Definitions and Processes

Eukaryotes: most of the DNA is stored in the nucleus (bounded by a double membrane)

Prokaryotes: the DNA is concentrated in the nucleoid (not membrane enclosed)

- Larger organisms do not necessarily have larger cells, just more of them

- Lipids and proteins are the staple ingredients of membranes, though carbohydrates are also important

- Phospholipids are the most abundant lipids in cell membranes

Amphipathic: has both a hydrophyllic and a hydrophobic region

- The phospholipid bilayer can exist as a stable boundary between two aqueous compartments

Fluid mosaic model: proposes that the membrane is a mosaic of protein molecules bobbing in a fluid bilayer of phospholipids

- Membranes are held together primarily by hydrophobic interactions which are weaker than covalent bonds, allowing for flexibility

- The temperature at which a membrane solidifies depends on its comprising lipids

- Kinks in the tails where double bonds are located prevent unsaturated tails from packing as closely together as saturated tails, making the membrane more fluid

Cholestrol: helps membranes resist changes in fluidity when the temperature changes

Steroid lipids: resist temperature changes in plant cells

- Cells recognize other cells by binding to molecules on the extracellular surface of the plasma membrane

- The diversity of molecules and their location on the cell's surface enable membrane carbohydrates to function as markers distinguishing cells apart

Selective permeability: substances do not cross the cell membrane indiscriminately

- Nonpolar hydrophobic molecules can dissolve in the lipid bilayer and can cross it easily without the aid of membrane proteins

- The hydrophobic interior of the membrane impedes the direct passage of ions and polar (hydrophyllic) molecules through the membrane

Transport (channel) proteins: span the membrane and have hydrophyllic channels which certain molecules and atomic ions ise as tunnels through the membrane

Carrier proteins: hold onto their "passengers" and change shape in a way which shuttles them across the membrane

Definitions and Processes (cont)

- Diffusion occurs from a region of higher concentration to a region of lower concentration

- Molecules diffuse randomly, but populations may diffuse directionally

- Each substance diffuses along its own concentration gradient, unaffected by those of other substances

- The behavior of a cell in a solution relies on both solute concentration and membrane permeability

Tonicity: the ability of a surrounding solution to cause a cell to gain or lose water

- Higher concentration of non-penetrating solutes: water leaves the cell

- Lower concentration of non-penetrating solutes: water enters the cell

Isotonic: no net movement of water (equillibrium)

Hypertonic: more NPS; the cell loses water, shrivels, and dies

Hypotonic: less NPS; the cell swells and lyses

Turgor pressure: the pressure exacted back on a cell which opposes further water intake (in plant cells due to their cell walls)

Plasmolysis: occurs when a plant is submerged in a hypertonic environment; the cell membrane pulls away from the cell wall at multiple locations

Sodium-Potassium pump: exchanges sodium for potassium across the cell membranes of animal cells

- Ions diffuse down their electrochemical gradients

3 stages of cell signaling: reception, transduction, and response

Reception: the target cell's detection of a signaling molecule outside the cell

Transduction: converts the signal to a form which can bring about a specific cellular response

Response: the transduced signal triggers a specific cellular response

- Proteins relay signals from receptor to response

- A signaling pathway may regulate the activity of proteins rather than causing their synthesis by activating gene expression

Nuclear envelope: encloses the nucleus and seperated its contents from the cytoplasm

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Organelles

Vesicles: transport membrane sacs

Smooth ER: carries out lipid synthesis, carbohydrate metabolism, detoxification, and storage of calcium ions

Rough ER: produce proteins which are secreted by cells

Golgi apparatus: modifies stores and ships products of the ER

Lysosomes: digest (hydrolyze) macromolecules

Vacuoles: large vesicles from the ER

Food vacuoles: formed by phagocytosis (engulfing of smaller organisms or food particles)

Contractile vacuoles: pump excess water from the cell and maintain a suitable intracellular concentration of ions and molecules

Central vacuole: allows plant cells to become larger with minimal investment in new cytoplasm

Mitochondria: sites of cellular respiration (the use of oxygen to drive the generation of ATP from sugar fuels)

Chloroplasts: sites of photosynthesis (the conversion of solar energy into chemical energy)

Thylakoids: membranous system of flattened interconnected sacs inside the chloroplast

Granum: a stack of thylakoids

Stroma: the fluid outside the thylakoids which contains chloroplast DNA, ribosomes, and many enzymes

Cytoskeleton: network of fibres extending throughout the cytoplasm which organize the structures and activities of a cell; made up of microtubules, microfilaments, and intermediate filaments

Microtubules: hollow rods constructed of tubulin

Microfilaments: thin solid rods made up of actin (globular protein)

Myocin: causes the contraction of muscle cells

Intermediate filaments: specialized for bearing tension

Cell wall: protects and shapes plant cells; prevents an excessive uptake of water

Integrins: cell surface receptor proteins which span the plasma membrane and bind on their cytoplasmic side to associated proteins attached to microfilaments of the cytoskeleton

Cell junctions: three types; tight junctions, desmosomes, and gap junctions

Tight junctions: the plasma membranes of neighboring cells are very tightly pressed together (bound by specific proteins)

Desmosomes: fasten cells together into strong sheets

Gap junctions: provide cytoplasmic channels from one cell to an adjacent cell

Organelles (cont)

Cytosol: semifluid inside all cells in which sub-cellular components are suspended

Nucleus: control center

Ribosomes: sites of protein synthesis

Nuclear envelope: encloses the nucleus and seperates its contents from the cytoplasm

Chromosomes: structures which carry genetic information (the units into which DNA is organized in the nucleus)

rRNA: ribosomal RNA; synthesized from genes in the DNA of the nucleolus

Endomembrane system: all orgenelles in a eukaryotic cell

Endoplasmic reticulum: network of membranes

Prokaryotic-specific:

Fimbriae: attachment structures on the surface of some prokaryotes

Nucleoid: region where the cell's DNA is located (not membrane enclosed)

Glycocalyx: outer coating of many prokaryotes consisting of a capsule (slime layer)

Flagella: locomotive organelles of some prokaryotes

Bacterial chromosome: carriers of genetic information (DNA)

Microvilli: long, thin projections in the surface of cells

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