1. **Scientific Method**

Write the definitions and be able to identify these parts in an experiment.

a. Problem: ____________________________

b. Hypothesis: ____________________________

c. Control Group: ____________________________

d. Experimental Group: ____________________________

e. Independent Variable: ____________________________

f. Dependent Variable: ____________________________

g. Procedure: ____________________________

h. Conclusion: ____________________________

2. **Classification**

a. Define classification- ____________________________

b. List the five kingdoms. ____________________________

c. Write two characteristics and two examples for each for each kingdom.

<table>
<thead>
<tr>
<th>Plant</th>
<th>Animal</th>
<th>Moneran</th>
<th>Fungus</th>
<th>Protist</th>
</tr>
</thead>
</table>


d. Write one main difference between plants and fungi. ____________________________

e. Write one main difference between members of the plant and members of the animal kingdom. ____________________________
f. Define cold-blooded-

g. List two cold-blooded animals.

h. Define warm-blooded-

i. List two examples of warm-blooded animals.

j. Give the characteristics of the following classes of animals and give two examples for each class.

Reptiles Birds Mammals Fish Amphibians

k. Write the scientific name for humans.

3. Cells, Cell Processes and Organization of Multicellular Organisms

Define the following terms:

a. Cell-

b. Tissue-

c. Organ-

d. Organ System-

e. Organism-

Write the functions and be able to identify the following cell parts:

f. Nucleus-

g. Chromosome-

h. Cell Membrane-

i. Cell Wall-
j. Vacuole-__________________________________________________________________________

k. Mitochondrion-_____________________________________________________________________

l. Chloroplast-_________________________________________________________________________

m. Endoplasmic Reticulum-________________________________________________________________

n. List three differences between plant and animal cells. ____________________________________

____________________________________________________________________________________

Know the definition of the following cell processes:

o. Diffusion-__________________________________________________________________________

p. Osmosis-___________________________________________________________________________

q. Plasmolysis-________________________________________________________________________

r. Give two examples of osmosis. _________________________________________________________

s. Give one example that would result in plasmolysis. _____________________________________

t. Give examples of diffusion. ___________________________________________________________

u. Explain the relationship of a cell membrane pore to the size of a molecule that is able to enter a cell.
____________________________________________________________________________________

4. Cell Division

a. Define meiosis-_____________________________________________________________________

b. Meiosis produces ___________ cells with ___________ the number of chromosomes of a body cell. In humans, meiosis results in sex cells with how many chromosomes? __________

(c. Define mitosis-_____________________________________________________________________

d. Mitosis results in body cells with the ___________ number of chromosomes as the original cell. In human body cells, mitosis results in body cells with how many chromosomes? ___________
5. Characteristics of Life
   a. List the characteristics of living things. ____________________________________________

   b. List the needs of living things. ____________________________________________________

   c. Organisms combine ______________________ with ______________________ to get energy.

   d. Which life process helps organisms to maintain their existence? _______________________

   e. The ultimate source of energy for all living things is _________________________________.

   f. Define metabolism- ______________________________________________________________

   g. What influences metabolism? ______________________________________________________

6. Bacteria and Viruses
   a. List the three shapes of bacteria. ____________________________________________________

   b. What conditions do bacteria favor? _________________________________________________

   c. Why are some bacteria becoming resistant to antibiotics? _____________________________

   d. What is needed for bacteria to reproduce? _________________________________________

   e. What is needed for viruses to reproduce? ___________________________________________

   f. Explain ways that bacteria are helpful and harmful. _________________________________

   g. Are antibiotics used to kill bacteria or viruses? ____________________________________

7. Reproduction
   a. Explain the difference between asexual reproduction and sexual reproduction.

   b. What is fertilization? ____________________________________________________________
8. Plants

a. Explain the process of photosynthesis. _________________________________________________
____________________________________________________________________________________

b. What is a tropism? _________________________________________________________________

c. What is a phototropism? ____________________________________________________________
____________________________________________________________________________________

d. What plant parts exhibit positive or negative phototropism? _______________________________
____________________________________________________________________________________

e. What is a geotropism? ______________________________________________________________

f. What plant parts exhibit positive or negative geotropism? _________________________________
____________________________________________________________________________________

9. Human Biology Part I

a. What is the main function of the skeletal system? _________________________________

b. What are ligaments? _______________________________________________________________

c. What are tendons? _________________________________________________________________

d. What are joints? __________________________________________________________________

e. What is cartilage? __________________________________________________________________

f. Where is cartilage located? __________________________________________________________

Know the location and scientific names of the skeletal bones studied in class.

g. What is the function of the muscular system? _________________________________

h. What is skeletal muscle? ____________________________________________________________

i. What is smooth muscle? ____________________________________________________________

j. What is cardiac muscle? ____________________________________________________________

k. Define involuntary muscle- __________________________________________________________
1. Give examples of involuntary muscles.

m. Define voluntary muscle-

n. Give examples of voluntary muscles.

o. What is the function of the circulatory system?

p. How many chambers are in the human heart?

q. What are veins?

r. What are arteries?

s. What are capillaries?

t. Where are blood cells made?

u. What is the substance in red blood cells that carries oxygen?

v. What do white blood cells do?

w. What do platelets do?

x. What is a pulse?

10. Human Biology Part 2

Know the following parts of the heart and their functions:

a. Aorta-

b. Pulmonary Artery-

c. Right Ventricle-

d. Left Ventricle-

e. Inferior Vena Cava-

f. Superior Vena Cava-

g. Pulmonary Vein-
h. What is the function of the nervous system? ____________________________________________

i. What is the main job of the brain? ___________________________________________________ 

What do the following parts of the brain control?

j. Cerebellum- ______________________________________________________________________

k. Cerebrum- ________________________________________________________________________

l. Medulla- _________________________________________________________________________

m. What do spinal nerves do? ___________________________________________________________

n. What is the job of the spinal cord? ___________________________________________________

Know the following about a reflex act and be able to recognize the parts on a diagram:

o. What is a stimulus? _________________________________________________________________

p. What does the sensory neuron do? ____________________________________________________

q. What does the interneuron do? _______________________________________________________

r. Where is the interneuron located? ____________________________________________________

s. What does the motor neuron do? _____________________________________________________

t. What is a response? ________________________________________________________________

u. What is digestion? __________________________________________________________________

v. What are the organs of the digestive system? ___________________________________________

____________________________________________________________________________________

Be able to label the digestive organs on a diagram.

Trace the path of food through the digestive system.

What do the following organs of the digestive system do?

w. Stomach- _________________________________________________________________________

x. Large intestine- ___________________________________________________________________
11. Genetics
   a. What is a phenotype- ______________________________________________________________________

   b. What is a genotype- ______________________________________________________________________

   c. What sex chromosomes does a male have? ______________________________________________________________________

   d. What sex chromosomes does a female have? ______________________________________________________________________

   Be able to read a pedigree chart.

12. Ecology

   Know the following definitions:

   a. Producer- ______________________________________________________________________

   b. Consumer- ______________________________________________________________________

   c. Herbivore- ______________________________________________________________________

   d. Carnivore- ______________________________________________________________________

   e. Omnivore- ______________________________________________________________________

   f. Decomposer- ______________________________________________________________________

   g. Energy Pyramid- ______________________________________________________________________

   Be able to analyze a food web.

13. The Microscope

   List the functions for the following microscope parts:

   a. Ocular- ______________________________________________________________________

   b. Coarse Adjustment Knob- ______________________________________________________________________

   c. Fine Adjustment Knob- ______________________________________________________________________
d. Clips- __________________________________________________________________________
e. Diaphragm- __________________________________________________________________________
f. Stage- __________________________________________________________________________

Be able to label a microscope diagram.
g. How do you calculate the total magnification when using a microscope?

_________________________________________________________________________________

14. Skills with Scientific Equipment

Be able to read a metric balance, a metric ruler, graduated cylinders and a thermometer.
a. If you are given a Gummy bear, a paper towel and a balance, how would you find the mass of the Gummy bear? ________________________________________________________________________

b. pH

Acids- _______________  Bases- _______________  Neutral- _______________

15. Genetics Problems

A. Punnett Square

In guinea pigs black fur (B) is dominant over white fur (b).

1. Fill in the blanks in the Punnett Square below to determine the cross a female hybrid (heterozygous) black guinea pig and a male pure white guinea pig.

<table>
<thead>
<tr>
<th>Phenotype-</th>
<th>Genotype-</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Phenotype-</th>
<th>Genotype-</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Phenotype-</th>
<th>Genotype-</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Phenotype-</th>
<th>Genotype-</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

2. If four offspring are produced from this cross, what is the ratio of black to white? ______________
3. Are the black offspring hybrid (heterozygous) or pure (homozygous)? ______________
4. What is the probability in % of getting white offspring from this cross? ______________

Use the pedigree below to answer the questions.
B. Pedigree

I

II

III

P is the allele for widow’s peak and p is the allele for straight line hair.

Males are square and females are round. White are dominant and shaded are recessive.

1. How many generations are shown? ________________

2. How many children did the parents in the first generation have? _______________

3. What is the genotype for parent 1 in the first generation? ____________________

4. What numbers are hybrid (heterozygous)?
   __________________________________________________________________________

5. List the generation and the numbers that have straight line hair?
   __________________________________________________________________________

6. What numbers most likely have the phenotype PP? ________________________________

7. How many females have the recessive trait? ________________________________

8. How many males have the dominant trait? ________________________________
16. Label Cells:
   - Nucleus
   - Cytoplasm
   - Cell Membrane
   - Cell Wall
   - Vacuole
   - Mitochondrion
   - Chloroplast
   - ER
17. **Label the parts of the microscope:** Ocular, Body Tube, Coarse Adjustment Knob, Fine Adjustment Knob, Arm, Base, Light, Stage, Clips, Revolving Nosepiece, Low Power Lens and High Power Lens

18. **Label Heart:**
- Aorta
- Inferior Vena Cava
- Pulmonary Artery
- Left Ventricle
- Right Ventricle
- Left Atrium
- Right Atrium
19. Label Brain:
Cerebrum
Cerebellum
Medulla
Spinal cord

20. Label Digestive:
Esophagus
Stomach
Liver
Small Intestine
Large Intestine
Anus
Pancreas
21. What kind of reproduction is this?

________________________________

22. Reflex Diagram
a. What kind of neurons are found in the skin?
   ________________________________
b. What kind of neurons are found in the muscles?
   ________________________________
c. Where are the interneurons located?
   ________________________________
Label the process in each box from the following word bank:

Runoff  Evaporation  Transpiration  Condensation  Precipitation  Accumulation
In the United States, planetary winds and the jet stream (a large stream of air moving from West to East in the upper atmosphere) move air masses.

Weather Fronts- When two air masses meet, this is called a weather front. It is often characterized by rapid weather changes accompanied by precipitation.

Cold Front- A cold front forms when a cold air mass meets a warm air mass. In the summer time, cold fronts are often associated with thunderstorms. Since the cold air mass is more dense than the warm air mass, it pushes the warmer air up. The moisture in the warmer air quickly condenses in the cooler upper air, forming cumulous clouds (towering thick white clouds) that characterize cold fronts.

Warm Front- A warm front occurs when warm air catches up with cold air. The less dense warm air glides over the denser cold air. The slow rising air also condenses in the cooler air as it rises. However, since it does not rise as rapidly as when a cold front collides with a warm front, it is characterized by the formation of feathery cirrus clouds followed by sheet-like stratus clouds. If the air had significant moisture in it, there would be wide spread precipitation.
Occluded Front - An occluded front takes place when a fast moving cold front overtakes a warm front, lifting it quickly, and causing large scale condensation and precipitation.

When a cold front and warm front meet, but move very slowly, relative to one another, a stationary front has formed. The denser cold air sinks slowly under the warmer air mass. Clouds form, but they form very slowly. They can last for a number of days until another air mass moves in with enough force to move the stalled air masses.
Earthquakes

An earthquake is the shaking and trembling that results from the sudden movement of part of the Earth’s crust. The most common cause of earthquake is faulting, illustrated below. Earthquakes also occur on the floor of the ocean. Ocean earthquakes often produce giant sea waves called tsunamis.

The point beneath the Earth’s surface where the rocks break and move is called the focus of the, on the Earth’s surface, is the **epicenter**.

Earthquake waves are known as **seismic waves**. The three main types of seismic waves are illustrated below. The fastest seismic waves are called **primary waves**, or **P waves**. They travel through solids, liquids and gases. As they travel, they push or compress rock particles ahead of them. **Secondary waves**, or **S waves**, are slower than P waves. S waves travel through solids, but not through liquids or gases. S waves move rock particles from side to side, at right angles to the direction the waves are heading. The slowest seismic waves are call **surface waves**, or **L waves**. They arrive last at any given point, after primary and secondary waves. They originate at the epicenter of an earthquake and move along the surface like waves travel in the ocean. They move the surface up and down and cause the most damage during an earthquake.

A seismograph is an instrument that detects and measures seismic waves. It consists of a weight attached to a string or wire. The weight is not attached directly to Earth, so it remains nearly still even when the Earth moves. When the Earth moves, a pen attached to the weight records the movement on a sheet of paper wound around a constantly rotating drum. The record is a wavy line called a seismogram. Seismologists,
scientists who study earthquakes, can determine the strength of an earthquake by studying the height of the wavy lines.

The strength of earthquakes is measured on the Richter scale. The Richter scale measures the amount of energy released by an earthquake by assigning it a number from 1 to 10. The more energy an earthquake releases, the stronger the earthquake is, and the higher the number on the Richter scale.

Earthquakes and volcanic eruptions are the most dramatic and observable examples of the constant movement of Earth’s crust. An earthquake or an eruption suddenly changes the surface of the Earth, often with devastating effects on human property and life.

**Effects of Volcanic Eruptions**

In 1816, Chauncey Jerome, a resident of Connecticut, wrote that the clothes his wife had laid out to dry the day before had frozen during the night. This event would not have been unusual except that the date was June 10th!

At that time, residents of New England did not know that the explosion of a volcanic island on the other side of the world had severely changed the global climate and was causing “The Year Without a Summer”.

**Volcanic Eruptions and Climate Changes**

The explosion of Mount Tambora in 1815 blanketed most of Indonesia in darkness for three days. It is estimated that 12,000 people died directly from the explosion and 80,000 died from the resulting hunger and disease. The global effects of the eruption were not felt until the next year. During large scale eruptions, enormous amounts of volcanic ash and gases are ejected into the upper atmosphere.

As volcanic ash and gases spread throughout the atmosphere, they can block enough sunlight to cause global temperatures to drop. The Tambora eruption affected the global climate enough to cause food shortages in North America and in Europe. More recently, the eruption of Mount Pinatubo caused average global temperatures to drop by as much as 0.5 degrees Celsius. Although this may seem insignificant, such a shift can disrupt climates all over the world.
The Rock Cycle

Round and Round It Goes

You have seen how different geological processes can change rock. Each rock type can change into one of the three types of rock. For example, igneous can change into sedimentary rock, metamorphic rock or even back into igneous rock. This cycle in which rock is changed by geological processes into different types of rock is known as the rock cycle.

Rocks may follow various pathways in the rock cycle. As one rock type is changed to another rock type, several variable including time, heat, pressure, weathering and erosion may alter a rock’s identity. The location of a rock determines which natural forces will have the biggest impact on the process of change. For example, rock at the Earth’s surface is primarily affected by forces of weathering and erosion, whereas deep inside the Earth, rocks change because of extreme heat and pressure. The figure above show the different ways rocks may change when it goes through the rock cycle and the different forces that affect rock during the cycle.
A mineral’s number indicates its relative hardness. The scale ranges from 1, which is the softest, to 10, which is the hardest. A mineral of a given hardness will scratch any mineral that is softer than it is.

A mineral’s resistance to being scratched is called hardness. To determine the hardness of minerals, scientists use Moh’s hardness scale shown above. Notice that talc has a rating of 1 and diamond has a rating of 10. The greater a mineral’s resistance to being scratched, the higher the mineral’s rating is. To identify a mineral by using Moh’s scale, try to scratch the surface of a mineral with the edge of one of the ten reference minerals. If the reference mineral scratches your mineral, the reference mineral is harder than your mineral.

**Characteristics of the Atmosphere**

If you were lost in the desert, you could survive for a few days without food and water. But you wouldn’t last more than five minutes without the atmosphere.

The atmosphere is a mixture of gases that surrounds Earth. In addition to containing the oxygen you need to breathe, the atmosphere protects you from the sun’s damaging rays. The atmosphere is always changing. Every breath you take, every tree that is planted, and every vehicle you ride in affects the atmosphere’s composition.
The Composition of the Atmosphere

As you can see in the diagram below, the atmosphere is made up of mostly nitrogen gas. The oxygen you breathe makes up a little more than 20% of the atmosphere. In addition to containing nitrogen and oxygen, the atmosphere contains small particles such as dust, volcanic ash, sea salt, dirt and smoke. The next time you turn off the lights at night, shine a flashlight, and you will see some of these tiny particles floating in the air.

Water is also found in the atmosphere. Liquid water (water droplets) and solid water (snow and ice crystals) are found in clouds. But most water in the atmosphere exists as an invisible gas called water vapor. When atmospheric conditions change, water vapor can change into solid or liquid water, and rain or snow might fall from the sky.

Nitrogen, the most common atmospheric gas (78%) is released when dead plants and dead animals break down and when volcanoes erupt.

Oxygen, the second most common atmospheric gas (21%) is made by phytoplankton and plants.

The remaining 1% is made up of argon, carbon dioxide, water vapor and other gases.

Atmospheric Pressure and Temperature

What would carrying a column of air that is 700 km high feel like? You may be surprised to learn that you carry this load every day. While air is not very heavy, its weight adds up. At sea level, a square inch of surface area is under almost 15 pounds of air. Carrying that much air on such a small surface area is like carrying a large bowling ball on the tip of your finger.
As Altitude Increases, Air Pressure Decreases

The atmosphere is held around the Earth by gravity. Gravity pulls gas molecules in the atmosphere toward the Earth’s surface causing air pressure. **Air pressure** is the measure of the force with which air molecules push on a surface. Air pressure is strongest at the Earth’s surface because more air is above you. As you move further away from the Earth’s surface, fewer gas molecules are above you. So as altitude (distance from sea level) increases, air pressure decreases. Think of air pressure as a human pyramid. The people at the bottom of the pyramid can feel all the weight and pressure of the people on the top. Air pressure works in a similar way.

![Image of human pyramid with more pressure at the bottom and less pressure at the top.]

**Atmospheric Composition Affects Air Temperature**

Air temperature also changes as altitude increases. The temperature differences result mainly from the way solar energy is absorbed as it moves through the atmosphere. Some parts of the atmosphere are warmer because they contain a high percentage of gases that absorb solar energy. Other parts of the atmosphere contain less of these gases and are cooler.