Cell Bio Review for Exam 1

ECM, Receptor and Cell Junctions

- What two types of proteins are notorious for their characteristic strength due to coiled coils?
    - Intermediate filaments and collagen
        - Collagen are triple helices assemble into fibrils then into fibers
- What two types of proteins include disulfide bonding between two polypeptide subunits?
    - Fibronectin and antibodies
        - Fibronectin dimmers are linked near C-terminus
- What type of bonds/interactions are disrupted when elastin is stretched?
    - Hydrophobic/hydrophilic
- What ECM component is responsible for the attraction of water in collagen fibers?
    - Proteoglycans
        - core protein with lots of sugar attached →hydrophilicity→ attracts sodium →attracts water
- Why is it important that cells have mechanisms for fine-tune control of ECM degradation and remodeling with tissues?
    - Cells need to be able to rapidly respond to their environments
        - Proteases degrade ECM proteins and protease inhibitors prevent degradation by proteases
- What type of integrin cluster is associated with actin filaments?
    - Focal adhesions/contacts
- What type of integrin cluster is associated with intermediate filaments?
    - Hemidesmosomes
- What type of cell junction blocks diffusion of plasma membrane molecules?
    - Tight junctions!!

Cytoskeleton

- What two types of cytoskeleton proteins exhibit treadmilling?
    - Microtubules and microfilaments/actin
- During the crawling of cells, what type of actin-binding protein acts on the minus end of actin to allow growth from the positive end only?
    - Capping protein
- Which type of cytoskeleton component uses ATP to grow?
    - Microfilaments
- What does the polymerization of G-actin monomers form?
    - F-actin (filamentous)
- Which protein binds existing actin filaments to create new nucleation sites?
    - ARP2/3
- What cytoskeleton protein is composed of alpha/beta heterodimer subunits?

    - Microtubules
- What cytoskeleton protein has no known polarity?
    - Intermediate filaments
- What cytoskeleton proteins main function is strength?
    - Intermediate Filaments
- " " is intracellular transport?
    - MTs
- " " is cell locomotion?
    - Microfilaments
- What is the name of the nucleation site for MTs
    - Gamma-TurC
- What cytoskeleton protein is the main component of nuclear lamins?
    - Intermediate Filaments
        - Forms strong cage inside nucleus
- What motor protein transports cargo to the positive end of a MT?
    - Kinesin
- " " to the negative end?
    - Dynein

Membranes

- Through what type of interaction does an integral membrane protein anchor itself into the interior or phospholipid membrane?
    - Hydrophobic
- What is the name of a protein that is associated with the cell membrane through weak electrostatic interactions with a transmembrane protein?
    - Peripheral membrane protein
- What protein secondary structure is typically found in the lipid bilayer of proteins that span the membrane?
    - Alpha helix
- What enzyme is responsible for transporting individual phospholipids from one phospholipid layer to the next?
    - Flippases
- What is the name of the 3-C sugar alcohol found in a phospholipid?
    - Glycerol

Nucleic Acid/Protein Methods

- What does gel electrophoresis separate individual molecules by?
    - Size
        - Rate of movement is inversely proportional to size (ie: smaller molecules can move through pores of gel easier/faster and are found at the bottom of gel)

- What detergent is ionic and therefore denaturing?
    - SDS
        - SDS is used during gel electrophoresis to negatively charge the molecules
- What detergent is non-ionic and not denaturing?
    - Triton X 100
- What is the name of the genetic engineering technique that allows one to insert a GFP into a foreign organisms' genome?
    - Transfection
- What is the specific characteristic of a specimen that changes the velocity of light and is responsible for the phase shift observed in phase contrast microscopy?
    - Specimen density
        - Density changes light velocity→changes phase of light wave→phase plate converts this into brightness difference
        - Dark regions observed have max phase shift = max density
- What type of microscopy allows for the visualization of the light emitted by an excited photon?
    - Fluorescence
- What is the name given to the property of microscopes that enlarges an image but doesn't necessarily make it any clearer?
    - Magnification
- What is the main disadvantage of Electron Microscopy?
    - The organism must be dead

Proteins

- What is the name of the bond that links to 2 amino acids together?
    - Peptide bond
- What level of protein structure is characterized by hydrogen bonding?
    - Secondary
- Name a common structural motif
    - Beta-alpha-beta motif, hairpin loop motif (2 beta sheets linked by a random coil), helix-turn-helix (two alpha helices linked by random coil)
- Name a protein we discussed in class that exhibits quaternary structure (2 of these)
    - Hemogloblin
    - Antibodies
- A change in protein shape is directly related to what?
    - A change in protein function

Nucleic Acids

- What is the name of process that turns a gene into RNA?
    - Transcription
- What is the name of the process that turns RNA into a polypeptide?

    - Translation
- What are the 3 component of a nucleotide?
    - Phosphate group, sugar, nitrogenous base
- What type of bonding is responsible for the interaction between 2 adjacent bases on opposite strands of DNA?
    - Hydrogen bonding
- What is the "bead" on the beads on string analogy?
    - Nucleosome
- What is a nucleosome composed of?
    - Histone proteins
- What is the form of DNA that has the highest packing ratio?
    - Chromatid
        - Nucleosomes→ 30nm chromatin fiber→looped domains→heterochromatin→ chromatids
- What is the name of bond that links nucleotides together?
    - Phosphodiester bond

Sugars

- What atoms does a carbohydrate contain?
    - C,H,O
        - "carbo-hydrate" = C and H2O
- What is the difference between alpha and beta glucose molecules?
    - C1 of alpha points down, C1 of beta points up
    - Humans can't digest beta-glycosidic bonds (cellulose)
- What is the difference between ribose and deoxyribose?
    - Ribose has hydroxyl group on C2
- What molecules can participate in hydrogen bonding with H?
    - O, F, N (electronegative attractive interaction)

Drawings:

- Nucleic acid (RNA or DNA
- Peptide (di/tri)
- Antibody
- phospholipid