By measuring the amounts of parent and daughter materials in a rock and by knowing the half-life of the parent, a geologist can calculate the absolute age of the rock. This method is called radiometric dating.

In this Virtual Lab you will confirm or refute the age of a rare fossil and determine when the organism that produced it was alive. To date the fossil you will use radiometric dating of rock layers and information about index fossils.

<u>OBJECTIVE:</u>
Investigate relative and absolute dating of fossils.

<u>PROCEDURE:</u>
1. **Begin at one of three dig sites. Click and drag a nail with a label to each of the four rock and sediment layers.**
2. **Drag the magnifying glass over the rock and sediment layers to look for fossils.**

Note: A hand is displayed on the handle of the magnifying glass. As you move the magnifying glass, the layer the hand is on indicates the rock layer where a fossil may be located.

Name: _____ Period: _____Date: _____

CLUES TO EARTH'S PAST; "HOW CAN FOSSIL AND ROCK DATA DETERMINE WHEN AN ORGANISM LIVED?"

PROCEDURE (continued):

3. **When you find fossils, compare them to those shown in the field guide. To access the field guide, click the laptop computer. Under Menu click field guide. Compare the geologic rock layers shown with those of the dig site. Click the Next button to research the fossils.**
4. **Record the names of the fossils and the layers in which you found them in the Table. Return to the dig site.**
5. **Click the drag the hammer to the layers you want samples from. The samples are placed in the tray according to the layers from which they are taken.**
6. **Click and drag each of the samples to the utility truck's front driver's side window.**
7. **Click the utility truck's window again to send the rock samples to the lab for absolute dating.**
8. **Click the laptop computer to check your email. Under Menu click e-mail to read the results of the absolute dating tests.**
9. **Click the Next button and read the graph to determine the age of your rock sample. Find the flashing point on the graph. Convert the number of half-lives into millions of years. You may use the Calculator, if necessary. If you received data for more than one rock sample, click the Next button again and determine the age of this rock sample. Record your findings in the Table.**
10. **Use your Journal to describe your findings.**
11. **To explore a different dig site, click the Reset button.**

Name: _____ Period: _____Date: _____

	Rock / Sediment Layers	Index Fossils Found	Rare, Undated Fossil Found
Cenozoic Quaternary 1.6 M.Y.B.P			
Cenozoic Tertiary 66.4 M.Y.B.P			
Mesozoic Cretaceous 144 M.Y.B.P			
Mesozoic Jurassic 208 M.Y.B.P			
Mesozoic Triassic 245 M.Y.B.P			
Paleozoic Permian 286 M.Y.B.P			
Paleozoic Pennsylvanian 320 M.Y.B.P			
Paleozoic Mississippian 360 M.Y.B.P			
Paleozoic Devonian 408 M.Y.B.P			
Paleozoic Silurian 438 M.Y.B.P			
Paleozoic Ordovician 505 M.Y.B.P			
Paleozoic Cambrian 544 M.Y.B.P			
Precambrian 4600 M.Y.B.P			

Name: _____ Period: _____Date: _____

CLUES TO EARTH'S PAST; "HOW CAN FOSSIL AND ROCK DATA DETERMINE WHEN AN ORGANISM LIVED?"

1. What steps did you take to date the fossils you found?

Answer: _____

_____

_____

_____

2. What steps did you take to date the rock layers?

Answer: _____

_____

_____

_____

_____

3. Does the information you collected from the dig site support the principle of superposition? Explain.

Answer: _____

_____

_____

_____

_____

Name: _____ Period: _____Date: _____

CLUES TO EARTH'S PAST; "HOW CAN FOSSIL AND ROCK DATA DETERMINE WHEN AN ORGANISM LIVED?"

4. Describe how you determined the age of rare fossils you found. Did you findings support the field guide information about the age of the rare fossils? Explain.
Answer: _____ _____ _____ _____