

AP Biology Summer Assignments

Welcome to Advanced Placement Biology. This summer you will be required to complete 4 assignments that are due on the first day of class.

Assignment #1: Vocabulary- Create a flash card per term or hand write the words and definitions on your own paper for Unit 1 (Cell/Biochemistry). [21 Possible Points- Assessment Grade]

Assignment #2: Review all lab safety rules. You will be quizzed on this the first week of school. You MUST pass the lab safety test to be able to participate in labs. [Quiz Grade]

Assignment #3: Data Nugget- Complete the questions and graph for the *Which would a woodlouse prefer?* data nugget. [20 Possible Points- Assessment Grade]

Assignment #4: Math- Complete all math questions by showing ALL work. CIRCLE your final answer. [25 Possible Points- Assessment Grade]

Assignment #1: Vocabulary- Due 1st Day of AP Biology (Assessment Grade)

You will be responsible for defining the terms for the following unit. You may create flash cards or write them on your own paper. If you choose to create flash cards, please number your flash cards with the respective word number.

***No computer printed words or definitions will be accepted. ONLY HANDWRITTEN WORK WILL BE GRADED.**

Cell/Biochemistry:

1. Monomer
2. Polymer
3. Protobiont
4. Prokaryote
5. Eukaryote
6. Valence Shell
7. Covalent Bond
8. Hydrogen Bond
9. Ionic Bond
10. Potential Energy
11. Kinetic Energy
12. Polar Molecule
13. Cohesion
14. Adhesion
15. Hydrophobic
16. Hydrophilic
17. Buffer
18. Denaturation
19. Amphipathic Molecule
20. Active Transport
21. Passive Transport

School Name _____

Teacher _____

PURPOSE

Science is a hands-on laboratory class. You will be doing many laboratory activities which require the use of hazardous chemicals. Safety in the science classroom is the #1 priority for students, teachers, and parents. To ensure a safe science classroom, a list of rules has been developed and provided to you in this student safety contract. These rules must be followed at all times. Two copies of the contract are provided. One copy must be signed by both you and a parent or guardian before you can participate in the laboratory. The second copy is to be kept in your science notebook as a constant reminder of the safety rules.

GENERAL RULES

1. Conduct yourself in a responsible manner at all times in the laboratory.
2. Follow all written and verbal instructions carefully. If you do not understand a direction or part of a procedure, ask the instructor before proceeding.
3. Never work alone. No student may work in the laboratory without an instructor present.
4. When first entering a science room, do not touch any equipment, chemicals, or other materials in the laboratory area until you are instructed to do so.
5. Do not eat food, drink beverages, or chew gum in the laboratory. Do not use laboratory glassware as containers for food or beverages.
6. Perform only those experiments authorized by the instructor. Never do anything in the laboratory that is not called for in the laboratory procedures or by your instructor. Carefully follow all instructions, both written and oral. Unauthorized experiments are prohibited.
7. Be prepared for your work in the laboratory. Read all procedures thoroughly before entering the laboratory.
8. Never fool around in the laboratory. Horseplay, practical jokes, and pranks are dangerous and prohibited.
9. Observe good housekeeping practices. Work areas should be kept clean and tidy at all times. Bring only your laboratory instructions, worksheets, and/or reports to the work area. Other materials (books, purses, backpacks, etc.) should be stored in the classroom area.
10. Keep aisles clear. Push your chair under the desk when not in use.

11. Know the locations and operating procedures, where appropriate, for all safety equipment including first aid kit, eyewash station, safety shower, fire extinguisher, and fire blanket. Know where the fire alarm and exits are located.
12. Always work in a well-ventilated area. Use the fume hood when working with volatile substances or poisonous vapors. Never place your head into the fume hood.
13. Be alert and proceed with caution at all times in the laboratory. Notify the instructor immediately of any unsafe conditions you observe.
14. Dispose of all chemical waste properly. Never mix chemicals in sink drains. Sinks are to be used only for water and those solutions designated by the instructor. Solid chemicals, metals, matches, filter paper, and all other insoluble materials are to be disposed of in the proper waste containers, not in the sink. Check the label of all waste containers twice before adding your chemical waste to the container.
15. Labels and equipment instructions must be read carefully before use. Set up and use the prescribed apparatus as directed in the laboratory instructions or by your instructor.
16. Keep hands away from face, eyes, mouth and body while using chemicals or preserved specimens. Wash your hands with soap and water after performing all experiments. Clean all work surfaces and apparatus at the end of the experiment. Return all equipment clean and in working order to the proper storage area.
17. Experiments must be personally monitored at all times. You will be assigned a laboratory station at which to work. Do not wander around the room, distract other students, or interfere with the laboratory experiments of others.
18. Students are never permitted in the science storage rooms or preparation areas unless given specific permission by their instructor.
19. Know what to do if there is a fire drill during a laboratory period; containers must be closed, gas valves turned off, fume hoods turned off, and any electrical equipment turned off.
20. Handle all living organisms used in a laboratory activity in a humane manner. Preserved biological materials are to be treated with respect and disposed of properly.

21. When using knives and other sharp instruments, always carry with tips and points pointing down and away. Always cut away from your body. Never try to catch falling sharp instruments. Grasp sharp instruments only by the handles.
22. If you have a medical condition (e.g., allergies, pregnancy, etc.), check with your physician prior to working in lab.

CLOTHING

23. Any time chemicals, heat, or glassware are used, students will wear laboratory goggles. There will be no exceptions to this rule!
24. Contact lenses may be worn provided adequate face and eye protection is provided by specially marked, non-vented safety goggles. The instructor should know which students are wearing contact lenses in the event of eye exposure to hazardous chemicals.
25. Dress properly for lab activities. Long hair, dangling jewelry, and loose or baggy clothing are hazardous. Long hair must be tied back and dangling jewelry and loose or baggy clothing must be secured. Shoes must completely cover the foot. No sandals allowed.
26. Lab aprons have been provided for your use and should be worn during laboratory activities.

ACCIDENTS AND INJURIES

27. Report any accident (spill, breakage, etc.) or injury (cut, burn, etc.) to the instructor immediately, no matter how trivial it may appear.
28. If you or your lab partner are hurt, immediately yell out "Code one, Code one" to get the instructor's attention.
29. If a chemical splashes in your eye(s) or on your skin, immediately flush with running water from the eyewash station or safety shower for at least 20 minutes. Notify the instructor immediately.
30. When mercury thermometers are broken, mercury must not be touched. Notify the instructor immediately.

HANDLING CHEMICALS

31. All chemicals in the laboratory are to be considered dangerous. Do not touch, taste, or smell any chemicals unless specifically instructed to do so. The proper technique for wafting chemical vapors will be demonstrated to you.
32. Check the label on chemical bottles twice before removing any of the contents. Take only as much chemical as you need.

33. Never return unused chemicals to their original containers.
34. Never use mouth suction to fill a pipet. Use a rubber bulb or pipet pump.
35. When transferring reagents from one container to another, hold the containers away from your body.
36. Acids must be handled with extreme care. You will be shown the proper method for diluting strong acids. Always add acid to water, swirl or stir the solution and be careful of the heat produced, particularly with sulfuric acid.
37. Handle flammable hazardous liquids over a pan to contain spills. Never dispense flammable liquids anywhere near an open flame or source of heat.
38. Never remove chemicals or other materials from the laboratory area.
39. Take great care when transporting acids and other chemicals from one part of the laboratory to another. Hold them securely and walk carefully.

HANDLING GLASSWARE AND EQUIPMENT

40. Carry glass tubing, especially long pieces, in a vertical position to minimize the likelihood of breakage and injury.
41. Never handle broken glass with your bare hands. Use a brush and dustpan to clean up broken glass. Place broken or waste glassware in the designated glass disposal container.
42. Inserting and removing glass tubing from rubber stoppers can be dangerous. Always lubricate glassware (tubing, thistle tubes, thermometers, etc.) before attempting to insert it in a stopper. Always protect your hands with towels or cotton gloves when inserting glass tubing into, or removing it from, a rubber stopper. If a piece of glassware becomes "frozen" in a stopper, take it to your instructor for removal.
43. Fill wash bottles only with distilled water and use only as intended, e.g., rinsing glassware and equipment, or adding water to a container.
44. When removing an electrical plug from its socket, grasp the plug, not the electrical cord. Hands must be completely dry before touching an electrical switch, plug, or outlet.
45. Examine glassware before each use. Never use chipped or cracked glassware. Never use dirty glassware.
46. Report damaged electrical equipment immediately. Look for things such as

frayed cords, exposed wires, and loose connections. Do not use damaged electrical equipment.

47. If you do not understand how to use a piece of equipment, ask the instructor for help.
48. Do not immerse hot glassware in cold water; it may shatter.

HEATING SUBSTANCES

49. Exercise extreme caution when using a gas burner. Take care that hair, clothing and hands are a safe distance from the flame at all times. Do not put any substance into the flame unless specifically instructed to do so. Never reach over an exposed flame. Light gas (or alcohol) burners only as instructed by the teacher.
50. Never leave a lit burner unattended. Never leave anything that is being heated or is visibly reacting unattended. Always turn the burner or hot plate off when not in use.
51. You will be instructed in the proper method of heating and boiling liquids in test tubes. Do not point the open end of a test tube being heated at yourself or anyone else.
52. Heated metals and glass remain very hot for a long time. They should be set aside to cool and picked up with caution. Use tongs or heat-protective gloves if necessary.
53. Never look into a container that is being heated.
54. Do not place hot apparatus directly on the laboratory desk. Always use an insulating pad. Allow plenty of time for hot apparatus to cool before touching it.
55. When bending glass, allow time for the glass to cool before further handling. Hot and cold glass have the same visual appearance. Determine if an object is hot by bringing the back of your hand close to it prior to grasping it.

QUESTIONS

56. Do you wear contact lenses?
 YES NO
57. Are you color blind?
 YES NO
58. Do you have allergies?
 YES NO
If so, list specific allergies _____

AGREEMENT

I, _____ (student's name) have read and agree to follow all of the safety rules set forth in this contract. I realize that I must obey these rules to ensure my own safety, and that of my fellow students and instructors. I will cooperate to the fullest extent with my instructor and fellow students to maintain a safe lab environment. I will also closely follow the oral and written instructions provided by the instructor. I am aware that any violation of this safety contract that results in unsafe conduct in the laboratory or misbehavior on my part, may result in being removed from the laboratory, detention, receiving a failing grade, and/or dismissal from the course.

Student Signature

Date

Dear Parent or Guardian:

We feel that you should be informed regarding the school's effort to create and maintain a safe science classroom/laboratory environment.

With the cooperation of the instructors, parents, and students, a safety instruction program can eliminate, prevent, and correct possible hazards.

You should be aware of the safety instructions your son/daughter will receive before engaging in any laboratory work. Please read the list of safety rules above. No student will be permitted to perform laboratory activities unless this contract is signed by both the student and parent/guardian and is on file with the teacher.

Your signature on this contract indicates that you have read this Student Safety Contract, are aware of the measures taken to ensure the safety of your son/daughter in the science laboratory, and will instruct your son/daughter to uphold his/her agreement to follow these rules and procedures in the laboratory.

Parent/Guardian Signature

Date

DATA *Nugget*

Which would a woodlouse prefer?

Featured scientist: Nora Straquadine from Michigan State University

Research Background:

Woodlice are small crustaceans that live on land. They look like bugs, but are actually more closely related to crabs and lobsters. To escape predators they hide in dark places. They spend most of their time underground and have very poor eyesight.

One day, when digging around in the dark dirt of her compost pile, Nora noticed that there were many, many woodlice hiding together. This made her wonder how woodlice decide where to live. Because woodlice have very simple eyesight, Nora thought that maybe they use dark and light colors to decide where to go. They might choose to move towards darker colors and away from lighter colors to prevent ending up above ground where predators can easily find them.



Woodlice, small terrestrial crustaceans.

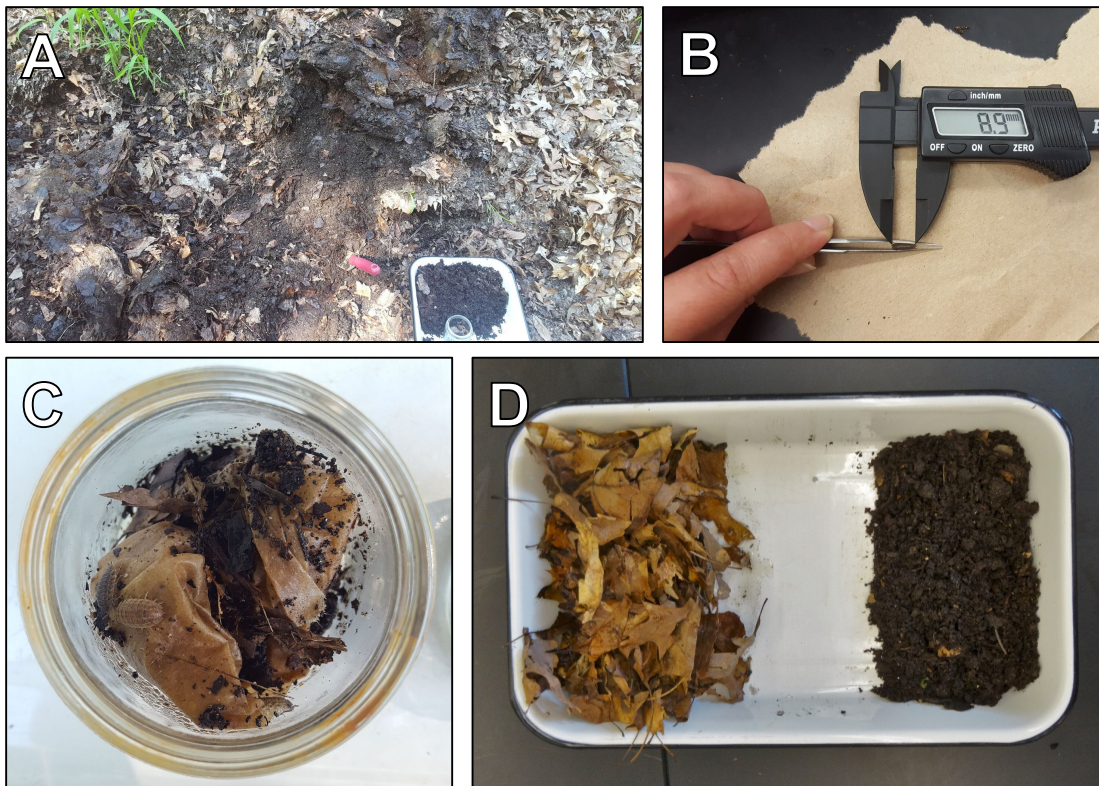
Nora, along with classmates in her ecology class at Michigan State University, decided to run an experiment to study woodlice behavior. She collected 10 woodlice from her compost pile and placed them in a jar. She brought the jar into the lab. Then she chose a set of trays to work with from what she had in the lab – white, with tall sides. The sides of the tray were tall and smooth so the woodlice were not able to climb out. On one end of the tray Nora put some dark soil, and on the other side she put lighter leaves. If her hypothesis was correct, Nora predicted that woodlice would more often choose to move towards the dark soil habitat, compared to the lighter leaves habitat.

For each trial, Nora gently picked up a single woodlouse with forceps. She then placed it in the center of the tray. All the woodlice were positioned so they started facing the top of the tray, not at either habitat type. The woodlice then chose to move towards one end of the tray or the other. When they reached one of the piles the students recorded which habitat they chose. It was then picked up with forceps. Nora and her classmates recorded its length and placed it in a new jar so it could be released back into the compost pile once the experiment was done.

Name _____

After running this experiment and looking at the data, Nora realized it did not work. The small sample size of only 10 individuals was not enough to see a pattern. Also, she realized that after one woodlouse went a certain way, all the others would follow it, maybe because they were following a scent trail. She decided she had to do the experiment again, this time with more woodlice and in a way that would prevent them following each other's scent trails.

For her second try, Nora increased her sample size and collected 51 woodlice from a different compost pile. Just like the first experiment, Nora placed lighter leaves on one end of a white tray and dark soil on the other. All the methods were the same, except for a few important changes. To get rid of scent trails, this time Nora wiped down the middle of the tray with a clean wet paper towel between trials. She also realized that she had forgotten to control for humidity on both sides of the tray, so she added equal amounts of water to both habitats to control for humidity. This ensured that if woodlice did show a preference for either habitat it would be due to habitat color, not humidity. Nora also used a stopwatch and recorded how long it took for an individual to choose one of the two habitats.



A. Nora collecting woodlice from the compost pile for her experiment, B. Nora measuring a woodlouse with calipers, C. Woodlice in a jar with a moist paper towel for humidity, D. The white tray with light leaves and dark soil habitats.

Name _____

Scientific Question: Do woodlice have a preference for the dark soil or the light leaves, or neither?

What is the hypothesis? Find the hypothesis in the Research Background and underline it. A hypothesis is a proposed explanation for an observation, which can then be tested with experimentation or other types of studies.

Scientific Data:

Use the data from Nora's second experiment to answer the scientific question:

Table 1: Individual number, time it took to choose (seconds), individual length (millimeters), and habitat choice (dark soil, light leaves).

#	Time (s)	Length (mm)	Habitat Choice
1	10.06	12.6	Soil
2	19.16	9.3	Soil
3	9.19	8.2	Soil
4	3.91	10.4	Leaves
5	1.53	12.5	Soil
6	19.47	10.8	Soil
7	7.9	6.7	Leaves
8	12.85	9.9	Leaves
9	15.19	7.7	Leaves
10	2.44	10	Soil
11	2.56	7.4	Soil
12	2	7.7	Soil
13	3.09	9	Soil
14	4.44	13	Soil
15	9.81	9.2	Soil
16	2.69	9.1	Soil
17	4.5	7.2	Leaves
18	4.81	12.1	Leaves
19	4.37	9.3	Leaves
20	33.91	7.3	Leaves
21	35.22	9	Soil
22	17.12	6.3	Leaves
23	27.63	7.6	Leaves
24	2.07	8.1	Leaves
25	27.09	6.5	Leaves
26	5.81	11	Soil

#	Time (s)	Length (mm)	Habitat Choice
27	47.25	8.7	Leaves
28	11.97	8.8	Leaves
29	4.06	8.1	Leaves
30	9.72	10.9	Leaves
31	7.09	7.3	Soil
32	3.84	8.9	Leaves
33	4	7.1	Leaves
34	6.78	11.3	Leaves
35	2.75	8.8	Soil
36	15.03	6.1	Soil
37	2.28	5.3	Soil
38	1.28	8.5	Leaves
39	6.87	8.1	Leaves
40	4.29	6.5	Leaves
41	8.78	7.6	Leaves
42	3	8.1	Soil
43	8.22	6.7	Leaves
44	2.09	8.1	Soil
45	6.44	10.3	Soil
46	4.63	12.4	Soil
47	4.87	7.5	Leaves
48	3.16	10.6	Leaves
49	7.54	8.9	Soil
50	1.41	11.5	Leaves
51	4.1	8.9	Leaves

Number of individuals that chose soil	
Number of individuals that chose leaves	

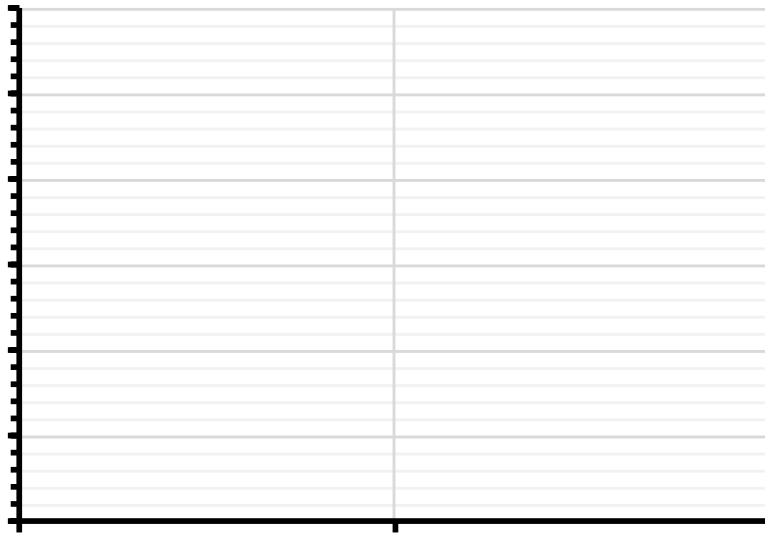
Name _____

What data will you graph to answer the question?

Independent variable: _____

Dependent variable: _____

Draw your graph below: Identify any changes, trends, or differences you see in your graph. Draw arrows pointing out what you see, and write one sentence describing what you see next to each arrow.



Interpret the data:

Make a claim that answers the scientific question.

Name _____

What evidence was used to write your claim? Reference specific parts of the table or graph.

Explain your reasoning and why the evidence supports your claim. Connect the data back to what you learned about woodlice and their poor eyesight.

Did the data support Nora's hypothesis? Use evidence to explain why or why not. If you feel the data were inconclusive, explain why.

Your next steps as a scientist: Science is an ongoing process. What new question(s) should be investigated to build on Nora's research? What future data should be collected to answer your question(s)?

Assignment #4: Math Review (Assessment Grade)

Show all of your work and CIRCLE your final answer. A formula sheet can be found at the end of the packet.

1. Initial mass of pumpkin cores was measured in grams. What is the **average** initial mass for the pumpkin cores? 29.15, 28.45, 30.92, 29.25, 32.09, 31.67.
Round to nearest hundredths.
2. **Hardy Weinberg**: If 250 people out of a population of 1,000 are born with sickle-cell anemia, **how many** people in the population will be more resistant to malaria because they are heterozygous for the sickle-cell gene?

3. **Surface Area/Volume**: Four blocks of phenolphthalein agar are placed in a vinegar solution. Solution changes to pink when in contact with an acidic solution. Calculate the SURFACE AREA and VOLUME of the following blocks of agar.

Block A: 2 cm x 4 cm x 4 cm

Block B: 2 cm x 8 cm x 4 cm

Block C: 1 cm x 8 cm x 8 cm

Block D: 1 cm x 1 cm x 64 cm

4. **-iCRT**: The molar concentration of a sugar solution in an open beaker has been determined to be 0.3M. Calculate the solute potential at 27 degrees celsius. Round your answer to the nearest tenths.
5. **Rate**: Hydrogen peroxide is broken down to water and oxygen by the enzyme catalase. The following data were taken over 5 minutes. What is the **rate** of enzymatic reaction in mL/min from 2 to 4 minutes? Round to the nearest hundreds.

Time (mins)	Amount of O ₂ produced (mL)
1	2.3
2	3.6
3	4.2
4	5.5
5	5.9

Appendix A

AP BIOLOGY EQUATIONS AND FORMULAS

STATISTICAL ANALYSIS AND PROBABILITY								
Standard Error			Mean					
$SE_{\bar{x}} = \frac{s}{\sqrt{n}}$			$\bar{x} = \frac{1}{n} \sum_{i=1}^n x_i$					
Standard Deviation			Chi-Square					
$s = \sqrt{\frac{\sum (x_i - \bar{x})^2}{n - 1}}$			$\chi^2 = \sum \frac{(o - e)^2}{e}$					
CHI-SQUARE TABLE								
Degrees of Freedom								
p	1	2	3	4	5	6	7	8
0.05	3.84	5.99	7.82	9.49	11.07	12.59	14.07	15.51
0.01	6.64	9.32	11.34	13.28	15.09	16.81	18.48	20.09
LAWS OF PROBABILITY					METRIC PREFIXES			
If A and B are mutually exclusive, then $P(A \text{ or } B) = P(A) + P(B)$					Factor			
If A and B are independent, then $P(A \text{ and } B) = P(A) \times P(B)$					Prefix			
HARDY-WEINBERG EQUATIONS					Symbol			
$p^2 + 2pq + q^2 = 1$		p = frequency of the dominant allele in a population			10^9			
$p + q = 1$		q = frequency of the recessive allele in a population			10^6			
					10^3			
					10^{-2}			
					10^{-3}			
					10^{-6}			
					10^{-9}			
					10^{-12}			
Mode = value that occurs most frequently in a data set								
Median = middle value that separates the greater and lesser halves of a data set								
Mean = sum of all data points divided by number of data points								
Range = value obtained by subtracting the smallest observation (sample minimum) from the greatest (sample maximum)								

s = sample standard deviation (i.e., the sample based estimate of the standard deviation of the population)

\bar{x} = mean

n = size of the sample

o = observed individuals with observed genotype

e = expected individuals with observed genotype

Degrees of freedom equals the number of distinct possible outcomes minus one.

RATE AND GROWTH		Water Potential (Ψ)
Rate dY/dt Population Growth $dN/dt=B-D$ Exponential Growth $\frac{dN}{dt} = r_{\max} N$ Logistic Growth $\frac{dN}{dt} = r_{\max} N \left(\frac{K-N}{K} \right)$	dY = amount of change t = time B = birth rate D = death rate N = population size K = carrying capacity r_{\max} = maximum per capita growth rate of population	$\Psi = \Psi_p + \Psi_s$ Ψ_p = pressure potential Ψ_s = solute potential The water potential will be equal to the solute potential of a solution in an open container, since the pressure potential of the solution in an open container is zero. The Solute Potential of the Solution $\Psi_s = -iCRT$ i = ionization constant (For sucrose this is 1.0 because sucrose does not ionize in water.) C = molar concentration R = pressure constant ($R = 0.0831$ liter bars/mole K) T = temperature in Kelvin ($273 + ^\circ\text{C}$)
Temperature Coefficient Q_{10} $Q_{10} = \left(\frac{k_2}{k_1} \right)^{\frac{10}{t_2-t_1}}$ Primary Productivity Calculation $\text{mg O}_2/\text{L} \times 0.698 = \text{mL O}_2/\text{L}$ $\text{mL O}_2/\text{L} \times 0.536 = \text{mg carbon fixed/L}$	t_2 = higher temperature t_1 = lower temperature k_2 = metabolic rate at t_2 k_1 = metabolic rate at t_1 Q_{10} = the <i>factor</i> by which the reaction rate increases when the temperature is raised by ten degrees	
SURFACE AREA AND VOLUME		Dilution – used to create a dilute solution from a concentrated stock solution
Volume of a Sphere $V = 4/3 \pi r^3$ Volume of a Cube (or Square Column) $V = l w h$ Volume of a Column $V = \pi r^2 h$ Surface Area of a Sphere $A = 4 \pi r^2$ Surface Area of a Cube $A = 6 a$ Surface Area of a Rectangular Solid $A = \Sigma$ (surface area of each side)	r = radius l = length h = height w = width A = surface area V = volume Σ = Sum of all a = surface area of one side of the cube	$C_i V_i = C_f V_f$ i = initial (starting) C = concentration of solute f = final (desired) V = volume of solution Gibbs Free Energy $\Delta G = \Delta H - T\Delta S$ ΔG = change in Gibbs free energy ΔS = change in entropy ΔH = change in enthalpy T = absolute temperature (in Kelvin)
		pH = $-\log [H^+]$