Name _____

BIOLOGY
SUMMER ASSIGNMENT
CLASSICAL HIGH SCHOOL
2020-2021

Instruction: Print the following packet and complete all questions. Bring your completed packet on the first day of school. **It WILL be graded!** There will be an assessment of this assignment during the first week of classes, and it will count for your ***FIRST test grade of the school year.***

This summer assignment has been designed for three purposes:

1. To get you to think during the summer and keep your mind sharp!
2. To introduce you to major concepts from Biology through non-classroom methods of learning and prepare you for entering 9th grade Biology.
3. To decrease the amount of new material that you will have to learn during the school year.

Part I: What Science Is and Is Not

Science is an organized way of gathering and analyzing evidence about the natural world. The goals of science are to provide natural explanations for events in the natural world and to use those explanations to make useful predictions. Science is different from other human works in the following ways:

- Science deals only with the natural world.
- Scientists collect and organize information about the natural world in an orderly way.
- Scientists propose explanations that are based on evidence, not belief.
- They test those explanations with more evidence.

Scientific Methodology: The Heart of Science Methodology for scientific investigation involves:

- Making an observation. Observation involves the act of noticing and describing events or processes in a careful, orderly way. Scientists use their observations to make inferences. An inference is a logical interpretation based on what scientists already know.
- Suggesting hypotheses. A hypothesis is a scientific explanation for a set of observations that can be tested in ways that support or reject it.
- Testing the hypothesis. Testing a hypothesis often involves designing an experiment. Whenever possible, a hypothesis should be tested by a controlled experiment—an experiment in which only one variable (the independent variable, or manipulated variable) is changed. The variable that can change in response to the independent variable is called the dependent variable, or responding variable. The control group is exposed to the same conditions as the experimental group except for one independent variable.
- Collecting, recording, and analyzing data, or information gathered during the experiment.
- Drawing conclusions based on data.

<u>Summarize What Science Is and Is Not</u>

1. What is science?

_____

_____

2. What are the goals of science?

_____

_____

Part II: Big Ideas in Biology

The study of biology revolves around several interlocking big ideas:

- ✓ *Cellular basis of life.* Living things are made of cells.
- ✓ *Information and heredity.* Living things are based on a universal genetic code written in a molecule called DNA.
- ✓ *Matter and energy.* Life requires matter that provides raw material, nutrients, and energy. The combination of chemical reactions through which an organism builds up or breaks down materials is called metabolism.
- ✓ *Growth, development, and reproduction.* All living things reproduce. In sexual reproduction, cells from two parents unite to form the first cell of a new organism. In asexual reproduction, a single organism produces offspring identical to itself. Organisms grow and develop as they mature.
- ✓ *Homeostasis.* Living things maintain a relatively stable internal environment.
- ✓ *Evolution.* Taken as a group, living things evolve, linked to a common origin.
- ✓ *Structure and function.* Each major group of organisms has evolved structures that make particular functions possible.
- ✓ *Unity and diversity of life.* All living things are fundamentally similar at the molecular level.
- ✓ *Interdependence in nature.* All forms of life on Earth are connected into a biosphere—a living planet.
- ✓ *Science as a way of knowing.* Science is not a list of facts but "a way of knowing."

Pick two of the big ideas from the chart and describe how the ideas connect.

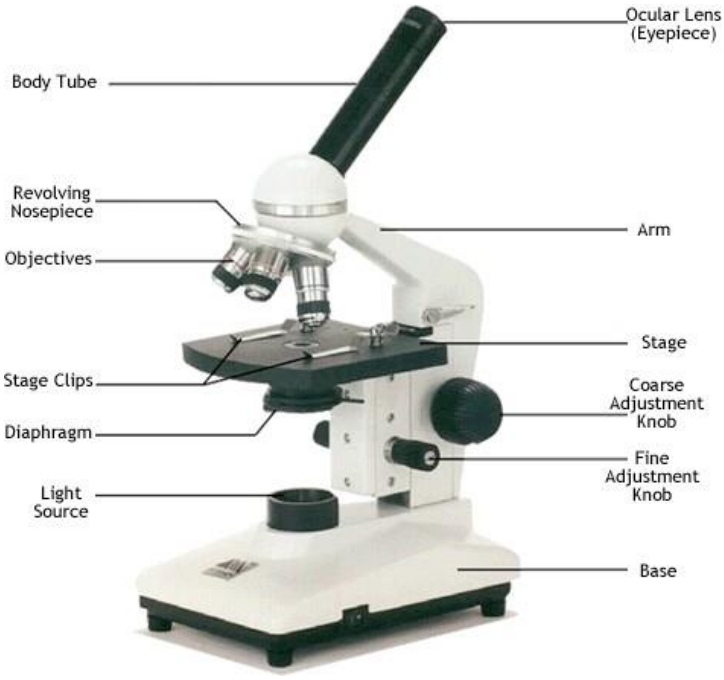
_____

_____

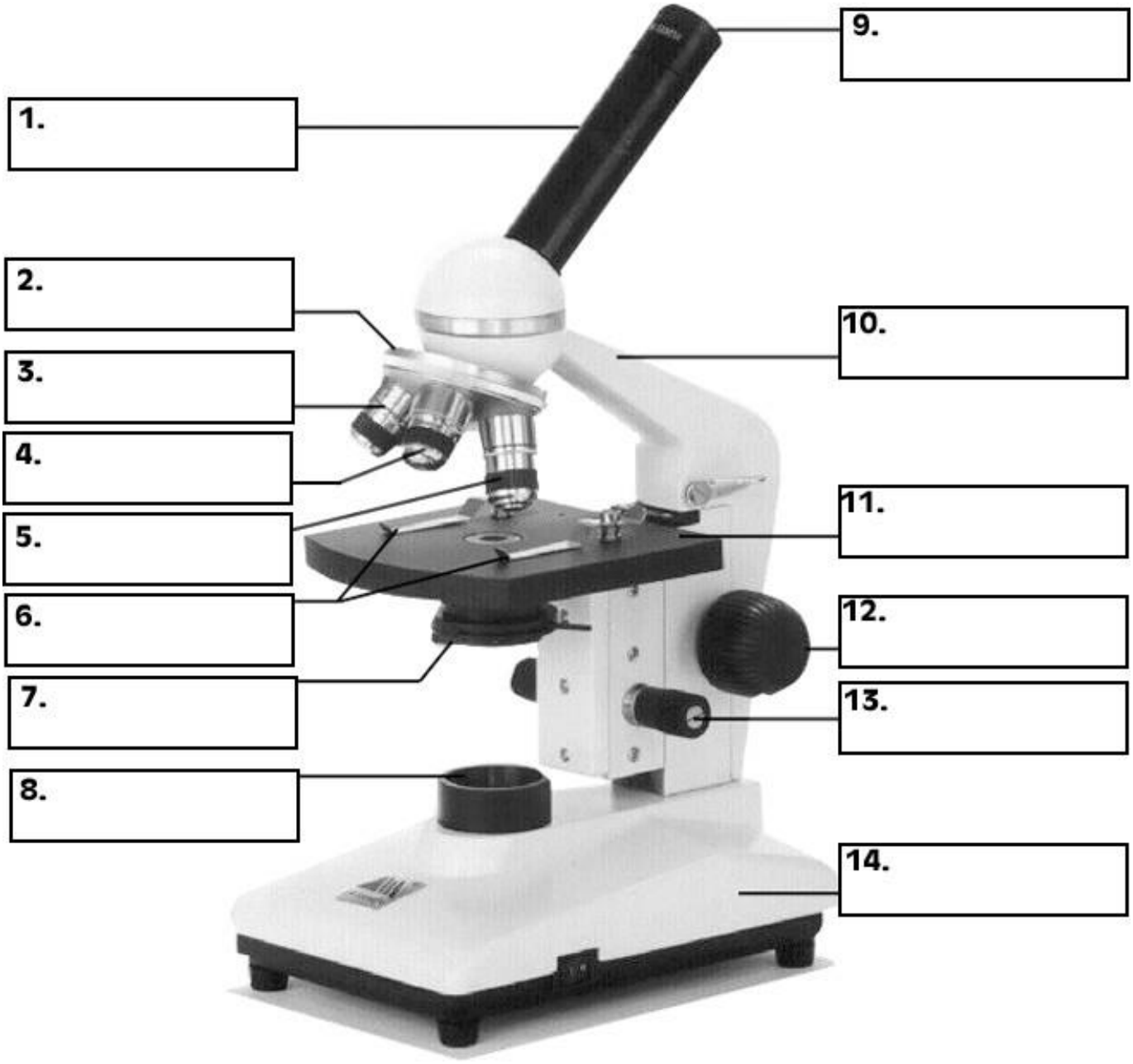
_____

_____

Part III: Microscopes 101



Ocular Lens – Your eye looks through this 10x magnification lens.
Body Tube – This extension tube focus the image at the eyepiece.
Revolving Nosepiece – You can switch to a higher magnification by carefully turning the nosepiece to a new objective lens.
Objectives – These lenses combine with the 10x ocular lens to magnify the image: 10x10x equals 100x magnification; 10x40x equals 400x magnification and 10x65x equals 650x magnification. *IMPORTANT: When viewing a slide for the 1st time, always being with the lowest power (10x) objective.*
Arm – Carry the microscope by grasping the arm with one hand and holding the Base with your other hand.
Stage – This is where you put your slide.
Stage clips help hold the slide still.
Diaphragm – This dial controls the amount of light that reaches the slide. Some images need more light; some need less.
Light source – This provides light to see your specimen.
Course adjustment knob – Use this knob to focus your slide when using the lowest power objective (10x). *IMPORTANT: Never use the course adjustment knob when focusing the medium- or high-power objective! This can break the slide and scratch the objective lens!*
Fine adjustment knob – Use this knob to focus the medium- and high-power objectives.



Questions:

1. When focusing a new slide, what objective should you start with? _____
2. Which focusing knob should only be used with the low power objective? _____
3. Which focusing knob should be used with the medium- or high-power objective? _____
4. What does the diaphragm control? _____
5. When carrying a microscope, you should hold onto the_____and the_____
6. If the ocular lens is 10x and the objective lens is 65x, what is the total image magnification? _____

Part IV: 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	
Qualitative Data	
Hypothesis	
Independent / Manipulated Variable	
Dependent / Responding Variable	
Control	
Observation	
Analysis	
Inference	
Conclusion	
Prediction	

Read the paragraph below and answer the following 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. How many trials were included in this experiment? _____
5. Write a hypothesis for this experiment in the "If…, then…." Format.

   _____

Read the paragraph below and answer the following questions.

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. Is there a control group used in this experiment? If so, what is it?

   _____

Read the paragraph below and answer the following questions.

The Strange Case of Beriberi In 1887, a strange nerve disease attacked the people in the Dutch East Indies. The disease was Beriberi. Symptoms of the disease include weakness, loss of appetite, and heart failure. Scientists thought the disease might be caused by bacteria. They injected chickens with bacteria from the blood of patients with Beriberi. The injected chickens became sick. However, a group of chickens that were not injected with bacteria also became sick.

1. What was the problem presented in this case?

   _____

   _____

2. What was the hypothesis?

   _____

   _____

3. How was the hypothesis tested?

   _____

   _____

4. Should the hypothesis be rejected or accepted based on the experiment? Why?

   _____

   _____

One of the scientists, Dr. Eijkman, made an important observation. Before the experiment, all of the chickens had eaten whole-grain rice, but during the experiment, the chickens were fed polished rice. Dr. Eijkman researched this interesting case. He found that polished rice lacked thiamine, a vitamin necessary for good health.

5. What is the new hypothesis in this scenario?

   _____

   _____

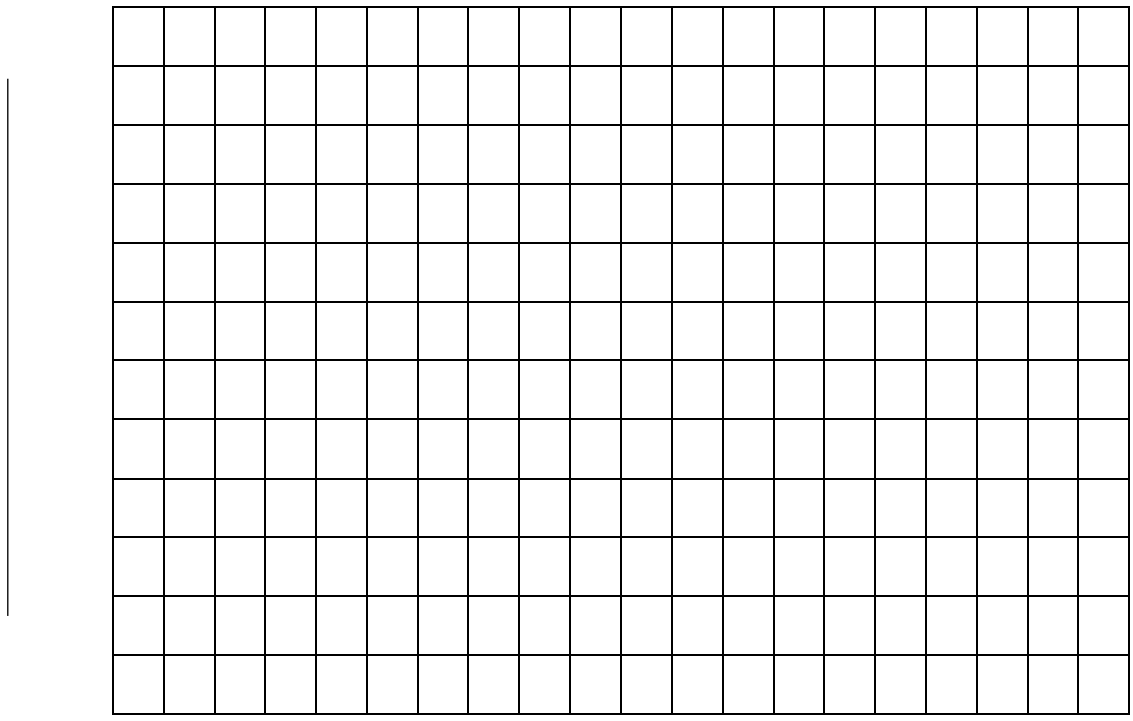
Part V: How to Create a Good Graph

1. Graphs need a title above the graph that summarizes the information that it is showing.
2. Both the X and Y axis need labeled (this means that you need to write what the numbers mean, for example: days, years, degrees Celcius, etc).
3. If you used any kind of symbol or colors then you have to include a key or legend to explain what they mean.
4. Your graph is designed to be visually pleasing and serve as a visual representation of numbers, so make it as large as possible (make it take up as much space as possible on the graph paper).
5. A graph is a visual representation of numbers so it needs to be very nice and neat (use rulers if need be).

Experiment 1: Use the following data to create an appropriate graph and answer the questions.

Diabetes is a disease affecting insulin producing glands of the pancreas. If there is not enough insulin being produced by these cells, the amount of glucose in the blood will remain high. A blood glucose level above 140 for an extended period of time is not normal. This disease, if not brought under control, can lead to severe complications and even death.

Time after eating (in hours)	Glucose in mg/dL Person A	Glucose in mg/dL Person B
0.5	170	180
1	155	195
1.5	140	230
2	135	245
2.5	140	235
3	135	225
4	130	200



1. Which individual would you potentially diagnose as a diabetic?

   _____

2. What evidence do you have that supports your answer?

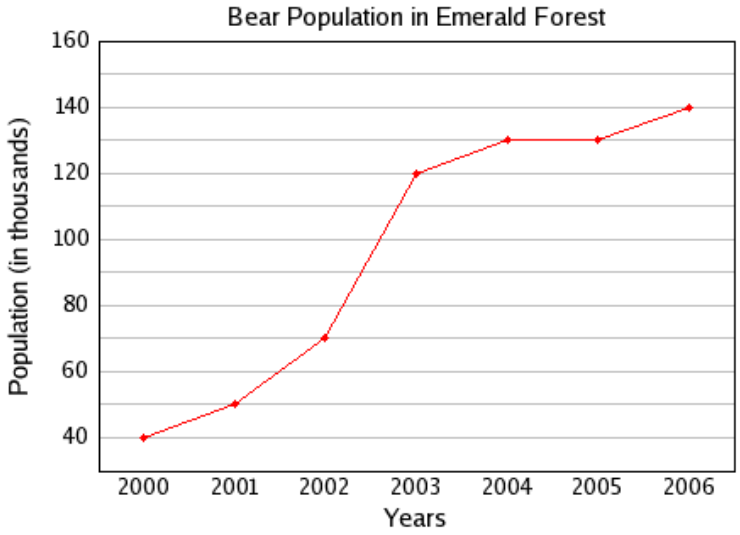
   _____

   _____

3. If the time period was extended to 6 hours, what would be the expected blood glucose level for Person A _____, Person B_____ (assume they do not eat again)

Part VI: Graph Interpretation

Use the graph below to answer the following questions.



1. What type of graph is shown above? Why is this graph appropriate to display this type of data?

   _____

   _____

2. What is the manipulated (independent) variable?

   _____

3. What is the responding (dependent) variable?

   _____

4. How many bears were in the Emerald Forest in 2001?

   _____

5. Based on the graph above, when did the greatest increase in the bear population occur?

   _____