Biology 5-1: Animal Systems I

Assignments:

<table>
<thead>
<tr>
<th>Description</th>
<th>Page(s)</th>
<th>Due Date</th>
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<td>MONDAY</td>
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<td>WEDNESDAY</td>
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<td>Feb 9</td>
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<td>Review for Test</td>
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<td>Holiday</td>
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<td>Feb 23</td>
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<td>Mar 2</td>
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<td>Quiz</td>
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<td>Mar 9</td>
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<td>Spring Break</td>
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<td>Mar 16</td>
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<td>Quiz</td>
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**Biology - 4th & 5th Six Weeks**
Animal Systems

Objectives:

- Analyze the levels of organization in biological systems and relate the levels to each other and to the whole system.
- Examine specialized cells, including animal cells such as blood, muscle, and epithelium.
- Describe the interactions that occur among systems that perform the functions of regulation, nutrient absorption, reproduction, and defense from injury or illness in animals.
- Describe the role of internal feedback mechanisms in the maintenance of homeostasis.

Vocabulary:

<table>
<thead>
<tr>
<th>cells</th>
<th>cephalization</th>
</tr>
</thead>
<tbody>
<tr>
<td>tissues</td>
<td>chordates</td>
</tr>
<tr>
<td>organ</td>
<td>feedback inhibition</td>
</tr>
<tr>
<td>organ systems</td>
<td>homeostasis</td>
</tr>
<tr>
<td>invertebrates</td>
<td>response</td>
</tr>
<tr>
<td>vertebrates</td>
<td>body segmentation</td>
</tr>
<tr>
<td>symmetry</td>
<td>affecter/receptor</td>
</tr>
<tr>
<td>metabolism</td>
<td>effector</td>
</tr>
</tbody>
</table>

Essential Questions:

1. How do responses to internal and external stimuli aid in an organism’s survival?
2. How do animal organ systems interact to maintain homeostasis? (multiple examples)
3. Why is it important that an organ system interact with other organ systems?
4. How do the structures of specialized cells carry out their specialized functions? (multiple examples)
5. What are the levels of organization within an animal?
**Introduction to Animals**

Characteristics of All Animals

1. Animals are _________________________
2. Animals are _________________________
3. Animals are _________________________
4. Animal cells lack cell walls

Evolutionary/Developmental Milestones in Animals

1. Cell ____________________ and levels of ____________________ (enabled groups of cells to become specialized to perform specific functions)
2. Development of _________________________ and _________________________
3. Development of an internal _________________________ and tissue layers

➤ Levels of Cell Organization from **smallest to largest** is:

➤ _________________________ is the balanced distribution of duplicate body parts or shapes.
➤ The body plans of most multicellular organisms exhibit some form of symmetry, either ________________ symmetry or ________________ symmetry.
   A small minority exhibit no symmetry (**asymmetrical**).

<table>
<thead>
<tr>
<th>Radial Symmetry</th>
<th>Bilateral Symmetry</th>
<th>Asymmetrical</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ex. Jellyfish</td>
<td>crab, human</td>
<td>coral, sponge</td>
</tr>
</tbody>
</table>

➤ **Segmentation** allows for the development of _________________________
➤ _________________________ is a head region with sensory organs and a brain.

<table>
<thead>
<tr>
<th>Tissue Layer</th>
<th>Develops Into</th>
</tr>
</thead>
<tbody>
<tr>
<td>Endoderm</td>
<td>digestion and respiration structures</td>
</tr>
<tr>
<td>Mesoderm</td>
<td>muscles, bones, blood, skin, reproductive organs</td>
</tr>
<tr>
<td>Ectoderm</td>
<td>skin, brain, nervous system</td>
</tr>
</tbody>
</table>
The significance of having a body cavity, or a coelom, is that it ________________

Animal Kingdom is divided into two main groups
1. Invertebrates – Animals without _______________________
2. Vertebrates – Animals with ___________________________

- Over _____% of all animal species are invertebrates
- There are 8 major phyla of invertebrates from the simplest to the most complex...

<table>
<thead>
<tr>
<th>Invertebrate Phylum</th>
<th>Example(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Porifera</td>
<td></td>
</tr>
<tr>
<td>Cnidarian</td>
<td></td>
</tr>
<tr>
<td>Platyhelminthes (Flatworms)</td>
<td></td>
</tr>
<tr>
<td>Nematoda (Round Worms)</td>
<td></td>
</tr>
<tr>
<td>Annelida</td>
<td></td>
</tr>
<tr>
<td>Mollusca</td>
<td></td>
</tr>
<tr>
<td>Arthropoda</td>
<td></td>
</tr>
<tr>
<td>Echnodermata</td>
<td></td>
</tr>
</tbody>
</table>

The 4 ways we will study body systems is to categorize them into the following functions:
1. ______________________: Excretory & Nervous Systems
2. ______________________: Respiration, Digestion, & Circulatory Systems
3. ______________________: Immune, Integumentary, Lymphatic, Skeletal, & Muscular Systems
4. ______________________: Reproductive & Endocrine Systems
Introduction to Animals

1. What 3 characteristics do all animals have in common? ________________________

2. What is cell specialization? ________________________________________________
   ________________________________________________________________
   ________________________________________________________________

3. List the organisms that would have a body cavity. ____________________________
   ________________________________________________________________
   ________________________________________________________________

4. Which organisms would have all of its body parts arranged around a central location? ______
   ________________________________________________________________

5. Which organisms would have a single plane dividing its body into 2 mirror images? ______
   ________________________________________________________________
Look at the animals below. Write R if they exhibit radial symmetry, B if they exhibit bilateral symmetry and A if they are asymmetrical.

6. _______  7. _______  8. _______  9. _______

10. _______  11. _______  12. _______  13. _______

14. Which of the animals above do not show cephalization? _____________________________

15. What is cephalization? _____________________________

List the levels of organization from most simple to most complex.

Simple > 16._________________________ > 17._________________________ > 18._________________________ > 19._________________________ > 20. _________________________ > Complex
Dichotomous Key to the Invertebrate Phyla – Part II

1. Radial symmetry or asymmetry.................................................................Go to 2
   Bilateral symmetry..................................................................................Go to 4

2. Highly porous surface, not true tissues..............................................Phylum Porifera
   Surface is not highly porous, true tissues present.................................Go to 3

3. Exhibits pentameral symmetry and tube feet.......................................Phylum Echinodermata
   Lacks pentameral symmetry and tube feet,
   possesses tentacles (with nematocysts)................................................Phylum Cnidaria

4. Possesses segmentation..........................................................................Go to 5
   Lacks segmentation................................................................................Go to 6

5. Exoskeleton with jointed appendages................................................Phylum Arthropoda
   No exoskeleton......................................................................................Phylum Annelida

6. Possesses a foot, radula, arms and/or shell.........................................Phylum Mollusca
   Lacks a foot, radula, arms and/or shell................................................Go to 7

7. Round worm with mouth and anus......................................................Phylum Nematoda
   Flat worm with 2 “eyespots”................................................................Phylum Platyhelminthes

A.__________________________________________________________

B.__________________________________________________________

C.__________________________________________________________

D.__________________________________________________________

E.__________________________________________________________

F.__________________________________________________________

G.__________________________________________________________

H.__________________________________________________________
<table>
<thead>
<tr>
<th>Digestive</th>
<th>Circulatory</th>
<th>Respiratory</th>
<th>Integumentary</th>
<th>Skeletal</th>
<th>Muscular</th>
</tr>
</thead>
<tbody>
<tr>
<td>Organs:</td>
<td>Organs:</td>
<td>Organs:</td>
<td>Organs:</td>
<td>Organs:</td>
<td>Organs:</td>
</tr>
</tbody>
</table>

![Digestive System](image)

![Circulatory System](image)

![Respiratory System](image)

![Integumentary System](image)

![Skeletal System](image)

![Muscular System](image)
<table>
<thead>
<tr>
<th>Immune</th>
<th>Lymphatic</th>
<th>Excretory</th>
<th>Nervous</th>
<th>Endocrine</th>
<th>Reproductive</th>
</tr>
</thead>
<tbody>
<tr>
<td>Organs:</td>
<td>Organs:</td>
<td>Organs:</td>
<td>Organs:</td>
<td>Organs:</td>
<td>Organs:</td>
</tr>
</tbody>
</table>
Nutrient Absorption
Digestive, Respiratory, Circulatory Systems

How many different systems do you see represented in the diagram below?

1. ____________________ - breaks down and absorbs nutrients
2. ____________________ - absorbs oxygen
3. ____________________ - transports nutrients

**Cellular Respiration:**

\[
\text{C}_6\text{H}_{12}\text{O}_6 + 6\text{O}_2 \rightarrow 6\text{CO}_2 + 6\text{H}_2\text{O} + 36 \text{ATP}
\]

- glucose + oxygen \rightarrow carbon dioxide + water + energy

1. Where does the glucose come from?
2. Where does the oxygen come from?
3. What are the final products of cellular respiration?
4. In which organelle does this take place in our cells?

**Evolutionary Trends of the Digestive System**

<table>
<thead>
<tr>
<th>Types of digestive systems:</th>
<th>Filter feeder</th>
<th>Digestive cavity: 1 opening (Gastrovascular cavity)</th>
<th>Digestive tract: 2 openings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Description of system:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Picture of system:</td>
<td><img src="image1.png" alt="Picture" /></td>
<td><img src="image2.png" alt="Picture" /></td>
<td><img src="image3.png" alt="Picture" /></td>
</tr>
<tr>
<td>Examples</td>
<td>Sponges</td>
<td>Jellyfish, Sea Anemone, Corals, Portuguese Man-of-War, Planaria (flatworm)</td>
<td>Snails, oysters, squid, octopus, starfish, sand dollar, crayfish, spiders, crabs, butterflies, humans</td>
</tr>
</tbody>
</table>
Human Digestive system

**Purpose:** converts food into [missing word] that can be used by the cells of the body; [missing word] food and eliminates waste

**How the Digestive System Works:**
- Digestion begins in the [missing word]
  - [missing word] – salivary glands produce amylase which begins to break down sugars and starches
  - [missing word] digestion – teeth grind and break down food into smaller pieces
- [missing word] moves food from mouth to stomach using peristalsis. (smooth muscle contractions)
- stomach – food is combined with acids and enzymes (chemical digestion); the stomach muscles squeeze and contract (mechanical digestion)
  - [missing word] – partially digested food
  - [missing word] sphincter – ring of muscle at top of stomach to keep food inside
  - [missing word] sphincter – ring of muscle at bottom of stomach to keep food pushed into small intestine from re-entering stomach
- Small Intestine – absorption of food molecules takes place here
  - inner surface of small intestine heavily folded and lined with small finger-like projections called [missing word] made of epithelial cells
  - this creates a large surface area for nutrient absorption
- [missing word] – absorbs water and compacts waste
- [missing word] – releases wastes outside the body
- Smooth muscle lining the digestive organs moves food through in a one-way direction (peristalsis)

**Accessory organs of the Digestive System**
- pancreas
  - Produces insulin to regulate blood sugar levels
  - Produces enzymes that break down carbohydrates, proteins, lipids and nucleic acids
- Liver - Produces [missing word], aids in the digestion of fats; is stored in the gall bladder
### Evolutionary Trends of the Digestive System

<table>
<thead>
<tr>
<th>Types of respiratory system:</th>
<th>Diffusion through skin/cells</th>
<th>Gills</th>
<th>Tracheal tubes</th>
<th>Book lungs</th>
<th>Lungs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Structures of system:</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Adaptation to land or water?</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Examples</td>
<td>Sponges, corals, jellyfish, planarian, earthworm</td>
<td>Fish, crayfish, lobsters, crabs</td>
<td>Insects</td>
<td>Spiders</td>
<td>Mammals, humans</td>
</tr>
</tbody>
</table>

### Human Respiratory System

**Purpose:**
- **Provides** $O_2$ to the blood for cellular respiration in the cells and **removes** $CO_2$ from the body
- Exchange of gases occurs through the walls of the lungs

**Structures:**
- **Nasal Cavity (Nose)**
  - ____________ as it passes over mucous membrane
- **Pharynx (Throat)**
  - Located where the passages from the nose and mouth come together
- **Epiglottis**
  - Flap of elastic tissue that forms a lid over the opening of the______________
- **Voice Box** (located between the pharynx and the trachea)
  - Contains two ligaments—_______________________—that produce sound (vibrate) when air moves through them

- **Trachea (Windpipe)**
  - Tube through which air moves from the pharynx to the lungs (stiff cartilage)

- **Bronchi**
  - Two short tubes which direct air into right and left lungs

- **Bronchioles**
  - Millions of smaller tubes that branch off each bronchi
  - ________________________
    - Small sacs found at the end of the bronchioles that are surrounded by capillaries
      - ________________________: oxygen and carbon dioxide exchange places in the capillaries

- **Diaphragm**
  - Sheet of muscle below the lungs that separate chest cavity (thorax) from the abdominal cavity
  - Contracts and relaxes to help inflate and deflate the lungs

### Respiratory Processes:

- **Breathing:**
  - the movement of air into and out of the lungs

- **External Respiration**
  - the__________________________ between the blood in the capillaries of the alveoli and the air
  - occurs in the__________________________

- **Internal Respiration (Cellular Respiration):**
  - the process by which cells get energy from the breakdown of glucose in the presence of oxygen
  - occurs in the__________________________ of the cells

Let’s review:

- After food is broken down/digested, what system do the molecules diffuse to? ______________________
- After you take a breath, in to what system does the oxygen diffuse to? ______________________
## Evolutionary Trends of the Circulatory System

<table>
<thead>
<tr>
<th>Types of circulatory system:</th>
<th>Diffusion through skin/cells</th>
<th>Open circulatory system</th>
<th>Closed circulatory system</th>
</tr>
</thead>
<tbody>
<tr>
<td>Description of system:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Examples</td>
<td>Flatworms</td>
<td>Insects, crustaceans, snails, oysters</td>
<td>Squid, octopus, Mammals, humans</td>
</tr>
</tbody>
</table>

### Human Circulatory System

**Purpose:** To transport _________________ and _________________ to all the cells in the body and to take carbon dioxide and wastes away from the cells of the body.

**Structures:**

- _________________: main organ that pumps blood
- _________________: tubes through which blood travels
  - **arteries:** carry blood away from heart
  - **veins:** carry blood toward heart
  - **capillaries:** smallest blood vessels
- _________________: liquid including red and white blood cells and platelets
  - **plasma:** thick, yellowish liquid in which blood cells are suspended
  - **red blood cells:** carry O₂ and remove CO₂ (transported by the protein __hemoglobin__)
  - **white blood cells:** help fight disease
- **platelets**: help form blood clots

**Big ideas:**

1. Where does the circulatory system take the molecules from your food and oxygen from your lungs?

   ______________________________________________________

2. What process do your cells use oxygen and molecules (glucose) for?

   ______________________________________________________

3. What do we get from this process?

   ______________________________________________________
Digestion of a Ham Sandwich

For lunch yesterday, you ate a ham sandwich. Your sandwich was made of two pieces of bread, one piece of ham, one piece of cheese, and the sandwich also had mayonnaise on it as well. By now it has left your body. What happened to that sandwich? Answer the following questions.

There are four components to your sandwich: bread, ham, cheese and mayonnaise. What kinds of life substances are found in each component (lipid, carbohydrate, or protein)?

<table>
<thead>
<tr>
<th>Component</th>
<th>Life Substance</th>
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</thead>
<tbody>
<tr>
<td>Bread</td>
<td></td>
</tr>
<tr>
<td>Ham</td>
<td></td>
</tr>
<tr>
<td>Cheese</td>
<td></td>
</tr>
<tr>
<td>Mayonnaise</td>
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</tr>
</tbody>
</table>

After digestion has occurred, each life substance is broken down into a smaller substance, what are these smaller substances?

- Proteins break down into ________________
- Lipids break down into ________________
- Carbohydrates break down into ________________

Write down the entire digestion process for this ham sandwich from start to finish. Make sure to explain what is happening in each organ and describe how each organ is involved.

Mouth: ____________________________________________________________________________

Esophagus: _________________________________________________________________________

Stomach: __________________________________________________________________________

Liver: ______________________________________________________________________________

Pancreas: __________________________________________________________________________

Small Intestine: ____________________________________________________________________

Large Intestine: ____________________________________________________________________

Anus: ______________________________________________________________________________
Journey of Respiration Pathway

Take the following words and place them in the correct order starting with a molecule of oxygen entering the nose and ending with a molecule of carbon dioxide leaving the nose.

1. ___________ NOSE ___________
2. __________________________
3. __________________________
4. __________________________
5. __________________________
6. __________________________
7. __________________________
8. CELLS of the BODY
9. __________________________
10. __________________________
11. __________________________
12. __________________________
13. __________________________
14. __________________________
15. _______ NOSE ___________
Blood Component Demo

Blood supplies oxygen and nutrients to all of the parts of the body, and it carries away waste products from cells. The blood vessels serve as the transportation pathways in the body for the flow of fluid, blood cells, platelets, gases, waste products, nutrients, lipids, sugars, amino acids, vitamins, proteins, hormones, electrolytes, and other substances. Blood contains all of these elements. Blood can be separated into its components by putting it into a centrifuge and "spinning it down." The parts separate according to their relative weights.

DIRECTIONS: Looking at the demo of a blood sample that has been centrifuged, label each layer as to its components and color each layer appropriately.

White Blood Cells and Platelets = The white blood cells are the mobile elements of the body's defense system. Platelets are small cell fragments which play an important part in blood clotting. These two components make up about 0.2% of blood volume.

Red Blood Cells = Also called erythrocytes, red blood cells (RBC’s) carry vital oxygen throughout the body, and they do so continuously in order to meet the oxygen requirements of the cells and tissues in the body. The oxygen-carrying component of the RBC is known as hemoglobin. RBC’s make up about 44% of blood volume.

Plasma = Plasma is the fluid part of the blood and takes up about 55% of the blood volume. Plasma is 91% water with various other materials in solution and suspension, such as dissolved proteins, nutrients, electrolytes, hormones, and metabolic wastes.

Blood Flow Through the Heart

DIRECTIONS:
A. Using colored pencils, color the flow of blood through the heart and out to the body. Use red to indicate oxygenated blood and blue for deoxygenated blood.
B. Label the four chambers of the heart.
Write the main functions of the following body systems.

1. Circulatory:

2. Respiratory:

3. Digestive:

Identify the following structures on the diagram of your respiratory system: Diaphragm, trachea, bronchi, bronchioles, alveoli.

Questions 4-8: Write the functions of the following respiratory structures.

4. Alveoli:

5. Larynx

6. Epiglottis:

7. Diaphragm

8. Trachea:

9. How does the respiratory system work with the circulatory system to provide oxygen to the cells in your body?

10. What are the 3 types of blood vessels in the body? What is the function of each?

11. (Arteries / Veins) bring deoxygenated blood back to the heart.


14. Identify the liquid part of the blood?

15. Identify the part of blood that bonds to blood vessels and other surfaces to form clots?

16. Where does the circulatory system take the molecules from your food and oxygen from your lungs?

17. What process do your cells use oxygen and molecules (glucose) for?

18. What do we get from this process?

19. After food is broken down and digested, what system do the molecules diffuse to?

20. After you take a breath, in to what system does the oxygen diffuse to?

Questions 21-28: Write the following terms next to the lines provided in the diagram of your digestive system: Small intestines, large intestine, stomach, salivary glands, mouth, esophagus, rectum.

21. (Peristalsis / Villi) moves food down esophagus to stomach.

22. Peristalsis / Villi) increase surface area for absorption in the small intestine.

23. The organ that secretes bile to help digest fat in the body is called the liver.

24. The large intestine uses peristalsis for what purpose?

25. The ______________________ is the organ where __________________ digestion takes place, and where the body absorbs most of the nutrients from food.

26. What enzymes digest (breakdown) carbohydrates? Where are they located?

27. Which organ produces/secretes bile? Where is it stored?

28. Where does the majority of digestion and absorption take place (which organ)?
29. What is the pathway of digestion beginning with the mouth? Which organ stores wastes at the end of the process?

30. What is the equation for cellular respiration? What is the organelle that is mainly responsible for cellular respiration?

31. List the levels of organization in an organism from smallest to largest.

32. What are the four major characteristics of Kingdom Animalia?

33. What is the difference between a vertebrate and an invertebrate?

34. Name and explain the three types of symmetry. Give an example of an animal with each type of symmetry.

35. Describe the evolution of the digestive system including the gastro-vascular cavity and the mouth to anus digestive tract.

36. Describe the evolution of the circulatory system including open and closed circulatory systems, and the heart.

37. The concentration of the nervous (brain) tissues and sensory organs in one end of an organism that eventually becomes the head is called?

38. The development of a body cavity is an evolutionary advancement that helps with the distribution of food and oxygen molecules. This body cavity is known as a ________________________?