



**High School  
Honors Biology  
Packet 2  
Eytcheson**

**4TH QUARTER  
CURRICULUM PACKET**

**Hayward Community  
School District  
715-634-2619**

**#HurricaneStrong**



## Problems Involving Genes With Multiple Alleles

1. Refer to problem I.2. Mrs. Smith has blood type A. Mr. Smith has blood type B. Their first child has blood type AB. Their second child has blood type O. Now is Mr. Smith justified? What are Mr. and Mrs. Smith's genotypes for these two genes?
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2. In a recent case in Spokane, Washington, a young woman accused a soldier of being the father of her child. The soldier, of course, denied it. The soldier's lawyer demanded that blood types be taken to prove the innocence of his client. The following results were obtained: Alleged father, Type O. Mother, Type A. Child, Type AB. The court found the soldier guilty on the basis of the woman's remarkable memory for dates and details that apparently eliminated all other possible fathers.
  - a. What are the possible genotypes for these three people?

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- b. Do you agree with the court's decision? Why or why not?
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3. A woman has a daughter. There are three men who she claims might have been the father of the child. The judge in the paternity court orders that all three men, the child, and the mother have blood tests. The results are: Mother, Type A; Daughter, Type O; Man #1, Type AB; Man #2, Type B; Man #3, Type O. The mother claims that this proves that Man #3 must be the little girl's father.
- a. Is the mother correct? Why or why not?

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- b. The judge isn't satisfied, so he asks for the medical records of the people involved. He discovers that the little girl is colorblind. Men #'s 1 and 2 are also colorblind; Man #3 has normal color vision, as does the mother. (Note: Colorblindness is X-linked and recessive.) Assuming one of these three men must be the father, can you now determine which of the three it is? Explain.

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- \*4. You are a scientist performing the first analysis of the genetic basis for the inheritance of flower color in a certain species of wildflower. You begin your investigation by observing that there are four different flower colors in the local wild population; white, red, blue and purple. Your first assumption (hypothesis) is that you are looking at the effects of a single gene, so operate under that assumption. You collect a variety of samples of all colors, take them back to your greenhouse, and begin making crosses. Remember, you are crossing members of a wild population - you have no idea whether any of your plants are homozygous or heterozygous. Here are the varied results you observe:

Cross	Offspring Results
White x white	All offspring always produce white flowers.
Red x red	In some matings, all offspring produce red flowers. In other matings, some of the offspring produce red flowers, some white, with red flowering offspring outnumbering white flowering offspring.
Blue x blue	In some matings, all offspring produce blue flowers. In other matings, some of the offspring produce blue flowers, some white with blue flowering offspring outnumbering white flowering offspring.
Purple x purple	Always produces a mixture of red, blue, and purple flowering offspring, with purple most frequent, followed by red and blue in roughly equal numbers.
White x red	In some matings, all offspring produce red flowers. In other matings, some of the offspring produce red flowers, some white. Red and white occur in roughly equal numbers.
White x blue	In some matings, all offspring produce blue flowers. In other matings, some of the offspring produce blue flowers, some white. Blue and white occur in roughly equal numbers.
White x purple	Always produces roughly equal numbers of blue flowering offspring and red flowering offspring.
Red x blue	Always produces purple offspring, but in some matings also produces red and/or blue offspring, and/or white offspring.
Red x purple	Always produces red and purple offspring, sometimes mixed with blue.
Blue x purple	Always produces blue and purple offspring, sometimes mixed with red.

NOTE: This problem has a relatively high difficulty level.

- a. How many alleles are governing flower color in this plant? What color does each of these alleles produce (in other words, what colors are your homozygous plants?)

- b. Explain the dominance relationships among your alleles, and explain the results of each of the crosses described above.



Honors Biology  
Unit 6: Genetics  
Mrs. Eytcheson

## Study Guide

**Concept 1:** Genetics developed from curiosity about inheritance.

1. Describe the methods Mendel used in his plant breeding experiments.
  - What is self-fertilization as it applies to plants?
  - Why is self-fertilization in pea plants important to Mendel?
  - What is cross-fertilization as it applies to plants?
  - Why is cross-fertilization in pea plants important to Mendel?
  - Describe the three generations of plants in Mendel's pea plant experiment.

**Concept 2:** Mendel discovered that inheritance follows rules of chance.

1. Explain the Law of Segregation.
  - What does segregate mean?
  - How is this law related to meiosis?
2. Describe how probability applies to genetics.
  - What is probability?
  - What do geneticists use probability for?
  - What kinds of information can probability be used to give information about?
  - Give an example of probability for a coin toss.
3. Contrast genotype and phenotype.
  - Define genotype.
  - Define phenotype.
  - Give an example of a phenotype and its related genotype.

- How are the terms homozygous and heterozygous related to genotype?
  - Give an example of a homozygous dominant genotype.
  - Give an example of a heterozygous genotype.
  - Give an example of a homozygous recessive genotype.
4. Explain Mendel's Law of Independent Assortment.
- In your own words, summarize this principle.
  - How does this principle relate to meiosis?

**Concept 3:** There are many variations of inheritance patterns.

1. Describe how alleles interact in incomplete dominance.
  - What is the relationship between two alleles that demonstrate incomplete dominance?
  - What is the phenotype of an offspring inheriting one of each allele?
  - Give an example of an incomplete dominance inheritance.
2. Describe inheritance patterns involving multiple alleles.
  - What is meant by "multiple alleles"?
  - Give an example of a human genetic trait that has multiple alleles.
3. Describe how alleles interact in co-dominance.
  - What is the relationship between two alleles that demonstrate co-dominance?
  - What is the phenotype of an offspring inheriting one of each allele?
  - Give an example of a co-dominance inheritance.

**Concept 4:** Sex-linked traits have unique inheritance patterns.

1. Explain how sex-linked genes produce different inheritance patterns in males and females.
  - What is a sex-linked trait?
  - Where are the sex-linked genes located?
2. Explain why most sex-linked disorders are more common in males.
  - Why do males exhibit traits that are sex-linked more often than females?
  - Under what condition would it be possible for a female to exhibit a sex-linked condition?
  - Give 2 examples of sex-linked conditions.

**Concept 5:** Mutations can change the meaning of genes.

1. Describe the type of mutation that can affect genes.
  - What is a mutation?
  - Give an example of a “bad” mutation. Why is it “bad”?
  - Give an example of a “good” mutation. Why is it “good”?
  - Mutations are a mechanism that aids the process of \_\_\_\_\_.
2. Explain what can cause a mutation.
  - Make a list of things you think could cause a mutation to occur.

**Concept 6:** Accidents affecting chromosomes can cause disorders.

1. Relate Down syndrome to non-disjunction.
  - What is non-disjunction?
  - When does non-disjunction normally occur in the cell cycle?
  - What is Down syndrome? Why is it known as a trisomy?

- Describe a person that has Down syndrome.
- Name another genetic disorder caused by non-disjunction.
- Give an example of a genetic disorder that is a monosomy?

**Concept 7:** Mendel's principles apply to humans.

1. Summarize the information provided in a pedigree.
  - List and describe the symbols used in a pedigree.
2. Explain how recessive, dominant, and sex-linked disorders are inherited.
  - In order for a person to inherit a recessive trait or disorder, what must happen?
  - In order for a person to inherit a dominant trait, including disorders caused by dominant genes, what must happen?
  - In order for a person to be male what must be inherited?
  - In order for a person to be female, what must be inherited?
  - How are sex-linked traits inherited?

**Miscellaneous:**

- Review your Genetics practice problems.
- Review your Pedigree practice problems.

**Standard 19:** I am able to understand and explain the process of meiosis, its purpose and its result.

1. What is meiosis?

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2. What type of cell uses meiosis when it divides?
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3. How many cells are produced when meiosis is used in cell division?
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4. How do the cells produced by meiosis differ from the parent cell?
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5. Why are cells like those produced by meiosis necessary? Why can't cells produced using mitosis be used for their purpose instead?
- 
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- 
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Standard 20: Explain the mechanism of nondisjunction in meiosis and how it relates to genetic disorders.

1. What is a genetic disorder?
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2. Identify two ways genetic disorders can occur.

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3. Which way does nondisjunction result in a genetic disorder?

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4. What is nondisjunction?

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5. During which stage of meiosis does nondisjunction occur?

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Standard 21: Describe how errors in DNA replication or transcription may result in genetic disorders.

1. What is DNA replication?

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2. How could a mistake in DNA replication end up resulting in a genetic disorder?

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3. What is transcription?

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4. How could a mistake in transcription result in a genetic disorder?

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Standard 22: Understand how crossing over results in the possibility of both positive and negative genetic variations.

1. What is crossing over?

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2. What is a mutation?

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3. Are mutations good or bad for the organism that has it?

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4. How does crossing over result in mutations?

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Standard 23: Name genetic disorders resulting from mutations caused by negative environmental factors.

1. Give an example of a genetic disorder that results from a negative mutation. Why is this a negative mutation?

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2. Give an example of genetic “disorder” that results from a positive mutation. Why is this a positive mutation? Why is this really NOT a disorder?

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Standard 24: Determine the probability of a trait occurring given various genetic scenarios (multiple alleles, co-dominance, incomplete dominance, sex-linked, etc.)

Solve the following genetics problems.

1. Albinism is a recessive genetic disorder in which the person does not produce the pigment melanin. It results in fair skin and hair as well as light blue eyes. A normal man without genes for this trait marries a woman who is a carrier of this trait. What is the chance that they will have a child who is an albino? Show the Punnett Square used to solve this problem.

2. A palomino horse is the result of the incomplete dominance inheritance pattern. It has a golden body color with a light color mane and tail. It typically results from the mating of a brown horse with a white horse. What are the chances of two golden palominos producing a brown foal? A white foal? A palomino foal? Show the Punnett square used to solve this problem.
  3. Human blood type is the result of multiple alleles exhibiting the co-dominance inheritance pattern. If a man who has type B blood marries a woman with type A blood, what are the chances of having a child with type AB blood? Show the Punnett square used to solve this problem.

4. Hemophilia is a human sex-linked genetic disorder in which the normal blood clotting factor is not produced. People with this disorder have difficulty getting their blood to clot after an injury. If a man who has hemophilia marries a woman who has no genes for this disorder, what are the chances of them having a boy who has hemophilia? Show the Punnett square used to solve this problem.
5. In cats, black color is dominant to a special, temperature-sensitive albino gene, which produces cats with dark legs, faces and tails (Siamese). A homozygous short haired (dominant) Siamese colored female is bred to a long haired homozygous black male. What are the expected genotypic and phenotypic ratios of their kittens?

6. A man and woman marry. They have five children, 2 girls and 3 boys. The mother is a carrier of hemophilia, a sex-linked disorder. She passes the gene on to two of the boys who died in childhood and one of the daughters is also a carrier. Both daughters marry men without hemophilia and have 3 children (2 boys and 1 girl). The carrier daughter has one son with hemophilia. One of the non-carrier daughter's sons marries a woman who is a carrier and they have twin daughters. Draw the pedigree for this family. What is the percent chance that each daughter will also be a carrier?

# **Honors Biology**

## **Unit 7: Classification of Living Things**

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Projects and Activities:

- ✓ “Organizing a Junk Drawer” Activity
- ✓ History of Classification WS
- ✓ Classifying the States Activity
- ✓ Classification Today WS
- ✓ Classification of Mammals by Physical Characteristics WS
- ✓ Classification of Mammals by DNA Sequence WS
- ✓ The Five Kingdoms WS
- ✓ Unit 7 Exam

### **Study Guide:**

Vocabulary:

- Binomial Nomenclature
- Genus
- Species
- Autotroph
- Heterotroph

Concepts:

- Give examples of the ways classification is used in science and in everyday life.
- Explain how binomial nomenclature is used to name living things.
- Relate biological classification to evolution.
- List the seven major classification groups.
- Describe some general characteristics of each of the five kingdoms.

### **Standards**

23. Identify and explain how DNA sequencing and physical characteristics are used to classify organisms.
24. Explain how natural selection is the result of genetic variation, adaptation, competition, and the ability to reproduce.



## Classification of Living Things

Unit 7

## History of Classification

### What is Classification?

- The grouping of things according to similar characteristics.
- Used by scientists.
- Used by you.

### Why Classify?

- May have helped organisms to not become extinct.
- Provides ways to learn more about life and the relationships between types of life.

### How to Classify?

- Based on observable characteristics.
- System used must be meaningful, easy to understand, and easy to communicate.

### What Has Been Classified?

- 2.5 million different types of living things.
- Scientists estimate that there may be another 7 million yet to be discovered.

## Taxonomy

- The science of classification is called taxonomy.

## Aristotle's Classification System

- Two groups
  - Plants and animals
- Three more groups
  - Flying, swimming, walking
- Problem:
  - Bird and bat would have ended up in same category.

## Linnaeus

- Two groups
  - Plant and animal
- Grouped by similarities in form.
- System still used today.



## Naming Living Things

- Originally a description in Latin
  - Too long
  - Not universal
- Binomial nomenclature
  - Linneaus
  - Binomial means two names
  - Nomenclature means system of naming

## Two Names

- Genus name is capitalized and printed in italics.
- Species name is not capitalized but printed in italics, too.  
*Canis lupus*
- Each organism has only one scientific name and no two can have the same name.
  - This name is universal.

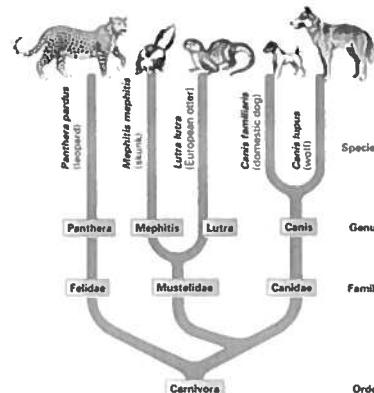
## Classification Today

### Largest Impact on Classification?

- Darwin's evolution theories.
- Technological advancements in science.

### Evolution and Classification

- During the history of Earth organisms have changed or evolved.
- Evolution is a process in which new organisms evolve from existing ones.
- Natural selection
- Taxonomists focus on evolutionary histories to group organisms.



### Natural Selection

- **Natural selection** is the gradual process by which biological traits become either more or less common in a population as a function of the effect of inherited traits on the differential reproductive success of organisms interacting with their environment. It is a key mechanism of evolution.

### Technology and Classification

- Internal and external structure
  - Can be difficult due to individual interpretation of characteristics.
- Cell structure
- Chemical tests
- DNA analysis
  - Finding similar DNA sequences proves relationship between organisms.

## What Does Classification Do For Science?

- Give each organism a unique name.
- Groups organisms according to evolutionary relationships.
- Groups organisms according to genetic relationships.

## 7 Levels of Classification

- Kingdom
- Phylum
- Class
- Order
- Family
- Genus
- Species

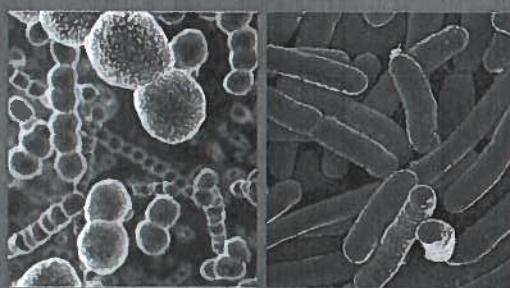


## The Five Kingdoms

### Kingdom Monera

- Bacteria
- All unicellular organisms.
- DNA not in nucleus.
- Characterized as being either an autotroph or a heterotroph.
  - Autotroph: an organism that is able to make its own food using the sun's energy.
  - Heterotroph: an organism that must consume other organisms to obtain energy.

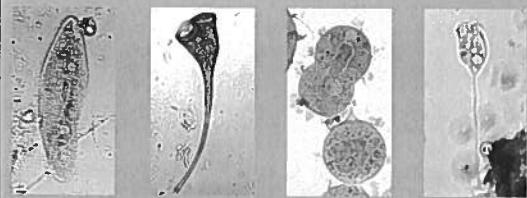
### Common Monerans



## Kingdom Protista

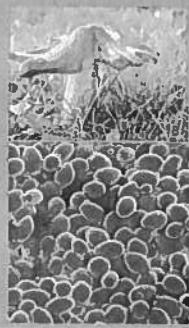
- All unicellular organisms with a nucleus.
- Some are plant-like and autotrophic.
- Some are animal-like and heterotrophic.

## Common Protista



## Kingdom Fungi

- Most are multicellular.
- All are heterotrophs.



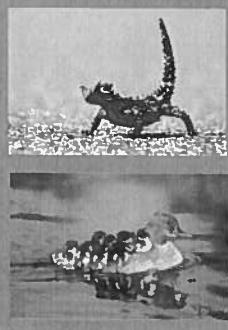
## Kingdom Plantae

- Most are multicellular.
- All are autotrophs.



## Kingdom Animalia

- All are heterotrophs.
- All are multicellular.





Honors Biology

Name \_\_\_\_\_

Unit 7: Classification of Living Things

Due Date:

Mrs. Eytcheson

## History of Classification

### Key Concepts

- Classification is the grouping of things according to similar characteristics.
- Biological classification systems name and organize living things in a logical, meaningful way.

### Building Vocabulary Skills: Learning the Meaning

Explain the actual meanings of the following words.

1. Binomial \_\_\_\_\_
2. Nomenclature \_\_\_\_\_
3. Now put words together and explain what biologists mean by the term binomial nomenclature. \_\_\_\_\_  
\_\_\_\_\_
4. What part of your own name corresponds to the *genus* name of an organism? \_\_\_\_\_
5. Do other people in the family share a "genus" name? \_\_\_\_\_
6. What part of your own name corresponds to the *species* name of an organism? \_\_\_\_\_
7. What is different about the order of names in *Genus species* and the way you usually write your signature in English? \_\_\_\_\_
8. Where might you find your name written in *Genus species* order?  
\_\_\_\_\_

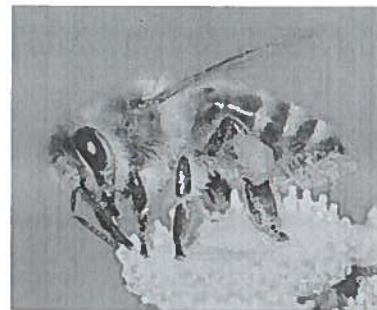
Study the illustrations below. Label each part of the name "genus" or "species".



*Canis lupus*

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*Apis mellifera*

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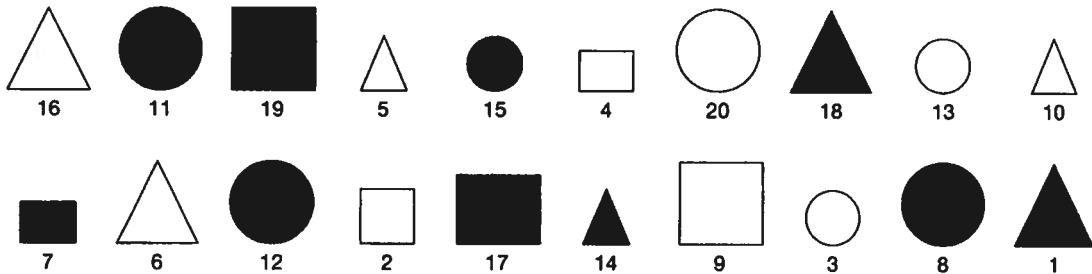
*Felis concolor*

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## Practicing Classification: Using the Main Ideas

Study the assortment of figures below. Devise a classification system to put the objects into two categories. List the numbers of the figures you selected in the space provided.



1. What figures did you put in Category #1? \_\_\_\_\_
2. What figures did you put in Category #2? \_\_\_\_\_
3. What was the basis of your classification system? \_\_\_\_\_

Perform the same activity putting the figures into three categories.

4. What figures did you place in Category #1? \_\_\_\_\_
5. What figures did you place in Category #2? \_\_\_\_\_
6. What figures did you place in Category #3? \_\_\_\_\_
7. What was the basis of your classification system? \_\_\_\_\_
  
8. If you compared your system with those of all your classmates, would they all be the same? \_\_\_\_\_
9. Have all biological classification systems been the same? \_\_\_\_\_
10. What conclusion can you draw from this information? \_\_\_\_\_



Honors Biology

Unit 7: Classification of Living Things

Mrs. Eytcheson

Name \_\_\_\_\_

Date Due:

## Classifying the States

In this activity you are to classify certain states in the United States using a taxonomic key. A taxonomic key consists of many pairs of opposing descriptions. Only one of the descriptions in a pair is correct for a given object. Following the correct description is an instruction that directs you to another pair of descriptions. By following each successive description and instruction in a taxonomic key, you will eventually arrive at an object's correct classification group. To identify the states, you will need a map of the United States. You may also use any reference materials that will help you to identify the states.

Read each phrase and follow the directions given. Write the name of the state on the line provided. Choose your answers from the following list.

- Arkansas
- California
- Colorado
- Iowa
- Kentucky
- Louisiana
- Minnesota
- Mississippi
- Missouri
- New York
- North Carolina
- Tennessee
- Wisconsin
- Illinois

### A Taxonomic Key

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1.     A.    Borders on the Mississippi River.....Go to 2  
         B.    Does not border on the Mississippi River.....Go to 11

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2.     A.    Begins with the letter M.....Go to 3  
         B.    Does not begin with the letter M.....Go to 5

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3.     A.    Shares a border with Tennessee.....Go to 4  
         B.    Does not share a border with Tennessee.....

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4. A. Its capital is Jackson.....  
B. Its capital is not Jackson.....
- 
5. A. Has eight or more letters in its name..... Go to 6  
B. Has fewer than eight letters in its name.....
- 
6. A. Entire state lies south of 40° latitude..... Go to 7  
B. Entire state does not lie south of 40° latitude..... Go to 10
- 
7. A. Borders on the Gulf of Mexico.....  
B. Does not border on the Gulf of Mexico..... Go to 8
- 
8. A. Is east of the Mississippi River..... Go to 9  
B. Is west of the Mississippi River.....
- 
9. A. Is nicknamed the "Volunteer State".....  
B. Is not nicknamed the "Volunteer State".....
- 
10. A. Is well known for its dairy products.....  
B. Is not well known for its dairy products.....
- 
11. A. Was one of the 13 original colonies..... Go to 12  
B. Was not one of the 13 original colonies..... Go to 13
- 
12. A. Borders on the Great Lakes.....  
B. Does not border on the Great Lakes.....
- 
13. A. Contains the Sierra Nevada Mountains.....  
B. Does not contain the Sierra Nevada Mts.....

Honors Biology  
Unit 7: Classification of Living Things  
Mrs. Eytcheson

Name \_\_\_\_\_

Date Due:

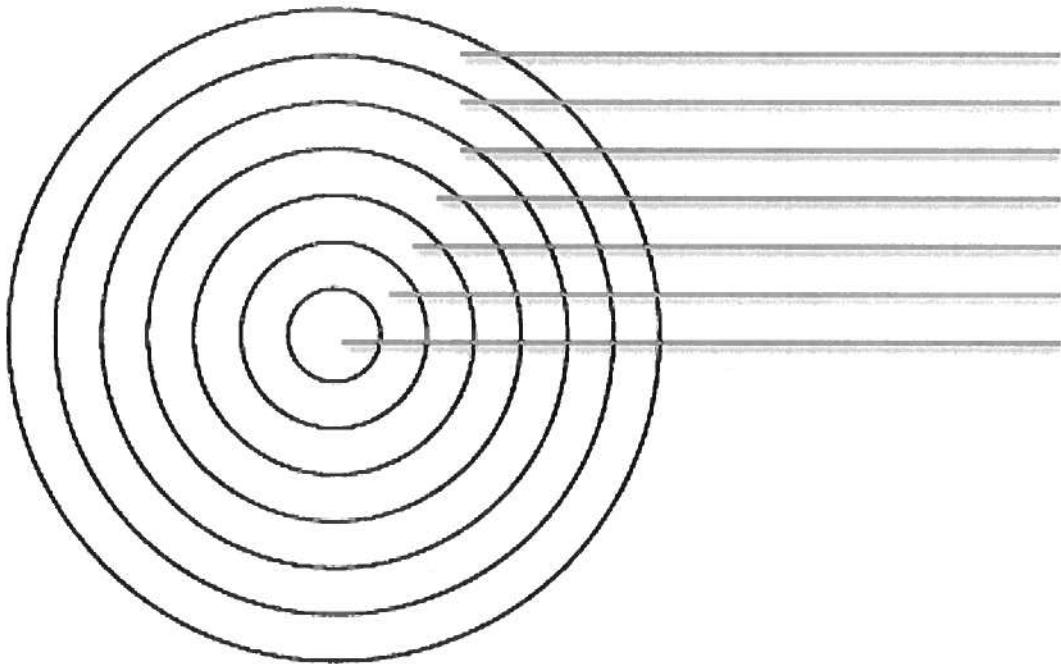
## Classification Today

### Key Concepts

- All living things are classified into seven major groups: kingdom, phylum, class, order, family, genus, and species.

### Explaining Relationships: Understanding the Main Ideas

Look at the following diagram. If the outermost circle represents a very large group of organisms, or a kingdom, what classification group does each of the smaller circles represent? Put your answers on the lines provided.



Using the diagram and the information you have learned, answer the following questions.

1. Would you find more different organisms in a class or a family?

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2. Which classification group has the largest number of different organisms? \_\_\_\_\_
3. Which classification group has only one type of organism?  
\_\_\_\_\_
4. The most closely related different organisms would probably belong to the same \_\_\_\_\_
5. List the classification groups, in order, from largest to smallest.  
\_\_\_\_\_

## Classification of Mammals by Physical Characteristics

You are investigating ten species of mammals. Your assignment is to decide how closely related these species are to one another so that you can fill in the phylogenetic tree on the back of this page. To do this, you should think about what these animals look like and what you know about where they live, what they eat, etc.

Fill in the blank tree on the back of this page to show how these animals are related.

**The ten species of mammals you will use to fill in the phylogenetic tree are:**

1. African Savannah Elephant  
(*Loxodonta africana*)



2. Chimpanzee  
(*Pan troglodytes*)



3. Common Shrew  
(*Sorex araneus*)



4. Dog  
(*Canis lupus*)



5. European Hedgehog  
(*Erinaceus europaeus*)



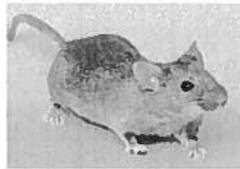
6. Gray, Short-tailed Opossum  
(*Monodelphis domestica*)



7. Horse  
(*Equus caballus*)



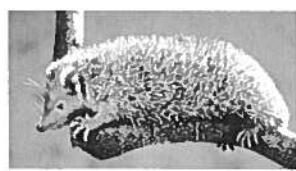
8. Mouse  
(*Mus musculus*)



9. Nine-banded Armadillo  
(*Dasypus novemcinctus*)

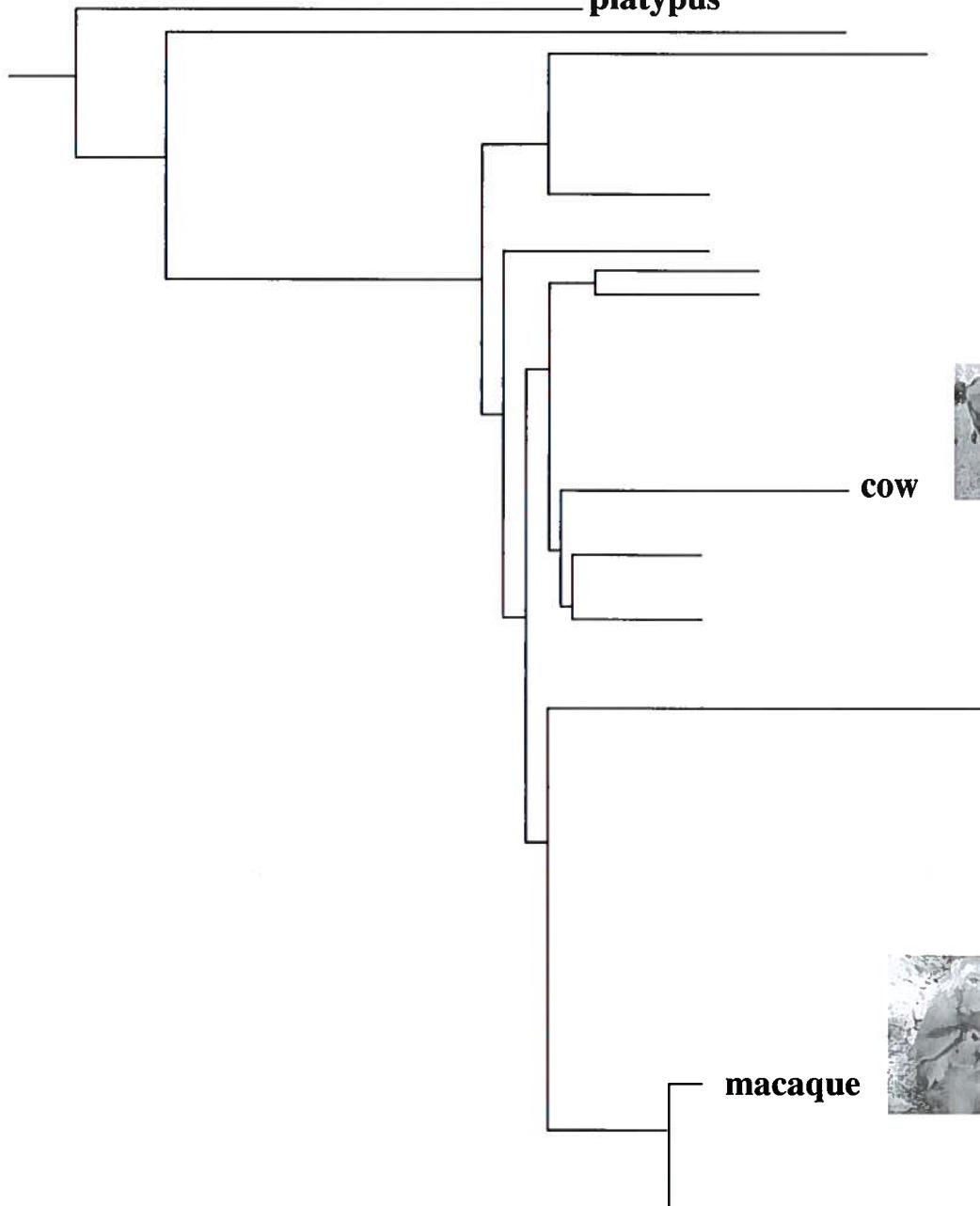


10. Tenrec  
(*Echinops telfairi*)





**platypus**



**cow**



**macaque**

## Classification of Mammals by DNA Sequence

You will now make a new version of the phylogenetic tree. Last time, you used physical appearance to group the mammals. This time, you will use DNA sequences from the mammals. You will fill in a new tree, found on the back of this page, to show the relatedness between these organisms based on their DNA sequence similarity.

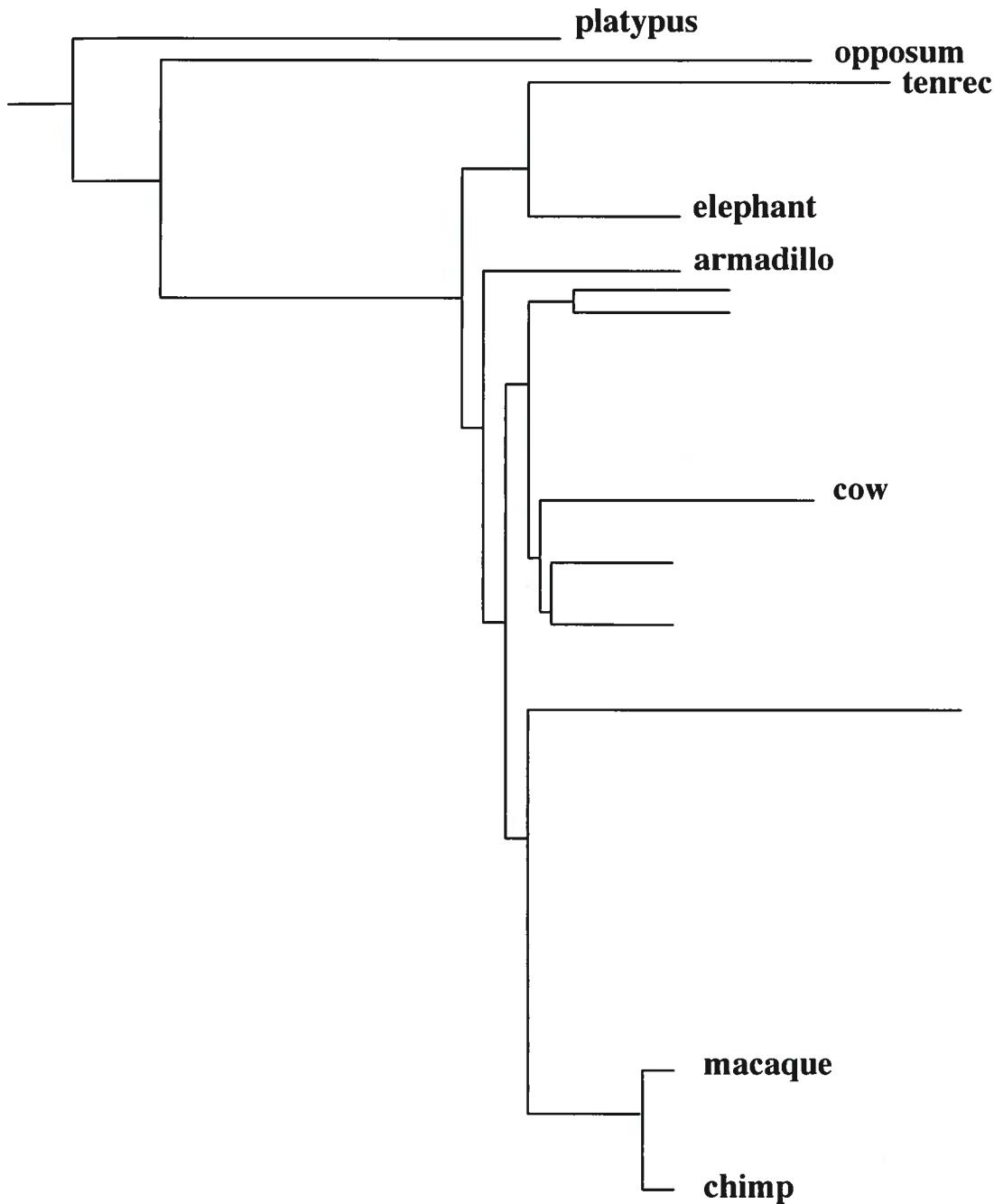
The five species we have not filled in on this phylogenetic tree are: Dog, Hedgehog, Horse, Mouse, and Shrew. Below are the DNA sequences of the same region of DNA from each of these five mammals, and from the cow as well.

Cow:	5' -ACCGTATTTGCCGAAG-3'
Dog:	5' -AGCGTAATTGCCGTAG-3'
Hedgehog:	5' -AGCGTAGTTCCGTAC-3'
Horse:	5' -AGCGTACTTGCCGTAG-3'
Mouse:	5' -ATAGTAGATCGCGCAT-3'
Shrew:	5' -AGCGTAGTTACCGTAC-3'

To determine the relatedness between two species, you need to count the number of differences between each of their sequences. Fill in every box that is not shaded in the chart below with the number of sequence differences between the two organisms that intersect at that box. An example has been done for you: Look in the box at the intersection of Hedgehog and Dog and you will see the number "3." This means that the Hedgehog and Dog DNA sequences shown above differ from each other by 3 letters.

	Cow	Dog	Hedgehog	Horse	Mouse	Shrew
Cow						
Dog						
Hedgehog		3				
Horse						
Mouse						
Shrew						

Using this information, fill in the phylogenetic tree shown below with the 5 organisms still missing from the tree (Dog, Hedgehog, Horse, Mouse, and Shrew). The easiest way to complete the tree is to first decide which organisms are the most closely related to each other (i.e. which organisms have the fewest differences between them). Then decide which organism is most related to cow, and place that organism on the closest line to cow. Then decide which is the next most closely related to cow, and place that organism on the next closest line to cow. Finally, decide which is the least most closely related to cow, and place that organism on the furthest line from cow. Proceed this way until the tree is complete.



**Now answer the following questions:**

1. Do everyone's trees based on physical characteristics look the same? Why or why not?
  2. Do everyone's DNA-based trees look the same? Why or why not?
  3. Which method do you think is used to generate current, scientifically accepted phylogenetic trees? Explain your answer.
  4. Which animal's placement on the DNA-based tree surprised you the most, and why?



Honors Biology  
Unit 7: Classification of Living Things  
Mrs. Eytcheson

Name \_\_\_\_\_

Date Due:

## The Five Kingdoms

### ***Key Concepts***

- Today, the most generally accepted classification system contains five kingdoms: monerans, protists, fungi, plants, and animals.

### **Building Vocabulary Skills: Applying Definitions**

In your words, write a definition for each of the following terms.

1. Autotroph \_\_\_\_\_  
\_\_\_\_\_

2. Heterotroph \_\_\_\_\_  
\_\_\_\_\_

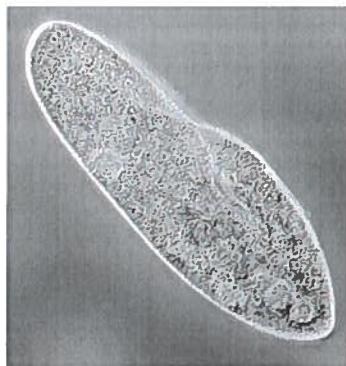
Now apply your understanding of the definitions by labeling each of the following organisms as either an **autotroph** or a **heterotroph**.



1. \_\_\_\_\_



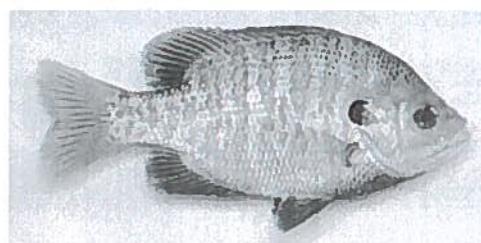
2. \_\_\_\_\_



3. \_\_\_\_\_

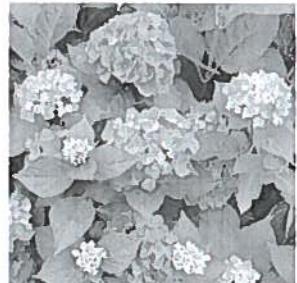
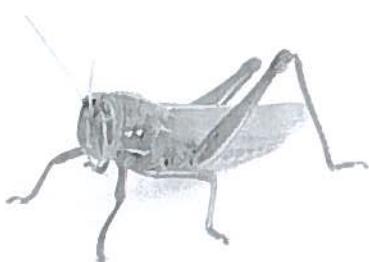


4. \_\_\_\_\_



5. \_\_\_\_\_

6. \_\_\_\_\_



7. \_\_\_\_\_

8. \_\_\_\_\_



9. \_\_\_\_\_

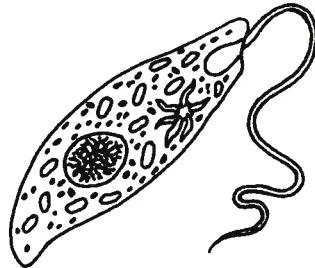
### Reviewing the Five Kingdoms: Understanding the Main Ideas

Complete the chart by using + to indicate that the description is true and a - to indicate that the description does not apply.

	Unicellular	Multicellular	No Nucleus	Nucleus	Autotroph	Heterotroph
Monera						
Protista						
Fungi						
Plants						
Animals						

## Applying Knowledge: Using the Main Ideas

Label each of the organisms with the name of the kingdom to which it belongs.



1. \_\_\_\_\_



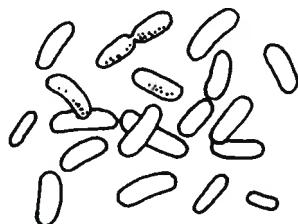
2. \_\_\_\_\_



3. \_\_\_\_\_



4. \_\_\_\_\_



5. \_\_\_\_\_

Compare and contrast the characteristics of one of the following pairs of kingdoms:

- Monera and Protista
- Plants and Fungi
- Plants and Animals

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Honor Biology

Unit 7: Classification of Living Things

Mrs. Eytcheson

## Study Guide

1. Give examples of the ways classification is used in science and in everyday life.
  - Give 3 examples of things scientists might classify.
  - Give 3 examples of things you would classify at home or school.
  - Does everyone classify things the same way? Why?
  - What is the science of classification called? Who does this?
2. Explain how binomial nomenclature is used to name living things.
  - What is binomial nomenclature?
  - What language is binomial nomenclature written in most often?
  - What part of an organism's scientific name is related to binomial nomenclature?
  - Who designed binomial nomenclature?
  - How did Aristotle classify living things? What were his limitations?
  - How did Linnaeus change the process of classifying living things?
3. Relate biological classification to evolution.
  - How is the study of evolution related to the classification of living things?
  - How is this relationship beneficial to scientists who are classifying living things?
4. List the seven major classification groups.
  - From largest to smallest, what are the seven major classification groups?
  - Which classification group would hold the most different organisms?
  - Which classification group would hold the most similar, yet different, organisms?
  - Would knowing the class or family tell you more about an organism?
  - What is the scientific name for modern human beings?

- How do you know that *canis lupus* and *canis domesticus* are related?
5. Describe some general characteristics of each of the five kingdoms.
- Name the five kingdoms.
  - Compare a heterotroph to an autotroph.
  - List the main characteristics of organisms found in the Kingdom Monera.
  - Give an example of a Moneran.
  - List the main characteristics of organisms found in the Kingdom Protista.
  - Give an example of a Protist.
  - List the main characteristics of organisms found in the Kingdom Fungi.
  - Give an example of a Fungus.
  - List the main characteristics of organisms found in the Kingdom Plantae.
  - Give an example of a plant.
  - List the main characteristics of organisms found in the Kingdom Animalia.
  - Give an example of an animal.

**Miscellaneous:**

- Be familiar with Unit 7 Vocabulary.
- Be prepared to do some classifying.

Standard 23: The student will identify and explain how DNA sequencing and physical characteristics are used to classify organisms.

1. Give 5 examples of physical characteristics of a living thing.

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2. Write a physical description of this animal:



3. Compare your description to another student's description. They are unlikely to be the same? Why not?

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4. How are physical characteristics used to classify living things?

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5. What is DNA sequencing?

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6. How can you tell from the DNA sequence of two organisms how closely related they are?

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7. Why is DNA sequencing more accurate in classifying organisms than using physical characteristics to do it?

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Standard 24: The student will explain how natural selection is the result of genetic variation, adaptation, competition, and the ability to reproduce.

1. What is genetic variation? Be specific.

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2. What is adaptation? How is this the result of genetic variation? Be specific.

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3. What is competition amongst living things in nature?

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4. Define natural selection.

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5. Natural selection is sometimes referred to as “the survival of the fittest”. What does this mean?

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6. Putting it all together: Explain how natural selection is the result of genetic variation, adaptation, competition and the ability to reproduce.

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# **Honors Biology**

## **Unit 8: Viruses and Monerans**

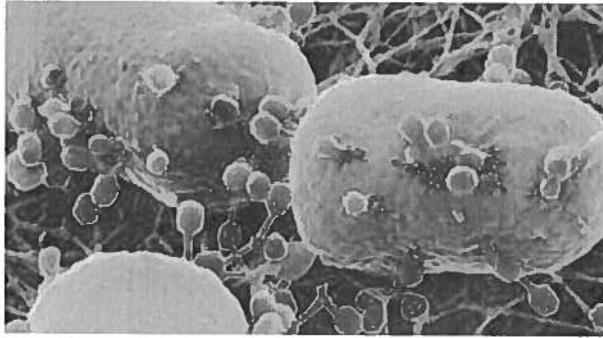
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### **Textbook References:**

- Biology: Exploring Life: Chapter 16
- Exploring Life Science: Chapter 5

### **Projects and Activities:**

- ✓ “Understanding Viruses” video
- ✓ Viruses WS
- ✓ Viruses and Bacteria Diagrams
- ✓ “Understanding Bacteria” video
- ✓ Monerans WS
- ✓ Mini Research Project
- ✓ Unit 8 Test



### **Study Guide:**

#### **Vocabulary:**

- Virus
- Host
- Parasite
- Decomposer
- Symbiosis
- Antibiotic

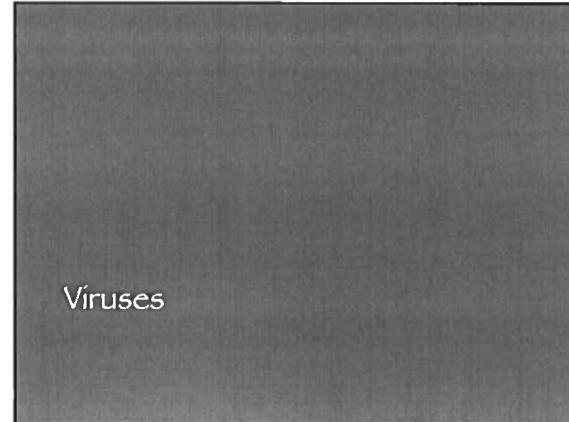
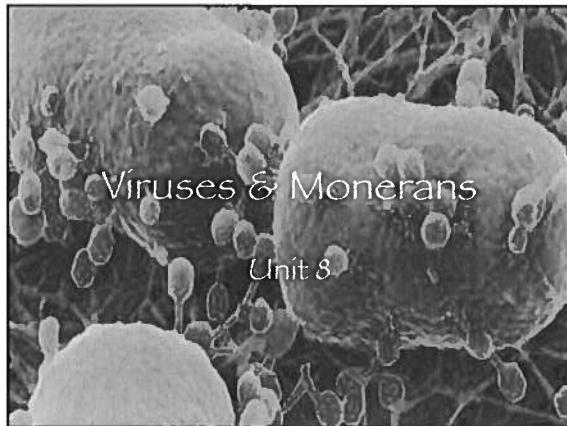
#### **Concepts:**

- List the parts of a virus.
- Describe how a virus reproduces and causes disease.
- Name and describe the parts of a moneran.
- Compare autotrophic and heterotrophic monerans.
- Discuss the helpful and harmful effects of the monerans.

#### **Standards:**

27. Describe the reproductive (infection) process of viruses and bacteria.
28. Identify the positive and negative impact of viruses and bacteria on humans.





### What is a Virus?



- A disease causing germ.
- Alive or not???
- Tiny particle that invades cells.
- Not a cell.

### Virus Facts

- Can't perform functions of life.
  - No need for food; no wastes.
- Can't reproduce on its own.
- All kingdoms affected.
- A virus can only infect a specific type of cell.
- Origin unknown.
  - After 1<sup>st</sup> cells.
  - Left over host DNA?

### Structure of Viruses

- 2 Parts:
  - Tail
    - Tail fibers like "legs".
    - Attachment of virus.
  - Head
    - Contains hereditary material (DNA or RNA).
    - Controls reproduction.
    - Has protein coat that protects & identifies virus.
- Many shapes.

### Bacteriophage Structure

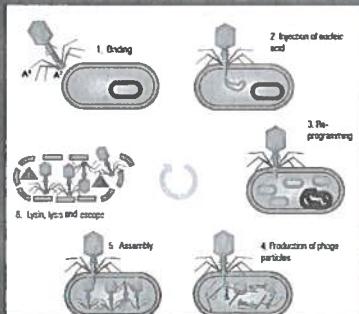
## Reproduction of Viruses

- Can't reproduce on its own.
- Needs a host.
  - Other living cell.
- Is a parasite.
  - Survives by living on, in or near a host and harming it.

## Bacteriophage Reproduction

- A bacteriophage is a virus that infects bacteria.
- Attaches to cell membrane.
- Injects hereditary material into bacteria.
- Bacteria reproduces using viral DNA, too.
- Bacteria becomes full of viruses and bursts.
- New viruses go out and infect more bacteria.

## Bacteriophage Reproduction



## What is a Vaccine?

- Preventive.
- Virus is killed or weakened.
- Injected into person.
- Person's immune system learns to recognize the intruder and builds a defense system (immunity).

## Beneficial Uses

- Used to kill harmful bacteria.
- Used to kill harmful insects, etc.
- "Germ warfare"?

## Genetic Engineering

- Viruses have been used to "plant" new DNA into a defective cell.
- Cures genetic disorders.
- Makes crops insect resistant, for example.

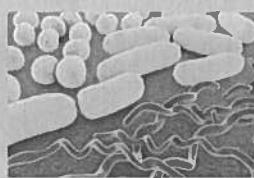
## Monerans

### Characteristics

- Are commonly called bacteria.
- First appeared 3.5 billion years ago.
- Simplest living organisms.
- Very numerous.  
– 1 g of soil may have 2.5 million bacteria.
- Found everywhere.  
– Some are “extremophiles”.  
• Live in extreme conditions (volcanoes).

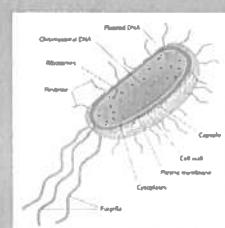
### What do bacteria look like?

- 3 basic shapes.  
– Rod, sphere, spiral
- Many colors.
- May live in a colony or singly.



### Bacteria Structure

- Cell wall
- Cell membrane and cytoplasm
- DNA not in a nucleus
- Movement  
– On own with flagella  
– Wind, water, etc.



### Life Functions of Bacteria

- Some are aerobic, some anaerobic.
- Some heterotrophs, some autotrophs.
- Some are decomposers.  
– Feeds on dead organisms – returning nutrients to the soil for re-use.
- In good conditions, reproduce quickly.
- In bad conditions, “wait it out”.  
– Have a capsule or endospore that enclosed and protects it.  
– Makes it difficult to kill.

### Bacteria in Nature

- Most do not cause disease.
- Instead have a beneficial role to play.

## Food and Energy Relationship

- Decomposers break down dead things to obtain energy.
- In the process, those dead things are recycled into simpler substances.
- Autotrophs use these to build their cells.
- Heterotrophs eat autotrophs, etc.....

## Oxygen Production

- Cyanobacteria release oxygen while making food.
- Helped to change Earth's early atmosphere.



## Changing Environments

- Can live on a rock and change it to soil then other organisms can live there.
- Cleaning up dead organisms.

## Symbiosis

- Symbiosis is a relationship between two organisms in which at least one of them benefits and neither is harmed.
- Nitrogen-fixing bacteria
  - These bacteria are found in the soil where certain types of plants grow (alfalfa).
  - Take nitrogen from the air and make it into a form plants can use from the soil.

## Bacteria & Humans

## Food

- Uses
  - Production of food (cheese, yogurt, pickles).
  - N-fixing for crop plants.
  - Food for other organisms.
- Cause food spoilage.
  - Prevent it by creating situations bacteria can't survive in.
  - Cold, salty, dry, hot, smoky, pasteurized

### Fuel

- Used to make fuel (methane or natural gas).
- Can cause the breakdown of organic material to become petroleum.

### Environmental Clean-up

- Treat sewage.
- Rot garbage.
- Clean up oil spills.
- Break down pesticides.

### Health & Medicine

- Keep us healthy.
  - Found in the digestive tract to help digest certain foods.
  - Cows and termites have bacteria living in their digestive tract to help them break down cellulose (plant fiber).

### Health & Medicine

- Can cause disease.
  - Use antibiotics to kill bacteria.
  - An antibiotic is a chemical that is used to kill bacteria.
  - Antibiotics work on bacteria ONLY!

### Industry

- Used in tanning leather.
- Takes valuable minerals out of rock.
- Many uses in food industry.
- Can cause breakdown of equipment, structures, etc.



Honors Biology

Unit 8: Viruses & Monerans

Mrs. Eytcheson

Mini Research Project

## Virus & Moneran Reports

### Objectives:

After completing this exercise, you will be able to:

1. Fully describe one disease including information regarding symptoms, prognosis, transmission and treatment.
2. Determine how vaccine programs can decrease the number of people infected by a particular disease.

### Instructions:

You should use a variety of resources including health care professionals, public, university or school libraries, hospital and university health education departments and/or the local department of public health. Following is a list of suggested diseases that you may choose to research:

- Polio
- Yellow Fever
- Pneumonia
- Scarlet fever
- Tuberculosis
- Typhoid fever
- Botulism
- Salmonella
- Meningitis
- Herpes I
- Herpes II
- Whooping cough
- Lyme's disease
- Encephalitis
- Pseudomonas
- Pyelonephritis
- Chicken pox
- Small pox
- Rubella
- Yellow fever
- Syphilis
- Mumps
- Bronchitis
- Rabies
- AIDS
- Mononucleosis
- Tetanus
- Anthrax
- Diphtheria
- Red measles
- Shingles
- Ebola

Your report should include the following information:

1. Diagnosis: What is the name of the disease? What part or parts of the body are affected?
2. Organism causing the disease: What is causing the disease? A virus or a bacterium? Give the genus and species name.
3. Symptoms: List the common initial signs of the disease. Do new symptoms develop as the disease progresses? What symptoms are characteristic of this disease? In other words, how is this disease distinguished from other, perhaps similar, diseases?
4. Type of transmission: How is the disease passed from person to person?
5. Treatment: How is this disease treated? Be sure to consider all aspects of treatment including medication, rest, etc. Are you aware of any treatments which are not based in Western medical tradition? Is there evidence for the effectiveness of these treatments? Why do you think that they may work?
6. Is there a vaccine for the disease? If yes, what type of vaccine is it? What is the recommended schedule of vaccination for this disease? Are booster shots required? Does the vaccine produce any side effects?
7. Prognosis: What is the chance of being cured if you contract this disease? If you are cured, can you get the disease again?

Honors Biology  
Unit 8: Viruses & Monerans  
Mrs. Eytcheson

Name \_\_\_\_\_

Due Date:

## Viruses

### **Key Concept**

- First, a virus gets its hereditary material into the host cell. Then the host cell makes more virus particles. Finally, the virus particles leave the original host cell and infect new hosts.

### **Building Vocabulary Skills: Identifying Facts**

In the spaces provided, extend your knowledge about the vocabulary words listed by writing two short complete sentences about each word.

1. Virus \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

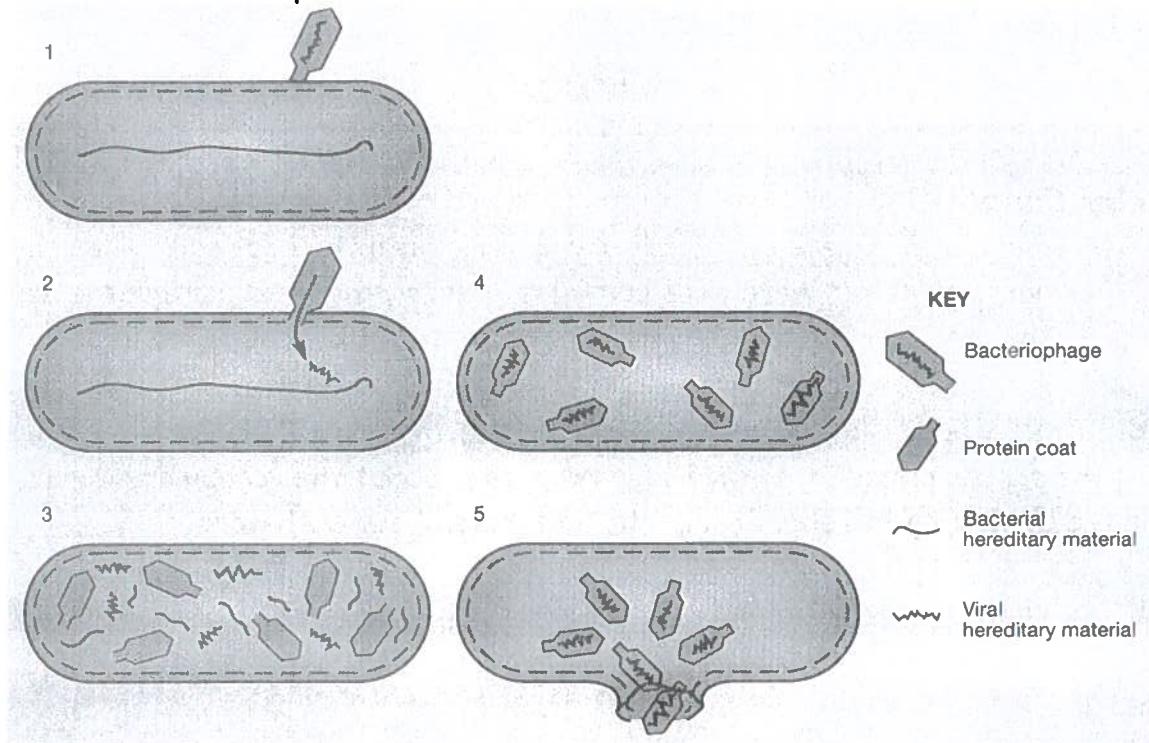
2. Parasite \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

3. Host \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

4. Bacteriophage \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

## Interpreting Diagrams: Using the Main Ideas

Study the illustration below. In the space provided, explain what happens in each numbered step.



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## Making a List: Understanding the Main Ideas

In any virus "life cycle", there are three basic steps. Summarize the steps in the spaces provided.

- 1.
  - 2.
  - 3.

In the space provided, write a short paragraph telling what you have learned about the interaction between viruses and human hosts. Concentrate on information you found to be interesting.



Honors Biology

Name \_\_\_\_\_

Unit 8: Viruses & Monerans

Mrs. Eytcheson

Due Date:

Diagram Activity

## Viruses & Bacteria

Identify each diagram and label the parts.

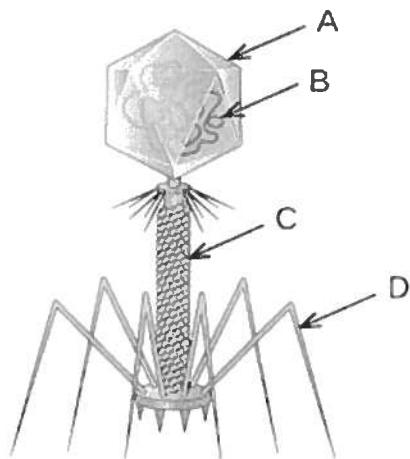
1. This is a diagram of a \_\_\_\_\_.

A. \_\_\_\_\_

B. \_\_\_\_\_

C. \_\_\_\_\_

D. \_\_\_\_\_



2. This is a diagram of a \_\_\_\_\_.

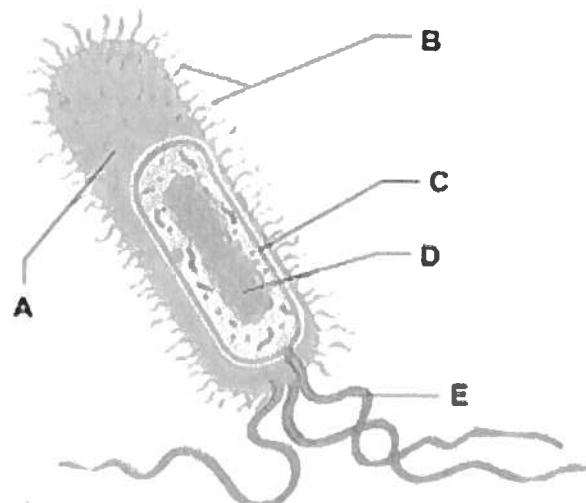
A. \_\_\_\_\_

B. \_\_\_\_\_

C. \_\_\_\_\_

D. \_\_\_\_\_

E. \_\_\_\_\_

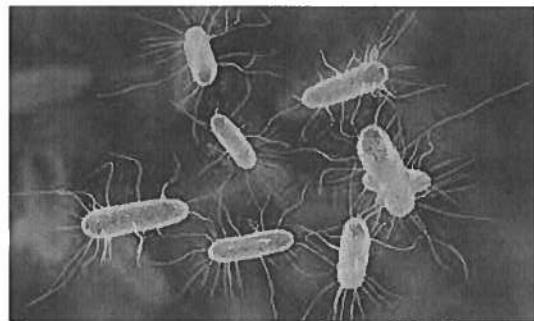




## Monerans

### Key Concept

- Bacteria are an essential part of the food and energy relationships that link all life on Earth.



### Building Vocabulary Skills: Fill in the Facts

Supply the missing information to complete the chart.

Simplest organisms that consist of a single cell	
Trait that makes monerans different from other cells	
	Common name for monerans
	When bacteria first appeared on Earth
Number of bacteria in a gram of soil	
3 basic shapes of bacteria	
Bacteria that feed on dead organisms	
Symbiosis	
Bacteria living within cows and termites	
	Chemicals that weaken or destroy bacteria

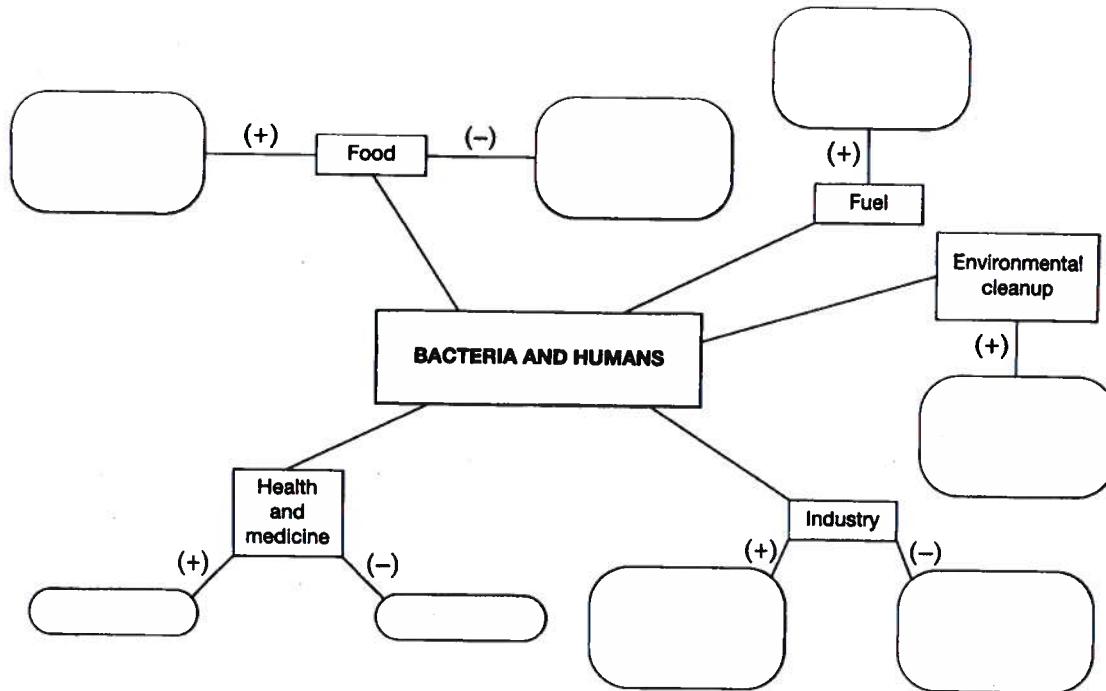
## Connecting the Links: Using the Main Ideas

Complete the chart with an appropriate example of each type of bacterial activity.

Activity of Bacteria	Example
Food and energy relationships	
Oxygen production	
Changing environments	
Symbiosis	

## Links Between Bacteria and Humans: Understanding the Main Ideas

Complete the following concept map. The (+) indicates a positive link whereas the (-) indicates a negative link.



Honors Biology  
Unit 8: Viruses & Monerans  
Mrs. Eytcheson

Name \_\_\_\_\_

### Standards Assessment Review

## Unit 8 Review

Standard 27: I am able to describe the reproductive (infection) process of viruses and bacteria.

1. Briefly describe how viruses reproduce.

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2. Briefly describe how bacteria reproduce.

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Standard 28: I am able to identify the positive and negative impact of viruses and bacteria on humans.

3. Give two examples of how viruses can negatively impact us.

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4. Give two examples of how viruses can positively impact us.

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5. Give two examples of how bacteria can negatively impact us.

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6. Give two examples of how bacteria can positively impact us.

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# **Biology**

## **Unit 9: Exploring Human Structure and Function**

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Textbook Reference: Chapters 15-21, pages 391 – 551

### **Projects and Activities**

- Human Body Corporation WebQuest
- The Human Body WS
- The Skeletal System WS
- The Muscular System WS
- The Importance of Food WS
- Digestion of Food WS
- Absorption of Food WS
- Maintaining Good Health WS
- The Body's Transportation System WS
- Circulation in the Body WS
- Blood – The River of Life WS
- Cardiovascular Diseases WS
- The Respiratory System WS
- The Excretory System WS
- The Nervous System WS
- Divisions of the Nervous System WS
- The Senses WS
- The Endocrine System WS
- The Reproductive System WS
- The Stages of Development WS
- Body Defenses WS
- Immunity WS
- Diseases WS

### **Concepts:**

- Relate anatomy and physiology.
- Identify the levels of structure in the human body.
- Describe how the integumentary system contributes to homeostasis.
- Describe how the skeletal system contributes to homeostasis.
- Describe how the muscular system contributes to homeostasis.
- Describe how the nervous system contributes to homeostasis.
- Describe how the digestive system contributes to homeostasis.
- Describe how the circulatory system contributes to homeostasis.
- Describe how the lymphatic system contributes to homeostasis.

- Describe how the respiratory system contributes to homeostasis.
- Describe how the urinary system contributes to homeostasis.
- Describe how the endocrine system contributes to homeostasis.
- Describe how the reproductive system contributes to homeostasis.

Standards Assessment:

25. Students will identify the 11 vertebrate systems and their functions.
26. Students will understand and describe the important relationships between body systems in controlling body functions.

Honors Biology

Unit 9: Exploring Human Structure and Function

Mrs. Eytcheson

## The Human Body Corporation Webquest

### Introduction

You are a body organ, employed with the Human Body Corporation. Due to recent cost increases, the Human Body has been forced to lay off some of its workers. Because you are terrified of losing your job, you have decided to make a presentation to the Executive Board of the Human Body Corporation (your classmates), defending your position in the company. You must be persuasive, and clearly explain the relevance of your role, as the company is quite large, and usually only notices any given department when there are 'internal problems'! Good luck! The company's future 'health' depends on you!

### The Task

For this webquest, you and your partner must write a persuasive, first-person letter to the Human Resources Department of the company (i.e. your classmates) requesting an audience with the Board of Directors. When, and if, this is granted, you will present your case to the Board.

In your presentation, you must provide answers to the following questions:

- What is your name? (i.e. the name of the organ)
- What do you look like?
- Where are you found within the Human Body Corporation?
- What are five interesting facts about you as a body organ?
- What are five interesting facts you have learned about your department(s)? What is your job within the department(s)?
- What other organs are involved in your department(s)?
- Why are you an important employee of the Human Body Corporation?
- What would happen to the Human Body Corporation if you were 'fired'? Try to be as specific as possible. (Some things to consider – What other departments (systems) would shut down? Would the corporation develop

a ‘disease’? How would the ‘disease’ affect how the corporation functions?

- You must also have clearly labeled diagrams of your organ and its related system(s), which you will use during your presentation.

## The Process

Working cooperatively with your partner, you will:

- Decide what organ you will personify in your letter and presentation. One person will research information on the organ, while your partner will study the systems that your chosen organ is involved with.
- Read the entire WebQuest to ensure that you completely understand what your task is, how to accomplish the assignment, and how you will be evaluated.
- Keep neat, detailed notes. You may want to organize your information by having the assigned questions serve as your section headings, ensuring that all questions have been fully answered, to the best of your ability. Make sure that you include in your notes, the name of the resource (website, book, etc.) where you found each piece of information.
- Share your notes and information with your partner and your teacher.
- Create a letter to the Human Resources Department of the Human Body Corporation, requesting an audience with the Executive Board to make your presentation.
- Create a Power Point presentation to present to the Executive Board to highlight the importance of your job within the corporation. Be sure to answer all of the questions proposed in this task within the context of your presentation.

## Evaluation

The evaluation of your assignment will be equally divided into three sections:

1. The research process
2. The presentation
3. The Letter

### *The research process:*

These are the guideline questions I will be referring to when I evaluate your research:

- Did the students work well during class time?
- Did the students cooperate with their partner?
- Did the students visit, and record with their information, all resources that had material on their organ or system?
- Were the student's notes logically and neatly organized?
- Did the students make an organized outline?
- Did the students find or create a well-labeled diagram on their organ or system?

### *The presentation:*

These are the guideline questions I will be referring to when I evaluate your presentation:

- Was the student's argument convincing?
- Was the student's presentation informative?
- Did the student obviously understand their diagram, and were they able to clearly explain it to the class?
- Could the student correctly answer logical questions asked by other students?
- Did the student speak in a loud, clear voice?
- Did the student use correct grammar?

### *The letter:*

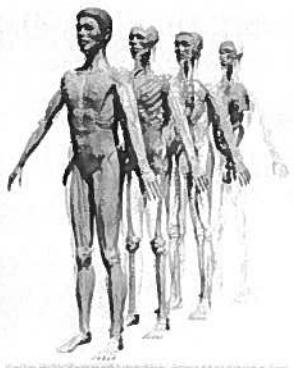
These are the guideline questions I will be referring to when evaluating your letter:

- Was the students' letter convincing?
- Did the students write in the first person?
- Did the students answer all of the given questions?

- Did the students organize their material logically?
- Did the students write their letter using complete sentences, and indenting new paragraphs where necessary?
- Did the students use proper grammar when writing their letter?
- Were there any spelling mistakes in their letter?
- Was the students' letter double spaced, and typed or neatly printed?

## Conclusion

I hope you have found your time as an employee of the Human Body Corporation to be both fun and educational. Through completing this webquest, you should now clearly understand the structure and function of a variety of organs and their roles within the major systems of the body. You should also be able to recognize the difficulties that can arise when organs malfunction and why it is important to look after our health.

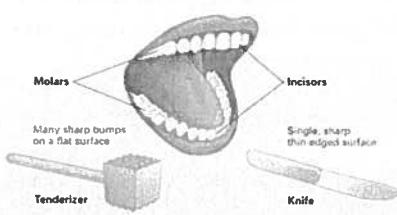


## Exploring Human Structure and Function

Unit 9

### Structure Fits Function in the Human Body

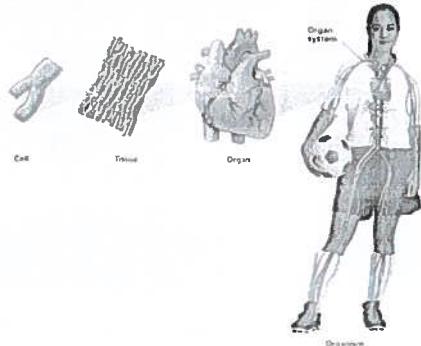
- Look at a structure...it gives you clues as to its function.



### Anatomy & Physiology

- The study of the structure of an organism and its parts is called anatomy.
- Physiology is the study of a structure's function.

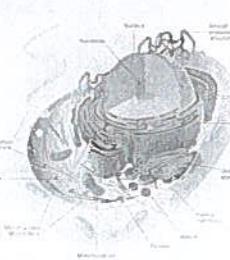
## Levels of Body Structure



## Organization of an Organism

- **Cell**

- The most specialized level.
- Each cell has one specific job.



## Organization of an Organism

- **Tissue**

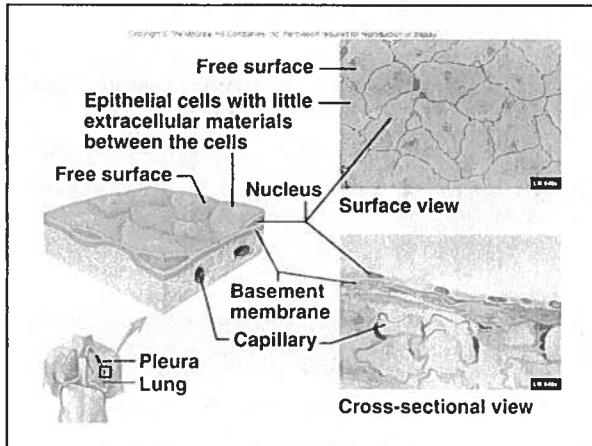
- Also a specialized level.
- Tissues are made of many similar cells doing one specific job.

- There are 4 types of tissues.

- Epithelial
- Connective
- Nervous
- Muscle

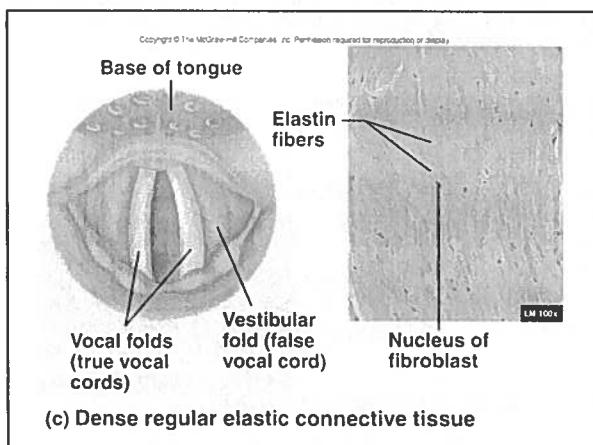
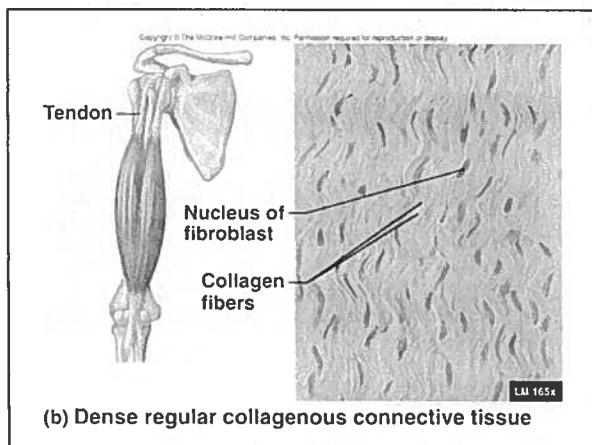
## Epithelial Tissue

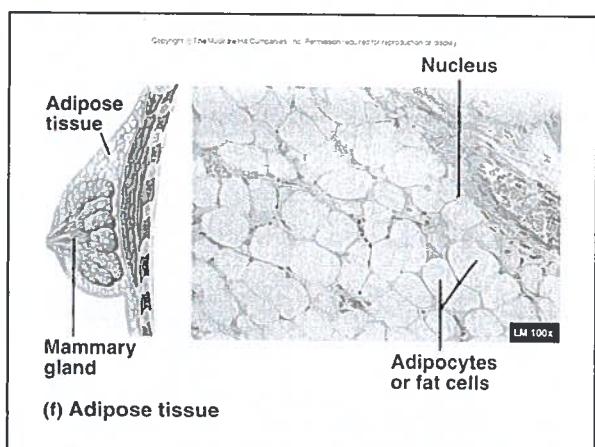
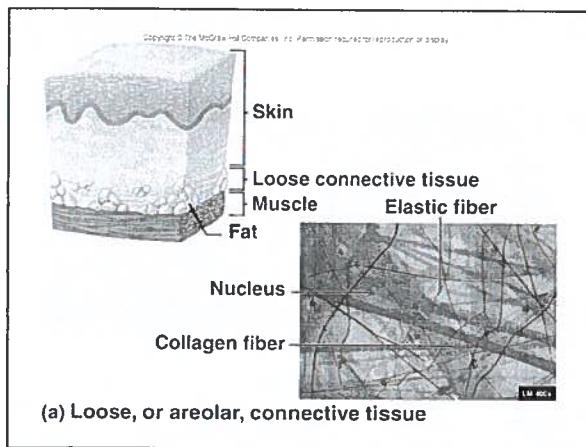
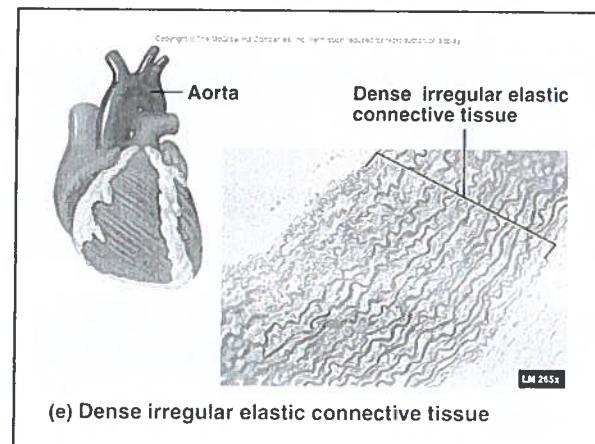
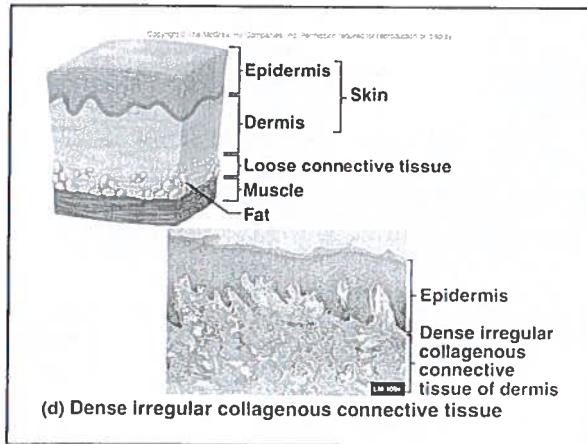
- Sheets of closely packed cells.
- Cover entire surface of body.
- Form the lining of your internal organs.
- Function to protect the tissues and organs they cover.

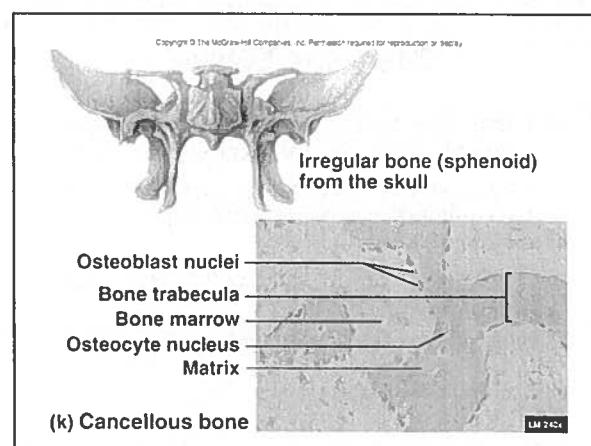
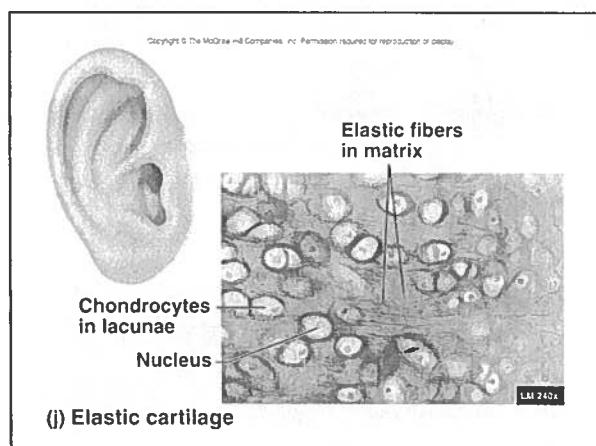
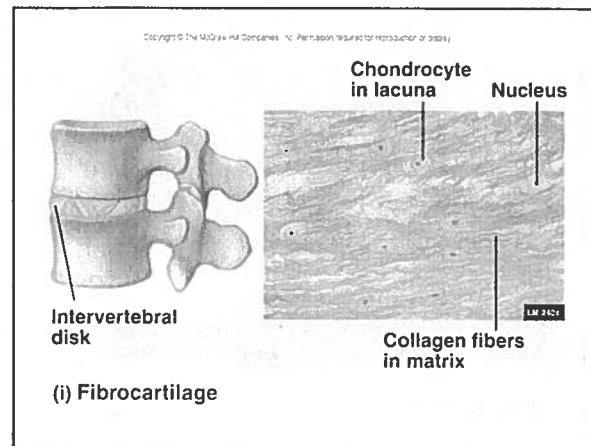
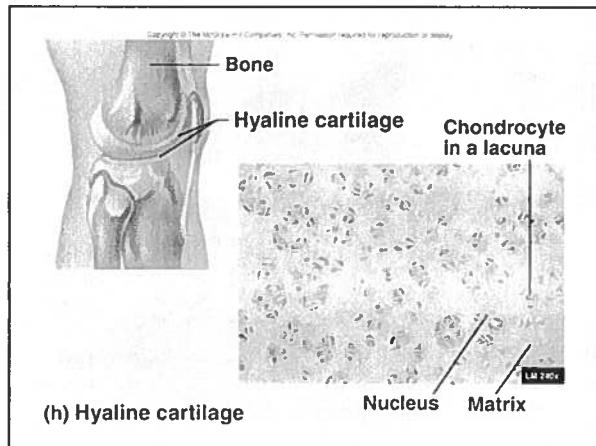


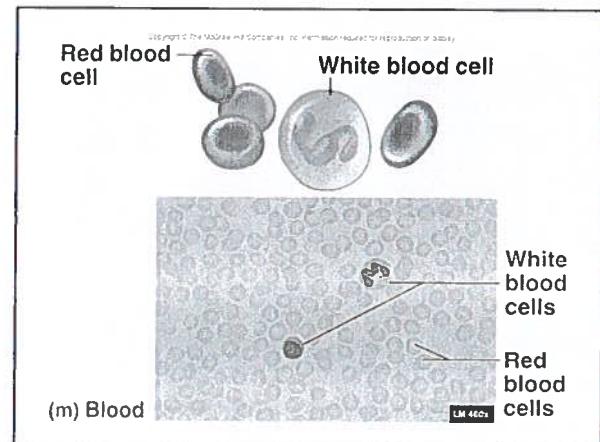
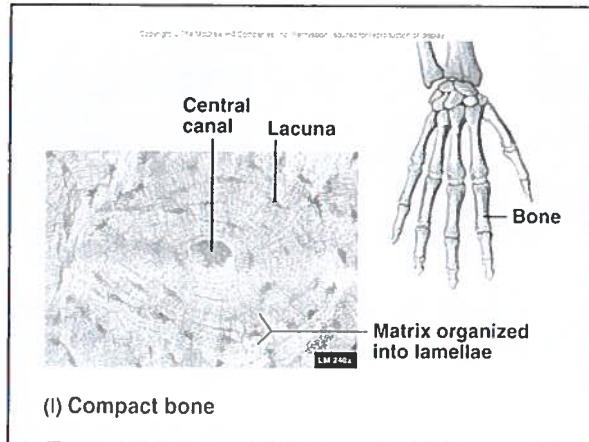
## Connective Tissue

- Main function is to hold together and support other tissues.
- Cushions, insulates, and connects organs.
- Cells are scattered in a “matrix” of fibers that acts like glue.



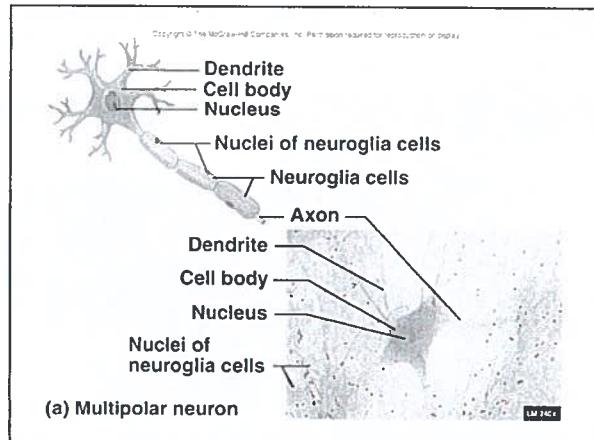






## Nervous Tissue

- Forms the communication system that connects brain to the rest of the body.
- Allows you to respond to changes in the environment - both internal and external.
- The neuron is the basic cell type found in this tissue.
- Neurons transmit signals rapidly over long distances.

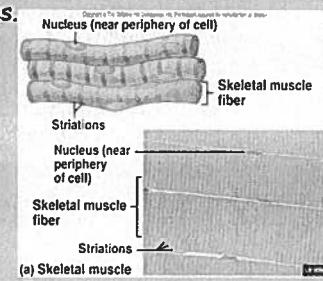


## Muscle Tissue

- Muscles are organs that enable us to move, move our blood, and push food through the digestive system.
- 3 types:
  - Skeletal
  - Cardiac
  - Smooth

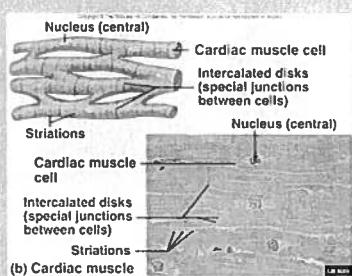
## Skeletal Muscle

- A voluntary muscle.
- Attaches to bones.



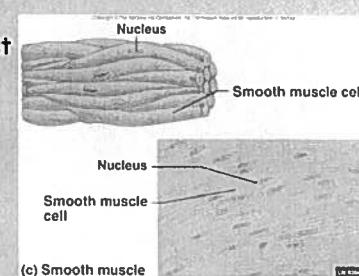
## Cardiac Muscle

- An involuntary muscle.
- Heart muscle.



## Smooth Muscle

- An involuntary muscle.
- Found in most organs.



## Organization of an Organism

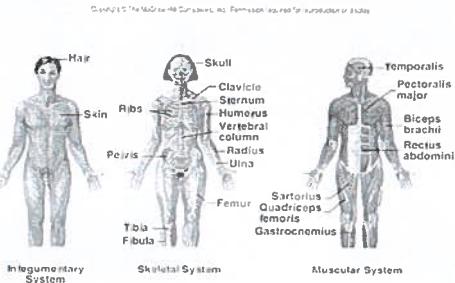
- Organ

- Organs are made up of several tissues working together to perform a specific job.

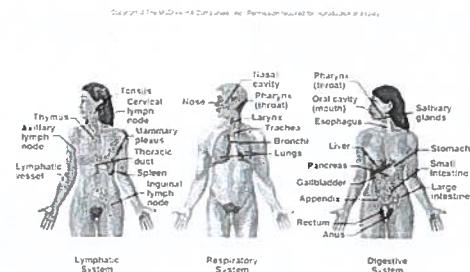
- Organ System

- Consists of multiple organs working together to perform a vital body function.

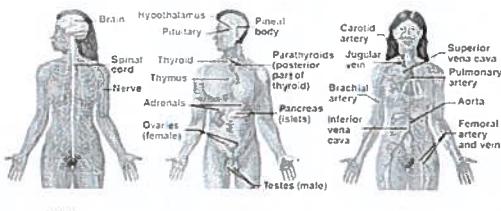
## Organ Systems of the Body



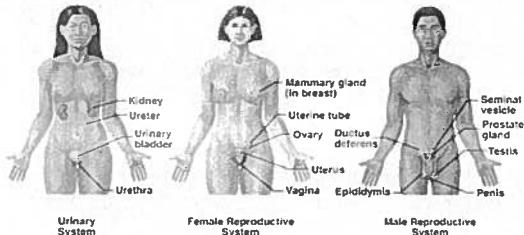
## Organ Systems of the Body



## Organ Systems of the Body



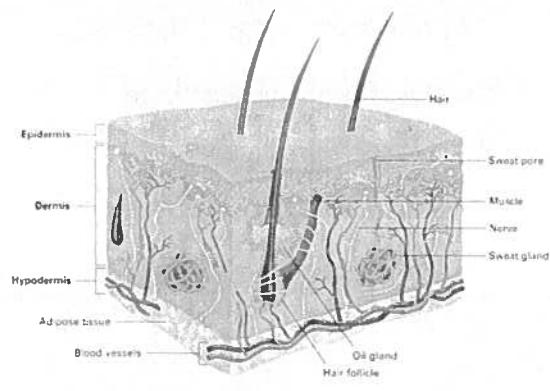
## Organ Systems of the Body



## The Integumentary System

### Anatomy of Integument

- Aka skin (2 mm thick)
- Physically separates the body from the environment.
- The epidermis is the top layer made up of mostly dead epithelial cells.
  - Impermeable
- The dermis is the cell layer under the epidermis made up of connective tissue.
  - Strong & elastic



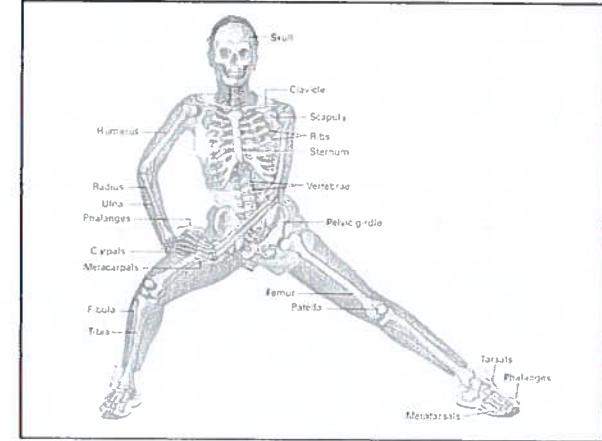
## Physiology of Integument

- Provides physical barrier against dirt and microorganisms.
- Insulation
- Cushion
- Sweat to cool body down.
- Hair protects scalp.
- Eyebrows and eyelashes protect eyes from dirt getting into eyes.

## The Skeletal System

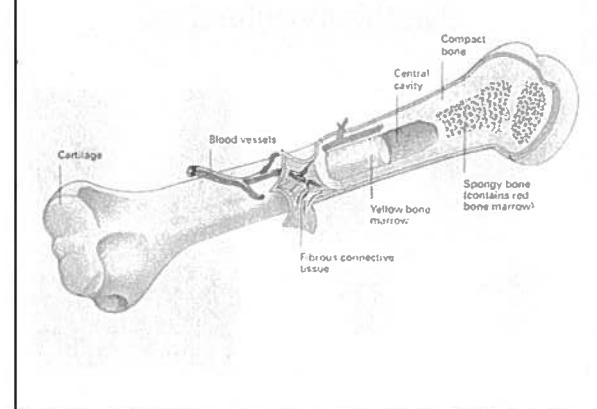
## Anatomy of the Skeleton

- Made up of bones and cartilage.
- Approx. 206 bones in adult skeleton.



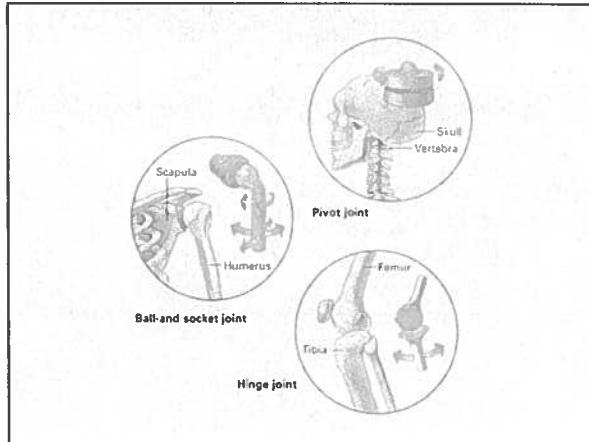
## Bone Structure

- Bone cells are surrounded by a material called bone matrix.
- Flexible fibers are made of protein.
  - Allows bone to flex a little.
- Hard minerals are phosphate and calcium.
  - Allows bone to withstand force.
- Contains marrow, a special tissue that stores fat or makes new blood cells.



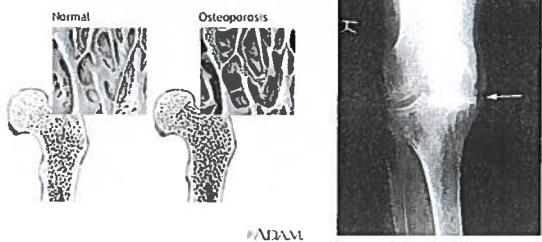
## Articulations

- Better known as the joints where your skeleton bends.
- A joint is a place where one bone connects and moves against another bone.
- There are many types of joints in your body.
- Bones involved in a joint are held together by a ligament.



## Skeletal Disorders

- Arthritis
  - Osteoporosis



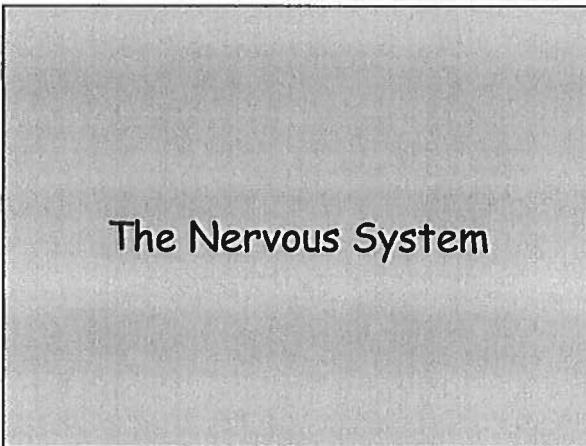
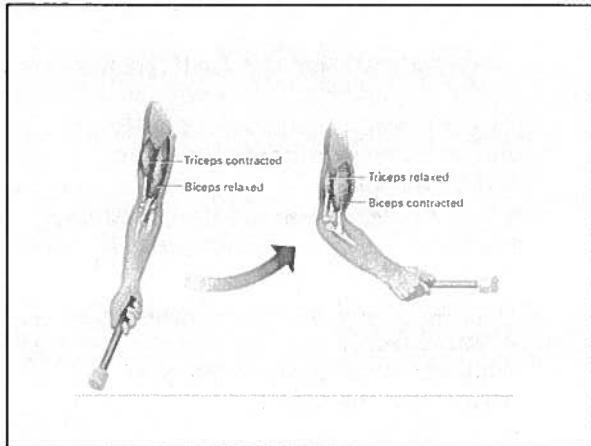
## The Muscular System

## Muscle Anatomy

- Muscles are made up of several muscle cells, called muscle fibers, running in the same direction.
  - Muscles are attached to the skeleton by tendons.

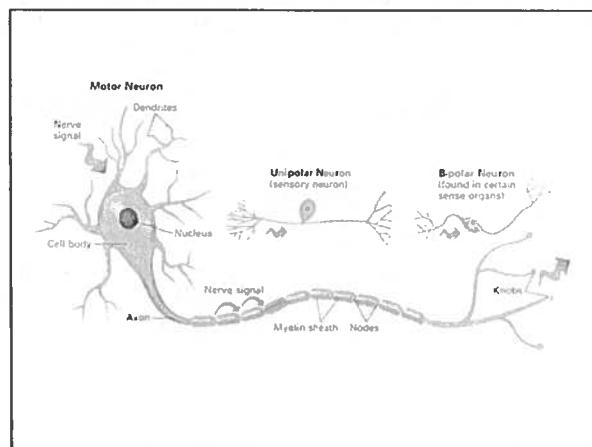
## Muscle Physiology

- Muscles can only pull - not push.
  - Have to work in opposing pairs.
  - When one muscle contracts, the other must relax.



## Nervous System Anatomy

- Neurons make up the nerves which make up your nervous system.
  - Cell body
  - Dendrite
  - Axon
    - Electrical signals travel through these carrying the impulse.
- Neurons are connected to each other by a space called the synapse.
  - The signal is carried across the synapse by the release of chemicals that travel across the gap.

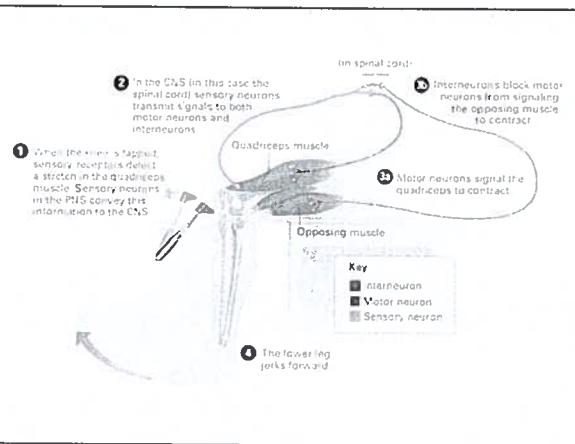


## Impulse Path

- Stimulus → Sensory receptor → sensory neuron → interneurons → motor neuron → effector → reflex
- A stimulus is something that causes a reaction.
- Sensory receptors are special cells that receive info from the environment.
- Sensory neurons receive the message from the receptor and send it to the brain and spinal cord.

## Nerve Pathway Continued

- Interneurons found in the spinal cord and brain connect sensory neurons to motor neurons.
- Motor neurons transmit the signal from the brain and spinal cord to muscle cells or glands in the body.
- The muscle cell or gland stimulated is the effector.
- What the stimulation message is determines the reflex.



## Divisions of the NS

- Central Nervous System**
  - Contains brain and spinal cord.
  - Control center of the body.
- Peripheral Nervous System**
  - Consists of a network of nerves that branch out from the CNS and connect it to the organs of the body.

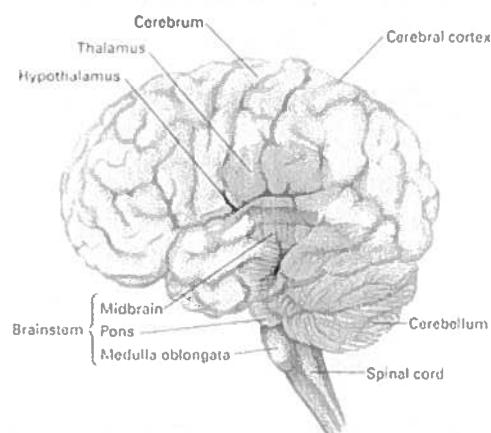
## The CNS

- Overview

- Interprets info that comes in from all over body.
- Issues commands to those same parts of the body.
- The brain is the main control center, transmitting and receiving messages thru the spinal cord.
- The spinal cord provides the link between body and brain.

## The Brain

- Billions of neurons.
- 1.4 kg
- Divided into 3 main parts:
  - The cerebrum
  - The cerebellum
  - The medulla



## The Cerebrum

- Largest part.
- Learning, intelligence, judgment occur here.
- Controls voluntary movement.
- Shapes attitudes, emotions, personality.
- Divided into left and right halves.
  - Left
    - Mathematical ability
    - Sensations on right side of body.
  - Right
    - Artistic ability
    - Sensations on left side of body.

## The Cerebellum

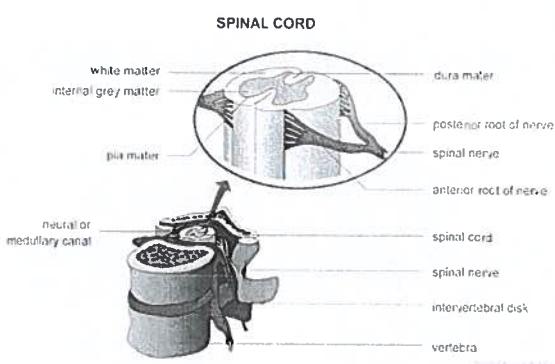
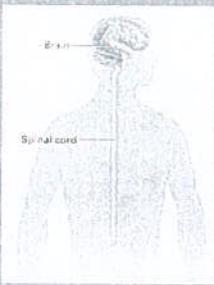
- 2<sup>nd</sup> largest part.
- Coordinates actions of muscles.
- Controls balance.
- Allows body to move smoothly and skillfully.

## The Medulla

- Aka the brainstem.
- Connects brain to spinal cord.
- Controls involuntary actions
  - Heartbeat
  - Breathing
  - Blood pressure

## The Spinal Cord

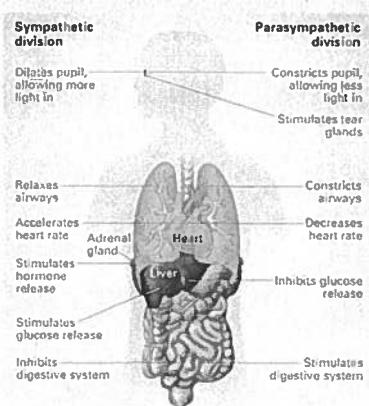
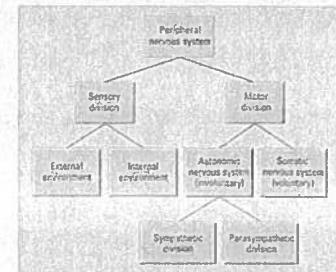
- Runs entire length of neck and back.
- Connects brain to all the nerves in the body.
- 31 pairs of nerves enter/exit the spinal cord.



## The PNS

- Overview

- Link between CNS and rest of body.
- 43 pairs of nerves.
- Some can be consciously controlled.
- Some are under involuntary control.
  - This is known as the autonomic nervous system.



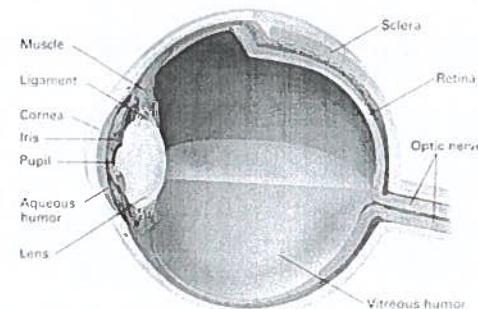
## The Senses

## Sense Organs

- Overview
  - Respond to light, sound, heat, pressure, and chemicals and also detect changes in the position of the body.
  - Gather info from external and internal environment.

## Vision

- Organ of vision is the eye.
- Designed to focus light rays to produce images of objects.

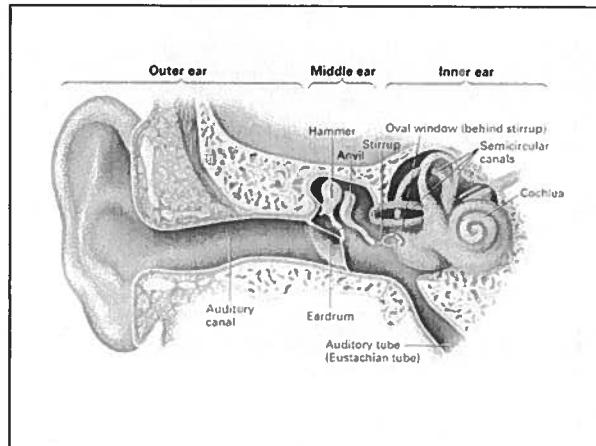


## Parts of the Eye

- Cornea: part of the eye's outer layer where light enters.
- Iris: colored part of eye.
- Pupil: opening in middle of iris that light enters the eye through.
- Lens: focuses light coming into eye.
- Retina: back surface of eye where light sensitive receptor cells are found.
  - Rods and cones

## Hearing and Balance

- The ear is the organ of hearing and balance.
- Designed to capture and transmit sound waves.

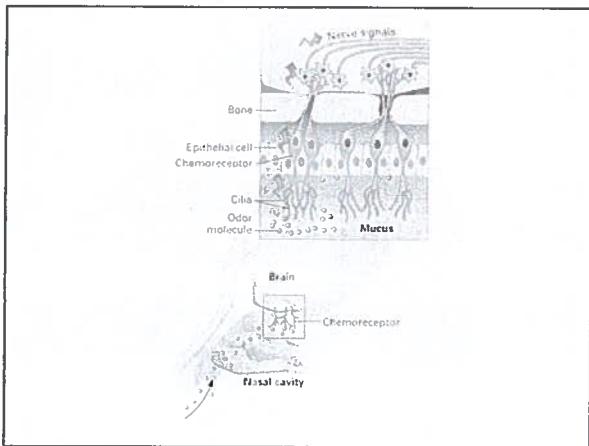


## Parts of the Ear

- Eardrum: tightly stretched membrane that separates the ear canal from the middle ear.
- Cochlea: Contains nerves that are stimulated by the waves of vibrations.
- Semicircular canals: responsible for balance; tiny hairs move as fluid adjusts to body position sending impulses to brain.

## Smell and Taste

- Organs of smell and taste respond to chemical stimuli instead of physical stimuli.
- The same chemicals stimulate taste and smell.
  - May be reason food is not flavorful when you have a stuffed up nose.



## Touch

- The skin is the sense organ for touch.
- In the skin are many sensory receptors.
- Touch, pressure, heat, cold, pain.
- Needed in order to recognize potential danger.

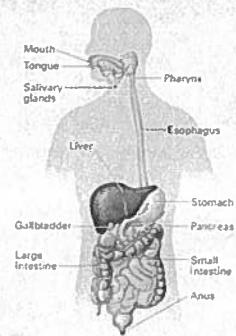
## The Digestive System

## Digestion Overview

- Entire tube is approximately 9 meters long.
- Entire tube is lined with epithelial cells that secrete a mucous.
  - Provides lubrication.
  - Prevents self-digestion
    - Digestive juices are so acidic they can dissolve an iron nail!
    - Stomach cells are replaced every 3 days.

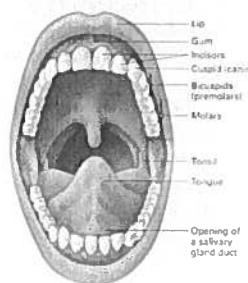
## Organs of the Digestive System

- Mouth
- Pharynx
- Esophagus
- Stomach
- Small intestine
- Large intestine
- Also includes:
  - Salivary glands
  - Pancreas
  - Liver
  - Gallbladder



## Mouth

- Mechanical digestion**
  - Teeth and tongue
- Chemical digestion**
  - Saliva contains enzymes that break food down, kill bacteria, neutralize acids, protect teeth from decay.

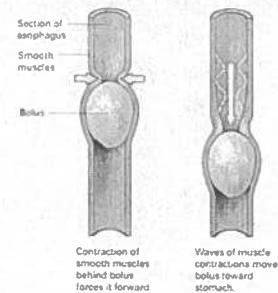


## Pharynx

- The tongue pushes a chewed clump of food (bolus) down into the throat.
- Upper portion of throat.
- Junction of digestive system with respiratory system.
- The epiglottis seals the airway when you swallow.

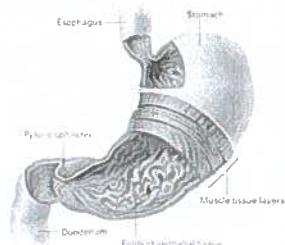
## Esophagus

- The bolus enters the esophagus next.
- A long, muscled tube.
- Connects pharynx to stomach.
- Food is pushed thru by peristalsis, the wave-like muscle contractions that start at the top and work their way down.



## Stomach

- The stomach is a stretchy muscular sac that holds food.
- Mechanical and chemical digestion occur here.
- When mixed with the digestive juices the bolus becomes chyme.



## Small Intestine

- 6 meters long.
- Digestion is finished.
- Absorption of food nutrients takes place.

## Liver

- Largest internal organ.
- Produces the digestive enzyme bile.
  - Used in the break down of fats.
- Delivers the bile to the small intestine.

## Gallbladder

- Bile from the liver is temporarily stored in the gallbladder until needed.

### Pancreas

- Produces and secretes insulin into the blood stream to control blood sugar level.
- Produces and secretes digestive enzymes into the small intestine.
  - Neutralizes the stomach's acids.

### Large Intestine

- Aka colon.
- 1.5 meters long.
- Major function is reabsorb water from the unusable materials left over from digestion.

### The Lymphatic System

- Organs are:
  - Lymphatic vessels and lymph nodes.
- Function is:
  - Removes foreign substances from the blood and lymph, combats disease, maintains tissue fluid balance, absorbs fats from digestive tract.

### Respiratory System

- Organs are:
  - Lungs and respiratory passages
- Function is:
  - Exchanges oxygen and carbon dioxide between blood and air and regulates blood pH.

## Endocrine System

- Organs are:
  - Glands, like the pituitary gland and thyroid gland, that secrete hormones.
- Function is:
  - A major regulatory system that influences metabolism, growth, reproduction, and many other functions.

## Cardiovascular System

- Aka: the circulatory system
- Organs are:
  - Heart, blood vessels, and blood.
- Function is:
  - Transports nutrients, waste products, gases, and hormones throughout the body; plays a role in the immune response and the regulation of body temperature.

## Urinary System

- Organs are:
  - Kidneys, urinary bladder, and vessels that carry urine.
- Function is:
  - Removes waste products from the blood and regulates blood pH, ion balance, and water balance.

## Reproductive System

- Organs are:
  - Ovaries, uterus, mammary glands, testes
- Function is:
  - Involved in the production of offspring.

### **Integumentary System**

- Organs are: skin, hair, nails, and sweat glands
- Function: protects us from injury and infection; regulates temperature, prevents water loss, and involved in producing vitamin D

### **Skeletal System**

- Organs are: bones, cartilage, joints
- Function is: protects, supports and allows body movement produces blood cells and stores minerals

### **Muscular System**

- Organs are: muscles attached to skeleton, like the biceps brachii.
- Function is: produces body movement, maintains posture, and produces body heat

### **Nervous System**

- Organs are: brain, spinal cord, nerves and sensory receptors
- Function is: major regulatory system; detects sensation, controls movement, controls physiological and intellectual functions

## Digestive System

- Organs are: Mouth, esophagus, stomach, intestines, liver, pancreas, gall bladder
- Function is: performs the mechanical and chemical processes of digestion, absorption of nutrients, and elimination of wastes