

Bio Study Guide Test 3

Microscopy

-two primary considerations in microscopy

-magnification- object image/ object's true size

-resolution- minimum distance between two points such that the points can still be distinguished from each other

-Types of Microscopy

-brightfield unstained- light shined through specimen

-brightfield stained- light through a stained specimen

-phase-contrast- used to examine living cells in culture, amplifies variation in density

-differential interference contrast-

-fluorescence- molecules tagged with fluorescent dyes

-confocal- lasers used to observe fluorescent stains

-scanning electron microscopy- the surface of whole cells or large molecules are coated with gold, and an electron beam excites surface electrons. The pattern translates to a video screen

-transmission electron microscopy- cells stained with heavy metals, and an electromagnetically controlled electron beam encounters variation in density

-Cell fractionation

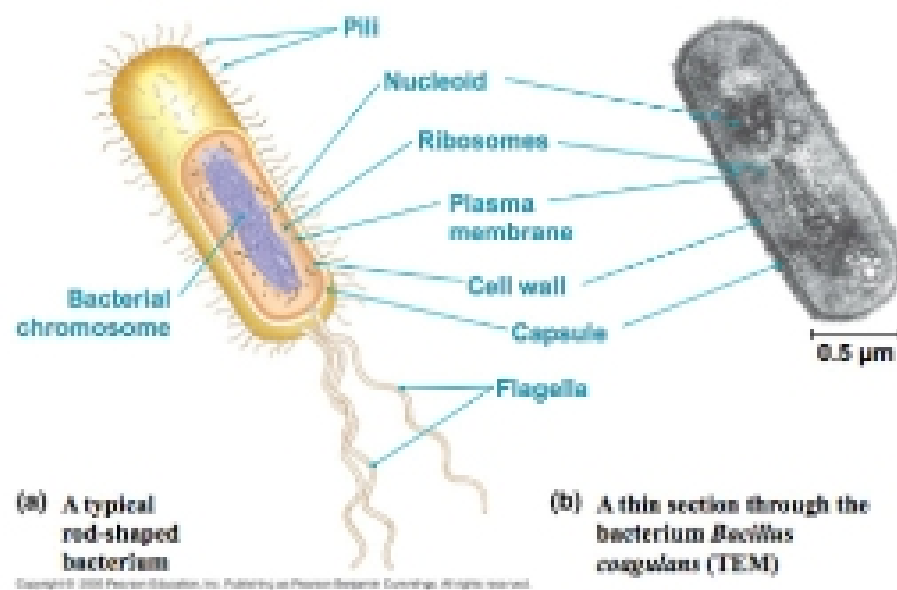
-cells are ground or gently homogenized

-cell extract goes through a series of centrifugation steps

-nuclei and cell debris → mitochondria and chloroplasts → microsomes (pieces of plasma membranes) → ribosomes

-proteins and/or organelles are subjected to further biochemical analysis

-Prokaryotic cell



-Cells require a high surface to volume ratio in order to insure an efficient exchange of materials across the cell membrane

-Plasma membrane of eukaryotic and prokaryotic cells is composed of a phospholipid bilayer and transmembrane proteins that communicate between the cytoplasm and extracellular environment

-cytoplasm-area between the nucleus and plasma membrane

-cytosol- semi-fluid substance within the plasma membrane that suspends organelles

- Animal cells have lysosomes, centrioles, and flagella (some plant have this in sperm)
- Plant cells have chloroplasts, central vacuole and tonoplasts, cell wall, and plasmodesmata
- Nucleus

- contains a nucleolus that contains rRNA and is responsible for ribosome assembly
- nuclear envelope- inner and outer membrane, nuclear pores
- scattered with chromatin- DNA and histones

-Ribosome

- large and small subunit
- ribosomal RNA and ribosomal proteins
- Site of protein synthesis
- Free ribosomes synthesize proteins that are used in the cytosol
- Bound ribosomes synthesize proteins that are either membrane-bound or secreted
- Ribosome numbers vary depending on cell type

-Endoplasmic Reticulum

-Rough ER

- site of synthesis of secreted proteins
- polypeptide chain grows from ribosome into the lumen of the rough ER
- proteins fold into the native shape and can be modified with carbohydrate chains (glycoproteins)
- secreted proteins are transported in vesicles that bud from the transitional ER

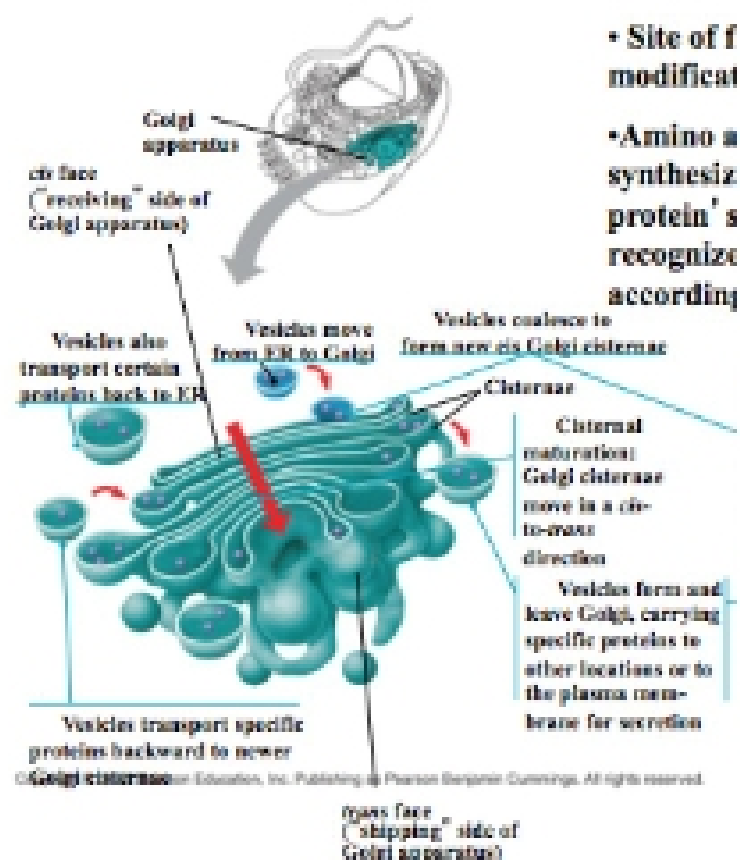
-transitional ER- site of synthesis of membrane phospholipids

-Smooth ER

- lipid synthesis- phospholipids and steroids
- responsible for the detoxification of drugs and toxins
 - in liver the enzymes add hydroxide groups to drugs increase their solubility and allow the drugs to be flushed from the body
- Drugs induce smooth ER synthesis, leading to drug resistance
- Site of cellular Calcium ion storage

-Golgi

- Site of further protein and phospholipid modification
- Amino acid sequences within the newly synthesized mature proteins provide the protein's intracellular address, which the Golgi recognize and transport accordingly



-Lysosome

- membranous sac of hydrolytic enzymes to break down macromolecules
- enzymes and lysosomal membranes are synthesized in the rough ER and completed in the Golgi
- phagocytosis-lysosome digesting food
- Damaged organelles are broken down and the monomeric subunits of macromolecules are recycled by the cell
- Autophagy- lysosome breaking down damaged organelle

-Vacuole

- membrane-bound regions that carry out a variety of functions, depending on the cell
 - adipocytes- lipid molecules
 - protists- contractile vacuole

-Mitochondria

- Site of ATP generation from glucose and lipids
- Contains inner and outer membrane, mitochondrial DNA, mitochondria matrix, cristae
 - Matrix contains free ribosomes

-Microtubule

- Hollow tubes whose wall consists of 13 columns of tubulin molecules
- subunits are alpha-tubulin and beta-tubulin
- responsible for maintaining cell shape, cell motility, chromosome and organelle movements

-Microfilaments

- Two intertwined strands of actin
- actin subunits
- responsible for maintaining cell shape, changes in cell shape, muscle contraction, cytoplasmic streaming, cell motility, cell division

-Intermediate filaments

- Fibrous proteins supercoiled into thicker cables
- Subunits are keratins
 - keratin forms an alpha helix, and then a two-chain coiled coil (two alpha helixes wrapped around each other), and a protofilament forms from two staggered, anti-parallel arrangement from disulfide bonds between adjacent coiled coils, which forms a protofibril (16-32 polypeptides arranged in cross section)
- responsible for maintaining cell shape, anchoring the nucleus and certain other organelles, and the formation of the nuclear lamina

- ATP powered motor protein traveling up the microtubule of the cytoskeleton with ATP

- receptor for motor protein- Kinesin

-Whipping motion of the flagella and cilia

