AP Biology Summer Assignments 2023-24

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Welcome to AP Bio! I hope to make AP Biology an exciting tour through an in-depth analysis of biological concepts and issues.   Whether you've experienced high school biology prior to taking AP or not, our learning process is meant to ensure success in the AP Bio program, as long as you are willing to put forth the appropriate level of effort. Your summer assignments are a good indicator of what to expect in AP – interesting reading, thoughtful analysis, with a high level of connections and application to life outside the classroom. The reading assignment should be completed by the first day of school in preparation for our Socratic Circle discussion that first week; your introductory video/power point is due by August 30th and should be emailed to me directly. *All assignments receive a grade.*

1. Read Bad Science by Ben Goldacre. **You MUST read the first 2 chapters, plus 2 others of your choice. The way the book is written means you do NOT have to read consecutive chapters** *Take notes (ONE PAGE ONLY per chapter), annotate, sticky note … You will need to submit your notes the first day of class, and expect a graded discussion/Socratic Circle the first week.* We will be discussing the concepts of the book throughout the year, but especially with our first unit on scientific processes and data collection.
    https://www.goodreads.com/book/show/3272165-bad-science

2. Find and ENJOY the biology of LIFE in your environment. Visit a State or National Park or nature preserve and take photographs of the **life** around you, examples of the **diversity of life** and the **interconnectiveness of life, i.e. symbioses**. Be sure to include **FLORA and FAUNA**. See the attached list of themes & vocabulary to guide your project. **Create a powerpoint, Prezi, pictograph or movie that introduces me to *YOU* and your various world (so inserting text blocks and commenting on the vocabulary above is part of your graded work). Your images should show YOU in them wherever possible. E**-mail your introductory project to me by August 30th.

3. ***SUGGESTED pre-AP work*** – Complete the "Science Skills Review Packet", posted as a pdf. These are concepts that should be familiar to you; we will be revisiting/learning stats and inquiry the first week of school. *IF you choose to do this assignment, you can hand it in the first day of school for extra points.*

Themes and Vocabulary for Outdoor project

Try to use as much vocab as you can as you describe your images; that might mean you need to look up vocab! **DO NOT SIMPLY SUBMIT IMAGEST WITHOUT SOME SORT OF DESCRIPTOR OF THE THEME USING THE SUGGESTED VOCABULARY**
Let's aim for 3-5 images per theme – you can do one slide per theme with descriptions

Themes to capture

- **Life finds a Way** – survivability, tenaciousness, the fight for life,
- **More, please** – populations, colonies, groups etc…
- **Break it down, Build it up** – death, decomposition, rebirth
- **Home sweet home** – habitats for life, homes/nests/caves, etc
- **Inner Beauty** – look for something that seems ugly on the outside, but has some inner secret beauty (especially flowers)
- **Bring it on** – predators, prey, symbiotic relationships
- **Shine the light on me** – photosynthesis and ways plants maximize photosynthesis
- **Endless forms most beautiful** – geometry and symmetry in nature, adaptations – across all of these themes!
- **Man meets environment, Environment meets man** – show me how we affect the environment, and how the environment fights back
- **My spirit animal** – find an organisms (from any Kingdom) that "speaks" to you; make this your last slide and tell me why this is your spirit organism.. I'll go first … Honey Bee, because of their industrious nature and their community work ethic.

Vocabulary:

Biome	Ecotone
Ecosystem	community
Producer/autotroph	consumer/heterotroph
Decomposer/detrivore	Trophic levels
Food web/food chain	keystone species
Symbiosis	parasite/host
Mutualism	commensalism
Ammensalism	predator/prey
Energy sources	trophic cascade
Senescence/Aging/Death	dormancy
Birth	germination/pollination/fertilization
Growth/development	differentiation
Population	organism
Logistic vs. exponential growth	r-strategist/K-strategist
Adaptations	selection pressures
Niche	habitat

Science Skills Review Packet

This is a review of basic science skills, including graphing, chemistry and biology– we will not spend mush class time on all these concepts, as they should have been learned already. Please make sure that you know them and if not, be sure to study through them. *Please hand write in pencil or pen.*

Chemistry Review:

1. Compare and contrast the term element with compound.

2. Know the symbols of the following elements and their charge:
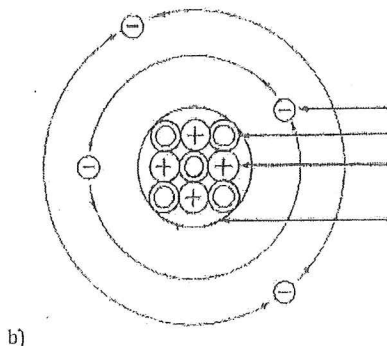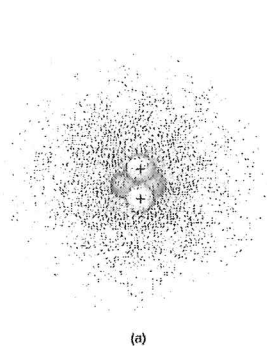   a. Carbon:

   b. Hydrogen:

   c. Oxygen:

   d. Nitrogen:

   e. Phosphorus:

   f. Sulfur:

3. Label the diagrams below and define the terms that you label. What atom is a? _____ b? _____

(a)   b)

4. Contrast the terms atomic mass and atomic number.

5. What determines interactions between atoms? Why are valence electrons important?

6. Define the following terms:
   a. Chemical bond

   b. Covalent bond

   c. Nonpolar covalent bond

   d. Polar covalent bond

7. Know both the molecular formula for the following compounds.
   a. Oxygen gas

   b. Carbon dioxide

      c.   Glucose

      d.   Nitrogen gas

      e.   Ammonia

      f.   Water (you would be surprised at how many people missed this!!!)

8.   How do ionic bonds compare with covalent bonds?

9.   What are hydrogen bonds

10. Define the following terms:
     a. Solute

     b. Solvent

     c. Aqueous solution

     d. Hydrophilic

     e. Hydrophobic

     f. Molarity

11. What defines an acid and a base?

12. What is special about carbon that makes it the central atom in the chemistry of life?

Biology Review:
13. Define the following:
     a. Biology:

     b. Hypothesis:

     c. Observation:

     d. Homeostasis:

14. What are the main characteristics of life (minimum of 5)?

15. Scientists are testing a new pain reducing drug in a trial with 50 patients. Group A gets the drug while group B gets a placebo pill. Level of pain is being recorded for each patient.
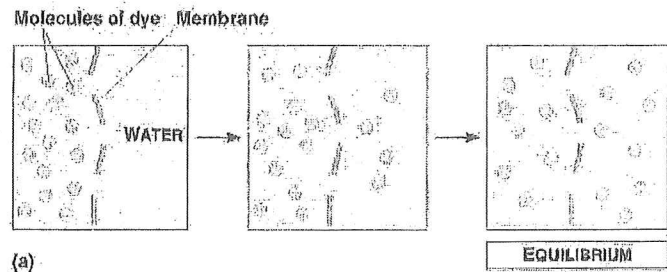   a. What is the control group:

    b. Experimental group:

    c. Independent variable:
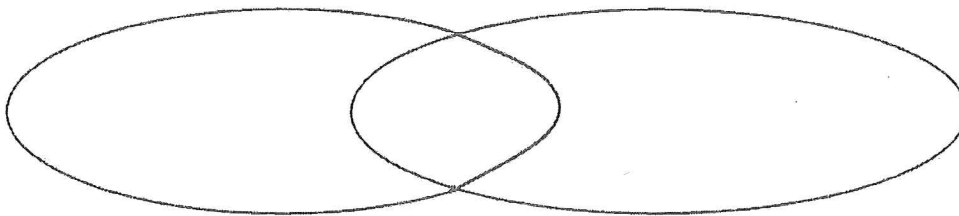
    d. Dependent variable:

16. Using the picture to the right:

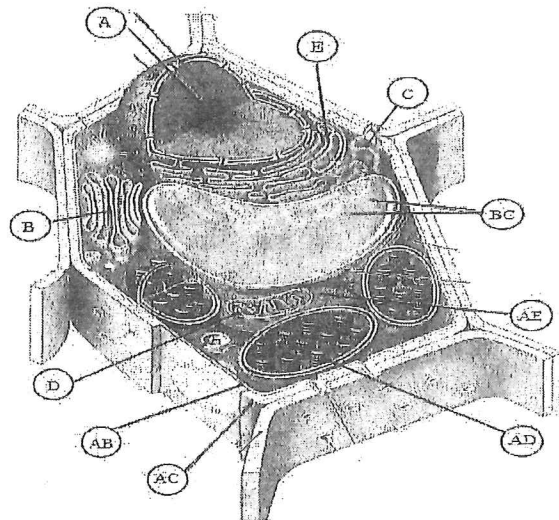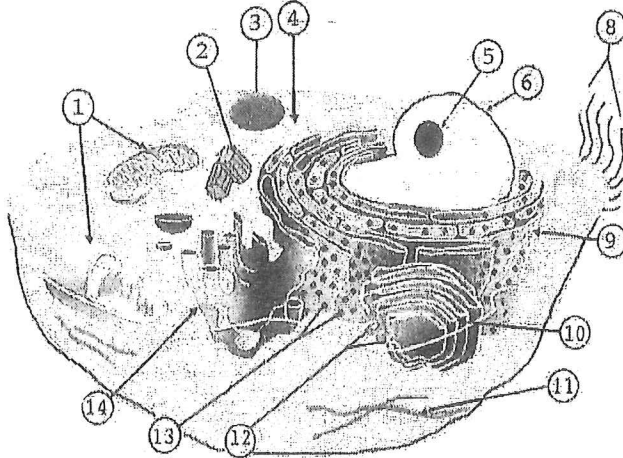   a. Explain *equilibrium*:

    b. Label the most concentrated side of the
       membrane in the first picture.

17. Complete the diagram comparing DNA and RNA:

18. **Label each number on the following**

    pictures:

1.	8.	A.	AB.
2.	9.	B.	AC.
3.	10.	C.	AD.
4.	11.	D.	AE.
5.	12.	E.	BC.
6.	13.		
7. *NA*	14.		

19. The tall allele, *T, is dominant to the short* allele, *t,* in Mendel's pea plants. You examine a pea plant that has
    a *phenotype* of *short.* What is its *genotype*? _____

20. If two plants with the genes Tt and Tt breed, what are the possible genes of their children? (Hint: create
    a punnett square)

Graphing Practice

Graphing is an important procedure used by scientists to display the data that is collected during a controlled experiment. **Line graphs** must be constructed correctly to accurately portray the data collected. Many times the wrong construction of a graph detracts from the acceptance of an individual's hypothesis

A graph contains five major parts:
- a. **Title**
- b. **The independent variable**
- c. **The dependent variable**
- d. **The scales for each variable**
- e. **A legend**

- The **TITLE**: depicts what the graph is about. By reading the title, the reader should get an idea about the graph. It should be a concise statement placed above the graph.
- The **INDEPENDENT VARIABLE**: is the variable that can be controlled by the experimenter. It usually includes time (dates, minutes, hours, etc.), depth (feet, meters), and temperature (Celsius). This variable is placed on the X axis (horizontal axis).
- The **DEPENDENT VARIABLE**: is the variable that is directly affected by the independent variable. It is the result of what happens because of the independent variable. Example: How many oxygen bubbles are produced by a plant located five meters below the surface of the water? The oxygen bubbles are dependent on the depth of the water. This variable is placed on the Y-axis or vertical axis.
- The **SCALES** for each Variable: In constructing a graph one needs to know where to plot the points representing the data. In order to do this a scale must be employed to include all the data points. This must also take up a conservative amount of space. It is not suggested to have a run on scale making the graph too hard to manage. The scales should start with 0 and climb based on intervals such as: multiples of 2, 5, 10, 20, 25, 50, or 100. The scale of numbers will be dictated by your data values.
- The **LEGEND**: is a short descriptive narrative concerning the graph's data. It should be short and concise and placed under the graph.
- The **MEAN** for a group of variables: To determine the mean for a group of variables, divide the sum of the variables by the total number of variables to get an average.
- The **MEDIAN** for a group of variables: To determine median or "middle" for an even number of values, put the values in ascending order and take the average of the two middle values. e.g. 2, 3, 4, 5, 9, 10   Add 4+5 (2 middle values) and divide by 2 to get 4.5
- The **MODE** for a group of variables: The mode for a group of values is the number that occurs most frequently. e.g. 2, 5, 8, 2, 6, 11   The number 2 is the mode because it occurred most often (twice)

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: Title, Axis Labels WITH Units, 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%.

PROCEDURE 1: Using the following data, answer the questions below and then construct a line graph.

Depth in meters	Number of Bubbles / minute Plant A	Number of Bubbles / minute 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 and why?

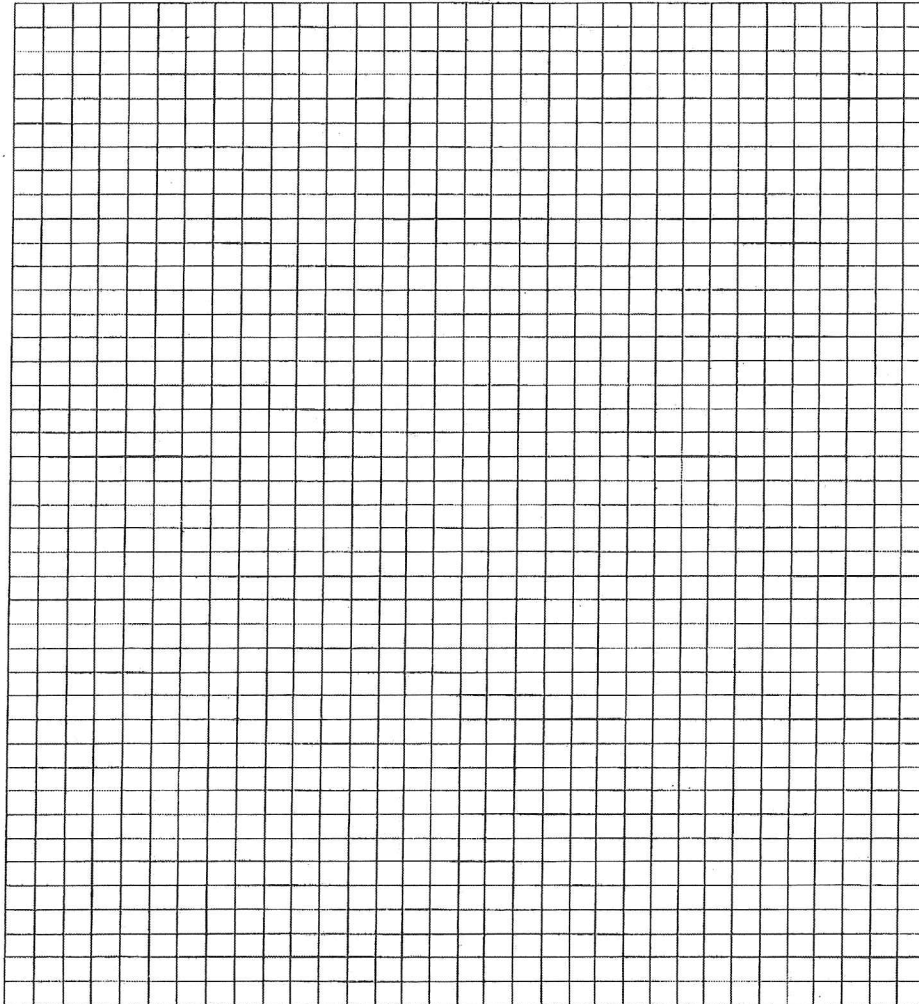2. What is the independent variable and why?

4. What are the mean, median, and mode of all 3 columns of data?
        a). Depth :   Mean_____Median_____Mode_____

        b). Bubble Plant A.:   Mean _____Median_____Mode_____

        c). Bubbles Plant B: Mean _____Median_____Mode_____

Title: _____

LEGEND:

5. Come up with an explanation for the data in this graph, including the varying rates in plant A and B.
    (This is an explanation or hypothesis of *why* the data is the way it is)

PROCEDURE 2:

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 of time 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 then graph it.

Time After Eating hours	Glucose ml / Liter of Blood Person A	Glucose ml / Liter of Blood 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 and why?_____

2. What is the independent variable and why? _____

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

5. What data do you have to support your hypothesis?

6. If the time period were extended to 6 hours, what would the expected blood glucose level for Person B? _____

Title: _____
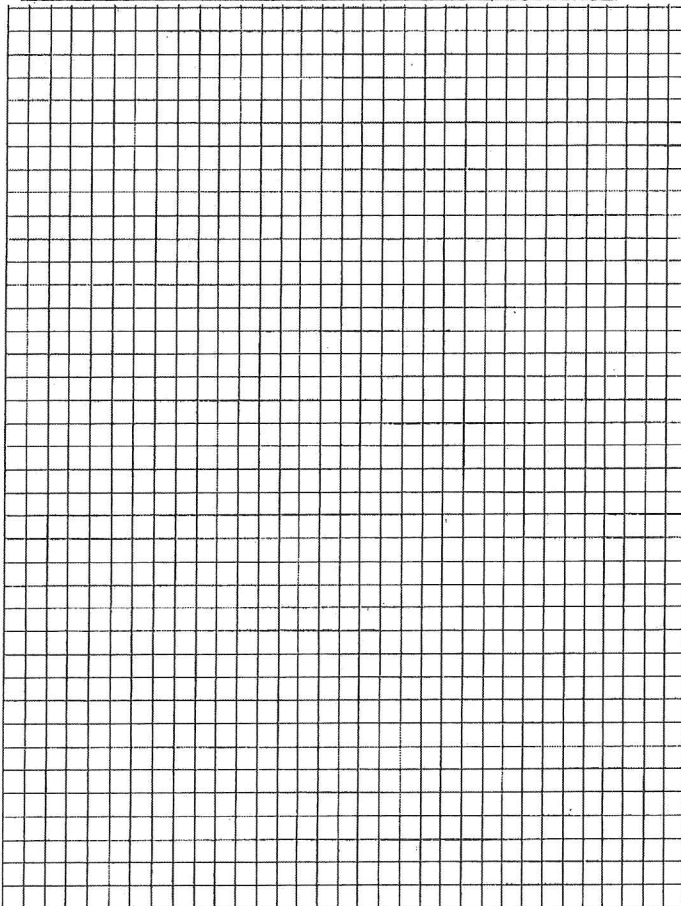
LEGEND:

7. What conclusions can be determined from the data in graph 2?

PROCEDURE 3:

The chart to the right is the raw data of the ml of water expelled by the contractile vacuole of a bacteria in different types of solutions.

This data was then summarized using averages in the table below.

Group	Baseline	Saline	Deionized
1	11.67	6.33	24.33
2	12.14	7.55	22.12
3	15.23	4.56	27.89
4	16.89	3.49	30.17
5	21.72	8.43	34.44
6	11.38	9.12	22.49
7	8.49	3.46	21.16
8	25.29	4.21	30.26
9	24.41	7.56	28.16
10	13.66	11.16	24.59
11	24.88	15.19	29.62
12	11.1	6.49	15.19

Solution	Baseline	Saline	Deionized
Average (in mL)	16.4	7.30	25.87
Standard deviation (error)	6.10	3.43	5.23

1. Construct a bar graph of the amount of water expelled for each solution type.

2. Each group has an error value or "standard deviation". Show this on your graph using lines above and below each bar. Use the example to the right of "Experiment 1" as a guide.

Experiment 1
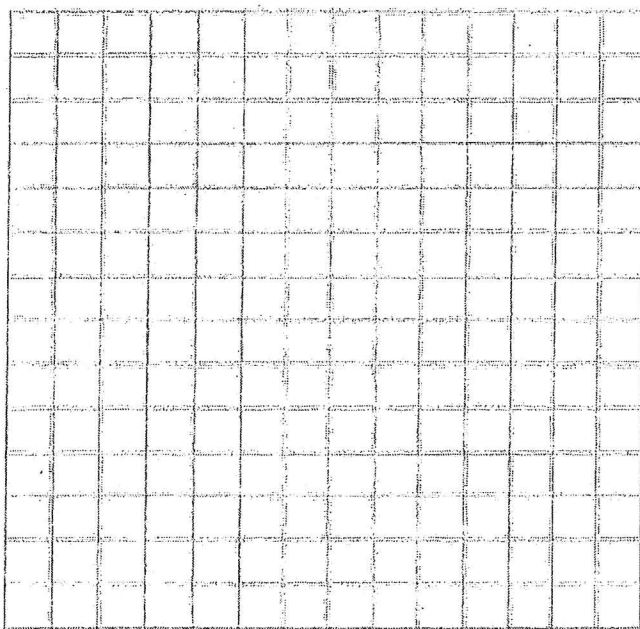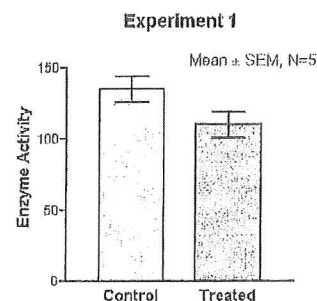
LEGEND:

1. Why are averages used to construct graphs?

2. What does "standard deviation" mean?

3. Come up with a possible hypothesis to explain the data.