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Study Guide for Science Semester Exam December 2016

Standards included in the Semester exam

S7L1. Students will investigate the diversity of living organisms and how they can be compared scientifically.
a. Demonstrate the process for the development of a dichotomous key.
b. Classify organisms based on physical characteristics using a dichotomous key of the six kingdom system (archaebacteria, eubacteria, protists, fungi, plants, and animals).

S7L2. Students will describe the structure and function of cells, tissues, organs, and organ systems.
a. Explain that cells take in nutrients in order to grow and divide and to make needed materials.
b. Relate cell structures (cell membrane, nucleus, cytoplasm, chloroplasts, and mitochondria) to basic cell functions.
c. Explain that cells are organized into tissues, tissues into organs, organs into systems, and systems into organisms.

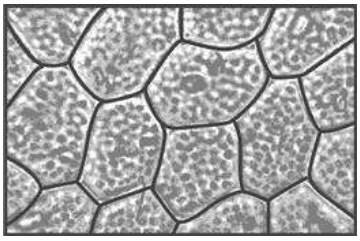
Answer the following questions on separate sheets of paper:

1. Your muscle cells produce energy from sugar. Waste from this process builds up in the cytoplasm. When the concentration of waste is higher inside the cell than outside the cell, the waste diffuses across the cell membrane and moves into the bloodstream.

   a. Which cell function is described above? **Diffusion**

   b. How is this process different from active transport? Give some examples. **Movement of special molecules across the cell membrane through protein channels that doesn't require energy**

2. The drawing below shows what a student sees when looking through a microscope. The object is magnified many times so that they are easily seen.



   Explain what the compartments are and how they relate to life. Why are these compartments grouped together?

   Every cell has work to do. But different cells may have different jobs. In multicellular organisms, cells with the same type of job often work together. These groups of specialized cells form tissue. In turn, tissues often group together to form larger units, called organs. The heart is an organ; so is the stomach. The cells of each organ or tissue have specific jobs. In humans, for instance, different groups of muscle cells are inchargeofwalking,throwing,chewingfood—evenblinking.

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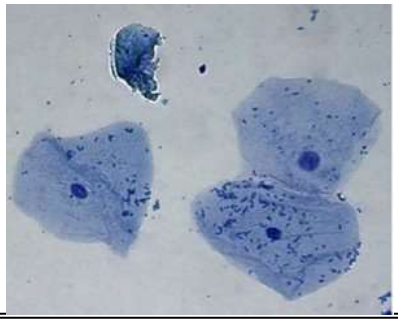
3. Cells have specific organelles with different structures and functions. Compare the mitochondria and chloroplast in terms of function. **Chloroplast and Mitochondria are organelles found in the cells of living organisms and perform functions vital for the cell to live. Mitochondria is the powerhouse and provides energy for the cell Chloroplasts are very similar to mitochondria, but are found only in the cells of plants and some algae. Like mitochondria, chloroplasts produce food for their cells. Chloroplasts help turn sunlight into food that can be used by the cell, a process known as photosynthesis.**

4. Multicellular organisms have five levels of organization ranging from simplest to most complex. The simplest level is the cellular level. This is an image of one type of cell found in your body: a cheek cell.



You are the most complex level: you are an organism. List the five levels of organization, from simplest to most complex. Describe each level with one or two sentences. Give an example at each level.

LEVEL 1 - Cells

- Are the basic unit of structure and function in living things.
- May serve a specific function within the organism
- Examples- blood cells, nerve cells, bone cells, etc.

LEVEL 2 - Tissues

- Made up of cells that are similar in structure and function and which work together to perform a specific activity
- Examples - blood, nervous, bone, etc. Humans have 4 basic tissues: connective, epithelial, muscle, and nerve.

LEVEL 3 - Organs

- Made up of tissues that work together to perform a specific activity
- Examples - heart, brain, skin, etc.

LEVEL4 - Organ Systems

- Groups of two or more tissues that work together to perform a specific function for the organism.
- Examples - circulatory system, nervous system, skeletal system, etc.
- The Human body has 11 organ systems - circulatory, digestive, endocrine, excretory (urinary), immune(lymphatic), integumentary, muscular, nervous, reproductive, respiratory, and skeletal.

LEVEL 5 - Organisms

- Entire living things that can carry out all basic life processes. Meaning they can take in materials, release energy from food, release wastes, grow, respond to the environment, and reproduce.

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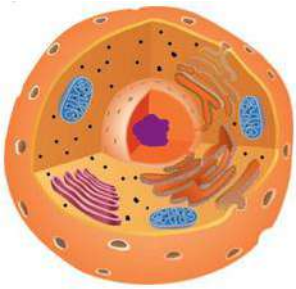
- Usually made up of organ systems, but an organism may be made up of only one cell such as bacteria or protist.
- Examples - bacteria, amoeba, mushroom, sunflower, human

5. Is the cell in the diagram eukaryotic or prokaryotic? Explain your answer using the defining characteristics of cells. Mention structural features of the diagram that support your answer.



- **Eukaryotic cells are larger than prokaryotic cells and have a "true" nucleus, membrane-bound organelles.**

and rod-shaped chromosomes,

- **The nucleus houses the cell's DNA and directs the synthesis of Protins and ribosmomes**

6. Exploring the South American rain forest, a scientist discovers a mysterious organism and brings it back to the lab for further study. What cell characteristics should the scientist examine to tell whether the organism is an animal or plant? Why? **Cell wall, chloroplast can help differentiate between plant and animal cell**
7. In the past, fungi were thought to be plants without chlorophyll. Now fungi are classified in their own kingdom. Compare and contrast fungi with plants, in terms of their means of getting nutrition.

Fungi and plants share few traits beyond the inability to move. While plants make their own food using photosynthesis, fungi require external sources of nutrients and food particles to survive. Fungi are heterotrophs and plants are autotrophs.

8. John loves trout fishing so much that he goes trout fishing several times throughout the year. He began to notice that during the dry season the trout had significantly more lice on them than during the rainy season. John, being a curious science student, wanted to find out what was causing the increase of lice on the trout. Write a testable hypothesis to help John focus his research. **More lice during the rainy season might point to a connection between extra water volume and lice hatching. An easy way to test this would be to conduct an experiment with**

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trout in large pools of varying water levels. A hypothesis could be "the pool with the most water will have trout with more lice on them"

9. Some organisms and objects cannot be seen by human eyes without special tools. What tool would be used to observe such organisms that cannot be seen by human eyes? How would you determine the magnification of that tool? **The Compound Light Microscope - To figure the total magnification of an image that you are viewing through the microscope is really quite simple. To get the total magnification take the power of the objective (4X, 10X, 40x) and multiply by the power of the eyepiece, usually 10X.**
10. Justin and Tara designed an experiment to see which fertilizer worked the best on tomato plants. They set up the experiment so that they had three tomato plants, and they designated them plant A, B, and C. They made sure that the only variable that differed between the plants was the type of fertilizer applied. Each tomato plant was the same type of plant and was planted at the same time. Each plant received the same amount of sunlight, was in the same room and therefore at the same temperature, was given the same amount of water at the same time, and was given the same amount of fertilizer at the same time. After three months of data collection, a conclusion was drawn.
    a. Although Justin and Tara took great care in carrying out the experiment, they made one major flaw. What is missing in this experiment? **Making sure all plants are of equal height before beginning the experiment**
    b. What would be the independent and the dependent variables in this experiment?
    Independent variable – Fertilizer Dependent Variable - Height
11. What are the six kingdoms of life? What are their identifying characters? Create a dichotomous key to identify these six kingdoms.

Archaea bacteria

Archaebacteria are bacteria with internal membranes and are found in deep-ocean thermal vents, hot springs in Yellowstone, and brine marine environments.

Eubacteria

Eubacteria are single-celled organisms that don't have a nucleus. Bacteria make up the entire kingdom. There are more forms of bacteria than any other organism on Earth. Some bacteria are beneficial to us, such as the ones found in yogurt. Others can cause us to get sick.

Protists

Protists are mostly single-celled organisms that have a nucleus. They usually live in water. Some protists move around, while others stay in one place. Examples of protists include some algae, paramecium, and amoeba.

Fungi

Fungi are usually motionless organisms that absorb nutrients for survival. They include mushrooms, molds, and yeasts.

Plants

Plants contain chlorophyll, a green pigment necessary for photosynthesis, a process in which plants convert energy from sunlight into food. Their cell walls are made sturdy by a material called cellulose, and they are fixed in one place. Plants are divided into two groups: flower- and fruit-producing plants and those that don't produce flowers or fruits. They include garden flowers, agricultural crops, grasses, shrubs, ferns, mosses, and conifers.

Animals

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Animals are the most complex organisms on Earth. Animals are multi-celled organisms, eat food for survival, and have nervous systems. They are divided into vertebrates and invertebrates and include mammals, amphibians, reptiles, birds and fish.

12. Compare and contrast photosynthesis and cellular respiration.

Photosynthesis – CO_2 and water combine with sunlight (energy) to make glucose and Oxygen

$CO_2 + H_2O + Energy \rightarrow Sugar\ and\ O_2$

Location – Chloroplasts

Produce Energy – Produces ATP

Sunlight – Only happens in sunlight

Organisms – Plants and Algae

Cellular Respiration - Glucose is broken down with oxygen to make water and carbon dioxide and ATP

$Sugar + O_2 \rightarrow CO_2 + H_2O + Energy$

Location – Mitochondria

Produce Energy - Produces ATP

Sunlight – Occurs at all times

Organisms – Animals, plants, bacteria, yeast