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**Regents Review # 3: Levels of Organization & Cell Structures and Functions**

**The Big Ideas:**

Important levels of organization for structure and function include organelles, cells, tissues, organs, organ systems, and whole organisms.

Humans are complex organisms. They require multiple systems for digestion, respiration, reproduction, circulation, excretion, movement, coordination, and immunity. The systems interact to perform the life functions.

The components of the human body, from organ systems to cell organelles, interact to maintain a balanced internal environment.

The organs and systems of the body help to provide all the cells with their basic needs. The cells of the body are of different kinds and are grouped in ways that enhance how they function together.

Cells have particular structures that perform specific jobs. These structures perform the actual work of the cell. Just as systems are coordinated and work together, cell parts must also be coordinated and work together.

Each cell is covered by a membrane that performs a number of important functions for the cell. These include: separation from its outside environment, controlling which molecules enter and leave the cell, and recognition of chemical signals. The processes of diffusion and active transport are important in the movement of materials in and out of cells.

Inside the cell a variety of specialized structures, formed from many different molecules, carry out the transport of materials (cytoplasm), extraction of energy from nutrients (mitochondria), protein building (ribosomes), waste disposal (cell membrane), storage (vacuole), and information storage (nucleus).

The structures present in some single-celled organisms act in a manner similar to the tissues and systems found in multicellular organisms, thus enabling them to perform all of the life processes needed to maintain homeostasis.

Plant cells and some one-celled organisms contain chloroplasts, the site of photosynthesis. The process of photosynthesis uses solar energy to combine the inorganic molecules carbon dioxide and water into energy-rich organic compounds (e.g., glucose) and release oxygen to the environment.

In all organisms, the energy stored in organic molecules may be released during cellular respiration. This energy is temporarily stored in ATP molecules. In many organ- isms, the process of cellular respiration is concluded in mitochondria, in which ATP is produced more efficiently, oxygen is used, and carbon dioxide and water are released as wastes.

**Important Facts:**

* Cells are the basic unit of life. All living things (except viruses) are made of cells.
* Organelles are cell parts with specific functions.

• Vacuoles - store waste and water (large in plant cells, small in animal cells)

• Ribosome - (very small and is often represented by a dot) located on the ER or in cytoplasm. Ribosomes are where proteins are made (protein synthesis).

• Mitochondria - Site of cellular respiration in both plant and animal cells where ATP (energy

usable by the cell) is made. The formula for cellular respiration:

glucose + oxygen 🡪 carbon dioxide + water + ENERGY (ATP)

• Chloroplasts - only in plant cells; where the process of photosynthesis occurs.

The formula for photosynthesis:

Sun’s ENERGY + carbon dioxide + water 🡪 glucose + oxygen

• Nucleus - is the control center of the cell and contains DNA.

• Cytoplasm - is the gel-like fluid that fills the inside of the cell.

• Cell Membrane - separates the contents of the cell from the outside environment, controls the transport of materials into and out of the cell (selectively permeable) and does cellular communication (recognizes and responds to chemical signals by using receptor molecules).

* ALL cells have a cell membrane, including those with cell walls (plants, fungi, some bacteria and

protists). The cell wall is mostly for protection; the cell membrane is needed to control movement into and out of the cell.

* Organization:

Cells are specialized into tissues.

Tissues are groups of cells specialized to do certain jobs. Examples of tissues include muscle tissue and nerve tissue.

Tissues work together to form organs (heart, lungs, kidney).

Organs work together in organ systems (digestive system, nervous system, etc).

* Organization of living things -

(smallest) Cells 🡪 Tissues 🡪 Organs 🡪 Systems 🡪 Organism [biggest]