AP - Honors Biology **J. Falabella**
Summer Assignment **2015 - 2016**

There are four parts to your summer assignment. Read carefully through each description and their due dates. You can check out a textbook over the summer but it's **HIGHLY** recommended that you use your etext access over the summer.

1. Digital Scavenger Hunt

You will be familiarizing yourself with various science terms that we will be using throughout the year. Vocabulary is going to be an important piece during our studies of this course. You will need to be able to recognize key terms and apply them to the natural world.

You will be taking **original photographs** of **20 key** terms as they are found in nature (do not purchase anything). You will need to place an object in the photograph (i.e. a penny, your phone, a photo of yourself, EHS student ID) to show it is an original photo. For each photograph of your identified term you will provide an explanation of the term and how it is represented in the photo. If it is an internal part to an organism such as "tendon" you can take the photograph of your little brother's Achilles tendon with a photo of his heal.

Example:

Radial Symmetry

The body organization of lower invertebrates in which the body parts are arranged around a central axis. These organisms are usually identified with a top (dorsal) and bottom (ventral). This is a picture of a Sea Urchin Shell. They are a part of the Echinoderm phylum which also includes Star Fish.

You may work as a team to complete this assignment but every student is required to turn in their own unique project. There are 110 choices; it would be highly unlikely of two students have the majority of the same terms.

You will present your final collection of **20 terms** in a PDF. Create a presentation or word document then turn the document into a PDF. Submit the PDF via e-mail to jfalabella@ellsworthschools.org.

Digital Scavenger Hunt it due on the first Friday of school, September 4th.

2. Summer Reading and Learning Objectives

This advanced course covers a breadth of material. Without completing summer work we will not be able to investigate all the aspects of biology required for the pace of this class. You will be responsible for reading over the **first three chapters** of our textbook **prior to our first day of school**. While you are reading address the learning objectives for each chapter. As you read through the text highlight (only in your own textbook), make notes (stickies are great for this), develop questions (again stickies), and jot down information related to each objective. You will take Juno Quiz over the first three chapters.

Reading of Chapter 1, 2, and 3 is due on the First Day of School and you will need to complete a Juno Quiz by September 2nd. The quiz will be open from August 24th until midnight September 2nd.

3. POGIL

POGILs are inquiry designed activities to reinforce various concepts. You will need to complete the POGIL activities **Experimental Variables**, **Analyzing and Interpreting Scientific Data**, and **Feedback Mechanisms**. These will be due the first day of class. We will be using them in our first small group discussions. Answer on the POGIL sheets.

Completed POGIL activities are due on the First Day of School.

4. Feedback Mechanisms

After completing the POGIL on Feedback Mechanisms you will need to explore feedback mechanisms within the context of biology. Write a brief (one paragraph) description of a two (2) positive feedback and two (2) negative feedback systems. You will need to find a feedback mechanism within each of the following areas Human Body, Ecosystems, Molecular Biology (i.e. DNA, Proteins, cells), and Evolution.

Completed descriptions are due on the First Day of School and will be part of the opening class activity.

5. Syllabus

Review the syllabus prior to our first day but you will need some school supplies at the beginning of the year. For AP students it is suggested to purchase a copy of the textbook it is NOT REQUIRED. Purchasing the text allows you to make notes in your own textbook. If you are planning on moving into a science related field then I highly recommend purchasing the textbook.

AP/Honors Biology ~ Summer Assignment
Digital Scavenger Hunt Word List

1. adaptation of an animal
2. adaptation of a plant
3. abscisic acid
4. actin
5. amniotic egg
6. amylase
7. angiosperm
8. animal that has a segmented body
9. annelid
10. anther & filament of stamen
11. arthropod
12. archaebacteria
13. autotroph
14. auxin producing area of a plant
15. basidiomycete
16. Batesian mimicry
17. biological magnification
18. bryophyte
19. C 4 plant
20. Calvin cycle
21. carbohydrate – fibrous
22. cambium
23. cellulose
24. chitin
25. chlorophyta
26. cnidarian
27. coelomate
28. conifer leaf
29. commensalism
30. connective tissue
31. cuticle layer of a plant
32. deciduous leaf
33. deuterostome
34. dicot plant with flower & leaf
35. diploid chromosome number
36. echinoderm
37. ectotherm
38. endosperm
39. endotherm
40. enzyme
41. epithelial tissue
42. ethylene
43. eubacteria
44. eukaryote
45. exoskeleton
46. fermentation
47. flower ovary
48. frond
49. fruit – dry with seed
50. fruit – fleshy with seed
51. gametophyte
52. gastropod
53. genetically modified organism
54. gibberellins
55. glycogen
56. gymnosperm cone
57. haploid chromosome number
58. heartwood
59. hermaphrodite
60. insect
61. K-strategist
62. keratin
63. leaf – gymnosperm
64. lepidoptera
65. lichen
66. lignin
67. lipid used for energy storage
68. littoral zone organism
69. long-day plant
70. meristem
71. modified leaf of a plant
72. modified root of a plant
73. modified stem of a plant
74. monocot plant with flower & leaf
75. muscle fiber – striated
76. mutualism
77. mycelium
78. mycorrhizae
79. myosin
80. nematode
81. niche
82. nymph stage of an insect
83. parasite
84. parenchyma cells
85. phloem
86. pine cone – female
87. platyhelminthes
88. pollen
89. pollinator
90. porifera
91. prokaryote
92. protein – fibrous
93. protein – globular
94. protostome
95. pteridophyte
96. r-strategist
97. radula
98. rhizome
99. scale from animal with two-chambered heart
100. spore
101. sporophyte
102. stem – herbaceous
103. stem – woody
104. stigma & style of carpel
105. tendril of a plant
106. thorn of a plant
107. unicellular organism
108. vascular plant tissue
109. xerophyte
110. xylem

AP - Honors Biology
Summer Assignment

J. Falabella
2015 - 2016

CHAPTER 1: Biology: Exploring Life

Chapter Objectives

Themes in the Study of Biology

1.1 Describe seven properties common to all life.

1.2 Describe the levels of biological organization from molecules to the biosphere, noting the interrelationships between levels.

1.2 Define the concept of emergent properties and describe an example of it.

1.3 Explain why cells are a special level in biological organization. Compare prokaryotic and eukaryotic cells.

1.3 Describe the relationship between structure and function.

1.4 Compare the dynamics of nutrients and energy in an ecosystem.

Evolution, the Core Theme of Biology

1.5 Explain how DNA encodes a cell's information.

1.6 Compare the three domains of life. Distinguish between the three multicellular kingdoms within Eukarya.

1.7 Describe the process and products of natural selection.

The Process of Science

1.8 Distinguish between qualitative and quantitative data. Compare the definitions and use of inductive and deductive reasoning in scientific investigations.

1.8 Distinguish between a hypothesis and a scientific theory.

1.8 Explain how science is a social activity.

1.9 Describe the structure of a controlled experiment and give an example.

Biology and Everyday Life

1.10 Explain how evolution impacts the lives of all humans.

1.11 Compare the goals of science and technology. Explain why an understanding of science is essential to our lives.

CHAPTER 2: The Chemical Basis of Life

Chapter Objectives

Elements, Atoms, and Compounds

2.1 Define matter, an element, a compound, and a trace element.

2.2 Explain how and why iodine, fluoride, and iron are added to the human diet.

2.3 Distinguish between the size, location, and properties of protons, electrons, and neutrons.

2.3 Define the atomic number and mass number of an atom.

2.3 Define an isotope and explain what makes some isotopes radioactive.

2.4 Describe the uses and dangers of radioactive isotopes.

Chemical Bonds

2.5 Explain how the electron configuration of an atom influences its chemical behavior.

2.6–2.8 Distinguish between covalent bonds, nonpolar polar covalent bonds, polar covalent bonds, hydrogen bonds, and ionic bonds, noting their relative strengths and how and where they form.

2.9 Explain the significance of chemical reactions. Identify the reactants and products of photosynthesis.

Water's Life-Supporting Properties

2.10–2.13 Describe the special properties of water that make it vital to living systems. Explain how these properties are related to hydrogen bonding.

2.10 Define and distinguish between cohesion, adhesion, and surface tension.

2.11 Define and distinguish between heat and temperature. Explain how sweating helps to cool your body.

2.12 Explain why ice floats.

2.13 Define a solute, a solvent, and a solution.

2.14 Explain how acids and bases directly or indirectly affect the hydrogen ion concentration of a solution.

2.14 Explain the basis of the pH scale.

2.14 Explain how buffers function.

2.15 Describe the causes and consequences of acid precipitation and ocean acidification.

2.16 Explain why the search for extraterrestrial life centers on the search for water.

CHAPTER 3: The Molecules of Cells

Chapter Objectives

Introduction to Organic Compounds

3.1 Explain why carbon is unparalleled in its ability to form large, diverse molecules.

3.1 Define organic compounds, hydrocarbons, a carbon skeleton, and an isomer.

3.2 Describe the properties of and distinguish between the six chemical groups important in the chemistry of life.

3.3 List the four main classes of macromolecules important to life. Explain the relationship between monomers and polymers. Compare the processes of dehydration synthesis and hydrolysis.

Carbohydrates

3.4–3.7 Describe the structures, functions, properties, and types of carbohydrate molecules common in the human diet.

3.6 Explain how and why high-fructose corn syrup is produced.

Lipids

3.8–3.10 Describe the structures, functions, properties, and types of lipid molecules.

3.9 Describe the scientific evidence that suggests that there is a greater health risk associated with the consumption of trans fats than saturated fats.

3.10 Describe the unique structural properties of phospholipids that make them essential for cell membranes.

3.11 Describe the health risks associated with the use of anabolic steroids.

Proteins

3.12–3.14 Describe the structures, functions, properties, and types of proteins.

3.13 Explain how a protein's shape determines its functions.

3.14 Describe the four levels of structure of a protein.

Nucleic Acids

3.15–3.16 Compare the structures and functions of DNA and RNA, noting similarities and differences.

3.17 Describe the adaptive advantage of lactose tolerance in people of East African descent.

Key Terms: Chapter 1

Archaea
artificial selection
Bacteria
biology
biosphere
cell
community
controlled experiment
domains
ecosystem
emergent properties
Eukarya
eukaryotic cells
evolution
genes
genome
hypothesis
molecule
natural selection
organ
organ system
organelle
organism
population
prokaryotic cells
systems biology
technology
theory
tissue

Key Terms: Chapter 2

acid
adhesion
aqueous solution
atom
atomic mass
atomic number
base
buffers
chemical bond
chemical reactions
cohesion
compound
covalent bond
electron
electron shells
electronegativity
element
evaporative cooling
heat
hydrogen bond
ion
ionic bond
isotopes
mass number
matter
molecule
neutron
nonpolar covalent bonds
nucleus
ocean acidification
pH scale
polar covalent bond
polar molecule
products
proton
radioactive isotope
reactants
salt
solute
solution
solvent
surface tension
temperature
thermal energy
trace elements

Key Terms: Chapter 3

amino acids
amino group
anabolic steroids
carbohydrates
carbonyl group
carboxyl group
cellulose
chitin
cholesterol
dehydration reaction
denaturation
deoxyribonucleic acid (DNA)
disaccharides
double helix
enzymes
fat
functional groups
gene
glycogen
hydrocarbons
hydrolysis
hydrophilic
hydrophobic
hydroxyl group
isomers
lipids
macromolecules
methyl group
monomers
monosaccharides
nucleic acids
nucleotides
organic compound
peptide bond
phosphate group
phospholipids
polymers
polypeptide
polysaccharides
primary structure
protein
quaternary structure
ribonucleic acid (RNA)
saturated fatty acid
secondary structure
starch
steroids
tertiary structure
trans fat
unsaturated fatty acid

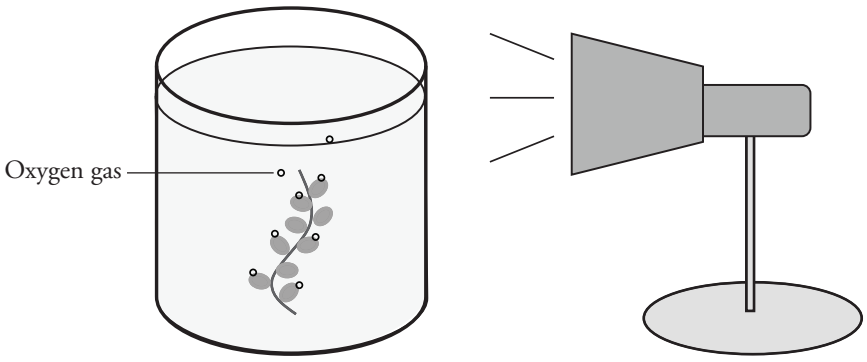
Experimental Variables

What is measured during a controlled experiment?

Why?

When scientists set out to do an experiment, they first think about the variables that may affect the outcome of the experiment. A **variable** is any condition that may cause a change in the system being studied. Some variables are measured quantitatively, like temperature, mass or height. Other variables are recorded in a qualitative manner, like color, texture or species. The most important factor is that the scientist runs a **controlled experiment**. In a controlled experiment, only one variable is changed to ensure that the effect of only that one variable can be measured.

Model 1 – Photosynthesis in an Aquatic Plant



1. The diagram in Model 1 illustrates a clipping of an aquatic plant in water.
   a. What process is occurring in the plant's cells to produce the gas in the bubbles that appear?

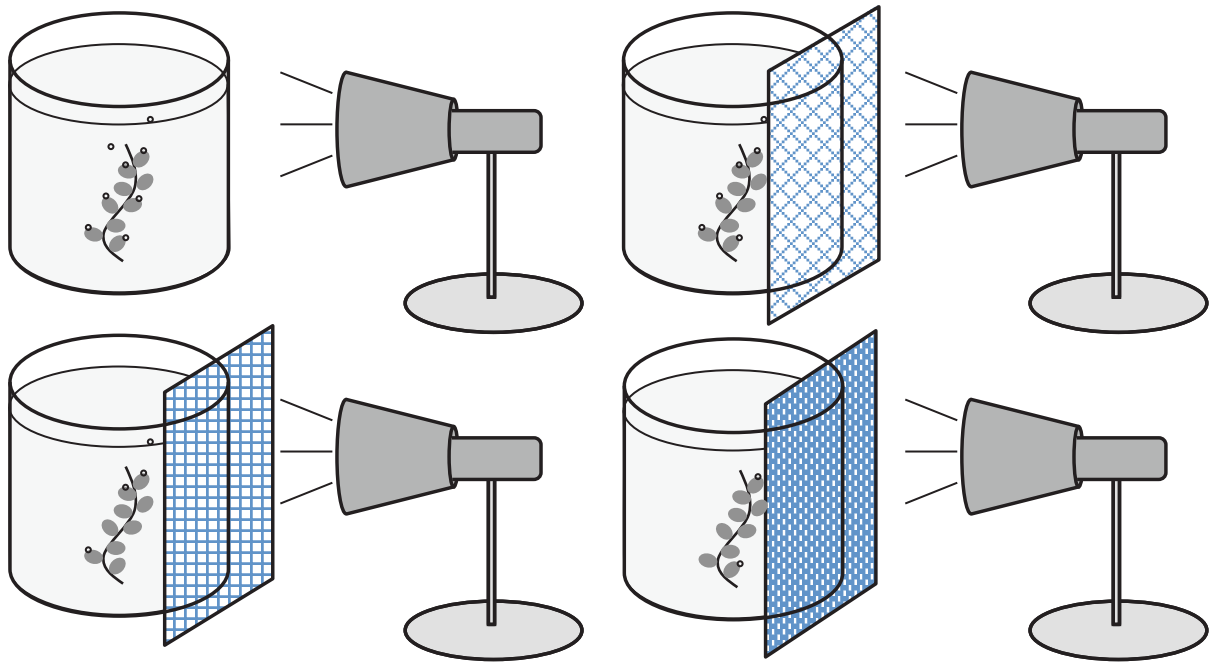
   b. What gas is the plant producing?

   c. What source of energy is the plant using to conduct the process recorded in part *a*?

2. Depending on the environment the plant is in, more or less gas may be produced. Suggest a method for measuring the rate of gas production from the aquatic plant in Model 1.

3. With your group, create a list of environmental factors that may affect the rate of gas production in the aquatic plant in Model 1. These factors could become variables in an experiment.

Model 2 – Aquatic Plant Experiment



4. Examine the four trials shown in Model 2. Identify several conditions in the experiment that are the same in each trial.

5. Describe the one condition that has been varied among the four trials in Model 2.

6. How does the condition described in Question 5 appear to affect the rate of gas production by the aquatic plant? Provide specific evidence from Model 2 to support your answer.

Model 3 – Aquatic Plant Data

	Length of clipping (cm)	Number of leaves on clipping	Lamp power (watts)	Percentage of light from lamp that reaches the plant	Number of oxygen bubbles formed in 10 minutes
A	12		40	100%	
B	12		40	75%	
C	12		40	50%	
D	12		40	25%	

7. Refer to the diagrams in Model 2 to complete the data table in Model 3.
8. The column headings in Model 3 each describe a variable in the experiment.
   a. What variable was purposefully changed in the experiment?

   b. What variable changed as a result of changing the variable listed in part *a*?

   c. What variable(s) in the Model 3 data table remained constant among all the trials?

Read This!

When designing an experiment, you need to consider three types of variables. The **independent variable** is changed by the experimenter in the design of the experiment. This variable is sometimes called the "manipulated variable." The **dependent variable** is what changes as a result of the change in the independent variable. This variable is sometimes called the "responding variable." In some cases more than one dependent variable is considered. The third category of variables is **controlled variables**. These are variables that you think may change the outcome of the experiment, but since they are not being studied, they need to be kept constant in each trial.

9. Identify the independent, dependent, and controlled variables for the experiment that produced the data in Model 3.

   Independent **Dependent** **Controlled**

Read This!

A well-written research question states the independent and dependent variables in the experiment. For example, a student investigated the effect of soil pH on the number of strawberries produced by a strawberry plant. Her research question was "How does the pH of soil affect the number of strawberries produced by a strawberry plant?"

10. Write a research question, using the format suggested in the *Read This!* box, for the experiment in Model 2.

11. A student wonders, "Does the moisture content in soil affect how far a worm can dig?" Identify the variables that are being considered in this experiment and the variables that need to be controlled.

Independent	**Dependent**	**Controlled**

Analyzing and Interpreting Scientific Data

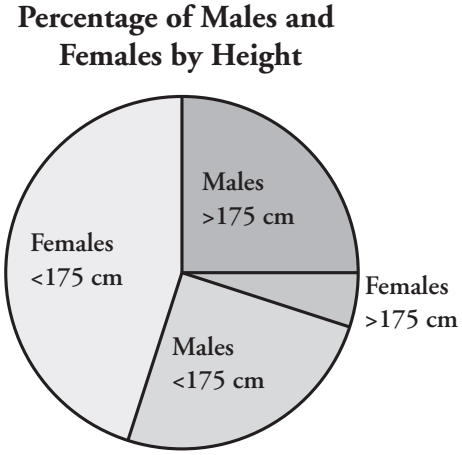
How can analyzing and interpreting scientific data allow scientists to make informed decisions?

Why?

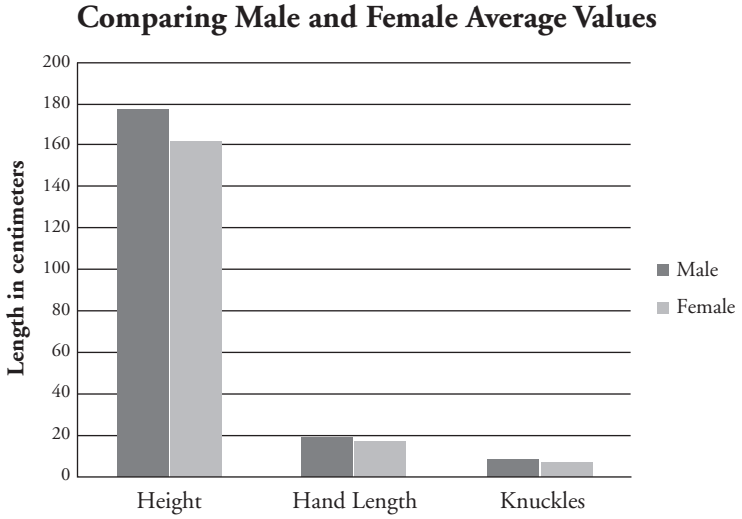
During scientific investigations, scientists gather data and present it in the form of charts, tables or graphs. The data must be properly collected, analyzed, and interpreted to allow scientists to make informed decisions regarding the validity of their study and any further work that may be necessary to achieve their objectives. The ability to present and use data charts, tables, and graphs correctly is essential for good scientific practice and also prevents unnecessary or inappropriate work and misinterpretation of the data.

Model 1 – Graphs and Charts of Classroom Measurement Data

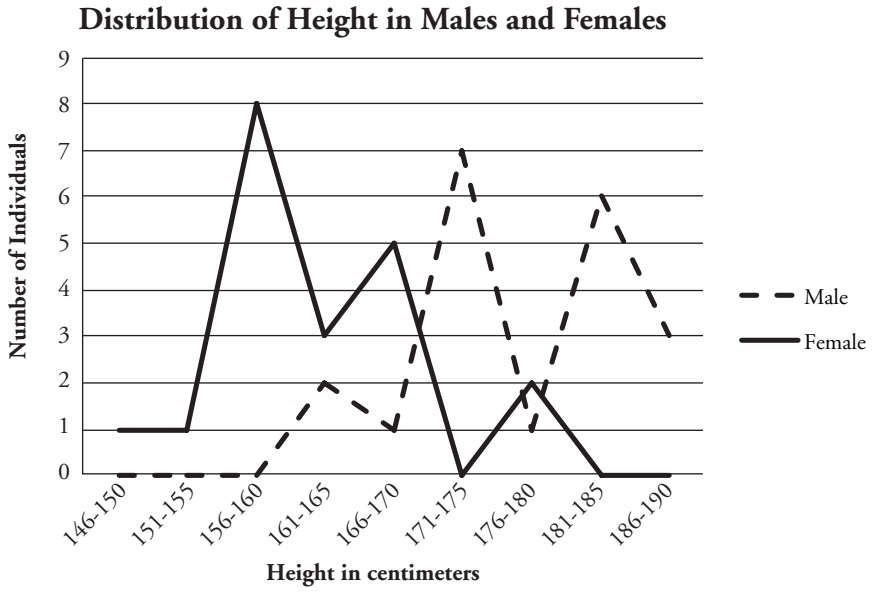
Pie Chart



Bar Graph



Line Graph



1. According to the data in Model 1, how many females fall within the range 146–155 cm tall?

2. According to the data in Model 1, how many males are 181 cm or above in height?

3. Using the graph(s) in Model 1, determine the approximate average height of males and of females.

4. Refer to the data in Model 1.
   a. How many males are taller than 175 cm and approximately what percentage of the total is that?

   b. Which graph(s)/chart(s) illustrate the answer to the previous question?

5. Which type of graph or chart in Model 1 shows a side by side comparison of data?

6. Which type of graph or chart in Model 1 shows trends in data across an entire data set?

7. Describe two trends in male and female height using the line graph.

8. Use complete sentences to compare the presentation of height data in the three graphs. Discuss any information that is located on more than one graph, and any unique information that is available on each.

9. If you wanted to see if a correlation exists between the height of an individual and his/her hand length, what would be the best type of graph/chart to make? Explain your reasoning.

10. What conclusions can you draw comparing the height, hand length, and knuckle width of males and females? State your conclusions in complete sentences.

Model 2 – Foot Width in a High School Classroom

Female foot width (cm)	Male foot width (cm)
7.8	10
8	10.5
8	9
5	9.3
17	13
7.5	7.5
7.5	10
7	9.2
7.8	9
7	4.5

Mean = $\frac{\text{sum of all data values}}{\text{number of data values}}$

Median = Middle value of an ordered set of data.

Mode = Most frequently occurring value in a set of data.

11. Refer to the data in Model 2.
    a. What value for foot width is most frequent in males?

    b. What is this value called?

12. Determine the median value for foot width for males and for females. Describe in complete sentences the method you used to determine the median values.

13. Determine the mean for each data group, and describe in a complete sentence how you calculated them.

Read This!

Within a data set there may be individual values that seem uncharacteristic or do not fit the general trend. These data points may be referred to as **outliers** or **anomalous data**. In most samples, a small number of outliers is to be expected, due to the variation inherent in any naturally-occurring population. Outliers can also result from errors in measurement or in the recording of data. Normal variation can often be distinguished from error by repeating the measurements to see if the same range is obtained. Scientists also use statistical calculations to determine the expected range of data, so that judgments can be made about the authenticity of individual data points. Outliers should not be ignored, however, as many interesting scientific discoveries have resulted from the study of such unexpected findings.

14. Which data point(s) in the foot width values in Model 2 might be considered outliers? Explain your choice(s).

15. The equation below allows you to calculate the amount of deviation (in percent) for the values within a data set. The percent deviation is reported as an absolute value.

$$\% \text{ deviation} = \frac{|(\text{mean value using all data}) - (\text{mean value excluding anomalous data})|}{\text{mean value using all data}} \times 100$$

a. What is the percent deviation in the female data set when the outlying value of 17 is excluded (*i.e.,* considered to be anomalous data)?

$$\% \text{ deviation} = \frac{|8.26 - 7.29|}{8.26} \times 100 = 11.7\%$$

b. What is the percent deviation in the male data set when the outlying value of 4.5 is excluded?

$$\% \text{ deviation} = \frac{|9.20 - 9.72|}{9.20} \times 100 = 5.65\%$$

c. Which data set (male or female) had the largest percent deviation?

16. Given the outliers and amount of deviation in each data set, which value (mean, median, mode) *best represents* the overall data set of foot width in males and females? Explain your answer in a complete sentence.

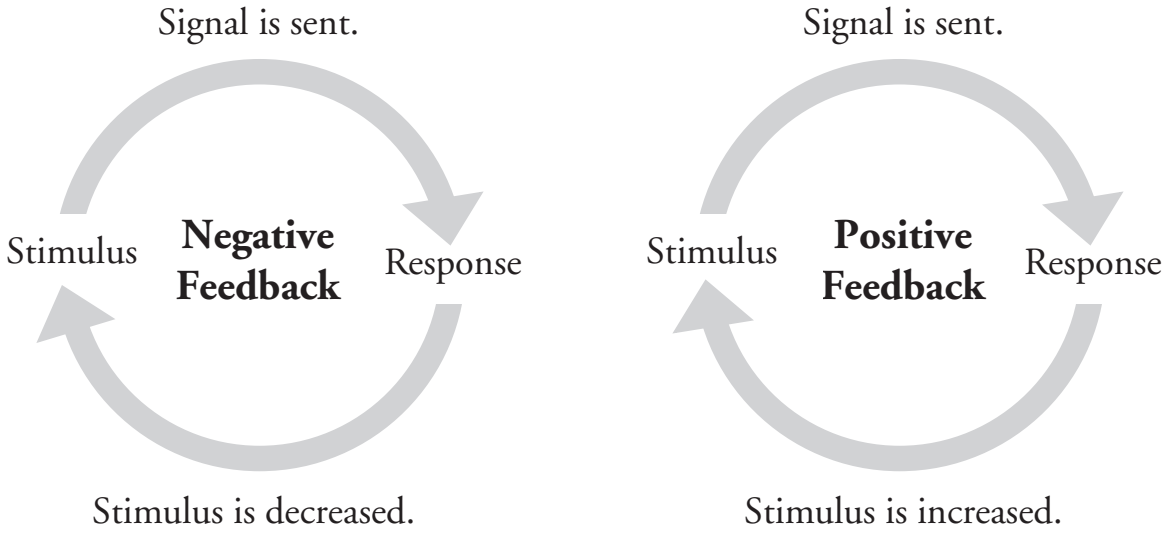
Feedback Mechanisms

How do organisms regulate complex systems through chemical interactions?

Why?

The heating system of a house works to keep the temperature constant. If the house gets too cold, then the heat automatically turns on to warm the house. The heat stops when the preset temperature is reached. This is an example of a **feedback mechanism**. Organisms use many feedback mechanisms to either maintain or amplify important chemical systems. This could happen at a molecular level to coordinate the function of a single enzyme or it could happen throughout the body to regulate the organism's internal temperature.

Model 1 – Positive and Negative Feedback



1. What two types of feedback mechanisms are illustrated in Model 1?

2. Define the words below as they are used in everyday language.

   Stimulus

   Signal

   Response

3. Identify at least three similarities in the two types of feedback mechanisms in Model 1.

4. Imagine that you have just gotten a puppy. In the course of playing with the puppy you throw a ball and the puppy chases after it. You then say "Good job!" and rub the puppy's head to show him he did what you wanted him to do.

   a. Is the puppy likely to chase the ball the next time you throw it? Justify your reasoning.

   b. Identify the portions of the scenario as stimulus or response.

   Puppy chases the ball. _____

   "Good Job" and head rub. _____

   c. Is this scenario an example of positive or negative feedback? Justify your reasoning using the words "stimulus" and "response."

5. Later that day your puppy urinates on the couch. You then say "No, bad dog!" and place the puppy outside.

   a. Is the puppy likely to urinate on the couch again? Justify your reasoning.

   b. Identify the portions of the scenario as stimulus or response.

   Puppy urinates on the couch. _____

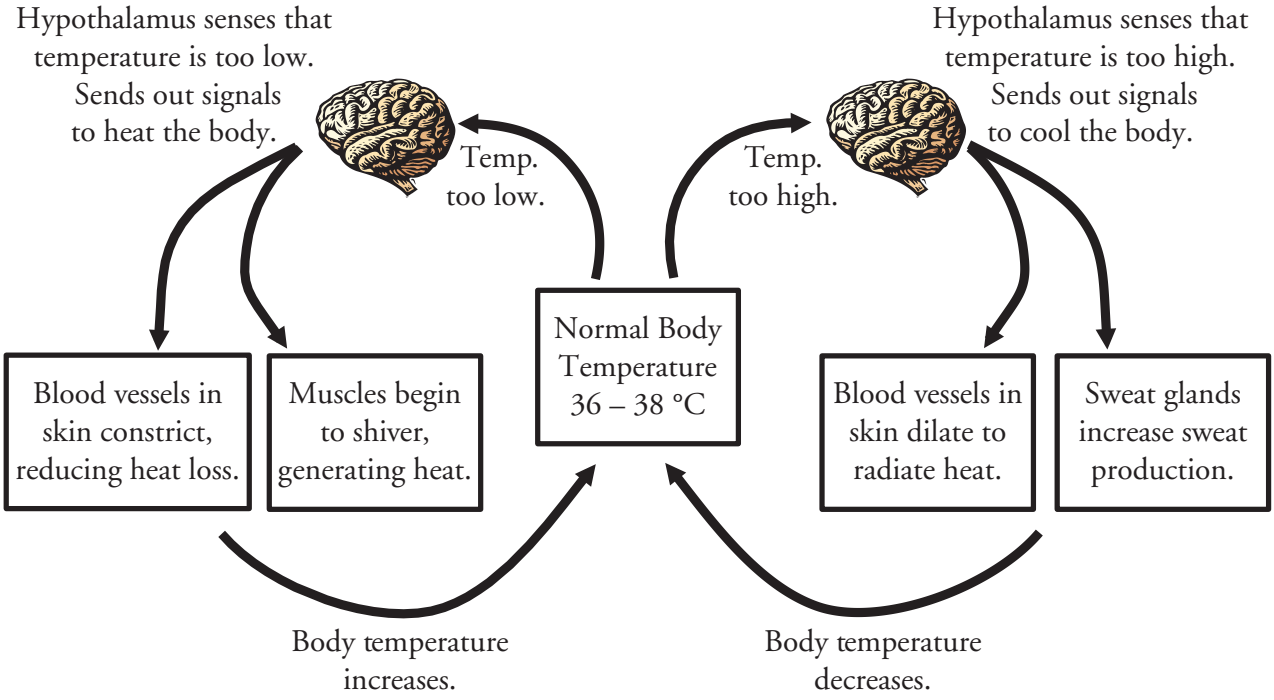
   "No, bad dog!" _____

   c. Is this scenario an example of positive or negative feedback? Justify your reasoning using the words "stimulus" and "response."

6. Which of the feedback mechanisms in Model 1 would be most useful for amplifying a condition that is advantageous for the organism?

7. Which of the feedback mechanisms in Model 1 would be most useful for stopping a condition that is detrimental or limiting a condition to specified levels?

Model 2 – Thermoregulation in Humans



8. Examine Model 2. Based on what you see in the model, propose a definition for "thermoregulation."

9. According to Model 2, what portion of the brain contains sensors that monitor body temperature?

10. According to Model 2:
    a. What are two mechanisms the body uses to cool itself?

    b. What are two mechanisms the body uses to heat itself?

11. Consider the feedback loop that cools the body when it is too warm.
    a. Identify the "stimulus" and "response" in the feedback loop.

    b. Is this feedback loop positive or negative feedback? Justify your reasoning.

12. Consider the feedback loop that heats the body when it is too cold.

    a. Identify the "stimulus" and "response" in the feedback loop.

    b. Is this feedback loop positive or negative feedback? Justify your reasoning.

Read This!

Many of the systems in the body are delicate. They function only under a specific range of parameters. Enzymes will denature if they get too hot or cold or if the pH of the solution they are in is too high or too low. Cells will not be able to process glucose for energy if the concentrations of oxygen in the blood are not high enough. Feedback mechanisms are used to keep the body in **homeostasis**. That is, many systems are in place that monitor and regulate important parameters of the body and keep them within normal levels.

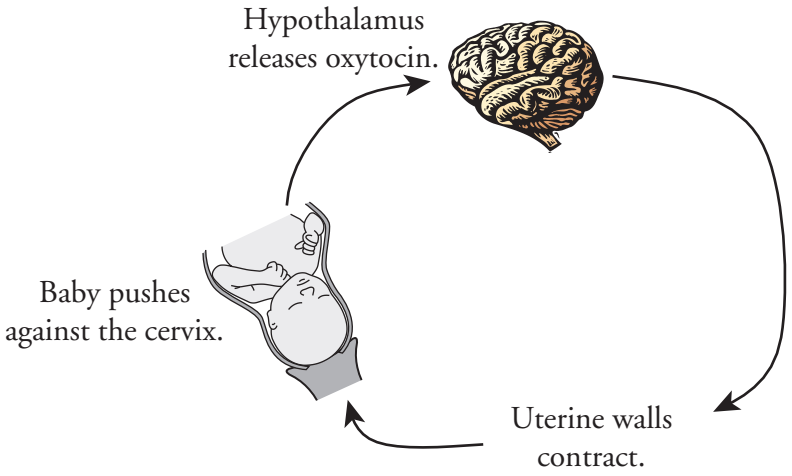
13. Consider the state of homeostasis—maintaining conditions within certain limits. The body needs multiple mechanisms to keep all types of systems in check.

    a. Would a positive feedback loop ever be helpful in maintaining homeostasis? Justify your reasoning.

    b. Would a single negative feedback loop ever be helpful in maintaining homeostasis? Justify your reasoning.

STOP

Model 3 – Childbirth and Contractions



14. According to Model 3, what is the stimulus and what is the response during childbirth?

15. What hormone, released from the hypothalamus, increases the intensity of contractions?

16. When the intensity of contractions increases, will the stimulus increase or decrease?

17. Is childbirth an example of a positive or negative feedback system? Justify your answer.

18. What will eventually stop the stimulus and thus stop the childbirth feedback loop?

19. Below are several descriptions of processes that occur in the human body. For each one identify the stimulus and the response and state whether the process is positive or negative feedback.

    a. When human tissue, such as skin or a blood vessel, is torn or cut, the cells near the damage send out a signal that activates platelets in the vicinity. As the platelets begin to form a plug, they release more chemical signals to attract more platelets and other clotting factors until the bleeding is stopped.

    b. When a person has not taken in sufficient water they become dehydrated. This may cause a loss of blood pressure, which will trigger the release of antidiuretic hormone (ADH) from the hypothalamus and pituitary glands. This hormone signals the kidney to allow reabsorption of water by the blood vessels to bring the blood pressure back to normal conditions.

    c. When a human increases physical activity, the amount of fuel burned in its cells also increases, which in turn increases the concentration of dissolved CO_2 in the blood. The CO_2 reacts with water in the blood to make a weak acid, which lowers the pH of the blood. Sensory cells in the medulla of the brain register this drop in pH and send signals to the diaphragm and heart to increase respiration. This will clear the CO_2 from the bloodstream.