

Bio Exam 2 (Chapters 4, 5, 20)

Chapter 4

4.1- Microscopes Reveal the World of the Cell

- Light microscope
 - Visible light is passed through a specimen, or a thin slice of tissue through glass lenses.
 - Can magnify objects about 1,000 times.
- Electron Microscope
 - Focuses a beam of electrons through a specimen or onto a specimen.
 - Scanning Electron Microscope
 - Helps study the detailed architecture of cell surfaces. (Makes it look 3D)
 - Transmission Electron Microscope
 - Used to study the details of internal cell structure.
 - Cannot be used to study living specimens because methods used to prepare the specimen kill the cells
- Magnification
 - The increase in the apparent size of an object.
- Resolution
 - A measure of the clarity of an image.
 - Ability of an optical instrument to show 2 nearby objects as separate.
- Cell Theory
 - All living things are composed of cells, and all cells come from other cells.

4.2- Size of Cells/Need of Gas Exchange

- Surface to Volume Ratio
 - Large cells have a greater surface area than small cells.
 - Large cells have less relative surface to their volume than small cells.
- Plasma Membrane
 - Boundary between living cell and its surroundings.
 - Composed of 2 regions
 - Two non polar fatty acids
 - Head with negative phosphate group
 - Hydrophilic end of the bilayer faces outward, exposed to the aqueous solutions on both sides of a membrane.
 - Hydrophobic end faces inward, mingling together and shielding self from water.
 - Proteins are embedded throughout the bilayer.
 - Form channels that shield ions and polar molecules.

4.3- Prokaryotic and Eukaryotic Cells

- Bacteria and Archaea consist of prokaryotic cells.

- All other forms of life are eukaryotic cells.
- Eukaryotic cells have a membrane bound nucleus.
- Prokaryotic cells are structurally simpler.
- All cells have:
 - A plasma membrane.
 - One or more chromosomes carrying DNA.
 - Ribosomes, that create protein.
 - Cytoplasm
 - In eukaryotes they bind to organelles.
- Prokaryotes have no nucleus, instead they have a nucleoid region, which is where the DNA is, but it doesn't have a membrane enclosing it.
- The reason antibiotics can kill bacteria in humans is because we lack cell walls to protect entrance.
- Flagella propel the cells in a liquid environment

4.4- Compartmentalization of Eukaryotes

- Organelles can be separated into 4 major functional groups
 - Nucleus and Ribosomes
 - Carry out genetic control of the cell
 - ER, Golgi, Lysosomes, Vacuoles, Peroxisomes
 - Involved in the manufacture, breakdown, and distribution of molecules
 - Mitochondria in all cells and Chloroplasts in plant cells
 - Energy processing
 - Cytoskeleton, Plasma Membrane, and Cell Wall
 - Structural support, movement, and communication between cells.
- Cellular metabolism
 - Chemical activities of cells occurring within organelles
- Enzymes required for certain processes are built into the organelle membranes
- NOT located in plant cells
 - Lysosomes and centrioles
- ONLY located in plant cells
 - Chloroplasts, vacuole, cell wall
- Cell Wall
 - Contains polysaccharide cellulose
- Plasmodesmata
 - Channels in the cell wall that allow connection with other cells.

4.5- Nucleus: The Command Center

- Contains most of the cells DNA.
- Controls cell activities by directing protein synthesis.
- When not dividing, chromatin appears as a mass.

- Nuclear envelope perforated with protein-linked pores to regulate movement of large molecules.
- Nucleolus is the site of rRNA synthesis.
- Nucleus also creates mRNA.

4.6- Ribosomes

- Carry out the commands of the nucleus.
- Free and bound ribosomes (bound to the nuclear envelope and the ER).
- Proteins made on free ribosomes function in the cytoplasm.

4.7- Endomembrane System

- Includes the nuclear envelope, endoplasmic reticulum, Golgi, lysosomes, vacuoles, and the plasma membrane
- Work together in the synthesis, distribution, storage, and export of molecules.
- Membranes of the ER are continuous with the nuclear envelope

4.8- Endoplasmic Reticulum

- Rough= bound to ribosomes
 - Bound ribosomes attached to the ER produce proteins that will be inserted into the growing ER membrane, transported somewhere else, or be secreted.
 - Secretory Proteins
 - Polypeptides are synthesized by ribosomes, and threaded into the cavity of the rough ER.
 - Sugars linked to the polypeptide making it a glycoprotein.
 - When ready for transport, packaged into a transport vesicle.
 - Vesicle buds off from the ER membrane
- Smooth= no ribosomes
 - Enzymes in the smooth ER are important in synthesis of lipids, including oils, phospholipids, and steroids.
 - In the liver, ER has more detoxifying enzymes that ward off drugs and alcohol.
 - Stores calcium ions

4.9- Golgi Apparatus

- After the ER, transport vesicles arrive at the Golgi
- # of Golgi correlates to how active the cell is in secreting proteins
- Sacs are not connected like the ER
- Golgi serves as a molecular warehouse and a finishing factory for the Er
 - One side of the Golgi serves as a receiving dock for transport vesicles from the ER.
 - A vesicle fuses with a Golgi sac, adding its membrane and contents to the receiving side.
 - Products of the ER are modified during their transport through the Golgi