Welcome to AP Biology
Summer Work Overview
2017-2018

Objectives:
AP Biology allows students to pursue college-level studies while in a high school setting. It is a challenging, fast-paced course. We will be covering a breadth of biological concepts in preparation for the AP Exam in May. The curriculum is designed with science practices that emphasize a student's ability to evaluate evidence, analyze & justify data and scientific claims, make predictions, develop advanced inquiry and reasoning skills as well as connect key concepts across the domains.

For the summer assignment, students will review basic statistics and outline core information from Unit 1: Chemistry of Life. The majority of this information should be a review from introductory biology, chemistry, and mathematics classes.

Summer Work Assignment:

Part 1: ***Sign up for Remind and Google Classroom*** ***Deadline: August 4, 2017***

For Remind App – Text @aprhsbio to number 81010

For Google Classroom - Class Code: gyj4yp1

Part 2: ***Interactive Notes on Water & Macromolecules*** ***Deadline: August 18, 2017***

Part 3: ***Statistics Packet*** ***Deadline: September 7, 2017***

Grading:
- Please follow the deadlines for the three parts of the summer assignment - ***10% of the total grade*** will be deducted for each late day.
- You will be assessed on your understanding of Unit 1 in September.

Questions/Concerns:
Have a great summer! If you have any questions, please don't hesitate to contact me.

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PART 2 CHEMISTRY OF LIFE: PROPERTIES OF WATER INTERACTIVE NOTES 25 POINTS

Your goal is to demonstrate that water is essential to biological systems and that the properties of water are observable in everyday life.

Your task is to take your own photographs that illustrate water's properties and their importance. You will need to use one object/figurine to appear in every picture to demonstrate authenticity. All photographs should be unique to the individual student. You must describe each property and explain how your photograph demonstrates the property.

Be creative and do your best. These interactive notes will serve as a study tool for your unit one test in September. They highlight some of the key ideas that you should know for each of the properties of water.

All work must be in complete sentences.

Submit or "turn in" this assignment on Google Classroom by **August 18, 2017**.

PROPERTIES OF WATER

Cohesion and Adhesion

- 1 authentic photograph depicting both cohesion and adhesion
- Description of cohesion and adhesion. As part of your description, include the following terms:
  Hydrogen bonding
  Capillary Action
- Explanation of how your photograph demonstrates cohesion and adhesion.

Moderation of Temperature

- 1 authentic photograph depicting that water resists temperature changes
- Description of moderation of temperature. As part of your description, include the following terms:
  Kinetic energy
  Thermal energy
  Calories
- Explanation of how your photograph demonstrates moderation of temperature.

Universal Solvent

- 1 authentic photograph depicting that water is the universal solvent
- Description of the term universal solvent. As part of your description, include the following terms:
  Solute
  Solvent
  Solution
  Hydration Shell
- Explanation of how your photograph demonstrates water as a universal solvent.

Density: Liquid/Solid

- 1 authentic photograph depicting that water is more/less dense as a liquid/solid
- Description of the property. As part of your description, include the following terms:
  Insulation
  Hydrogen Bonding
  Crystal Lattice
  Seasons
- Explanation of how your photograph demonstrates the density of water

Polarity

- 1 authentic photograph depicting that water is polar
- Description of the term polarity. As part of your description, include the following terms:
  Electronegative
  Electron
  Negative Charge
  Positive Charge
- Explanation of how your photograph demonstrates water as a polar molecule.

High Specific Heat

- 1 authentic photograph depicting that water has a high specific heat.
- Description of high specific heat. As part of your description, include the following terms:
  Homeostasis
  Habitable
- Explanation of how your photograph demonstrates water as having a high specific heat.

PART 2 CHEMISTRY OF LIFE: PROPERTIES OF MACROMOLECULES

INTERACTIVE NOTES

The molecules of life are an important concept in AP Biology as they are the foundation of all living organisms.

Your task is to take your own photographs that illustrate the four macromolecules and answer the bullets pertaining to each molecule. You will need to use one object/figurine to appear in every picture to demonstrate authenticity. Every photograph should be unique to the individual student.

Be creative and do your best. These interactive notes will serve as a study tool for your unit one test in September and will highlight some of the key ideas that you should know for each of the macromolecules.

You can bullet and list your answers unless otherwise noted.

Submit or "turn in" this assignment on Google Classroom by **August 18, 2017**.

Carbohydrates

1. Include an authentic photograph that demonstrates carbohydrates. Use your object of authenticity.
2. Identify the *elements* that make up carbohydrates.
3. Identify the *monomer* for carbohydrates. Give **two** *examples*.
4. List the **four** polysaccharides and their *importance*.
5. List **two** key *functions* of carbohydrates.

Lipids

1. Include an authentic photograph that demonstrates lipids. Use your object of authenticity.
2. Identify the *elements* that make up lipids.
3. Lipids do <u>not</u> contain true polymers. Explain how lipids are *classified.*
4. List **two** key *functions* of lipids.
5. <u>Fats/Triglycerides</u>:
    a. What makes fats *hydrophobic*?
    b. Take a *picture* of a saturated fat and a picture of an unsaturated fat. Use your object of authenticity. *Compare* the chemical structure of each.
6. <u>Phospholipids</u>:
    a. Explain the structure and function of a phospholipid
7. <u>Steroids</u>:
    a. Why are human sex hormones considered lipids?

Proteins

1. Include an authentic photograph that demonstrates proteins. Use your object of authenticity.
2. Identify the *elements* that make up proteins.
3. Identify the *monomer* for proteins. *Draw* the general structure for the monomer.
4. List **eight** key *functions* of proteins. Make sure you understand what each of these functions means.
5. Identify and explain the *four* levels of protein folding.

Nucleic Acids

1. Include an authentic photograph that demonstrates nucleic acids. Use your object of authenticity.
2. Identify the *elements* that make up nucleic acids.
3. The *monomer* for nucleic acids is a nucleotide. Draw and label the components of a *nucleotide.*
4. Identify the **two** types of nucleic acids and their roles in heredity. Compare their structures.
5. Identify the nitrogenous bases found in both types of nucleic acids.

Carbon and the Diversity of Life

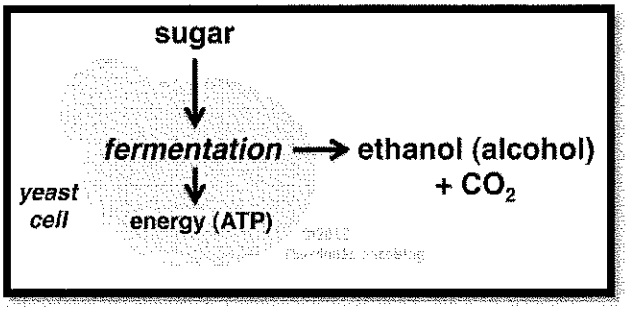
Write a brief *paragraph* explaining how the chemical structure of the carbon atom has allowed for such diversity of organisms on Earth.

Synthesis and Breakdown of Polymers

1. **Define** the terms DEHYDRATION SYNTHESIS and HYDROLYSIS.
2. **Find** an image online that demonstrates:
   a) The condensation reaction for joining 2 amino acids to form a dipeptide.
   b) A hydrolysis reaction of a disaccharide.

PART 3 **STATISTICS**
25 POINTS Due September 7, 2017

Data is information collected during an investigation. Data may be quantitative, qualitative, or ranked. Quantitative data may be discontinuous, as displayed in a bar graph, or continuous, as shown in a line graph over time. Additionally, controlled experiments have defined parts such as dependent variables, independent variables, and a control group. These types of experiments allow you to determine the effect of one variable at a time. The ability to identify these components of an experiment is fundamental in AP Biology.



Investigation 1
Case Study: An experiment investigated the amount of ethanol produced in fermentation when using varying amounts of sugar applied to yeast.

- 12 test tubes were used
- Each test tube contained 5 mL of yeast and one of the following sugar solutions: 5%, 10%, 15%, 20%, 25%, or 30%
- Two tubes were used for each sugar solution (For example: 2 tubes were made with 5% sugar)
- The experiment ran at 40C for 30 minutes

1. Write a hypothesis for this experiment.

2. What is the independent variable?

3. Name the unit for the independent variable.

4. What is the dependent variable?

5. What would students use for a control in this experiment?

6. What type of graph is appropriate for presenting this data? Explain.

Having learned that the optimum sugar concentration is 25%, the team decides to investigate whether different strains of yeast produce different amounts of alcohol. If you were going to graph the data from the second part of this case study, what type of graph would be used? Explain your reasoning.

Descriptive statistics are used to summarize a data set and describe its basic features. The type of statistic calculated depends on the type of data and its distribution. In class, we will be using a variety of mathematical practices and statistical analyses including standard deviation and chi-square. Below you will find some examples of simple statistics that you should be familiar with in September.

Investigation 2

Table 1. Radish plant root mass under six different fertilizer concentrations.

Fertilizer concentration (g L^{-1})	Sample (n)					Total Mass (g)	Mean Mass (g)
	1	2	3	4	5		
0	80.2	83.4	82.2	79.2	84.4		
0.06	109.5	110.3	108.0	107.3	110.3		
0.12	117.3	118.9	118.6	119.0	117.7		
0.18	128.3	127.2	127.1	126.4	DNG*		
0.24	23.5	140.1	139.9	137.5	142.1		
0.30	122.4	120.1	122.3	121.8	123.8		

*DNG=Did not germinate

Table 2. Number of leaves on radish plants under six different fertilizer concentrations.

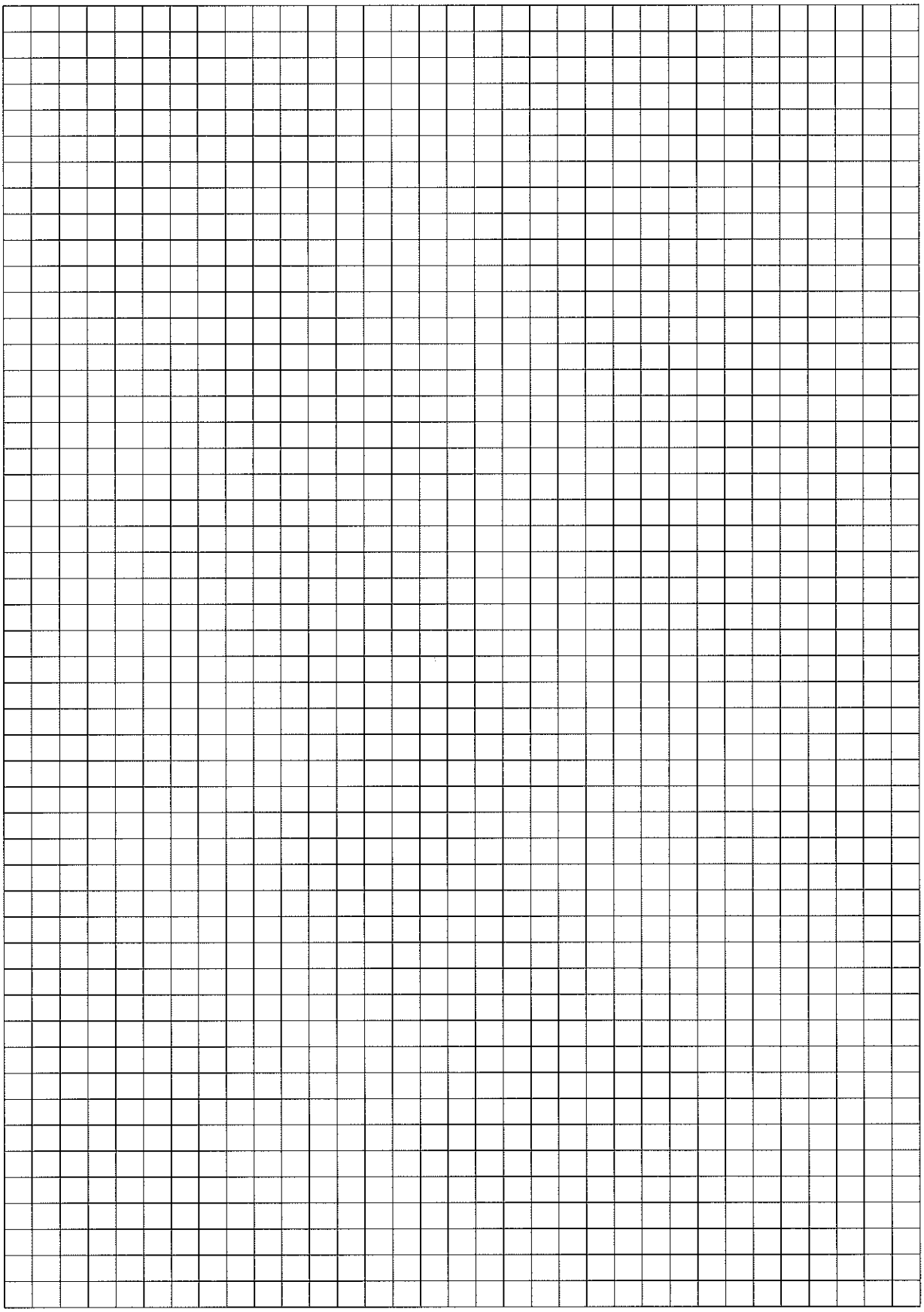
Fertilizer concentration (g L^{-1})	Sample (n)					Mean	Median	Mode
	1	2	3	4	5			
0	9	9	10	8	7			
0.06	15	16	15	16	16			
0.12	16	17	17	17	16			
0.18	18	18	19	18	DNG*			
0.24	6	19	19	18	18			
0.30	18	17	18	19	19			

*DNG=Did not germinate

1. Calculate the total mass and mean mass for Data Table 1.

2. Calculate the mean, median, and mode for the leaf data in Data Table 2.
   a. Mean:
   b. Median:
   c. Mode:

3. Use the grid on the following sheet to draw a line graph of the experimental results. Plot your calculated mean mass data from Table 2. Remember to include a title and correctly labeled axis.



4. Based on the data and your graph:
    a. Which fertilizer concentration appeared to produce the best growth of radish mass?

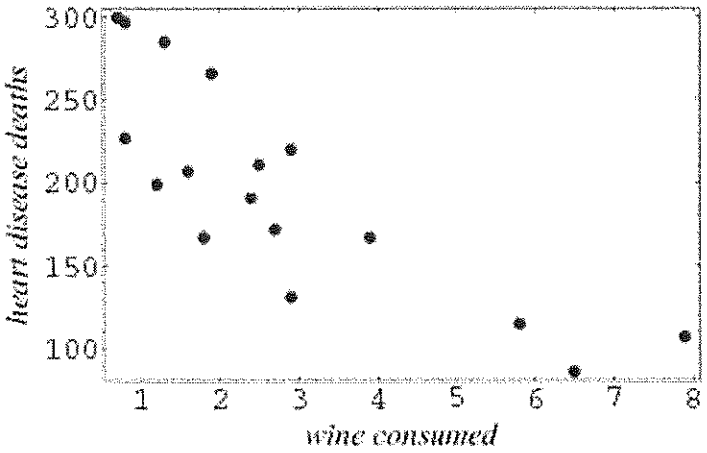
    b. Which fertilizer concentration appeared to produce the best growth of leaves?

You may have heard the saying, "correlation does not imply causation". This means that although there may be a strong correlation between variables (meaning they vary together in a predictable way) it does not necessarily mean that a change in one variable caused change in the other.

Line of Best Fit: When drawing a best fit line on a scatter plot remember half of the data point should be found on either side of the line and the line doesn't necessarily pass through any particular point. The best fit line should pivot around the point representing the mean of the x and y variables.

Investigation 3

A study was conducted testing the number of deaths from heart disease in comparison to the number of glasses of wine consumed daily.



1. Draw a line of best fit through the data.

2. Describe the results:

3. Using your line of best fit as a guide, comment on the correlation between heart disease death and wine consumption.

Histograms are plots of continuous data and are often used to represent frequency distribution. The data is numerical and continuous so the bars of the diagram will touch. The y-axis usually records the frequency.

Investigation 4

Table 1. Test Scores for AP Biology Exam

81	77	63	92	97
88	78	96	85	70
80	99	63	58	83
89	94	92	85	76
81	77	63	92	97

Table 2. Interval Frequency

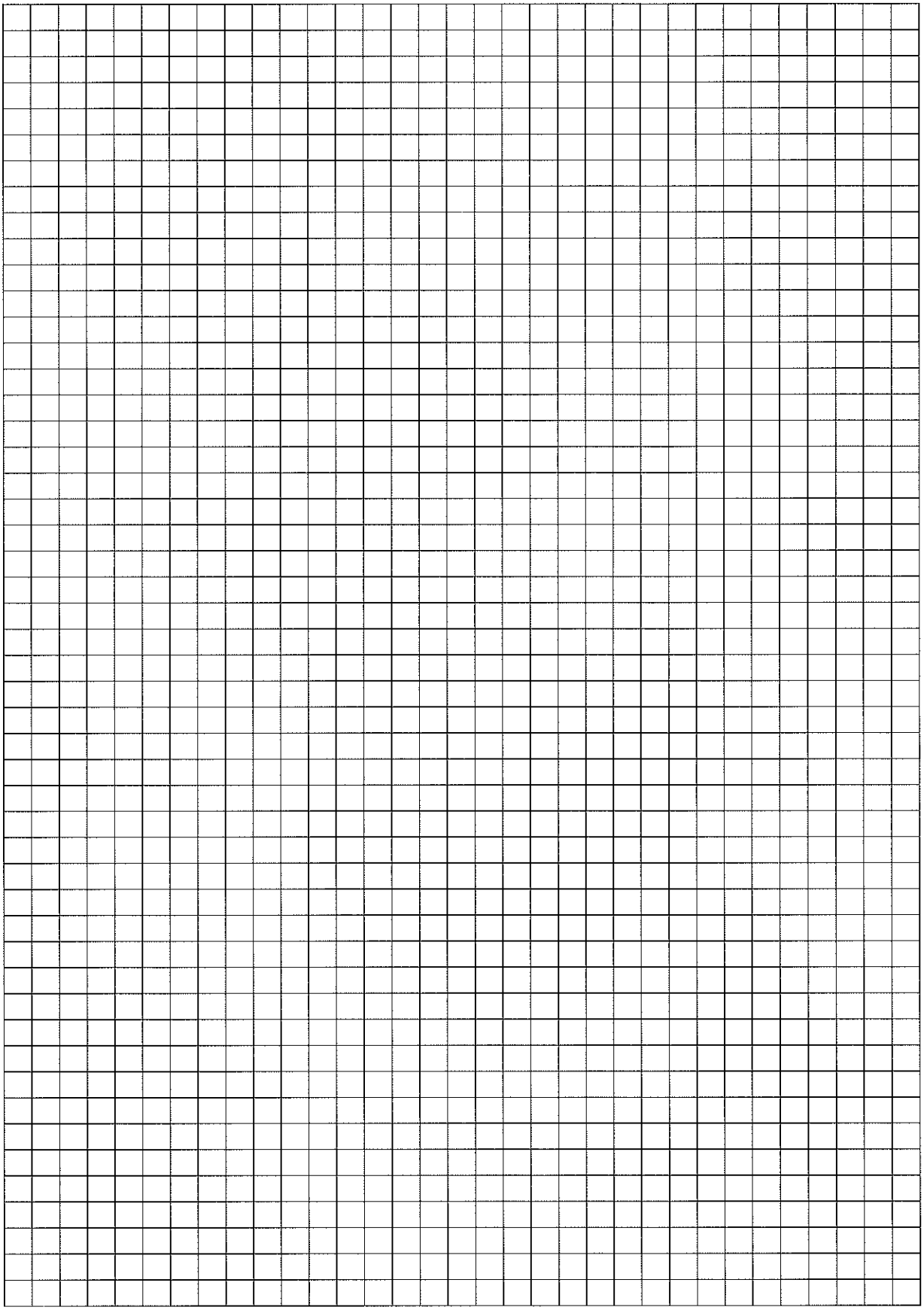
Score	Tally	Total
60 - 69		
70 – 79		
80 - 89		
90 - 99		

1. Tally and total the interval frequency for the AP Biology test scores.

2. Plot a frequency histogram of the tallied data on the attached grid. Remember to give it a title and label your axis.

3. Analyze your data. Does your data have normal distribution? Skewed? Bimodal?

4. Calculate the mean, median, and mode for the test grade data.
   a. Mean
   b. Median
   c. Mode
   d. Explain which one (mean, median, or mode) is the best measure for central tendency in this data.



Large scale changes in numerical data can be made more manageable by transforming the data using logarithms or plotting the data on semi-log paper. Log transformations are used for data where there is an exponential increase or decrease in numbers.

Investigation 5

The chart below shows the distance traveled by each DNA fragment from the origin well location during electrophoresis.

Distance Traveled (cm)	BP Length
5	27,500
10	23,150
20	12,555
60	4,361
100	1,560

1. Graph the data above on the attached semi-log graph paper.

2. Create a best fit regression line.

3. Predict the BP length of a DNA fragment that travels **40 cm**.

4. Log transformations are often used when a value of interest ranges over several orders of magnitude. Can you think of another example from the natural world where the data collected might show this behavior?