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|  | Mitochondria and chloroplasts change energy from one form to another  Mitochondria and chloroplasts are the organelles that convert \_\_\_\_\_\_\_\_\_ to forms that cells can use for \_\_\_\_\_\_\_.  **Mitochondria:**  **Chloroplasts:** |
| ***Mitochondria and chloroplasts have a similar evolutionary origin.***  The **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ theory** states that an early ancestor of eukaryotic cells engulfed an oxygen-using non-photosynthetic prokaryotic cell.  Which came first mitochondria or chloroplasts?    There is considerable evidence to support the endosymbiont theory for the origin of mitochondria and chloroplasts. |
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|  | ***Mitochondria convert chemical energy within eukaryotic cells.***  Almost all eukaryotic cells have mitochondria.  How many mitochondria are there per cell? Why?  Mitochondria have a smooth outer membrane and a convoluted inner membrane with infoldings called **\_\_\_\_\_\_\_\_\_\_\_\_**.  Intermembrane space:  Mitochondrial matrix: |
| ***Chloroplasts capture light energy and convert it to chemical energy.***  Chloroplasts contain the green pigment \_\_\_\_\_\_\_\_\_\_\_\_\_\_ as well as enzymes and other molecules that function in the photosynthetic production of \_\_\_\_\_\_\_\_\_\_\_.  The contents of the chloroplast are separated from the cytosol by an envelope consisting of two membranes separated by a narrow intermembrane space.  Stroma.  Thylakoids.  Grana.  The membranes of the chloroplast divide the chloroplast into three compartments: |
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|  | ***The peroxisome is an oxidative organelle.***  Peroxisomes, bound by a single \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, contain enzymes that transfer \_\_\_\_\_\_\_\_\_ from various substrates to oxygen, producing hydrogen peroxide (H2O2) as a byproduct.  Some Functions:  The H2O2 formed by peroxisomes is itself toxic, but peroxisomes also contain an enzyme that converts H2O2 to \_\_\_\_\_\_\_\_\_\_ |
| The cytoskeleton is a network of \_\_\_\_\_\_\_\_\_\_\_\_a that organizes structures in the cell  The cytoskeleton provides support, motility, and regulation.  The cytoskeleton provides anchorage for:  The cytoskeleton is dynamic.  The cytoskeleton also plays a major role in *cell motility:*  The cytoskeleton also plays a role in the regulation of biochemical activities in the cell in response to mechanical stimulation. |
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|  | ***Three main types of fibers make up the cytoskeleton:***  *\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_* are the thickest of the three types of fibers; *\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_* (or actin filaments) are the thinnest; and *\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ filaments* are fibers with diameters in a middle range.  **Microtubules** are \_\_\_\_\_\_\_\_\_\_\_\_\_ rods about 25 nm in diameter and 200 nm to 25 µm in length.  Constructed of the globular protein \_\_\_\_\_\_\_\_\_\_.            Functions:  Microtubules are also responsible for the separation of chromosomes during cell division.  Centrosome composed of centrioles: |
| **Cilia and flagella:**  Cilia and flagella differ in their beating patterns.  In spite of their differences, both cilia and flagella share a common structure. |
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|  | Movement of cilia requires motor proteins called **\_\_\_\_\_\_\_\_\_\_\_\_\_** spaced along its length and reaching toward the neighboring doublet.  These changes in shape are powered by \_\_\_\_\_\_\_\_\_\_\_.  A typical dynein protein has two “feet” that “walk” along the microtubule of the adjacent doublet; one foot maintains contact while the other releases and reattaches one step farther along the microtubule.  Other motor proteins: |
| **Microfilaments**  Structure:  Functions:  In animal cells specialized for transporting materials across the plasma membrane, such as intestinal cells, bundles of microfilaments make up the core of microvilli.  Microfilaments are important in cell motility, especially as part of the contractile apparatus of \_\_\_\_\_\_\_\_\_\_\_\_\_ cells.  Role in cell division.  Role in cell motility.  Role in plant cells. |
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|  | ***Intermediate filaments are a diverse class of cytoskeletal units, built from a family of proteins that includes the keratins.***  Like microfilaments, intermediate filaments are specialized for bearing \_\_\_\_\_\_\_\_\_\_\_.  Intermediate filaments are more \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ fixtures of the cytoskeleton than are the other two classes.  The \_\_\_\_\_\_\_\_\_\_\_\_\_\_ sits within a cage made of intermediate filaments, fixed in location by branches of the filaments that extend into the cytoplasm.  Other intermediate filaments make up the nuclear \_\_\_\_\_\_\_\_\_\_ that lines the interior of the nuclear envelope. |
| Extracellular components and connections between cells coordinate cellular activities  Plant cells are encased by \_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_.  The basic design of cell walls consists of microfibrils of \_\_\_\_\_\_\_\_\_\_\_\_\_ synthesized by an enzyme called cellulose synthase.  A young plant cell secretes a relatively thin and flexible wall called the **\_\_\_\_\_\_\_\_ cell wall**.  In actively growing cells, the cellulose fibrils are oriented at right angles to the direction of cell expansion.  Between the primary walls of adjacent cells isa **\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.**  When a plant cell stops growing, it strengthens its wall by secreting hardening substances into the primary wall or by adding a **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ cell wall** between the plasma membrane and the primary wall. |
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|  | The extracellular matrix of animal cells provides: support, adhesion, movement, and regulation.  Though lacking cell walls, animal cells do have an elaborate **\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_ (ECM)**.  The primary constituents of the ECM are \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, especially **\_\_\_\_\_\_\_\_** fibers, embedded in a network of glycoprotein **proteoglycans**.  **Fibronectins** in the ECM connect to **\_\_\_\_\_\_\_\_\_\_\_\_\_,** cell-surface receptor proteins that span the membrane and bind on their cytoplasmic side to proteins attached to microfilaments of the cytoskeleton.  Mechanical signaling involves fibronectin, integrins, and \_\_\_\_\_\_\_\_\_\_\_\_\_\_ of the cytoskeleton. |
| Intercellular junctions help integrate cells into higher levels of structure and function.  Neighboring cells in tissues, organs, and organ systems often adhere, interact, and communicate through direct physical contact.  Plasmodesmata in plants:  Animals have three main types of intercellular links: |
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