**9th grade Biology Summer Assignment**

This assignment is for 9th grade Biology students. It is provided so that students may review fundamental concepts and prepare for the vocabulary that is involved in the course. Students will be tested over the material in this summer assignment during the 1st week of school.

<u>Word Roots-Tools for</u>
<u>Scientists</u>

Science courses can often seem difficult because of the vocabulary. If you know the meaning of the prefix or suffix of the term with which you are working, often you will be able to determine the definition of the entire term. Below are some examples of common prefixes and suffixes you will encounter in your study of biology.

| Prefix | Meaning | Suffix | Meaning |
|--------|---------|--------|---------|
| Hydro- | Related to water | -logy | Study of |
| Intra- | Within | -phyll | Leaf |
| Bio- | Related to life | -plast | Organized living material |
| Proto- | First | -troph | Food |
| Chloro- | Greenish yellow | -cellular | Having to do with plants |
| Zoo- | Related to animals | -phyte | Plant |
| Ex- | Out | -synthesis | To put together |
| Hetero- | Different | -ation | Process |
| In- | Inside | -scope | Instrument for viewing |
| Micro- | Small | -lysis | A releasing or loosening |
| Photo- | Light | -cretion | The process of separating |
| Uni- | One | -gestion | To carry |
| Multi- | Many | -meter | Instrument used to measure |
| Auto- | Self-operating | -stasis | A stationary condition |

Use the meaning of the prefixes and suffixes in the table to form words that will match these definitions.

1. _____ First organized particle

2. _____ The study of small forms of life

3. _____ The study of animals

4. _____ Instrument used to measure water and other liquids

5. _____ A plant that grows in water

6. _____ The process of making something self-operating

7. _____ Small leaf

8. _____ Within a cell

9. _____ Removal of waste products from the body

Each group of words listed below shares certain parts (maybe more than TWO). The first two words in each group are defined for you. The part of the word and the part of the definition that correspond are underlined. Use these definitions to help you to define each word that follows the first two words. These make real words!

10. Mono<u>filament</u>     A single <u>fiber</u>

    <u>Micro</u>scope     Instrument for looking at <u>small objects</u>.

    Microfilament     _____

11. Photo<u>tropism</u>     <u>Response</u> to light

    <u>Chemo</u>therapy     Treatment that involves <u>chemicals</u>

    Chemotropism     _____

12. Pesti<u>cide</u>     <u>An agent used to destroy</u> pests

    <u>Herb</u>aceous     Related to leafy <u>plants</u>

    Herbicide     _____

13. <u>Derma</u>tology     The study of the structure and diseases of <u>the skin</u>

    <u>Sclero</u>sis     Disease in which body tissues <u>harden</u>

    Scleroderma     _____

14. <u>Arthr</u>itis     Inflammation of the <u>joints</u>

    <u>Pod</u>iatrist     Doctor who treats and cares for the human <u>foot</u>

    Arthropod     _____

Science and the Scientific Method

The scientific method is the problem solving method that all scientist use to solve questions related to our world. Experimentation is a key component of the scientific method and the foundation of upon which all science rests. To better your understanding of the scientific method, define the following terms:

Scientific method                                         Quantitative Data
Hypothesis                                                Qualitative Data
Law                                                       Independent/Manipulated Variable
Theory                                                    Dependent/Responding Variable
Data                                                      Control Variable (Constants)
Observation                                               Analysis
Inference                                                 Conclusion
Deduction/Prediction

Application of Vocabulary
Terms

**Read the paragraph and answer the questions.**

Chris wanted to test the effect of diet pills on how tall the tomato plants in his garden would grow. He took two pots, filled them with dirt from the same bag, and planted four tomato plants in each. He watered one planter with tap water, and he watered the other planter with tap water mixed with dissolved diet pills. The plants were in the same location to ensure that they got the same amount of sunlight, and the water was measured so that each pot received the same amount of water. He measured their height at the end of each week for eight weeks, and averaged the height of the four plants in each pot. He then graphed the results to show how the diet pills affected the height of the plants.

1. What is the independent variable of this experiment?

2. What is the dependent variable of this experiment?

3. What is the control?

4. List the constants in this experiment.


5. How many trials were included in this experiment?

6. Write a hypothesis for this experiment in the "If…, then…." Format.

**Carefully read the paragraph below. Answer the following questions in complete sentences.**

During gym class Sally noticed that her friend Melissa always ran faster than she could run. Sally knew that they exercised equally, so she wondered what could cause Melissa to run so fast. Sally began to compare herself and Melissa to see what could cause the difference in speeds. She noticed that Melissa was taller and wondered if height affected speed. Sally predicted that taller people were able to run faster, but wanted to check her prediction. She asked her gym teacher if she could test her idea because the class consisted of only girls and she thought this would help her get accurate results. Sally measured all of her classmates' height in centimeters and recorded it in her chart. Each classmate then ran one mile while Sally timed them with a stopwatch and recorded the data in seconds. She then began to review her data and look for the answer to her question.

1. What question is Sally trying to answer?

2. What made her want to answer this question?

3. What is the dependent variable in this experiment?

4. Are the observations qualitative or quantitative?

5. What factors does Sally think might cause the measurement to change?

6. What parts of the experiment were constants?

7. Is there a control group used in this experiment?

8. How many trials were involved in this experiment?

**Carefully read the paragraph below and then answer the questions that follow.**

Suzie wants to know the effect of different colors of light on the growth of plants. She believes that plants can survive the best in white light. She buys 5 ferns of the same species, which are all approximately the same age and height. She places one in white light, one in blue light, one in green light, one in red light, and one in the closet. All of the ferns are planted in Miracle-Grow and given 20 mL of water once a day for 2 weeks. After the two weeks, Suzie observes the plants and makes measurements.

1. What is her hypothesis?


2. What is her independent variable?

3. What is her dependent variable?


4. Which group is her control group?


5. Which group is her experimental group?


6. Which variables were constants?


7. What type of measurements can Suzie make to determine how they did in the different types of light?


**Answer the following questions about the scientific method.**

1. Why is a control group necessary?


2. How many variables can be tested within one experiment?


3. Why do scientists use quantitative data most often?


4. Do all theories become laws? Explain.

<u>Metric Measurement</u>

Scientists use metric measurement as a way of describing and comparing things. For example, linear measurements can identify and distinguish between male and female skeletons: The female skeleton has a wider pelvis than the male.

In biology, we use the **metric system** of measurement for two reasons:

(1) The units of measurement are based on multiples of 10, and it is easy to make conversions from one unit (such as a millimeter) to another unit (such as a centimeter).

(2) The things we measure in biology are often very small (such as the length of a cell or the weight of a single seed). The smallest units in the English measurement system, the inch and ounce, are not easily divided into smaller units and are impractical to use.

In this class you will be determining **linear**, **volume**, **mass** and **temperature** measurements. Linear, volume and mass measurements are metric. We will be using the **Celsius** scale for measuring temperature. The following tables show simple conversions for different units of measurement.

| Type of Measurement | Some Conversions | Examples |
|---|---|---|
| **1) Linear:** measured in divisions of a **meter (m)** | 1 meter=100 centimeters (cm) 1 meter=1,000 millimeters (mm) 1 meter=1,000,000 micrometers ($\mu$m) 1 mm=1,000 $\mu$m | One meter is a little over 3 feet. A centimeter is slightly less than one-half an inch. We use micrometers ($\mu$m) to measure cells and micro-organisms such as bacteria. |
| **2) Volume:** measured in division of a **liter (L)** | 1 liter=1,000 milliliter (ml or mL) | Coke comes in one-liter bottles. Poland Spring water can be purchased in 500 ml or half-liter bottles. |
| **3) Mass:** measured in divisions of a **gram (g)** | 1,000 grams=1kilogram (kg) 1 gram=1000 milligram (mg) 0.1 gram=100 mg 0.001 g=1mg | A small paper clip or a packet of sugar weigh approximately one gram. |
| **4) Temperature** measured in degrees **Celsius (° C)** | 0 °C 22 °C 37 °C 100 °C | Freezing point of water Room temperature Normal body temperature Boiling point of water |

**Convert the following metric problems.**

A. 83 g =___kg
D. 50 mg =___g
G. 98 degrees F =_____°C

B. 250 cm =___m
E. 32 m =___mm
H. 14.3 m =____km

C. 7000 ml =___L
F. 12 L =___ml
I. 57 g=____mg

# Life Science Review

## Life Processes
1. What are the 9 characteristics of all living things?
2. What occurs during the process of <u>synthesis</u>? What are the building blocks to synthesize proteins
3. What does responding to stimuli allow an organism to do? BE SPECIFIC
4. All organisms use and release _____.
5. Define homeostasis and explain why it is important.
6. Define growth.

## Cells Parts
1. What are the three points of the cell theory?
2. What piece of equipment helped scientists develop the cell theory?
3. Describe the <u>function</u> of each of the following organelles:
   - a) nucleus
   - b) cytoplasm
   - c) cell membrane
   - d) ribosomes
   - e) vacuole
   - f) mitochondria
   - g) chloroplast
   - h) cell wall
4. Which organelles are found in plant cells but not in animal cells?
5. Which organelles are found in animal cells but not in plant cells?
6. What is the difference between passive transport and active transport?
7. Define diffusion.
8. Give at least 1 example of diffusion.
9. Define osmosis.
10. Put the following levels of organization in order.
    Systems — Organs — Cells — Tissues — Organisms

## Cellular Mitosis, Meiosis, Respiration & Photosynthesis
1. Define cancer.
2. Define mitosis. How many chromosomes are in the daughter cells compared to the parent cell?
3. Name the 5 stages associated with the cell cycle in order, and describe the events that occur in each stage.
4. Define meiosis. How many chromosomes are in the daughter cells compared to the parent cell?
5. What are the reactants of photosynthesis?
6. What are the products of photosynthesis?
7. What are the reactants of cell respiration?
8. What are the products of cellular respiration?
9. Write out the (balanced) equation for photosynthesis.
10. Write out the (balanced) equation for cellular respiration.
11. In what organelle does cellular respiration occur?
12. In what plant cell organelle does photosynthesis occur?
13. What pigment is necessary for photosynthesis?
14. Describe <u>**specifically**</u> how the processes of photosynthesis and cell respiration are dependent on each other.
15. What organisms go through the process of respiration?
16. What organisms go through the process of photosynthesis?

## Genetics
1. What is genetic material carried on chromosomes made of?
2. What is the function of DNA.
3. Which nitrogen bases match in a molecule of DNA?
4. Define chromosome. What is the shape and location?
5. Put the following terms into the proper order from <u>least complex</u> to <u>most complex</u>.
   chromosome - gene - nucleotide - DNA
6. Define heredity.
7. Define genetics.
8. Who is the "Father of Genetics?"
9. Define the following terms:

| | a) Dominant | c) Genotype | e) Heterozygous (hybrid) |
|---|---|---|---|
| | b) Recessive | d) Phenotype | f) Homozygous (purebred) |

10. Traits are inherited in _____ of alleles.
11. Define sexual reproduction.
12. Define asexual reproduction.
13. Explain how offspring resulting from <u>sexual reproduction</u> get alleles from their parents.
14. What are the names of the male and female sex cells?
15. What is the name of the process that produces the gametes (sex cells), and what happens to the number of chromosomes during this process?
16. Explain the purpose of a Punnett Square.
17. What is the difference between complete Inheritances with Incomplete inheritance? (number of phenotypes and types of letters used) Give an example of each.
18. If a couple is going to have a baby, what is the probability that it will be a girl? Boy?
19. Explain your answer to question 18 using a Punnett square.
20. What is a pedigree chart used for? What are circles and squares on a pedigree chart?
21. What is genetic engineering? What are its uses?  Give an example.

# 6. Evolution
1. In what kind of rocks are most fossils found?
2. How is sedimentary rock formed?
3. In a sample of undisturbed sedimentary rock, which rock layer is the oldest?
4. What can scientists learn from fossils?
5. Define mutation
6. Define the term adaptation.   Give three examples of adaptations in humans.
7. Define evolution.
8. Name and describe Lamarck's theory of evolution.
9. What is the name of Darwin's theory of evolution?
10. Name and describe the four parts of Darwin's theory.

# 7. Classification
1. What are the two parts of a scientific name - in order? What is the scientific name of humans?
2. What are the seven major levels of classification in order from most general to most specific?
3. Name the 6 kingdoms in our modern classification system.
4. Describe the general traits of organisms in each of the kingdoms in the chart below

| Kingdom → ↓ Traits | Archaebacterial | Eubacteria | Protista | Fungi | Plantae | Animalia |
|---|---|---|---|---|---|---|
| How many cells? (uni/multi) | | | | | | |
| Can they move from place to place? (yes/no) | | | | | | |
| How do they get their nutrients? (autotroph /heterotroph) | | | | | | |
| Do their cells have nuclei? (prokaryotic /eukaryotic) | | | | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| **Examples** | | | | | | |

# 8. Chemistry

1. All matter is composed of _____ .
2. Describe the three states of matter - solid, liquid and gas - speed of molecules, distance between molecules and amount of energy below:

| State of Matter | Solid | Liquid | Gas |
|---|---|---|---|
| Amount of energy | | | |
| Speed of atoms/molecules | | | |
| Distance between atoms/molecules | | | |

3. Define element. List three examples.

4. Define compound.  List three examples.

5. Name each of the following changes and state whether energy is released or absorbed in each below:

| Change | Solid to liquid | Liquid to gas | Gas to liquid | Liquid to solid | Solid to gas |
|---|---|---|---|---|---|
| Name of change | | | | | |
| Is energy absorbed or released? | | | | | |

6. Describe the following terms and give an example of each:
   a) chemical symbol
                b) chemical formula
                        c) chemical equation.

7. Describe the "Law of Conservation of Mass."

8.  What elements are commonly found in organic compounds?
9. What are the building blocks of proteins? (aka protein synthesis)
10. Enzymes are made what type of organic compounds?
11. Be able to interpret a Periodic Table of Elements. Find carbon on the periodic table and answer the following questions:
    a) Find # of protons in an atom
    b) Find # of neutrons in an atom
    c) Find # of electrons in an atom
    d) Find the atomic number of an atom of an element
    e) Find the atomic mass of an atom of an element
    f) Which period and group is it in?

# 9. Viruses and Bacteria

1. How are viruses like living organisms?
2. How are viruses different from living organisms?
3. What structure does bacteria lack that animal and plant cells have?