Name:

Life Science: Biology Summer Assignment

Instructions:

1. Click the link for each section to read the required text for each topic.
2. Answer the check for understanding and cluster questions that follow in **full sentences**.
3. Please submit your completed assignment during the **first week of classes**. Be prepared for a quiz covering these topics shortly thereafter.

Topic 1: Cellular Evidence & Organization

Reading: Characteristics of Life & Organization of Living Things

Check for Understanding:

1. A paramecium moving away from an obstacle is an example of a cell responding to an external stimulus. Use evidence to construct an explanation for how this response contributes to the organism's ability to maintain a stable internal condition (homeostasis) and ultimately survive.

2. The cell is the basic unit of life. Provide evidence based on microscopic observation that confirms an object is composed of cells and is therefore a living organism, rather than an inanimate object.

Topic 1 Practice Cluster:

The Phenomenon: The Mystery of the "Invisible" Builders

A student is looking at a piece of a pond weed and a small piece of a plastic toy under a powerful magnifying glass. To the naked eye, both look like solid, continuous objects. However, when viewed under a high-powered microscope, the pond weed reveals a hidden world of tiny, repeating "boxes," while the plastic toy just looks like a smooth, solid surface. The table below shows the observations made by students using a microscope at 400x magnification.

Sample	Source	Observation at 400x Magnification
Sample A	Leaf from an Elodea plant	Thousands of small, rectangular green structures packed together.
Sample B	Scraping from the inside of a human cheek	Many clear, irregular-shaped, rounded structures with a dark spot in the middle.
Sample C	Granule of white table sugar	Clear, sharp-edged geometric crystals with no internal parts.
Sample D	Drop of pond water	Several tiny, oval-shaped objects, swimming actively.

____3. Based on the observation table, which samples provide evidence of being composed of cells?

A. Samples A and B only
B. Samples A, B, and D
C. Samples C and D only
D. Samples A, B, C, and D

4. Analyze the structure and function observed in the table to identify the non-living sample. Construct an argument using the observed patterns to explain why it does not meet the criteria of being composed of cells.

The students decide to look closer at Sample D (Pond Water). They observe that some organisms in the water consist of only a single "box" that does everything, moves, eats, and grows on its own. They then look at a Sample E, a thin slice of a mushroom. They see millions of tiny, thread-like structures made of many cells linked together.

_____5. How does the evidence from Sample D and Sample E support the cell theory for all organisms?

A. It proves that all organisms must have many cells to survive.
B. It shows that only plants and animals are made of cells.
C. It provides evidence that living things can be made of one cell or many different numbers of cells.
D. It suggests that single-celled organisms are not actually "living" until they join together.

6. A student claims that because Sample B (animal cell) and Sample A (plant cell) look different, they cannot both be the basic building blocks of life. Use the data provided in the table to construct a scientific argument that **refutes** this claim, emphasizing the common role of the cell as the fundamental unit of structure and function for all organisms.

Topic 2: Cell Parts & Functions

Reading: Common Parts of the Cell, Prokaryotic vs Eukaryotic, & Other Cell Organelles

Check for Understanding:

7. A Paramecium is a single cell but functions as a complete organism. Construct an explanation for how specialized structures within this single-celled organism (like the nucleus and cytoplasm) interact to function as a complete, self-contained living system.

8. The cell membrane is often called the "gatekeeper." Use a model or analogy to explain how the structure of the cell membrane allows it to regulate the movement of materials into and out of the cell, thereby contributing to the maintenance of homeostasis (internal stability).

9. Construct a scientific argument supported by evidence to explain how the specialized structures (organelles and nucleus) in a eukaryotic cell make it functionally more complex than a prokaryotic cell.

10. Develop a cause-and-effect explanation for what would happen if a cell's mitochondria were damaged, to the ability of the cell membrane or cilia to do their jobs.

Topic 2 Practice Cluster:

The Mystery of the Single Cell

The Phenomenon: A student observes a drop of pond water under a microscope. At first, it looks like just water, but as they adjust the focus, they see tiny, clear "blobs" moving around. Some of these blobs seem to stretch parts of themselves to "grab" even smaller particles, while others have green circles inside that stay still. The student creates a table to compare what they saw in the pond water (Organism A) to a leaf from a nearby plant (Organism B).

Feature	**Organism A (Pond Blob)**	**Organism B (Plant Leaf)**
Outer Boundary	Flexible thin layer	Rigid, thick outer wall, with a flexible thin layer visible inside
Control Center	Large dark spot in the middle	Large dark spot near the edge
Internal Parts	Clear fluid with small moving dots	Many small green oval structures
Movement	Changes shape to crawl	Does not move from its spot

_____11. Based on the table, which structure demonstrates the principle of regulating the flow of materials needed for cell stability in both Organism A and Organism B?

A. The rigid outer wall
B. The small green oval structures
C. The flexible thin layer
D. The clear fluid

12. Identify the "large dark spot" found in both organisms and describe its function for the cell as a whole.

The student learns that Organism B (the plant) can make its own food using sunlight, while Organism A must "eat" other tiny particles to survive. The student decides to add a drop of salt water to the pond water on the slide. They observe that Organism A begins to shrivel up and get smaller.

_____13. The small green oval structures in Organism B are most likely:

A. Ribosomes that make proteins.
B. Chloroplasts that capture energy from sunlight.
C. Mitochondria that release energy from food.
D. Vacuoles that store extra water.

14. Develop a model (drawing or written explanation) to predict the effect of the saltwater environment on the cell membrane of Organism A. Then, explain how this change in structure impacts the organism's ability to maintain homeostasis.

_____15. Which statement best describes the interdependent relationship between the structures in Organism B (the plant) and the cell as a whole?

A. Each structure works independently and does not need the others.
B. The cell wall and chloroplasts work together to help the plant stay upright and make food.
C. The nucleus is the only part that matters for the cell's survival.
D. Only multicellular organisms have parts that work together.

Topic 3: Body Systems Hierarchy
Reading: Organization of Cells

Check for Understanding:
16. List the levels of organization from smallest to largest (starting with the cell). Using the spinal cord as an example, explain how it fits into this hierarchy (is it a cell, tissue, or organ?).

17. Explain how having specialized tissues allows an organ (like the heart or a muscle) to do things that a single, isolated cell could not do alone.

18. If a specific tissue in an organ system is damaged (e.g., nerve damage in the leg), explain how this "cause" creates an "effect" on the entire organism's ability to function.

Topic 3 Practice Cluster:

The Marathon Runner's Body

A student is training for a 5-kilometer race. During a practice run, they notice several things happening at once: their breathing becomes fast and deep, their heart beats rapidly against their chest, and they begin to sweat. After the run, even though they are tired, they notice their breathing and heart rate slowly return to normal. The student researches how different parts of the body interact during exercise and creates the following data table:

Body Part / Level	**Observation During Exercise**	**Role in the System**
Cardiac Muscle Cell *(Cell)*	Contracts faster and uses more energy/oxygen	Smallest functional unit that performs work (contracting)
Cardiac Tissue *(Tissue)*	Groups of cells contract together in a synchronized rhythm	Group of similar cells working together to create the pumping force
Heart *(Organ)*	Pumps faster and harder to push more blood per minute	Organ made of interacting tissues that moves oxygen and nutrients to the body
Circulatory System *(System)*	Increased blood flow and nutrient delivery throughout the entire body	Multiple organs (heart, blood vessels) working together to transport materials

_____19. Which statement best describes the relationship between the components listed in the table?

A. Each component operates independently to keep the runner moving.
B. Cells make up tissues, which make up organs, which work together in a system.
C. The heart is the only part of the body that changes during exercise
D. Systems are made of cells, but they do not need organs to function.

20. Using evidence from the table, explain how a change at the microscopic level (cardiac muscle cells) creates a ripple effect that changes how the entire macroscopic level (the circulatory system) functions during a race.

On a very cold day, the runner goes out for a jog. Instead of sweating, they begin to shiver (muscles twitch rapidly) and the hair on their arms stands up. Their body is working to keep its internal temperature at exactly 98.6°F (37°C), even though the air outside is 30°F. This process of maintaining a stable internal environment is called homeostasis.

_____21. When the runner's body maintains a stable internal temperature despite the cold air, it is providing evidence of

A. Growth and development B. Photosynthesis C. Homeostasis D. A failed system.

22. Describe how a change in the Nervous System (which senses the cold) would affect the Musculoskeletal System (the muscles) to help the body maintain homeostasis in this scenario.

____23. Which of the following is the best example of a system interaction?

A. A single cell membrane controlling what enters a cell.
B. The brain (nervous system) sends a signal to the heart (circulatory system) to beat faster when you are scared.
C. A plant leaf turning green in the sunlight
D. A bone staying still while a person is sitting.

Topic 4: Information & Response

Reading: Homeostasis

Check for Understanding:

24. In a reflex (like touching a hot stove), which structure carries the signal *away* from the spinal cord to make the muscle move? Explain in detail.

25. A reflex happens before the signal even reaches the brain. Why is this rapid, automatic system more advantageous for survival than a response that requires conscious thought? Explain in detail.

26. Explain how the nervous system and muscular system must interact to create a protective response to a stimulus. Explain in detail.

27. How does the rapid response of a reflex arc contribute to the overall stability (homeostasis) of the human body? Explain in detail.

Topic 4 Practice Cluster:

Phenomenon: How We Sense the World

A student is sitting in a quiet library when someone suddenly drops a heavy book behind them. Before the student even thinks about it, they jump in their seat, and their heart begins to race. A few seconds later, they realize what happened and remember a similar time they were startled in the same library last year. The student draws a diagram showing the flow of information in their body during this event.

Step	What Happens	Part of the Body Involved
1. Stimulus	The loud "BANG" of the book hitting the floor	Ears (Sense Organ)
2. Reception	Special cells in the ear detect the sound vibrations	Sensory Receptors
3. Transmission	A signal travels from the ear to the brain	Nerve Cells
4. Processing	The brain decides what the sound means	Central Nervous System
5. Response	The student jumps and feels a fast heartbeat	Muscles and Heart

_____28. Based on the table, what is the first part of the student's body to respond to the loud noise?

A. The heart, which beats faster.
B. The brain, which remembers the sound.
C. The sensory receptors in the ear.
D. The muscles in the student's legs.

29. Using the table, explain the path the information takes from the moment the book hits the floor until the student "jumps." Explain in detail.

A week later, the student is walking past the same spot in the library. Even though it is perfectly quiet, they find themselves looking behind them and feeling a little nervous, remembering the loud book from before. This is because the brain did more than just react; it stored the event.

_____30. The student feeling nervous when they return to the same spot in the library, even when it is quiet, is evidence that the brain:

A. Only reacts to immediate loud noises
B. Can store information as a memory.
C. No longer needs sensory receptors.
D. Has stopped working correctly.

31. Explain how the sensory receptors were involved in creating the memory of the loud book falling.

_____32. Which of the following is an example of a behavior caused by a sensory receptor responding to a stimulus?

A. Thinking about what to have for dinner.
B. Pulling your hand away from a hot stove.
C. Growing taller over the summer.
D. Having blue eyes like your parents.