Name _____

AP Biology
Summer Assignment

Welcome to AP Biology!

The purpose of this summer assignment is to review graphing skills that we will be using throughout the course and to preview content we will be learning this year. All parts of the assignment will be turned in on the first day of classes. There are four parts of this assignment. I would recommend that you print out this packet and complete it on paper (especially the graphing section). All parts of this assignment will be graded for accuracy. If you have any questions please reach out to me at: mike.gerst@beechwood.kyschools.us.

Part 1: Graphing Review and Practice

Graphing is an important procedure used by scientists to display the data that is collected during a controlled experiment. When a graph is put together incorrectly, it detracts the reader from understanding what you are trying to present. Most graphs have 5 major parts:

1. Title
2. Independent Variable (X-axis)
3. Dependent Variable (Y-axis)
4. Scale for each variable
5. Legend (or Key)

A. **Title:** Depicts what the graph is about. The Title gives the reader an understanding about the graph. A good title is closer to a sentence than a phrase and is usually found at the top of the graph.

B. **Independent Variable:** Variable controlled by the experimenter. The variable that "I" am testing. (I for Independent). Common independent variables include: time, generations, measurements (length, distance), and temperature. This variable goes on the X-axis.

C. **Dependent Variable:** Variable that is affected by the independent variable; what the experimenter measures. Example: How many oxygen bubbles will depend on the depth of the water. This variable goes on the Y-axis.

D. **Scale:** Before you can plot your data points, you must figure out how much each box on your graph paper is worth. Scale doesn't' always have to start at zero, but I must be consistent. If you start off making each box worth 5 cm, each subsequent box must also be 5 cm. Always make sure your scale is labeled with what it is and what the units are.

E. **Legend:** A short description about the graph's data. Most often used to show what different patterns or colors stand for on your graph.

Rules and Tips for Graphing:

1. Always use a pencil to draw your graph. It's easier to fix mistakes (Or use Excel!).
2. Always draw lines with a ruler. Do not freehand. Use at least half of your paper for the graph.
3. Make sure Independent Variable is on the X-axis and Dependent Variable is on the Y-axis.
4. Include all parts:
    a. Title
    b. Axis Labels WITH Units
    c. Legend
5. If you are graphing multiple subjects, use different colored or patterned lines and explain what they are in the legend.
6. Choose an appropriate graph to explain your data. Examples:
    a. LINE: Measuring a change in something over time
    b. BAR: Comparing individuals to each other with only one data point.
    c. PIE: Show percentages that add up to 100%.

<u>When do I use a line graph versus a bar graph?</u>

Continuous variables are those that have an unlimited number of values between points. Line graphs are used to represent continuous data. For instance, time is a continuous variable over which things such as growth will vary. Although the units on the axis can be minutes, hours, days, months, or even years, values can be placed in between any two values. Amount of fertilizer can also be a continuous variable. Although the intervals labeled on the x-axis are 0, 200, 400, 600, 800, and 1000 (g/100 m2), many other values can be listed between each two intervals.

In a line graph, data are plotted as separate points on the axes, and the points are connected to each other. Notice in Figure 2.7 that when there is more than one set of data on a graph, it is necessary to provide a key indicating which line corresponds to which data set.

Discrete variables, on the other hand, have a limited number of possible values, and no values can fall between them. For example, the type of fertilizer is a discrete variable: There are a certain number of types which are distinct from each other. If fertilizer type is the independent variable displayed on the x-axis, there is no continuity between the values.

Bar graphs, as shown in Figure 2.8, are used to display discrete data.

1. For each of the following independent variables, indicate whether a line graph or bar graph would be most appropriate.

    Time _____ Height _____

    Fish Species _____ Car brand _____

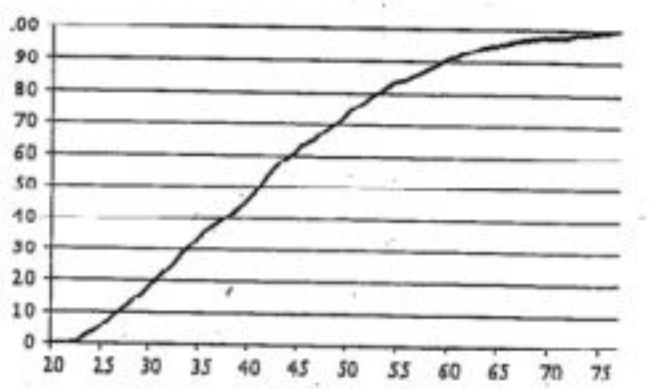
    Age _____ Month _____

Speed _____ Subject _____

Country _____ Distance _____

2.

The graph below is not a good graph. What parts are missing?



3.

Experiment #1: Use the following data to create an appropriate graph and answer the questions. (graph paper on next page).

Depth (meters)	Bubbles per minute Plant A	Bubbles per minute Plant B
2	29	21
5	36	27
10	45	40
16	32	50
25	20	34
30	10	20

4

a) What is the dependent variable?

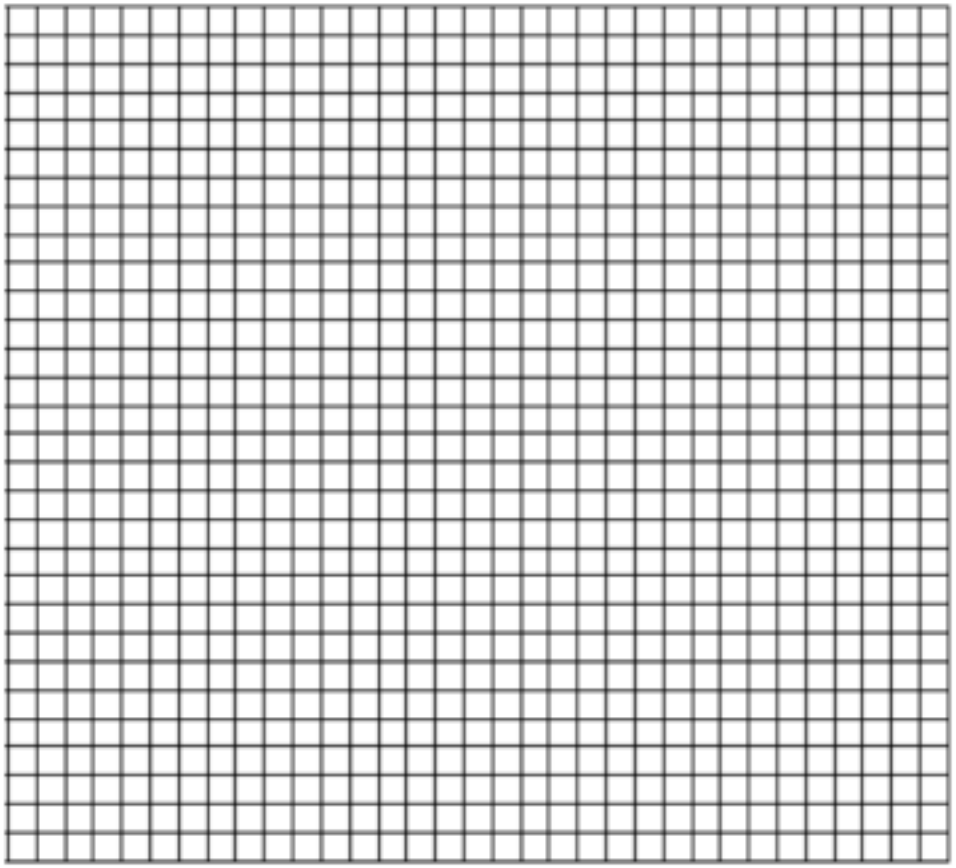
b) What is the independent variable?

c) What type of graph would be best for this data? Why?

d) What will you label the X-axis with?

e) What will you label the Y-axis with?

f) Graph the data on the grid below.



4.

Experiment 2: Use the following data to create an appropriate graph and answer the questions.

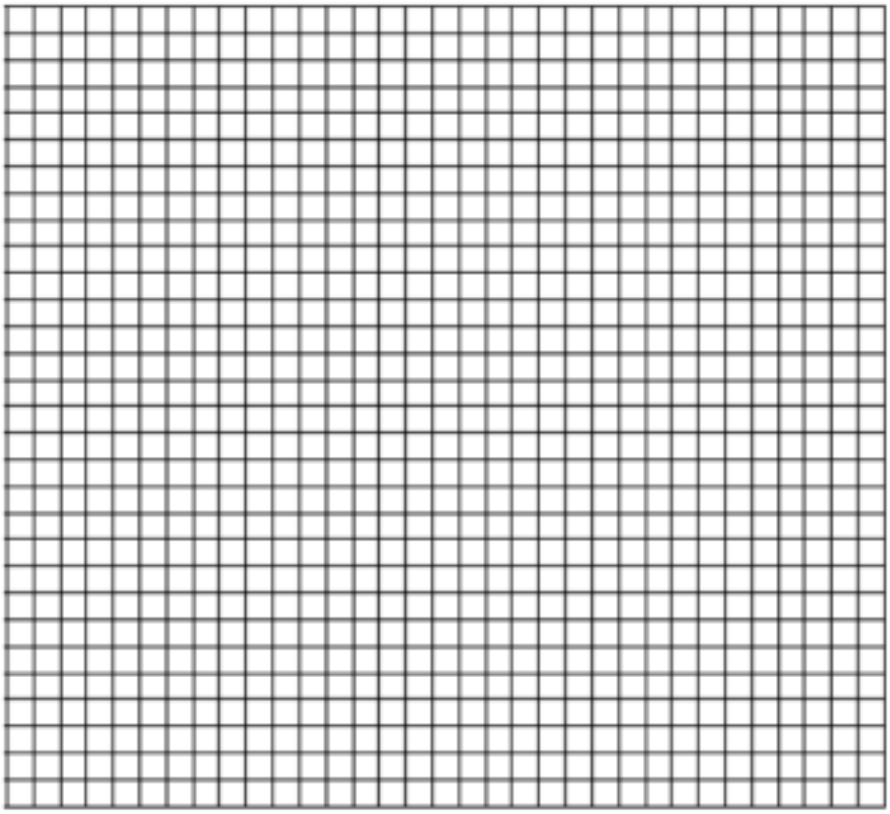
Time after eating (Hours)	Glucose in mg/dL Person A	Glucose in mg/dL Person B
0.5	170	180
1	155	195
1.5	140	230
2	135	245
2.5	140	235
3	135	225
4	130	200

a) What is the dependent variable?

b) What is the independent variable?

c) What type of graph would be best for this data? Why?

d) Graph the data on the grid below.

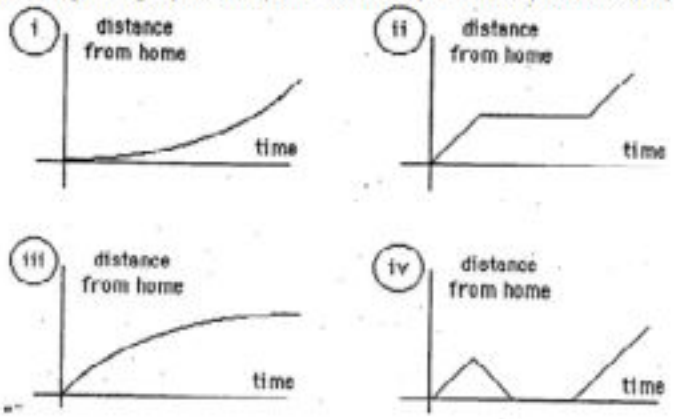


e) Which individual would you potentially diagnose as diabetic?

f) What evidence do you have that supports your answer?

5.

In addition to being able to draw a graph based on data collected, you will also need to interpret data given to you in graph form. Answer the following questions based on the graphs presented. NOTE: Most of these are NOT examples of great graphs, they are for interpretation practice only.



Identify the graph that matches each of the following stories:

_____I had just left home when I realized I had forgotten my books so I went back to pick them up.

_____Things went fine until I had a flat tire.

_____I started out calmly, but sped up when I realized I was going to be late.

6.

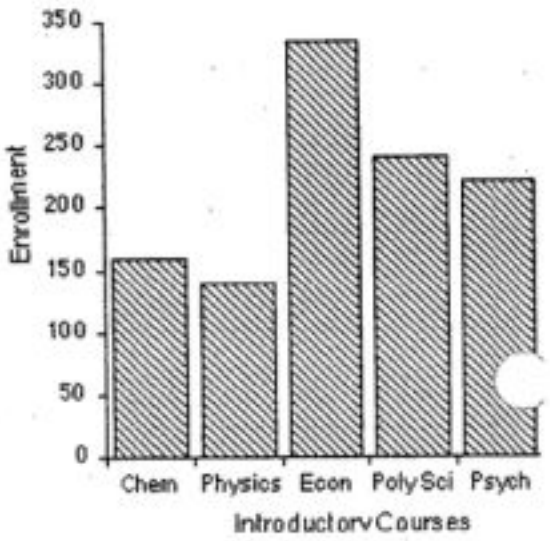
The bar graph to the right represents the declared majors of freshman enrolling at a university. Answer the following questions:

31. What is the total freshman enrollment of the college?

32. What percent of the students are majoring in physics?

33. How many students are majoring in economics?

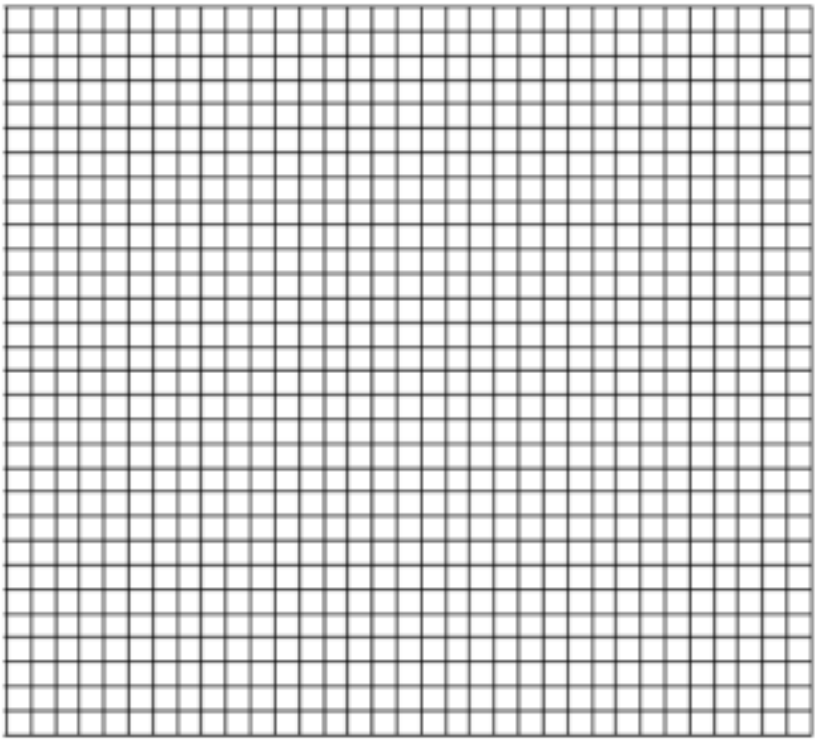
34. How many more students major in poly sci than in psych?



7.

11. After an outbreak of influenza, a student gathered data on the number of students who became ill, until she became sick on the 14th day of her study. The information she gathered is shown below. Create a line graph of the data below.

Date (Feb., 1996)	Number of ill Students
1	12
2	18
3	30
4	49
5	115
6	127
7	125
8	107
9	108
10	115
11	117
12	95
13	60
14	52



a) On what day were most students ill?

b) During which period of time did the most students become ill?

c) What was the greatest number of students who were ill on any one day?

d) Estimate the total number of students who were ill on the 15th day.

Part 2: The AP Biology Exam

Use the College Board's AP Biology website (google it) to answer the following questions about the AP exam. 1. What is the date and time for this year's exam?

2. How long is the exam?

3. Section 1 is a multiple choice section. How many questions are there? How long is this section? What % of your score comes from section 1?

4. Section 2 is a free response (FRQ) section. How long is this section? What % of your score comes from section 2? How many FRQs are there? For each FRQ type (long and short, what sort of questions are students asked?

5. What are the 6 "Science Practices" covered in AP Biology?

6. List and (briefly) describe the 4 “Big Ideas” in AP Biology.

Part 3: GET OUTSIDE

Directions: Choose ONE option from the following list of biology summer homework experiences, and read all instructions carefully. In order to get credit for this assignment, you must follow the directions and submit required components on the due date. You will be sharing your study and results with others in the class.

1. BURY IT.

Take an athletic sock and fill it with various forms of garbage (soft drink can, banana peel, paper, etc.). Record in a data table some descriptive observations of the things you put in the sock. Some time before June 7, go outside and bury it approximately 2 feet deep. On the weekend before school starts, dig up the sock and examine the objects inside. In the same data table, record your descriptive observations of the objects. Write a 250-word summary of the results and compare the sock to what you think happens in landfills where our trash is taken. *Required Evidence: (1) A data table with descriptions of trash before and after burying including illustrations or pictures. (2) A 250-word summary of what happened and comparison to landfills.*

2. OBSERVE A ROTTING LOG FOR A PERIOD OF 14 DAYS.

Find a rotting log to observe for a period of at least 14 days. Visit it each day. Make five quantitative (measurements, length, etc.) and qualitative (feels like, looks like, colors) observations and record them. Use colored pencils to sketch the log each day or, if you prefer, take one or more pictures of it each day and print them. Finally, record observations about any living creatures (insects, plants, etc.) you see on the log. *Required Evidence: (1) Document with five observations each day, a daily sketch or photograph, and observations about living things around the log. (2) A 250-word summary of what happened and the implications of those changes.*

3. PICTORIAL 2-WEEK NATURE STUDY.

Use a digital camera or disposable camera and find a tree, shrub, insect activity, or nearby park. For 2 weeks, take a photo each day of this one thing in nature and make observations. Use the photos to create a timeline of changes and observations made during the 2-week period.

Required Evidence: (1) A document containing a series of 14 photos in chronological order. (2) Two-sentence observations about each day (can be interspersed in the photo document). (3) A 250-word reflection about the changes you observed during the 2 weeks.

4. DESIGN AN INVESTIGATION ABOUT NATURE.

Design a local investigation around a question you have about something in nature (e.g., What seeds do cardinals prefer?). You should pick something to which you -- and the internet -- do not know the answer. Determine a method to investigate your question. Collect data, both numerical and observational. Prepare your results with at least two graphs or charts.*Required Evidence: (1) A lab report including the hypothesis, methods, results (text plus at least two graphs or charts). (2) A 250-word conclusion that includes questions for further research.*

5. WHAT PROBLEMS DOES SALTING OF ROADS CAUSE? OBSERVE NAILS RUSTING OVER 14 DAYS.

Fill four small plastic cups with tap water and label them with numbers 0, 1, 2, and 3.

- In cup #3, put three Tablespoons of salt.
- In cup #2, put two Tablespoons of salt.
- In cup #1, put one Tablespoon of salt.
- In cup #0, do not put any salt.

Put an **iron or steel** nail into each cup. Each day, for 14 days, make observations about each nail. Use these questions to guide your data collection: What color changes have occurred? How much rust is present? Which nails seem the most rusty? Finally, write a conclusion that summarizes the data that you have found. Focus on these questions: How does salt in the water seem to affect the rustiness of the nails? How are the results aligned with, or at odds with, your hypothesis about what would happen?

Required Evidence: (1) Data log for 14 days. (2) A 250-word conclusion summarizing what you found and discussing the practical implications related to salting roads. (3) Your four nails, transported carefully in baggies. Make sure the nails are labeled with the cup number or the amount of salt added.

6. ADAPTATIONS OBSERVATION.

An animal's habitat is an environment that provides the food and shelter required for the animal to make its home. Take a walk in your yard, neighborhood, park, aquarium, or zoo. Choose five animals. For each animal, visit the exhibit and observe the habitat created by the zoo and read about the natural habitat. Write a description of the habitat that they live in naturally. What adaptations help the animals survive in their environments? Each habitat description should be at least 150 words. Include at least one hand-sketched illustration (black and white OK) or COLOR zoo photograph for each.
Required Evidence: (1) Five different 150-word descriptions and illustrations of an animal's habitat. Make sure you discuss how the animal is adapted to its real-life environment. (2) Sketch or picture of your organism

Part 4: Biology I Review

Before the school year starts, you will need to these topics . There is a quiz the first week of school ONLY to see where you stand and what you can remember from biology. This is just a way for you to see what are some things you remember and what are some things that you don't remember. I chose just a few questions to get you thinking a bit. Answer the following questions to help you review. There are also some review videos if you like to watch them. The videos are not mandatory but it basically gives you the main ideas. Each video is 2-7 minutes long.

Chemistry:

1. What is the difference between ionic and covalent bonds?
2. Explain what occurs during a hydrogen bond.
3. What is a polar molecule?
4. How does a molecule become polar?
5. Explain why water is polar.
6. List three unique properties of water.
7. What is an ion?
8. How does an atom become an ion?
9. List the three parts that make up an atom, their charge, and their location.

Math: AP Biology Formula Sheet

1. Explain how to calculate mean, median, mode, range?
2. Explain how to find the surface area and volume of a cube?
3. Explain what the acronym "DRY MIX" means when setting up a graph.
   Graphing Data by Hand

Biological Macromolecules: Macromolecules | Classes and Functions

1. What is an organic molecule?
2. List and discuss the role of the four major biological organic macromolecules.
3. List an example of each macromolecule?
4. Explain the difference between dehydration synthesis and hydrolysis reactions.

5. What is a functional group?

Enzymes: How Enzymes Work

1. What is activation energy?
2. Explain the difference between a reactant and a product.
3. What is an enzyme and what do they do?
4. Explain how enzymes work.
5. Give an example of an enzyme and discuss its function.

Cells: Introduction to Cells: The Grand Cell Tour

1. Explain the difference between a prokaryotic and eukaryotic cell.
2. Give an example of each.
3. List the function of the following organelles: mitochondria, chloroplast, vacuole, nucleus, endoplasmic reticulum, ribosome, and lysosome.
4. Explain the major differences between an animal and a plant cell.

Cellular Respiration: Cellular Respiration

1. What is the chemical equation for cellular respiration?
2. Briefly describe the three steps in cellular respiration?
3. What is ATP and what is it used for?
4. Explain the difference between aerobic and anaerobic respiration.
5 Discuss the two types of fermentation (anaerobic respiration).

Photosynthesis: Photosynthesis

1. What is the chemical equation for photosynthesis?
2. Briefly describe the two steps in photosynthesis?
3. What occurs during transpiration?
4. Discuss the role of the stomata in plants.

Cellular Transport: Cell Transport

1. What does the cell membrane do?
2. List and discuss the components of the cell membrane (phospholipid bilayer).
3. Explain the difference between active and passive transport? Can you describe what a concentration gradient is?
4. Explain the difference between osmosis, diffusion, active transport, and facilitated diffusion.
5 What is turgor pressure?

DNA: DNA Replication (Updated)

1. What DNA and what does it stand for?
2. What are the three parts that make up the DNA molecule?
3. List the four nitrogenous bases and Chargaff's base pairing rule?
4. What does the order of nitrogenous bases determine?
5. Discuss what occurs during replication.
6. Explain what would happen if the DNA bases change?

Protein Synthesis: Protein Synthesis

1. Where does protein synthesis take place?
2. What are the two steps of protein synthesis?
3. Briefly summarize what occurs during transcription.
4. List the three types of RNA and their functions.
5. What are codons?
6. Briefly explain what occurs during translation.

Mitosis: Cell Cycle

1. What are the three phases of the cell cycle?
2. Briefly describe what happens during Interphase.

3. Briefly describe what happens during Mitosis.
4. Briefly describe what happens during Cytokinesis.
5. What type of cells are produced from the cell cycle?
6. Explain the difference between a diploid and a haploid cell.

Meiosis: Stages of Meiosis

1. What happens during meiosis?
2. Where in the body does meiosis occur?
3. What is the end result of meiosis?

Genetics:

1. Explain the difference between phenotype and genotype?
2. What is an allele?
3. How are genotype and phenotype related to each other?

Evolution: Evolution

1. Explain what occurs during natural selection and give a specific example.
2. What is necessary for speciation to occur?
3. Discuss how Darwin's finches may have evolved on the different islands of the Galapagos. (Do not just say they adapted or evolved, explain the process)
4. Discuss three pieces of evidence that have shown us that evolution has occurred?

Ecology:

1. What the difference between mutualism, commensalism, and parasitism
2. What is the difference between primary and secondary succession