Any questions please contact:
Mrs. Kimberly Wallace
kwallace@berkscatholic.org

AP Biology Summer Assignments

Welcome to AP Biology! I can't wait to meet you (or see you again) in August. I hope you will find AP Biology to be as fun as I do; but it is intense. There is a lot of material that needs to be covered in a relatively short amount of time, so be aware that it is going to take A LOT of independent work and you will spend many hours learning content on your own outside of class. Keep in mind, AP Biology is a college course (not college prep) with college level expectations for behavior, attendance, participation, and effort. This course is designed to help you develop a conceptual framework of modern Biology, to gain a deeper appreciation of science as a process and to prepare you for the AP Biology exam.

The 4 Big Ideas for AP Biology
Big Idea #1 - The process of evolution drives diversity and unity of life.
Big Idea #2 – Biological systems utilized free energy and molecular building blocks to grow, to reproduce and to maintain dynamic homeostasis.
Big Idea #3 – Living systems store, retrieve, transmit, and respond to information essential to life processes.
Big Idea #4 – Biological systems interact, and these systems and their interactions possess complex properties.

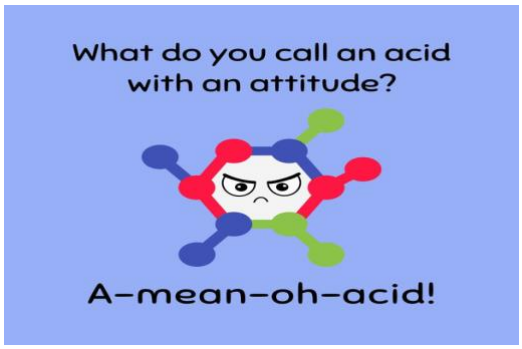
I know the words "summer assignment" may send chills down your spine, but these assignments will be very beneficial to you as we start the school year. The reason I am giving you a summer assignment is to not only get you thinking about Biology, but to keep your mind sharp so you are ready to hit the ground running come the first day of school. On the pages that follow, you will find detailed instructions of the assignments that comprise your summer work for AP Biology. Hopefully you find some fun along the way.

I am looking forward to "working" with you next year. AP Biology is a lot of work for me as well. It is my job to make sure that you are adequately prepared to take the AP Exam and get at least a 4 so that your college will give you credit for your hard work. Please know that I will be working on ways to help me achieve this goal during the summer. I will be participating in several workshops to help me help you. Don't wait until 8/31 at 11:59PM to email or try to share an assignment and realize you don't have internet- it will be late! Please do not procrastinate on these assignments; but don't let them keep you from having a wonderful summer. Do not hesitate to contact me over the summer with any questions you have. I am happy to help!

Included in this packet are the following documents:

AP Biology Survival Guide
Assignment #1 – Introductory Letter – 25 points DUE: any time before 9/1 *Email me information about yourself!
Assignment #2 – Biological Photo Collection – 125 points Due: 9/1 *Instructions *Biological Collection List and Rubric *Biological Photo Collection Table of Contents and Example Entry
Assignment #3 – Graphing Practice – 100 points Due: 9/8
Assignment #4 – Chemistry Review – 125 points Due: 9/15 *Chemical Context of Life *Macromolecules and Water
Task Verbs – Memorize Definitions for a quiz on 9/16

Please note that any student who turns in LATE or INCOMPLETE summer assignments will receive consequences – NO EXCEPTIONS!



AP BIOLOGY SURVIVAL GUIDE – Read Thoroughly

General Study Habits

Your college professors will expect you to exceed the accomplishments of your high school coursework, and that means you must adjust your study habits to meet this challenge. AP Biology will give you a good idea of what the college-level workload is like. A good way to begin this adjustment is to consider the ways in which AP Biology and college coursework differs from high school coursework:

*Material is presented more rapidly and in larger quantities.
* Each exam covers a vast amount of material; labs are an essential part as well.
*Keeping up with previous material is essential to understand the new material. Much of the material is intertwined.
*Unlike some other AP classes, considerable out-of-class time investments are required to effectively learn course material.
*Critical thinking is much more important than rote memorization.
*Students are expected to not only understand the specific examples given in class, but also to apply their knowledge broadly.
*Only you can ensure that necessary coursework gets done on time.
*Help is always available, but you must take the initiative to seek it out, and not at the last minute possible.

Take Studying Seriously

One of the keys to academic success is learning to balance often conflicting pressures. You must devote the necessary time to study to achieve academic success. Generally, speaking for every class you have, approximately 1-2 hours of work outside of class is required to master the material. Of course this varies from person to person.

Study Often and Early

The coursework that accompanies this class is demanding. It is therefore essential that you stay ahead of the class by studying often and early and completing the work on time. You will be given classwork and homework daily. You may work ahead but there are strict due dates. Many times, you will be responsible for the lecture portion on your own in order for class time to be spent either on labs or understanding certain concepts in greater detail.

Don't be Afraid to Ask for Help

Sometimes it's difficult for students to admit that they are having trouble with a class. Pride, embarrassment, or just the shock of realizing for the first time in your school career that you are unable to quickly master a topic can all contribute to this situation. Experience has shown that AP Biology can be a "problem" course for students. Don't get discouraged! Unfortunately, many students wait too long before doing something constructive about their difficulties. Should you find yourself having problems with AP Biology, you must not be afraid to ask for help as early in the course as possible.

Time Management

In school, as in life, there never seems to be enough time. One of the most difficult challenges you will face is to recognize and deal constructively with the fact that you, and only you, are in charge of determining how your valuable time is spent. One of the most serious mistakes you can make is to commit the error of thinking that you have "plenty of time" to get things done. Your workload is getting heavier, you may be getting a job, plus sports, clubs, etc. True undertaking of a subject is more important than simple memorization of a

concept. It is not a viable option to "cram" the night before a test and still expect a good grade. You really can't get by with only last-minute efforts on assignments, and thus you must learn to manage your time wisely.

You Must Take Studying Seriously and Make a Commitment to Your Work

This means prioritizing your academic and social activities to ensure that there is adequate time in your schedule to complete all course assignments. Please do not email me the night before an assignment is due (that you have had a week to do) saying that you have had a lot going in the last week with sport tournaments, other classes assignments to make up, and extra shifts at your job so would it be okay to be late – it will NOT be okay. Points will be taken off for late assignments!

Taking Notes and Reading

College professors expect you to follow a rapidly developing train of thought and to capture those thoughts in your own notes. The notes you take in Biology should:

- Capture the main points with examples if relevant
- Be organized in some coherent manner for later study
- Leave room to include additional information that makes sense to you
- Use a personalized shorthand notation that makes sense to you
- Do NOT record every word said during lecture or copy, verbatim, words from PowerPoint slides. Filter out nonessential portions and concentrate on connections between the essential ideas and terms.

Find and Use Resources

I will share resources with you daily to help supplement your knowledge and understanding of the discussed concepts. Please do yourself a favor – if you truly want to do well not only in class but on the AP exam – purchase the AP Biology Exam Prep book! It is a valuable resource – it breaks down each unit into succinct explanation of topics (I don't get any kickbacks from recommending it; I just know it was my go-to when reviewing AP Biology after 30 some years☺)

study

(*verb*)

The act of texting, eating,
and watching TV with an
open textbook nearby.

Assignment #1 – Introductory Email (25 points)

Prior to the school year, I would like to know a little bit about you! So, your first assignment is to email me (kwallace@berkscatholic.org) with your response to the following questions. You can choose to do this in an email format or email me a document with the typed information. **This must be emailed to me before the first day of school to receive credit for this portion of the assignment.** Please follow this format:

Place on the Subject Line: Your name - AP Biology Intro Letter 26/27
Body: Your full name (any nickname) and stuff about you (birthday, favorite meal, etc.)

1.) What do you like to do? (hobbies, sports, interests, etc.)
2.) Do you have a job, or will you be getting one this year? If so, where?
3.) What are your personal strengths when it comes to learning new material? How do you learn best?
4.) What causes you to struggle in a course?
5.) How many AP Exams have you taken so far? How many AP Exams have you scored a 3 or higher on?
6.) How many AP classes are you taking this year? Which ones?
7.) What was your favorite topic from Biology? Least favorite?
8.) What are you looking forward to the most about AP Biology?
9.) What makes you most anxious about AP Biology?
10.) Why are you taking this course? What is the "end goal" if you have one?
11.) What do you hope to gain from taking this course?
12.) Any binge-worthy show recommendations?
13.) Feel free to add any other information you'd like to share – it's all confidential!

Assignment #2 - Biological Photo Collection (125 points)

For this assignment you will "collect" 25 photographic examples of biological terms/concepts and compile them into one document. They must be YOUR OWN pictures, and you must have the same unique identifier (such as the turtle in the example at the end of the document) included in each picture you take. Select any 25 of the items from the Biological Collection List to include in your document. This will introduce you to the language of biology, but also emphasizes that biology is something that's DONE, not just memorized.

Your Biological Photo Collection must be typed, organized and easy to follow. You must use Canva to display your photo collection. Create a Canva account (if you have not already) using your SCHOOL EMAIL ADDRESS (if you have one) (incoming students will just create an account using a personal email; but please don't forget it). Either share it with me by adding me to search bar or click under "Access" and click on "anyone can view" and then copy the link and email it to me at kwallace@berkscatholic.org

Directions for the Biological Photo Collection:

1.) **"Collect" an item by taking a picture of it.** Then **define**, IN YOUR OWN WORDS, the biological term/concept. Explain in a few sentences how the picture represents the term or concept. Use the Biological Collection List given on the next page. **The connection between the item and the definition must be clear or no credit will be given for that item.**
2.) **Upload the photo, definition, and explanation** to Canva.
3.) **Be creative.** If you choose an item that is internal to a plant or animal, like a phloem, you could submit a photograph of the whole organism or a close-up of one part and then explain what a phloem is and **specifically** where the phloem is in the specimen. **However, each item can only be used for one term**. So, if you use a picture of a daisy for the term phloem you must find a completely different kind of plant to explain the term xylem.
4.) Use original photos ONLY. You MAY NOT use an image from any publication or from the internet. You must take the photo yourself. The best way to prove that the photo is your work is to have a Proof Object in each photo. A Proof Object is something in your picture that represents you. This could be a key chain, a bracelet, a small toy, etc. **The item must be unique and at the end of the document you must have a picture of you with your Proof Object.**
    a.) **Proof Object** – Your proof must be an object that is inanimate and separate from you. It must be unique – not a yellow #2 pencil or a penny. If you lose your Proof Object before you are able to take a picture with it then you must start over. For that reason, I suggest taking a picture with your Proof Object early on. I will not allow more than two objects used per project—so if you lose it twice, you will need to redo some of your photos! Safeguard your Proof Object carefully.
5.) You should only use natural items. Take a walk in your neighborhood, go to the park or zoo, go for a hike in the woods, etc. Humans are natural items and may be used, but only for a **total of two** entries.
6.) This is an individual project. While brainstorming, discussing, and even going on collecting adventures together is welcome, your items and photos are to be unique. With 89 concept choices, probability says that there is a very slim chance that any two students will have the same items chosen from their list.
7.) Be careful and respectful! **Never touch plants or animals you are unfamiliar with. Don't kill or hurt any organisms. Don't remove any organisms from the natural environment.** If any pictures deem that you didn't follow this rule, then they will not be accepted.

Biological Collection List (Assignment #2)

1. Adaptation of an animal
2. Adaptation of a plant
3. Altruistic behavior
4. Amniotic egg
5. Analogous structure
6. Animal that has a segmented body
7. Anther and filament of stamen
8. Asexual reproduction
9. ATP
10. Autotroph
11. Auxin producing area of a plant
12. Basidiomycete
13. Batesian mimicry
14. Bilateral symmetry
15. Biological magnification
16. C3 Plant
17. C4 Plant
18. CAM Plant
19. Calvin Cycle
20. Cambium
21. Cellular Respiration
22. Coevolution
23. Ectotherm
24. Endosperm
25. Enzyme
26. Ethylene
27. Eubacteria
28. Eukaryote
29. Exoskeleton
30. Fermentation
31. Flower ovary
32. Frond
33. Gametophyte
34. Genetic variation within a population
35. Genetically modified organism
36. Gibberellins
37. Glycogen
38. Gymnosperm cone
39. Gymnosperm leaf
40. Homeostasis
41. Homologous structures
42. Hydrophilic
43. Hydrophobic
44. Introduced species

45. Commensalism
46. Connective tissue
47. Cuticle layer of a plant
48. Detrivore
49. Dominant vs. Recessive phenotype
50. Littoral zone organism
51. Long day plant
52. Mating behavior (be careful!!!)
53. Meristem
54. Modified leaf of a plant
55. Modified root of a plant
56. Modified stem of a plant
57. Mullerian mimicry
58. Mutualism
59. Mycelium
60. Mycorrhizae
61. Niche
62. Parasitism
63. Parenchyma cells
64. Phloem
65. Pollen
66. Pollinator
67. Population
68. Predation
69. Prokaryote
70. R-strategist
71. Radial symmetry (animal)
72. Redox reaction
73. Rhizome
74. Seed dispersal (animal, water)
75. Spore
76. Sporophyte
77. Stigma and style of carpel
78. Succession
79. Taxis
80. Territorial behavior
81. Trophism
82. Unicellular organism
83. Vestigial structures
84. Xylem
85. Keystone species
86. Krebs cycle
87. K-strategist
88. Lichen
89. Lipid used for energy storage

Rubric for Biological Photo Collection (Assignment #2)

Points	Biological Photo Collection Entry (per photo) 100 pts total	Points	Table of Contents 25 pts
1 (x25)	Original photo posted		Points below are awarded all or nothing! If the guideline is is not fully met, no point will be given
1 (x25)	Biological term/concept identified	5	Picture of <u>you</u> with your proof object **included on last slide**
1 (x25)	Biological term/concept defined in your own words	10	Each biological term/concept listed **in the # order, it appears**
1 (x25)	Biological term/concept and photo relationship explained fully	10	Document is easy to follow and neatly presented through Canva

Biological Photo Collection Table of Contents Name: _____
Assignment #2

Photo Order	Biological terms/concepts	Teacher Comments	Points Earned
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			
13			
14			
15			
16			
17			
18			
19			
20			
21			
22			
23			
24			
25			

Example Entry for Assignment #2

Notice the turtle figurine in the picture below. This is the Proof Object and is used to demonstrate that the photos in the document are indeed original. **Make sure you have the Proof Object <u>in each</u> of your photos and <u>your last slide</u> should be a picture of you holding your Proof Object**.



1. **Cuticle layer of a plant**

   This is a picture of a Gerber daisy showing both flowers and leaves. The leaves of the plant contain a waxy, protective layer on the surface called the cuticle. It helps the plant from losing too much water and protects the plant from disease and other environmental factors.

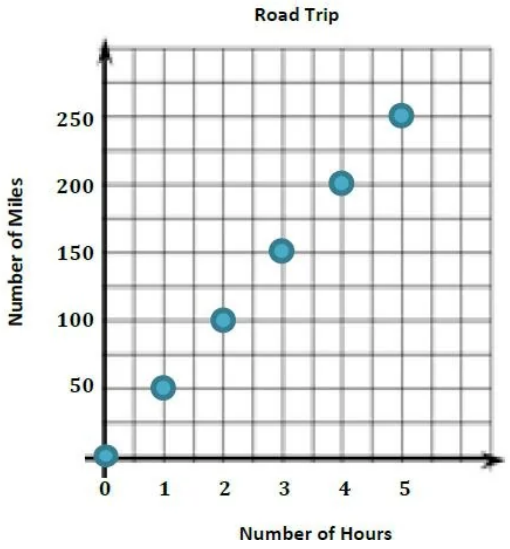
<u>Assignment #3 - Graphing Practice</u> (100 points)

Graphing is an important procedure used by scientists to display the data that is collected during a controlled experiment. Representing and describing data is one of the major practices you will need to learn for the exam.

Read and study each graph type below.

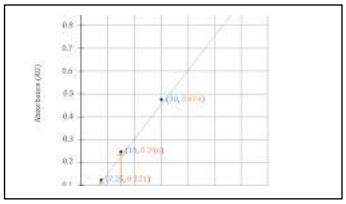
1. **X, Y Graph**:

This is your standard graph with the independent variable (what you change in an experiment, often a unit of time) on the X-axis and the dependent variable (what you measure in the experiment) on the Y-axis. An example is shown on the right.



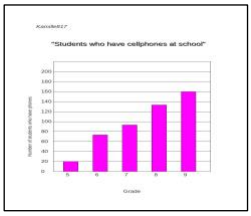
2. **Log Y Graph:**

This graph is similar to the X, Y Graph except the Y-axis is a logarithmic scale.



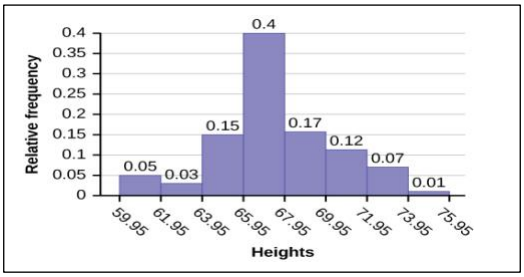
3. **Bar Graph**:

A graph showing the numerical value of a variable as the height or length of a rectangle representing categorical (non-numerical) data. Note that the categorical data can be on the horizontal or vertical axis.



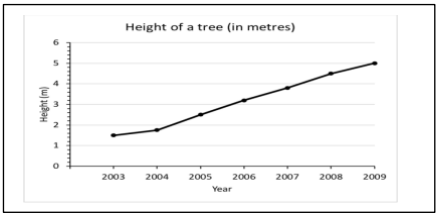
4. **Histogram**:

A histogram is like a bar graph except that the data is noncategorical and continuous (think distribution) and the rectangles are placed side by side (no gaps). A histogram represents the frequency distribution of continuous variables. Histograms present numerical data, and a bar graph shows categorical data.



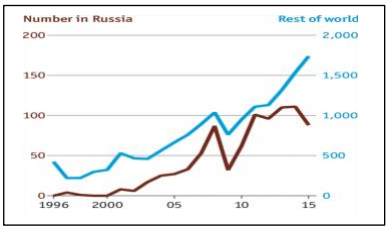
5. **Line Graph**:

A line graph consists of a series of points plotted on the grid and connected point to point by a line. Line graphs are only used when both variables are quantitative. Line graphs show changes over time. Line graphs should start and end on dots!



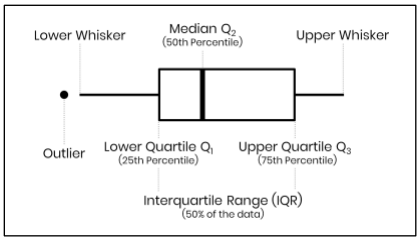
6. **Dual Y Graph**:

A graph showing 2 dependent variables (Y-axes) for the same independent variable (X-axis). The Y-axes are placed at opposite ends of the X-axis and scaled and labeled independently.



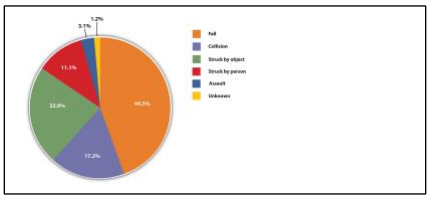
7. **Box and Whisker Graph**:

A graphic way to display the median, quartiles, and extremes of a data set on a number line to show the distribution of data. The box shows the interquartile line, the line on the box marks the median, and the "whiskers" are the lines running from the box and show minimum and maximum values.



8. **Pie Graph**:

A special chart that uses "pie" slices to show relative sizes of data. The chart is divided into sectors, where each sector shows the relative size of each value. The total equals 100%.



Basic Graphical Elements:

1. **Axis Labels:** Plot the independent variable on the horizontal axis (x-axis) and dependent variable on the vertical axis (y-axis). Label each axis.
2. **Units:** Write the units in parentheses on the axis label.
3. **Intervals/Scaling:** Choose uniform intervals that make it easy to read so the data occupies most of the graph.
4. **Data:** Plot the data points on the graph. You do not normally connect the dots. You may connect the dots, but make sure that the line starts and stops on the dot. If the data point shows a correlation, you may add a trend line (line of best fit).
5. **Title:** Choose a title for the graph that uniquely identifies it.

Graphing and Data Skills: Practice Questions for Assignment #3

Research the following questions to determine the answers. The practice questions and graphs should be submitted on paper by Tuesday, September 8th .

1. In designing an experiment or other scientific study, why do scientists sample from a population rather than using an entire population? (2 points)

2. Suppose you are designing an experiment to test the effects of nicotine on the heart rate of rats. What are the disadvantages of having too small a sample size (i.e., testing on too few rats)? What re the disadvantages of having too large a sample size (i.e., testing on too many rats)? (4 points)

3. What is the difference between an independent and dependent variable? (2 points)

4. Write an explanation for each term below and calculate each for the following data (6 points): 75, 72, 87, 94, 72, 89, 72
   a. Mean

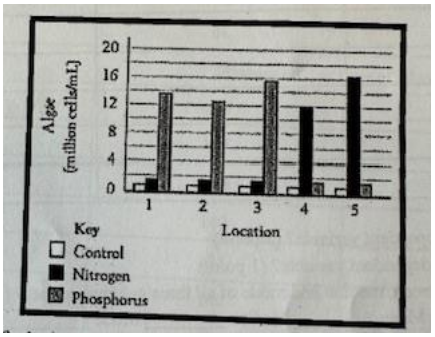
   b. Median

   c. Mode

5. What is a null hypothesis? Give an example. (2 points)

Problem A:

Scientists examined the effects of adding nutrients to waters off the Eastern coast of the United States on algae growth. The graph shows the nutrient added and the resulting algae counts at six locations. No nutrients were added in the control condition. (When identifying the IV and DV, you can use the experiment title or summary to determine. Look at the underlined statement in the caption and use the format of "the effects of (IV) on (DV)" to determine these variables.)



a. Identify the independent variable. (1 point)

b. Identify the dependent variable. (1 point)

c. Based on the data, determine the location with the largest amount of algae. (1 point)

d. Determine the relationship between algae growth and phosphorous. (2 points)

e. Estimate the number of algae that you would expect to find at the site located between 5 and 6. (2 points)

f. Justify adding no nutrients to the control condition as a control group. (Hint: Adding no nutrients to the control conditions shows the effects of _____ in the experiment.) (2 points)

g. Propose a null hypothesis for the experiment. (Hint: There is no relationship between the IV and DV) (2 points)

Problem B:

Use the following data to answer the questions below and then construct a line graph.

	Numbers of Bubbles Per Minute	
Depth in Meters	Plant A	Plant B
2	29	21
5	36	27
10	45	40
16	32	50
25	20	34
30	10	20

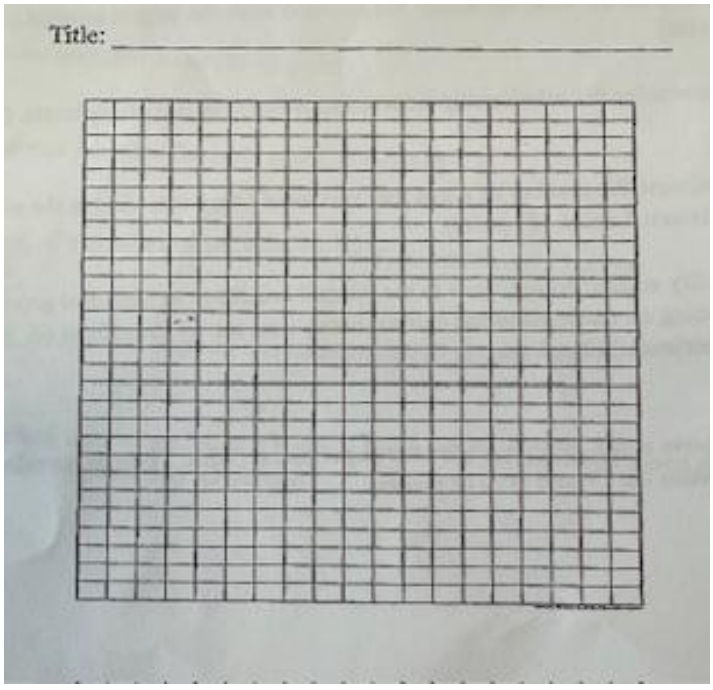
1. What is the dependent variable? (1 point)

2. What is the independent variable? (1 point)

3. What is the mean, median, and mode of all three columns of data? (9 points)

a. Depth: Mean _____ Median _____ Mode _____
b. Bubbles Plant A: Mean _____ Median _____ Mode _____
c. Bubbles Plant B: Mean _____ Median _____ Mode _____

4. Add a title and graph the data. You must include axis labeling, units, proper scaling, plotting points, and a trend line if necessary. (12 points)



Problem C:

Diabetes is a disease affecting the 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 is not considered normal. This disease, if not brought under control, can lead to severe complications and even death.

Answer the following questions concerning the data below and construct a graph.

	Glucose mL per Liter of Blood	
Time After Eating (Hours)	Person A	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. What is the dependent variable? (1 point)

2. What is the independent variable? (1 point)

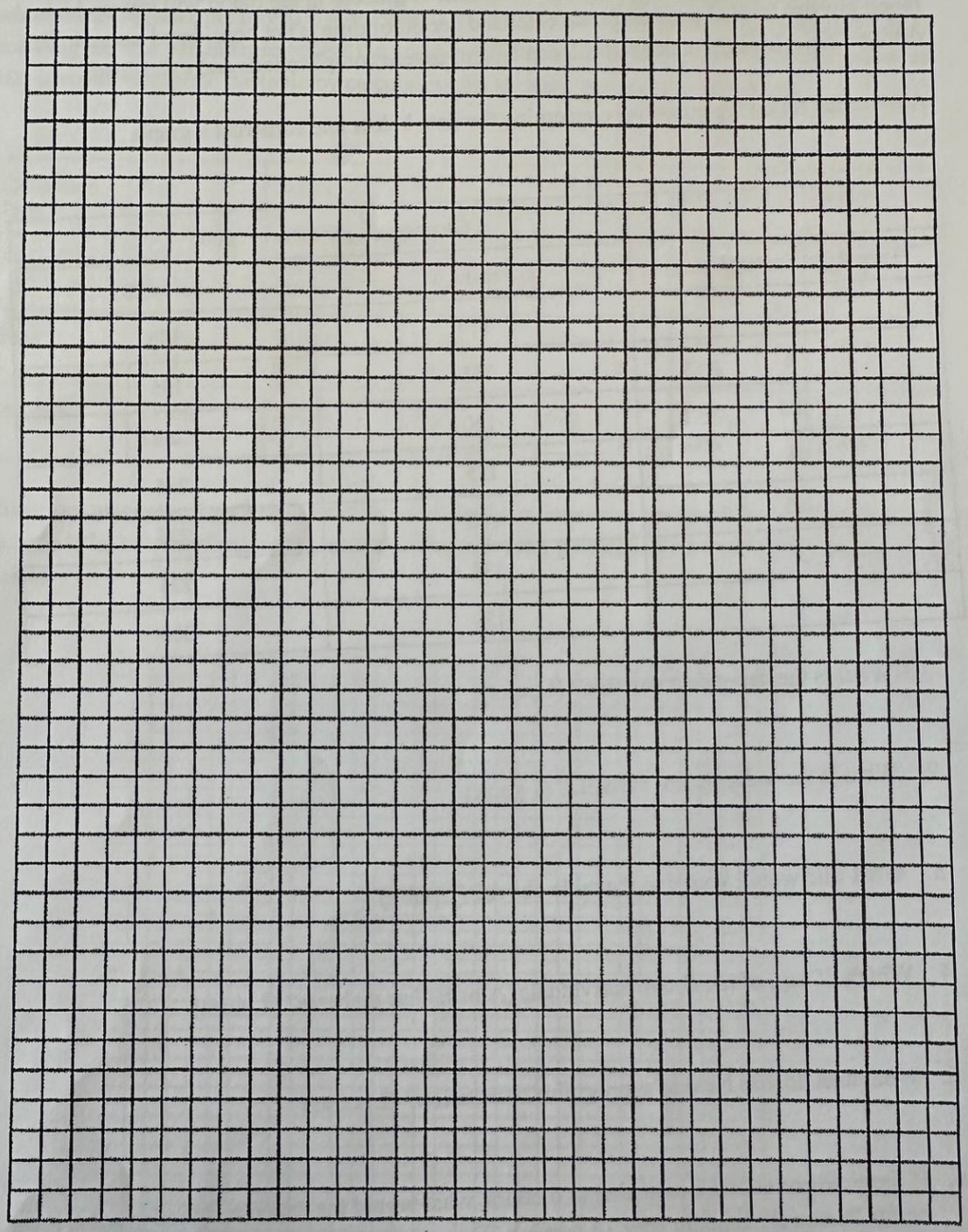
3. What title would you give the table above? (1 point)

4. Which, if any, of the above individuals (A or B) has diabetes? (1 point)

5. What data do you have to support this conclusion? (2 points)

6. If the time were extended to 6 hours, what would the expected blood glucose level be for Person B? Explain why. (2 points)

Graph must include title, axis labeling, units, proper scaling, plotting points, and a trend line if necessary. (12 points)



Finally, watch Bozeman: Standard Error and Kevin Piers: Standard Deviation and Standard Error of the Mean

a. From Bozeman: Explain the significance of the standard error among 2 different sets of data with different sample sizes that have the same mean (in terms of precision.) (4 points)

b. From Piers:
   1. What do SEM bars that have overlapping means on a graph indicate? (3 points)

   2. Explain the significance if SEM bars overlap, but the means do NOT overlap. (3 points)

   3. Explain the significance if there is no overlap between SEM bars. (3 points)

   4. Solve the problems on the next page. (17 points)

Formula for calculating Standard Deviation:

$$\sigma = \sqrt{\frac{\sum(x-\bar{x})^2}{n}}$$

σ – Greek letter sigma represents standard deviation
Σ – Capital sigma represents the sum of a series of numbers
x – a value in the data set
$\bar{x}$ - the mean of the data set
n – the number of values in the data set

Step 1: Calculate mean

Step 2: Find the difference between the data value and the mean

Step 3: Square each difference

Step 4: Find the average (mean of these squares)

Step 5: Take the square root of the mean of the squares to find the standard deviation

Data Set 1			
x	$\bar{x}$	$x-\bar{x}$	$(x-\bar{x})^2$
12.6	15	-2.4	5.76
15.1	15	0.1	0.01
11.2	15	-3.8	14.44
17.9	15	2.9	8.41
18.2	15	3.2	10.24
$\frac{\sum(x-\bar{x})^2}{n}$			7.772
Standard Deviation: $\sqrt{\frac{\sum(x-\bar{x})^2}{n}}$			≈ 2.79

Which set of data has a greater standard of deviation?

The data set with the larger standard of deviation has a larger more spread out range of values.

If many of the data values are close to the mean, then the data would have a relatively small standard deviation. This would tell you that the data is not very spread out.

Data Set 2			
x	$\bar{x}$	$x-\bar{x}$	$(x-\bar{x})^2$
13.4			
11.7			
18.3			
14.8			
14.3			
$\frac{\sum(x-\bar{x})^2}{n}$			
Standard Deviation: $\sqrt{\frac{\sum(x-\bar{x})^2}{n}}$			

Assignment #4 – Chemistry Review (125 points)

1. Contrast the term element with the term compound. (2 points)

2. Fill in the following table: (18 points)

Element	Symbol	Atomic Number	Electron Shell Diagram
a. Carbon			
b. Hydrogen			
c. Oxygen			
d. Nitrogen			
e. Phosphorus			
f. Sulfur			

3. Contrast the terms atomic mass and atomic number. (2 points)

4. What is an isotope and what is so special about radioactive isotopes? (2 points)

5. What determines interactions between atoms? Why are valence electrons important? (2 points)

6. Define the following terms: (7 points)

a. Chemical bond

b. Covalent bond

c. Single bond

d. Double bond

e. Electronegativity

f. Nonpolar covalent bond

g. Polar covalent bond

7. What is the difference between a structural and molecular formula? (2 points)

8. Express both the structural and molecular formula of the following compounds. (12 points)

a. Oxygen gas

b. Carbon dioxide

c. Glucose

d. Phosphate

e. Ammonia

f. Water

9. How do ionic bonds compare to covalent bonds? (2 points)

10. Compare and contrast hydrogen bonds and van der Waals interactions. (2 points)

11. Define a dynamic equilibrium in terms of quantities of reactants and products. (2 points)

12. Why is water considered a polar molecule? (2 points)

13. Define the following terms: (6 points)

a. Solute

b. Solvent

c. Aqueous solution

d. Hydrophilic

e. Hydrophobic

f. Molarity

14. What defines an acid and a base? (2 points)

15. Why are small changes in pH so important in biology? (2 points)

16. What is a buffer? Give an example of how a buffer works in a human. (2 points)

17. What is special about carbon that makes it the central atom in the chemistry of life? (2 points)

18. Be familiar with the following functional groups. Write the chemical formula and the functional property of each: (12 points)

a. Carbonyl

b. Carboxyl

c. Hydroxyl

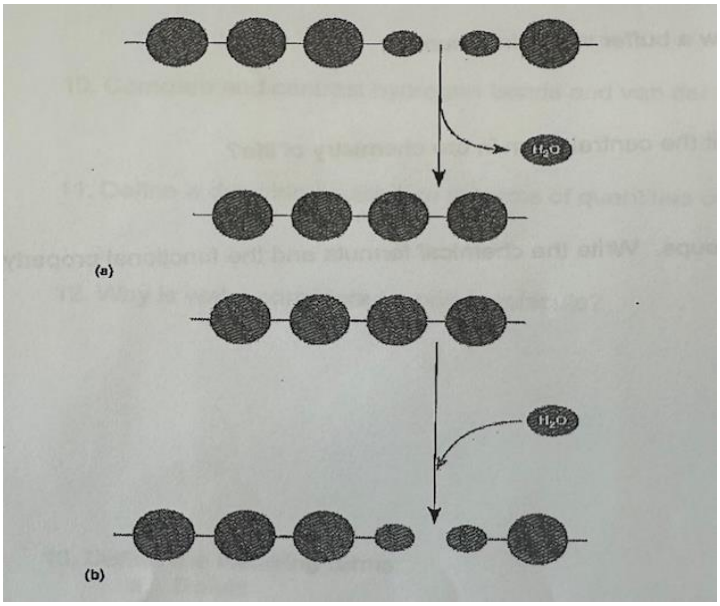
d. Amino

e. Sulfhydryl

f. Phosphate

Assignment #4 – Macromolecules

1. Label the diagram below – identify a monomer, polymer, condensation reaction, and hydrolysis. (4 points)



2. What are the three hexose monosaccharides? (2 points)

3. Compare and contrast the two storage polysaccharides. (2 points)

4. Compare and contrast the two structural polysaccharides. (2 points)

5. Why are lipids grouped together? (1 point)

6. What are the building blocks of fats? (1 point)

7. Contrast saturated and unsaturated fats – how does this relate to the concept that structure and function are linked? (2 points)

8. How would you recognize a basic steroid molecule? (1 point)

9. What are the names for the monomers and polymers of proteins? (1 point)

10. Draw two amino acids- note the amino group, the carboxyl group and the alpha carbon, circle the water molecule to be removed and then note the peptide bond formed when the two are joined. (6 points)

11. Explain the four levels of protein structure: (4 points)

a. Primary

b. Secondary

c. Tertiary

d. Quaternary

12. How does the characteristics of an amino acid – nonpolar, polar, acidic or basic relate to the issue of tertiary and quaternary structure? (1 point)

13. What does denaturation mean and why is it important? (1 point)

14. What are chaperonins and what is their role in protein structure? (1 point)

15. What are the roles of nucleic acids? (1 point)

16. What is meant by the term that DNA is antiparallel? (1 point)

Assignment #4 – Water

1. For each of the below listed properties of water – briefly define the property and then explain how water's polar nature and polar covalent bonds contribute to the water special property. (6 points)

a. Cohesion

b. Adhesion

c. Surface Tension

d. High Specific Heat

e. Heat of vaporization

f. Evaporative cooling

2. What is special about water and density? (1 point)

3. Explain how these properties of water are related to the phenomena described in the statements below. More than one property may be used to explain a given phenomenon. (6 points)

a. During the winter, air temperatures in the northern United States can remain below 0° Celsius for months; however, the fish and other animals living in the lakes survive.

b. Many substances – for example, salt (NaCl) and sucrose – ($C_{12}H_{22}O_{11}$) dissolve quickly in water.

c. When you pour water into a 25ml graduated cylinder, a meniscus forms at the top of the water column.

d. Sweating and evaporation of sweat from the body surface help reduce a human's body temperature.

e. Water drops that fall on a surface tend to form rounded drops or beads.

f. Water drops that fall on your car tend to bead or round up more after you polish (or wax) the car than before you polished it.

Task Verbs

Pay close attention to the task verbs used in the free-response questions. Each one directs you to complete a specific type of response. Here are the task verbs that you'll see on the exam:

- **Calculate**: Perform mathematical steps to arrive at a final answer, including algebraic expressions, properly substituted numbers, and correct labeling of units and significant figures.
- **Construct/Draw:** Create a diagram, graph, representation, or model that illustrates or explains relationships or phenomena. Labels may or may not be required.
- **Describe:** Provide relevant characteristics of a specified topic.
- **Determine:** Decide or conclude after reasoning, observation, or applying mathematical routines (calculations).
- **Evaluate:** Judge or determine the significance or importance of information, or the quality or accuracy of a claim.
- **Explain:** Provide information about how or why a relationship, process, pattern, position, situation, or outcome occurs, using evidence and/or reasoning to support or qualify a claim. Explain "how" typically requires analyzing the relationship, process, pattern, position, situation, or outcome; whereas explain "why" typically requires analysis of motivations or reasons for the relationship, process, pattern, position, situation, or outcome.
- **Identify:** Indicate or provide information about a specified topic, without elaboration or explanation.
- **Justify:** Provide evident to support, qualify, or defend a claim, and/or provide reasoning to explain how that evidence supports or qualifies the claim.
- **Make a claim:** Make an assertion that is based on evidence or knowledge.
- **Predict/Make a prediction:** Predict the causes or effects of a change in, or disruption to, one or more components in a relationship, pattern, process, or system.
- **Represent:** Use appropriate graphs, symbols, words, illustrations, and/or tables of numerical values to describe biological concepts, characteristics, and/or relationships
- **State (the null/alternative hypothesis):** Indicate or provide a hypothesis to support or defend a claim about a scientifically testable question.
- **Support a claim:** Provide reasoning to explain how evidence supports or qualifies a claim.