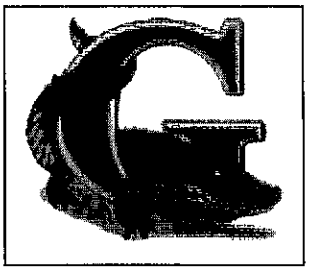


Palm Beach Gardens Community High School
Advanced Placement Biology
Summer Assignment
Mrs. Murphy Room 3321

AP Biology Student,
Advanced Placement Biology is a course designed to be the equivalent of a college introductory course usually taken by biology majors during their first year. The college course in biology differs significantly from the usual first high school course in biology with respect to the kind of textbook used, the range and depth of topics covered, the kind of laboratory work done by the students, and the time and effort required of students.

The textbook we will be using is:
Title: **Biology** 8th edition
Authors: Neil Campbell and Jane Reece
Some students go online and order a used copy so that as they read, they can highlight the text. Feel free to do this if you so desire. We will be getting the 8th edition of this book the first week of school.

It is required that the students purchase the following AP Review Book:
Title:

Barron's AP Biology, 6th Edition

(College Test Preparation) [Paperback]

I will be using sections for review from this book. Students must have this book for use during the second week of School.

Because the exam is in mid-May I require that my students complete summerassignments prior to the start of school. This is necessary to ensure that all topics in biology are covered in order to fully prepare you for the AP exam. The following should be **completed before the first day of school.** These are to be turned in on the first day of school. Students that do not complete the summer assignments will receive a grade of **"0"** and their grade will duly suffer. An exam on this material will occur on or about the fourth class that you attend.

- ***Fill out information form and return to Mrs Murphy Room 3321*** ***before Friday May 25, 2018***
- ***Join Remind*** ***before Friday May 25, 2018***
- ***Join Google Classroom*** ***before Friday May 25, 2018***
- ***Watch the Bozeman Videos on Google Classroom AP Biology 2018-2019***
- ***Complete Vocabulary Cards***
- ***Graphing Packet.*** You must answer every question and draw every graph requested. Making and interpreting graphs is an important part of biology. Every AP exam has a few questions about graphs. The AP Exam has also frequently had students make and interpret a graph on an essay question. This is a basic skill that you need to do well in any AP science class.
- Extra Credit Opportunity: Read The Immortal Life of Henrietta Lacks/ I have copies for $5/ Oral Test Second Week of School.

It is my goal that the AP Biology course offered to students at Palm Beach Gardens High School provides students with the conceptual framework, factual knowledge, and analytical skills necessary to deal critically with the rapidly changing science of biology. I am confident that AP Biology can help you greatly as you continue to develop the academic skills necessary to succeed in college, while providing you with a realistic notion of what college may be like. I look forward to seeing you in August. Please contact me at Patricia.Murphy@palmbeachschools.org with any questions or concerns. Have a Great Summer and DON'T PROCRASTINATE!

Sincerely,
Patricia Murphy
AP Biology Instructor

Advanced Placement Biology
Palm Beach Gardens High School
Mrs. Murphy
2018-2019

Please print the information requested below and turn in by May 23rd to Mrs. Murphy in Room 3-321: Thank You ☺

Name _____

Grade _____**2018-2019**

Parent/Guardian Contact Phone # _____

Address_____

_____

Parent/Guardian E-mail _____

Student E-mail _____

Please e-mail me as a way to introduce yourself so I will be able to add you to my AP e-mail list. My e-mail address is patricia.murphy@palmbeachschools.org. Thank You ☺

By signing this paper I acknowledge that I have a summer assignment due on the FIRST day back from vacation. I understand that there will be NO EXCEPTIONS made and no late work will be accepted. I further understand that I will have a test on the book The Immortal Life of Henrietta Lacks on the third day of class.

Student's Name (Print) _____ **Date** _____

Signature _____

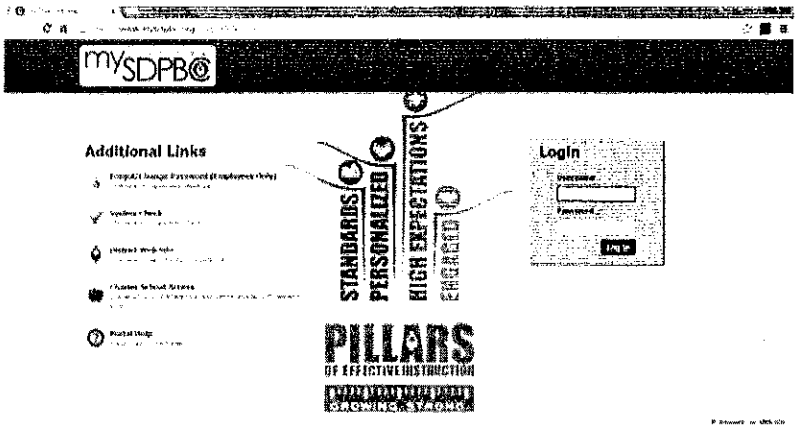
Parent's Name (Print)_____

Signature_____

Name _____ Date _____ Period ____

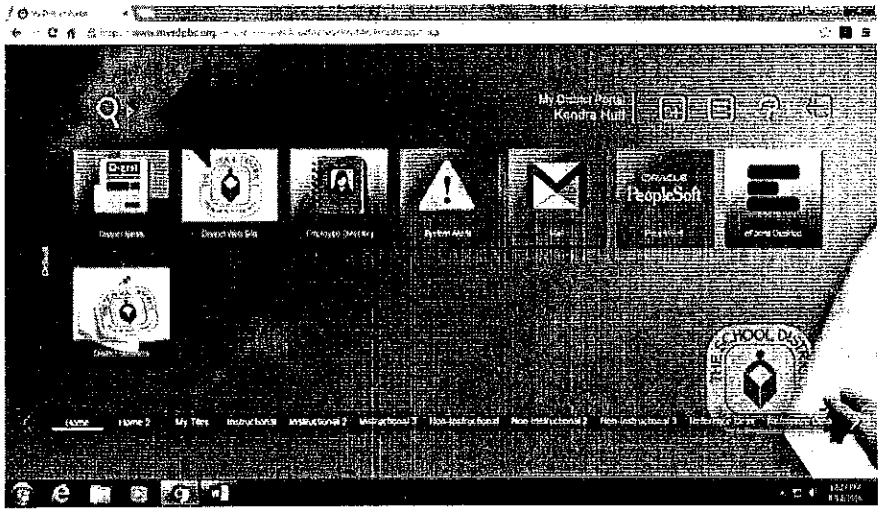
Google Classroom Instructions for STUDENTS:

1. On ANY computer or device that has internet access, go to mysdpbc.org.

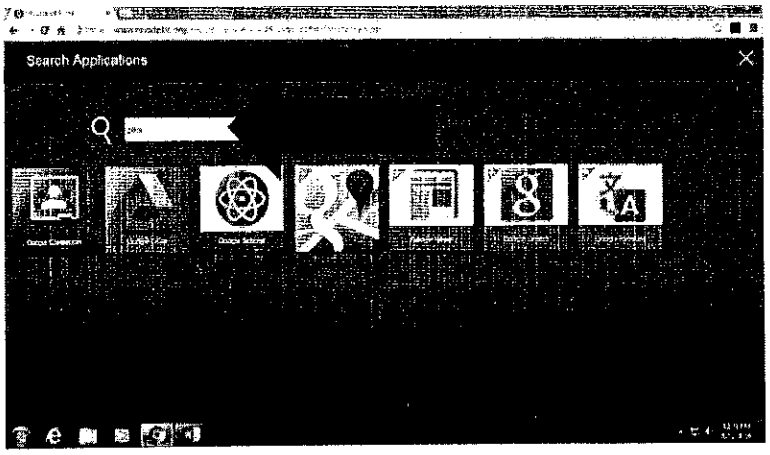


2. Using your NORMAL DISTRICT log in credentials that you normally use at school, fill in log in blanks and click LOG IN.

3. You should reach a screen that somewhat resembles this:



4. If you have not used google classroom in a while or at all, you will have to search for the correct tile. Click the magnifying lens and type GOOGLE.

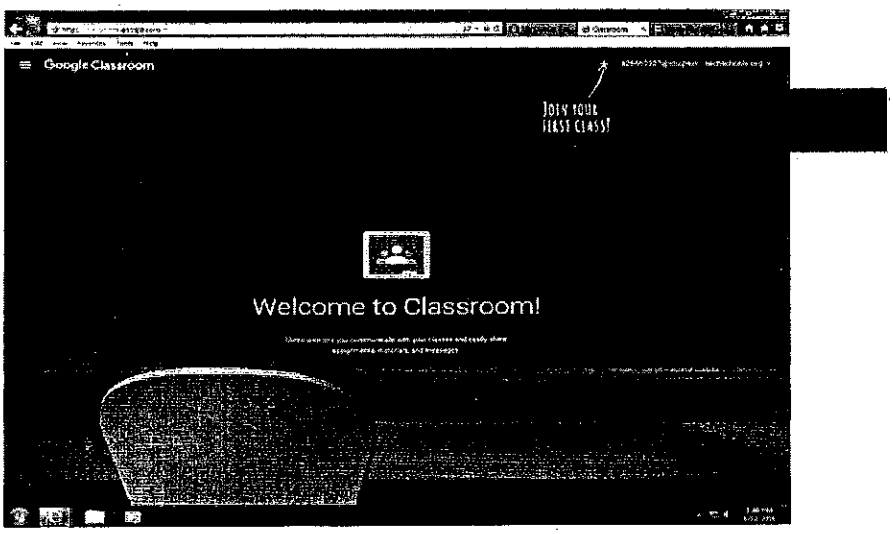


5. The Google Classroom tile will appear! Click on it.

6. It will prompt you with "Get started using Google Classroom. I am..." Select STUDENT.

7. Click on JOIN A CLASS.

(At this stage you might have to hit I AGREE to terms and conditions to proceed)

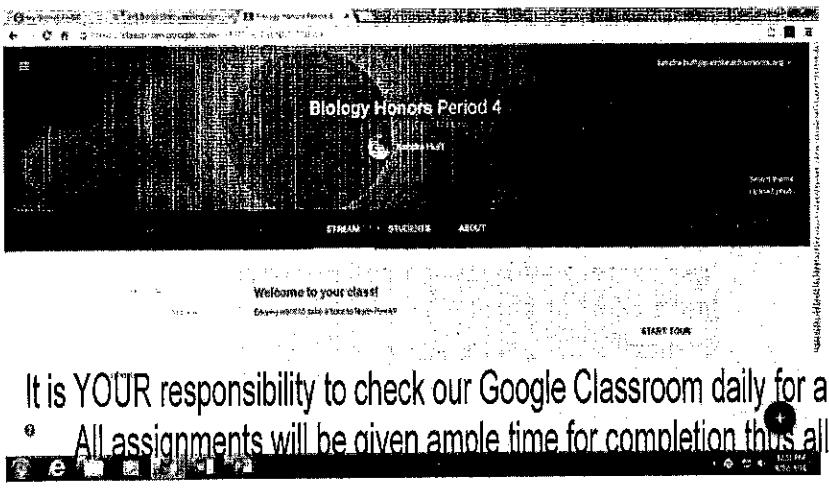


7. Use the code given by your teacher for YOUR class:

AP Biology Summer Group 2018-2019 = **olr1hvb**

There will be tutorials available as you navigate GC, you can choose to utilize them or skip.

When complete it should look something like this:



It is YOUR responsibility to check our Google Classroom daily for assignments, announcements and extra credit.

- All assignments will be given ample time for completion thus all work is due by date and time specified!!!

remind

Sign up for important updates from Mrs. Murphy.

Get information for **Palm Beach Gardens High School** right on your phone—not on handouts.

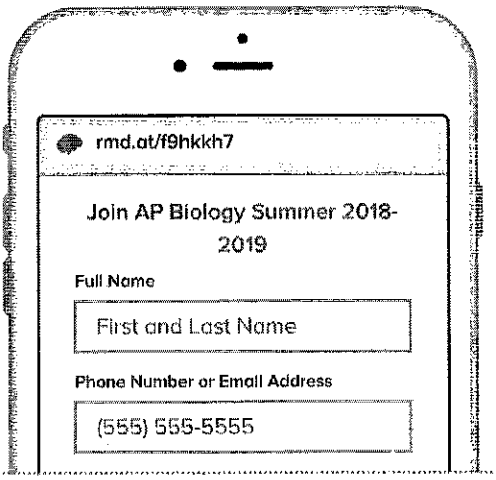
Pick a way to receive messages for **AP Biology Summer 2018-2019**:

A **If you have a smartphone, get push notifications.**

On your IPhone or Android phone, open your web browser and go to the following link:

rmd.at/f9hkkh7

Follow the instructions to sign up for Remind. You'll be prompted to download the mobile app.



B **If you don't have a smartphone, get text notifications.**

Text the message **@f9hkkh7** to the number **81010**.

If you're having trouble with **81010**, try texting **@f9hkkh7** to **(561) 666-4972**.

** Standard text message rates apply.*

Don't have a mobile phone? Go to rmd.at/f9hkkh7 on a desktop computer to sign up for email notifications.

Assignment #1 – Video Notes – due 1st day of AP Biology

Watch the videos listed below and take ***hand-written*** notes on each of them. The note should be your ***original work.*** EACH note sheet will be scored 0 to 5 based on completeness and thoroughness as shown in the rubric below. Note pages **will not** be accepted late nor will they be accepted typed.

#	Video Content	Links
1	The Natural of Science	https://youtu.be/77TFiYWPxoQ
2	The Scientific Method	https://youtu.be/SMGRe824kak
3	CER (Claim- Evidence-Reasoning)	https://youtu.be/5KKsLuRPsvU
4	AP Biology Science Practice 1 Model and Representations	https://youtu.be/v5Nemz_cVew
5	AP Biology Science Practice 2 Using Mathematics Appropriately	https://youtu.be/jgqYlSKoXak
6	AP Biology Science Practice 3 Formulate Questions	https://youtu.be/2zB272Ak63A
7	AP Biology Science Practice 4 Data Collection Strategies	https://youtu.be/AzTXnne40wU
8	AP Biology Science Practice 5 Analyze Data and Evaluate Evidence	https://youtu.be/0JqukouOtZA
9	AP Biology Science Practice 6 Scientific Explanations and Theories	https://youtu.be/3gK1xWNM7kk
10	AP Biology Science Practice 7 Connecting Knowledge	https://youtu.be/7l4bcs49JP8

0 **No Credit**	**2** **Below expectations**	**3-4** **Complete**	**5** **Exceeds expectations**
No notes OR copied from a peer.	Several criteria are missing from entry	All criteria are met, but there's room for improvement within criteria OR one criterion is missing from entry.	All criteria listed below are met or have been exceeded for each entry.

What does work that "exceeds expectations" have?

- ✓ Each video's notes are on a different page.
- ✓ The video's title is written as it appears in the video on the top line of the paper.
- ✓ The notes are legibly written.
- ✓ Highlighting or colors are used to emphasize key points, new vocabulary, and/or important concepts.
- ✓ Examples are documented in some way when given in the video.
- ✓ Pictures, charts, or graphs are used to display details provided in the video.
- ✓ A summary of the video content is provided at the end of the notes. Please emphasize the summary in some way (title it, star it, highlight it, etc.)

Notes are to be *original work* and are not to be copied from a peer – these serve as a log of what you have learned from the video. Copying them from a peer and not watching the video does you no good. You will receive zero credit if you are found submitting work that is too closely aligned with a classmate's work.

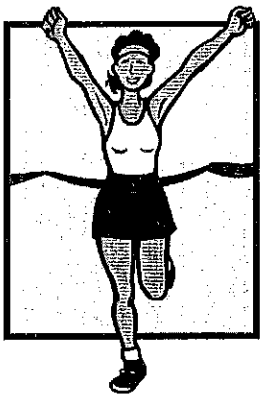
ASSIGNMENT #2 – AP BIOLOGY VOCABULARY

AP Vocabulary Instructions

1. Purchase 3x5 ruled index cards.
2. On the unlined side of the card, write the vocabulary word and a drawing that will help you remember the word. Drawing MUST be in color and quality will count.
3. On the ruled side, Write the definition(s) of the word.
4. Write a sentence in which you use the word.
5. Turn in your cards on the date due, fastened together with a rubber band.
6. **MUST BE HANDWRITTEN!** Why? I want you to learn the words, not copy and paste, print, and slap them on an index card.
7. Number each word in the upper right hand corner. Put Your Name on the front of the First and the Back of the Last Cards.

#1

indomitable



Definition: Incapable of being subdued or overcome, unconquerable.

Sentence: Mrs. Huff's indomitable spirit helped her survive teaching middle school.

Advanced Placement Biology Vocabulary

Big Idea 2: Biological systems utilize free energy and molecular building blocks to grow, to reproduce and to maintain dynamic homeostasis.

Enduring understanding 2.A: Growth, reproduction and maintenance of the organization of living systems require free energy and matter.

Essential knowledge 2.A.1: All living systems require constant input of free energy.

Subobjective 2.1: I can explain how biological systems use free energy based on empirical data that all organisms require constant energy input to maintain organization, to grow and to reproduce.

1) Energy
   The ability to make a change
2) Kinetic energy
   Energy of motion
3) Heat
   Measure of the movement of energy from one place to another
4) Potential energy
   Stored energy due to location or position
5) Chemical energy
   Potential energy associated with the covalent bonds that hold atoms and molecules together
6) Matter
   Anything with mass and volume
7) Element
   A substance that cannot be broken down chemically into another substance
8) Compound
   A substance made of two or more different elements
9) Emergent property
   Properties of a system that arise due to complexity and cannot be attributed to the properties of the parts of the system (one of the unifying themes in biology)
10) Atom
    The smallest unit of an element. Composed of a dense nucleus orbited by electrons
11) Neutron
    A subatomic particle that is a component of the nucleus. It has no charge and a change in the number of them changes the isotope of the atom
12) Proton
    A subatomic particle that is a component of the nucleus. It has a +1 charge and the number of them determines the type of atom
13) Electron
    A subatomic particle that has a -1 charge. They are involved in bonding.
14) Valence electrons
    Electrons in the outermost energy level (they are involved in bonding and therefore determine the chemistry of an atom)

15) Covalent bond
Sharing one or more pairs of electrons
16) Molecule
2 or more atoms covalently bonded together
17) Compound
2 or more different molecules bonded together
18) Electronegativity
How good an atom or molecule is at attracting electrons
19) Nonpolar covalent bond
A covalent bond where the electron pair is shared equally
20) Polar covalent bond
A covalent bond where the electron pair is shared unequally
21) Ionic compound
A combination of 2 different kinds of ions in a fixed ratio
22) Ion
A charged atom or compound
23) Hydrogen bond
An intermolecular force that holds two molecules together. It results from unequal electron sharing between a hydrogen atom and another atom it is covalently bonded to
24) Van der Waals forces
Weak interactions between atoms due to the constant movement of electrons causing brief moments of positive and negative charges around the atom
25) Chemical reaction
Making and breaking bonds resulting in a rearrangement of atoms and molecules
26) Law of conservation of matter
Matter cannot be created nor destroyed UNDER NORMAL CONDITIONS
27) Thermodynamics
The study of energy transfers
28) First law of thermodynamics
Energy cannot be created nor destroyed. It only changes "forms"
29) Second law of thermodynamics
Disorder (entropy) increases in a closed system
30) Free energy
The portion of a system's energy that can perform work when temperature and pressure are uniform
31) Enthalpy
Total energy of a system
32) Chemical equilibrium
When forward and backward reactions occur at the same rate
33) Exergonic reaction
A reaction where the free energy is lost (ΔG is negative)
34) Endergonic reaction
A reaction were the free energy is gained (ΔG is positive)
35) Energy coupling
Use of an exergonic pathway to drive an endergonic pathway utilizing ATP as an intermediate

36) Hydrolysis
A chemical reaction that consumes one water molecule and breaks up one molecule into two releasing energy
37) ATP
Adenosine triphosphate. It is the energy currency of all life on the planet
38) Phosphorylated intermediate
A molecule that is phosphorylated, which couples an exergonic and endergonic reaction

Subobjective 2.2: I can defend a scientific claim that free energy is required for living systems to maintain organization, to grow, or to reproduce, but that multiple strategies for obtaining and using energy exist in different living systems.

39) Metabolism
All of the chemical reactions that sustain an organism
40) Catabolism
Breaking down complex molecules into smaller ones releasing energy
41) Anabolism
Building up complex molecules from smaller ones consuming energy
42) Metabolic rate
The amount of energy an organism uses per unit of time
43) Homeostasis
Maintenance of conditions within a narrow range
44) Endothermic
An organism that maintains a relatively constant internal body temperature mostly by generating heat from metabolism
45) Ectothermic
An organism that mainly heats its internal environment with external sources

Subobjective 2.3: I can predict how changes in free energy availability affect organisms, populations, and/or ecosystems.

46) Producer
Organisms that make their own carbon compounds (organic compounds) by photosynthesis or chemosynthesis
47) Chemosynthesis
Making carbon compounds using energy from the bonds holding inorganic molecules together (examples are hydrogen gas (H_2) and hydrogen sulfide (H_2S)
48) Autotroph
An organism that makes its own organic molecules by photosynthesis or chemosynthesis (all autotrophs are producers)
49) Heterotroph
An organism that gets its organic molecules from other organisms (all heterotrophs are consumers)
50) Trophic level
Feeding level (where on a food chain you get your organic molecules)

Essential knowledge 2.A.2: Organisms capture and store free energy for use in biological processes.

Subobjective 2.4: I can use representations to pose scientific questions about what mechanisms and structural features allow organisms to capture, store and use free energy.

51) Photoautotroph
    An organism that makes its own food (organic compounds) using free energy from the Sun
52) Light
    Electromagnetic radiation that we can see
53) Electromagnetic spectrum
    The range of light radiation
54) Photon
    The quantum unit or particle of electromagnetic radiation
55) Protein
    A sequence of amino acids that fold up taking on a shape that determines their function
56) Pigment
    A protein that absorbs certain wavelengths of light
57) Spectrophotometer
    A device that directs photons of light of various wavelengths through a solution and measures the amount of radiation that is transmitted
58) Chlorophyll *a*
    The main pigment used by most photosynthesizing organisms to trap free energy from the Sun
59) Chemoautotroph
    An organism that uses the free energy in the bonds holding inorganic molecules together to make its food (synthesize organic compounds)
60) Polymer
    A molecule made of similar or identical molecules (monomers) covalently bonded together
61) Dehydration reaction
    A type of condensation reaction that binds monomers together resulting in the release of one water molecule
62) Carbohydrate
    One or more saccharide (sugar) molecules covalently bonded together. They have many functions including being a source for free energy storage.
63) Disaccharide
    A carbohydrate composed of 2 monosaccharides
64) Polysaccharide
    A carbohydrate composed of many monosaccharides
65) Lipid
    A macromolecule that is not a polymer. They have many functions, including insulation, protection, and storage of free energy
66) Enzyme
    A protein catalyst. It speeds up reactions and doesn't get used up in the reaction.
67) Active site
    The substrate binding region of the enzyme
68) Oxidative – reduction reaction (redox)
    A reaction where one species gains electrons therefore becoming reduced by taking electrons from another species, which is oxidized

69) Reducing agent
A substance that donates electrons (it becomes oxidized)
70) Oxidizing agent
A substance that receives electrons (it becomes reduced)
71) Cellular respiration
$C_6H_{12}O_6 + 6O_2 \rightarrow 6CO_2 + 6H_2O$ + Energy (ATP + heat)
72) NAD^+
The electron shuttle used in cellular respiration

Subobjective 2.5: I can construct explanations of the mechanisms and structural features of cells that allow organisms to capture, store or use free energy.

73) Substrate-level phosphorylation
ATP synthesis mediated by enzymes that transfer a phosphate group from a molecule (substrate) to ADP
74) Glycolysis
The near universal metabolic pathway that oxidizes glucose into 2 3-carbon molecules. The negative free energy change is used to make 2 ATP molecules and 2 NADH molecules
75) Alcohol fermentation
NAD+ is regenerated by reducing pyruvate to ethanol
76) Lactic acid fermentation
NAD+ is regenerated by reducing pyruvate to lactate
77) Anaerobic
Not with oxygen
78) Aerobic
With oxygen
79) Mitochondria
Organelles (small cellular structures) that produce the majority of the ATP used by the cell
80) Endosymbiont theory
Some cellular structures such as mitochondria and chloroplasts evolved from symbiotic relationships between proto-eukaryotic and prokaryotic cells
81) Prokaryote
A single-celled organism composed of two domains (Archaea and Bacteria). They typically have a cell wall, no membrane bound organelles and a single "circular" chromosome
82) Eukaryote
An organism composed of one or more cells with membrane bound organelles, a true nucleus, and multiple linear chromosomes
83) Oxidative phosphorylation
ATP synthesis driven by the redox reactions of the electron transport chain. Inorganic phosphate is added to ADP by ATP synthase.
84) ATP synthase
The enzyme complex that utilizes a proton gradient to drive the endergonic synthesis of ATP from ADP and inorganic phosphate
85) Kreb's cycle (also called the citric acid cycle)
The complete oxidation of acetyl CoA into CO2 forming 1 ATP, 3 NADPH, and 1 FADH2 per acetyl CoA molecule
86) Electron transport chain
A series of protein complexes that use the free energy in the electrons of NADH and FADH2 to create a proton (hydrogen ion) gradient across a membrane

87) Chemiosmosis
Energy stored in the form of a hydrogen ion H+ gradient across a membrane is utilized to generate ATP

88) Proton-motive force
The capacity of the H+ gradient to do work (generate ATP) established by the electron transport chain

89) Noncompetitive inhibition
When a molecule binds allosterically (away from the active site) of an enzyme causing a shape change in the active site that prevents the substrate from binding and therefore inhibits the functioning of the enzyme

90) Feedback inhibition
A metabolic pathway that is switched off by the inhibitory binding of its end product to an enzyme that acts early in the pathway

91) Anaerobic respiration
The complete breakdown of organic molecules for energy using a final electron acceptor other than oxygen

92) Chloroplasts
Organelles within plant cells and some protists where photosynthesis occurs

93) Protist
A polyphyletic grouping of eukaryotic organisms that is typically unicellular, but may be multicellular without tissues. There are plantlike, animal-like, and fungus-like groups

94) Stomata (singular is stomate)
Openings in a leaf that allow for gas exchange

95) Stroma
The fluid interior of the inner membrane of the chloroplast (analogous to the cytosol)

96) Thylakoids
Stacked sacs within the stroma that contain photosystems II and I within their membranes

97) Absorption spectrum
The percentage absorption of various wavelengths of light by something

98) Photosynthesis
$6CO_2 + 12H_2O \rightarrow C_6H_{12}O_6 + 6CO_2 + 6H_2O$

99) Isotope
An alternative form of an element with a different mass number because it has more or less neutrons. Isotopes typically have identical chemical behavior

100) Carotenoids
Orangish pigments found in plant cells that protect chlorophyll *a* from harmful radiation and increase the range of light absorption

101) Photosystem II
A series of light dependent reactions that produce a proton gradient in the thylakoid lumen (space)

102) $NADP^+$
The electron shuttle for the Calvin cycle in photosynthesis

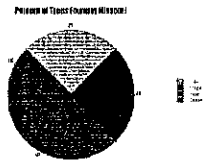
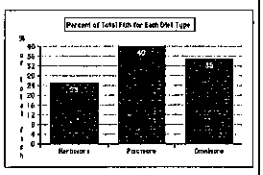
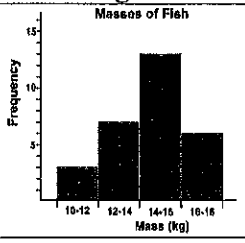
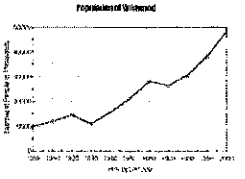
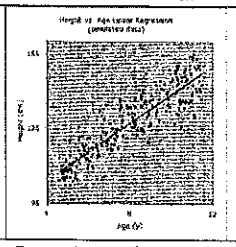
103) Photosystem I
A series of light dependent reactions that reduce $NADP^+$ to NADPH

104) Calvin cycle
A series of reactions that fix CO_2 and produce G3P (glyceraldehyde-3-phosphate), which is used to make glucose and other carbon compounds in photosynthesizing organisms.

Name: _____ Date: _____ Period: _____

RETEACHING: Graphing Skill #1: What Type of Graph is it?

There are several types of graphs that scientists often use to display data. They include:

Pie Graphs	Bar Graphs	Histograms	Line Graphs	Scatter Plots
				
• Dependent variable is NOT continuous • Usually presents data as a "part of a whole" or as percentages	• Dependent variable is NOT continuous • There is no order to the categories on the X-axis • Bars typically don't touch • Y-axis is usually a percentage or a frequency (count)	• A specific type of bar graph • Dependent variable must have a natural order that can be grouped into defined "chunks" • Bars must always touch • Y-axis is usually a percentage or a frequency (count)	• Dependent variable IS continuous • Points are plotted using x- and y-components • The points are connected because the observations are NOT independent (the next value depends on the previous value)	• Dependent variable IS continuous • Points are plotted using x- and y-components • The points are NOT connected because the observations are independent (the next value does NOT depend on the previous value) • Uses a best-fit line or curve to show relationship

Based on these definitions, and the descriptions of the experiments below, please put an "X" in the box for the type of graph that would be *most* appropriate (some descriptions may have several graph types that would be appropriate; you only need to select one).

#	Description	Pie	Bar	Histo.	Line	Scatter
Ex	A graph showing the number of 5th graders who prefer Coke or Pepsi		X			
1	A graph showing how a newborn baby's weight changes over time					
2	A graph showing the percentage of the class earning As, Bs, and Cs.					
3	A graph showing the distribution of trees of different size groups (e.g. 0-10cm, 10-20cm, etc…) in a forest					
4	A graph showing the relationship between height and arm length					
5	A graph showing the percentage of an allowance spent on different categories (e.g. food, movies, etc)					
6	A graph showing the amount of rainfall, by month over a 12 month period					
7	A graph showing the number of ice cream cones purchased as a function of the day's temperature					
8	A graph showing the number of pushups done each day during a 2-week training program					

Name: _____ Date: _____ Period: _____

Graphing Skill #2: Labeling Axes

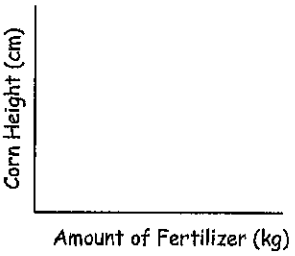
When labeling your axes, keep 3 things in mind:

- The independent (manipulated) variable is written along the horizontal axis (X axis)
- Dependent (responding) variable is written along the vertical axis (Y axis)
- Units on any variables should be included in parentheses ( ) following the axis title

Practice Problems

For each experiment described below, write the independent and dependent variable on the appropriate axis. Be sure to include units when appropriate.

SAMPLE: A farmer wants to know if there is a relationship between the amount of fertilizer (in kilograms) she uses and how tall her corn grows (in centimeters).



Graph 1: A ball is dropped from several distances above the floor (in meters) and the height it bounces is then measured (in centimeters).

Graph 2: A candle was burned under glass jars of different volumes (in mL) to see if the volume of the jar affects the length of time (in seconds) the candle burns.

Graph 3: A fisherman used fishing lines of several different gauges (test pounds) and recorded the number of fish caught on each gauge.

Graph 4: Geologists wanted to know if there was a relationship between the density (in g/cm^3) of a rock and how many meters down it was collected from.

Name: _____ Date: _____ Period: _____

Graph 5: Is there a relationship between the numbers of hours a student studies and the score s/he gets on the weekly quiz?	**Graph 6:** A scientist studied the relationship between amount of rain (in cm) and the numbers of zebra babies born each spring.
Graph 7: Do longer pendulums (measured in cm) have higher frequencies (measured in Hertz)?	**Graph 8:** Does the grade point average that a student earns in college depend on his/her SAT score from high school?
Graph 9: How does the depth of a river (in meters) impact its speed (measured in meters per second)?	**Graph 10:** Sea otters were counted over a several years to see if their numbers were decreasing over time.
Graph 11: Does the length of time an ice cube is in water (in seconds) affect the temperature of the water (in degrees Celsius)?	**Graph 12:** Does the amount of nitrogen in the soil (measured in kilograms) affect corn production (measured in kilograms)?

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Graphing Skill #3: Scaling Axes

There are a few important steps involved in correctly scaling an axis:

- STEP 1: Find the range for the variable
  - Range = Largest Value - Smallest Value
- STEP 2: Divide the range by the number of intervals you want (not too many or too few). We don't want all of the data smooshed in only part of the graph; spread it out.
  - After dividing, we may need to round *up* to get a number that is easy to count by. (It is easier to count by 2s instead of 1.9s)
- STEP 3: Use the rounded number to mark off intervals along the axis.
  - The interval must be the same amount each time (count up by the same number).

STEP 1: What is the range of my data? Find the range of the data for each column below.

EX.

Mass (g)
5
11
14
19
26
30
40

Largest #: 40

Smallest #: 5

Range: 35-5 = 35

A)

Students
100
99
88
70
72
64
55

Largest #: _____

Smallest #: _____

Range: _____

B)

Distance (cm)
3
5
6
7
9
10
12

Largest #: _____

Smallest #: _____

Range: _____

C)

Time (s)
0.22
0.51
0.78
1.01
1.23
1.60
1.74

Largest #: _____

Smallest #: _____

Range: _____

STEP 2: What number do I count by? Assume that our graph has 10 intervals (places to put numbers). If needed, round up to get to a good counting number.

A)

Range = 35

# of intervals = 10

$\frac{\text{Range}}{\text{Intervals}} = \frac{35}{10} = 3.5$

Round to Count = 4

A)

Range = _____

# of intervals = _____

B)

Range = _____

# of intervals = _____

C)

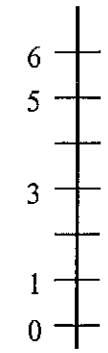
Range = _____

# of intervals = _____

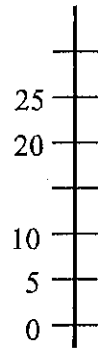
Name: _____ Date: _____ Period: _____

STEP 3: What does my scale look like? Each of the scales for the *dependent* variables has a few missing values on it. Please fill in any missing values.

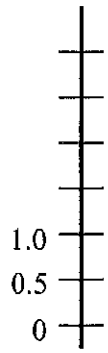
A)



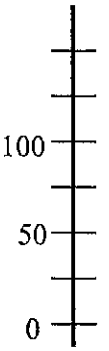
B)



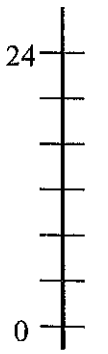
C)



D)



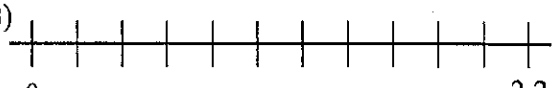
E)



Each of the scales for the *independent* variables has a few missing values on it. Please fill in any missing values.

A)

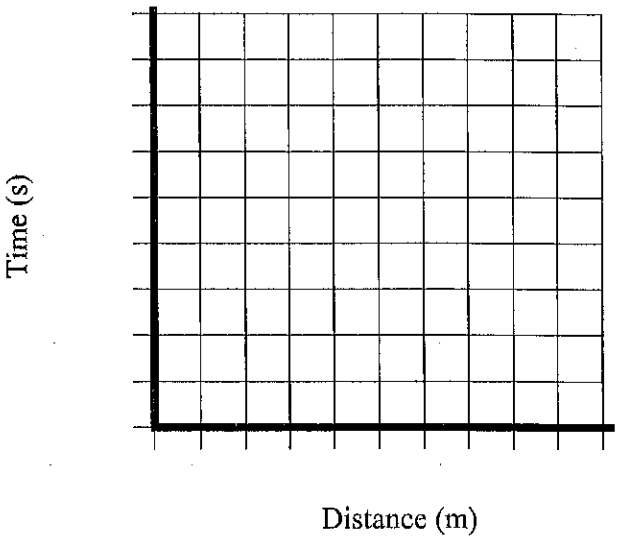
B)



Putting it all together: Please create appropriate scaling for each axis.

Distance (m)	Time (s)
10.3	1.5
20.2	2.9
29.8	4.3
40.4	5.8
49.1	7.0
60.9	8.7
70.2	10.0
80.1	11.4
90.6	12.9

Time vs. Distance



Name: _____ Date: _____ Period: _____

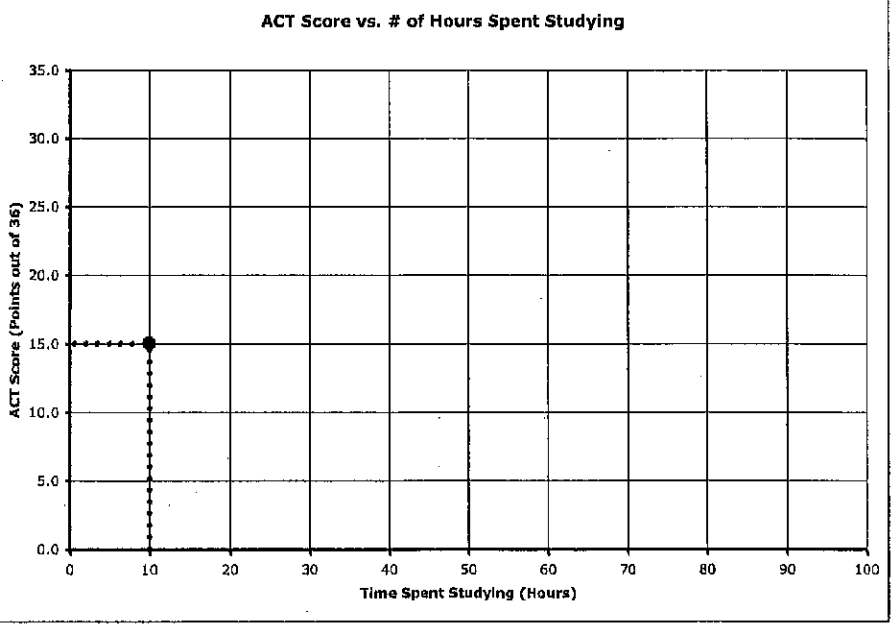
Graphing Skill #4: Plotting Points

Plotting points can be easy if you follow these simple steps…

- STEP 1: Select the first pair of values from the data table (X and Y).
- STEP 2: Draw a light dashed line up from the number on the X axis and over from the number on Y axis.
  - Once you get good at plotting points, you won't need to draw these lines anymore
- STEP 3: Where these dotted lines cross, put a dark point. Repeat for the next pair of points.

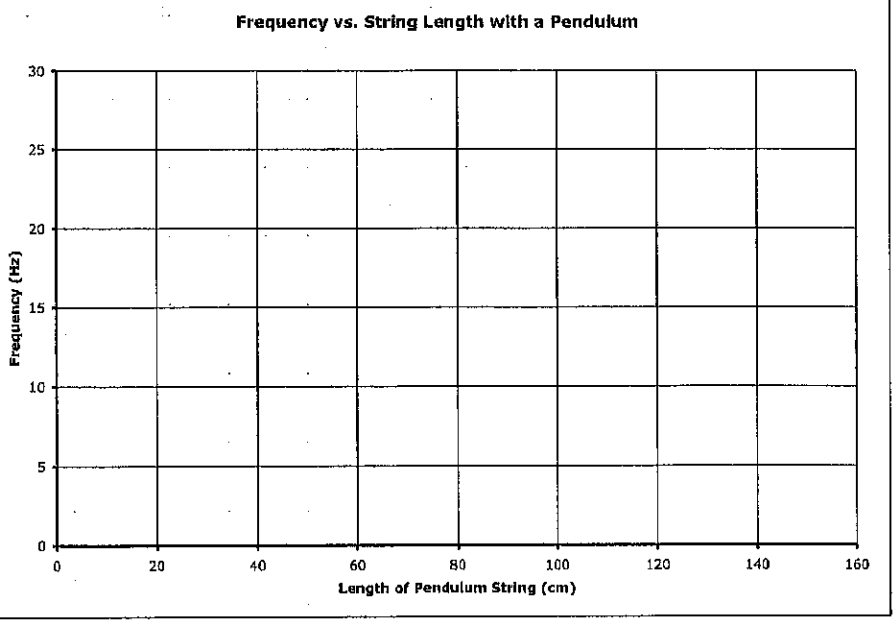
Practice: Please plot these points. The first pair has been plotted for you as an example.

Time Spent Studying (hours)	Score (pts)
10	15.0
20	17.0
30	19.0
40	21.0
50	23.0
60	25.0
70	27.0
80	29.0
90	31.0



More Practice: Please plot these points.

String Length (cm)	Frequency (Hz)
10	25
20	23
30	22
40	21.5
50	20.5
60	20
70	19.5
80	19
90	16
100	15
110	14.5
120	13
130	12.5
140	12
150	11



Name: _____ Date: _____ Period: _____

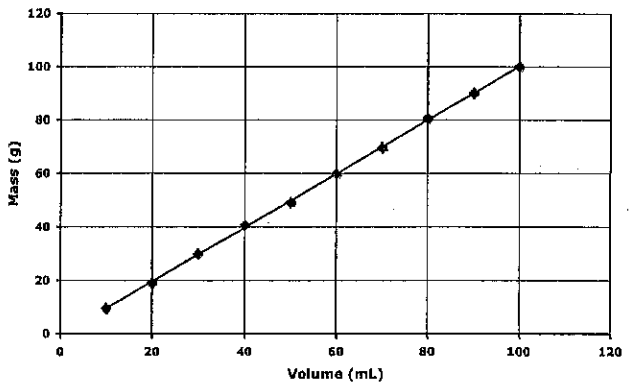
Graphing Skill #5: Best-Fit Line or Curve

With scatter plots it is important to put a best-fit line or curve through points where relationships exist.

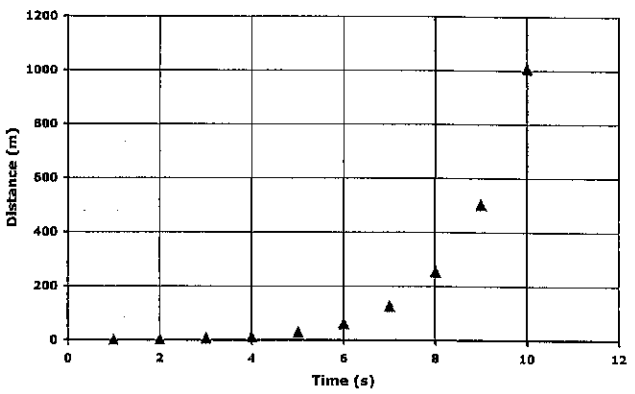
- Do you notice a pattern or trend in the data?
- If so, draw a straight line or curve that represents that trend.
- All points should lie on or very near the line
- For points not on the line, about half should be above the line and half below the line
  - The sum of the distance between the line and all points above should approximate the sum of the distance between the line and all points below (residual values)
- Your line **should not** extend beyond the range of your data

For each of the following graphs, please add the best-fit line or curve. The first one has been done for you.

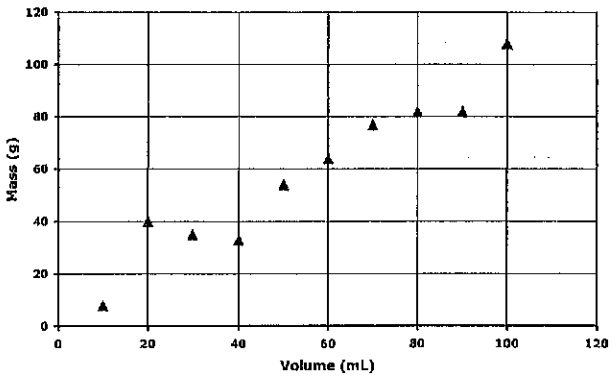
Ex.



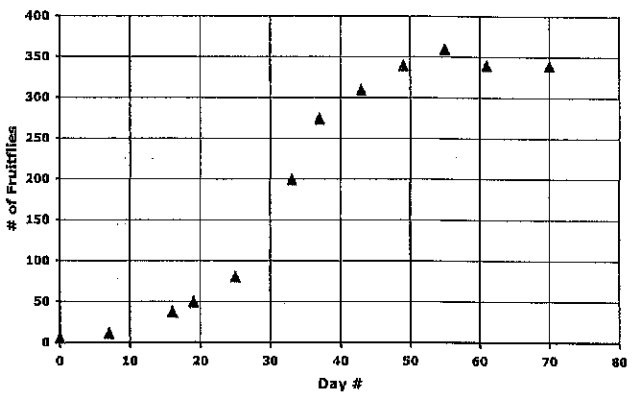
A)



B)



C)



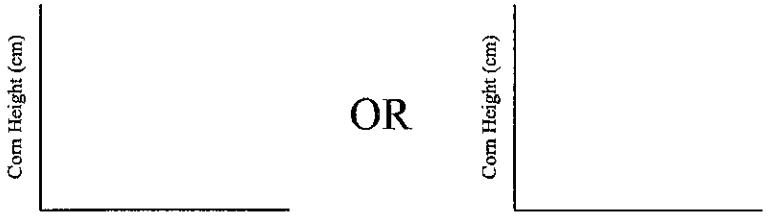
Name: _____ Date: _____ Period: _____

Graphing Skill #6: Creating Titles

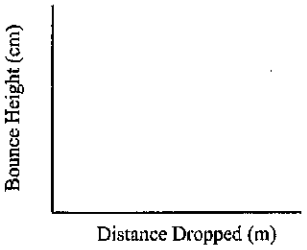
When writing a title for you graph, please remember:

- ☐ Must communicate the dependent and independent variables and include the units of each
- ☐ Can be presented in the form "Y versus X"
- ☐ Some graphs need more explanation than others. Make sure your reader would be able to understand what your data represent

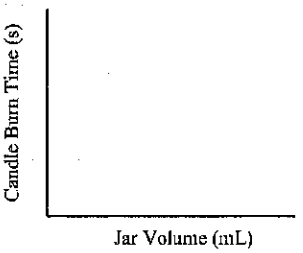
SAMPLE: A farmer wants to know if there is a relationship between the amount of fertilizer (in kilograms) she uses and how tall her corn grows (in centimeters).



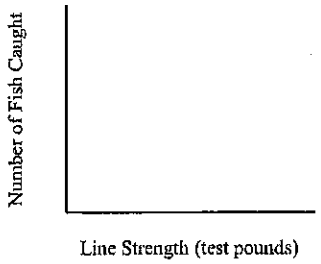
Graph 1: A ball is dropped from several distances above the floor (in meters) and the height it bounces is then measured (in centimeters).



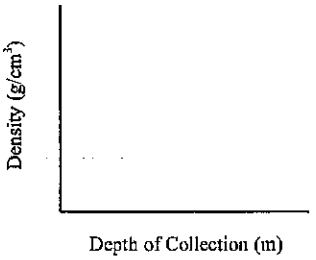
Graph 2: A candle was burned under glass jars of different volumes (in mL) to see if the volume of the jar affects the length of time (in seconds) the candle burns.



Graph 3: A fisherman used fishing lines of several different gauges (test pounds) and recorded the number of fish caught on each gauge.

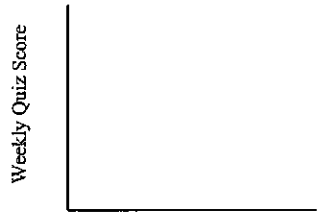


Graph 4: Geologists wanted to know if there was a relationship between the density of a rock and how many meters down it was collected from.

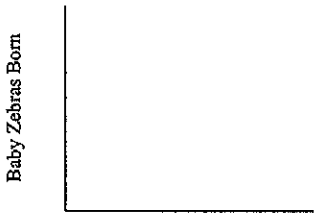


Name: _____ Date: _____ Period: _____

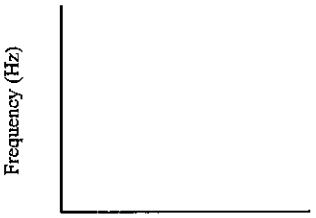
Graph 5: Is there a relationship between the numbers of hours a student studies and the score s/he gets on the weekly quiz?



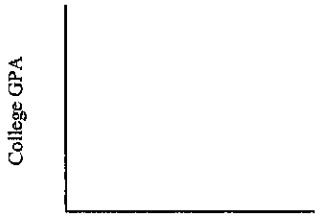
Graph 6: A scientist studied the relationship between amount of rain (in cm) and the numbers of zebra babies born each spring.



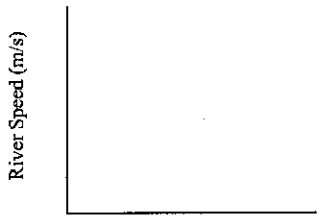
Graph 7: Do longer pendulums (measured in cm) have higher frequencies (measured in Hertz)?



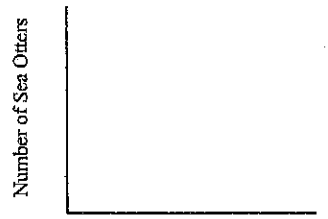
Graph 8: Does the grade point average that a student earns in college depend on his/her SAT score from high school?



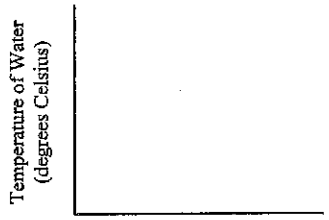
Graph 9: How does the depth of a river (in meters) impact its speed (measured in meters per second)?



Graph 10: Sea otters were counted over a number of years to see if their numbers were decreasing over time.



Graph 11: Does the length of time an ice cube is in water (in seconds) affect the temperature of the water (in degrees Celsius)?



Graph 12: Does the amount of nitrogen in the soil (measured in kilograms) affect corn production (measured in kilograms)?