1 | **Biomolecules quiz review, raw**

1.1 | **Carbohydrates**

- Set 1, carbs. See Luke De's video + KBhBIO101Carbs
  - *Glucose vs. fructose* — both monosacharrides, one is a 6-carbon ring and one is a 5-carbon ring
  - *Mono vs. di. vs. polysaccharide* — carbohydrates made out of a single, double, and multiple monomer (single-unit) carbohydrates
  - *Starch vs. glycogen vs. cellulose* — lots of alpha glucose in less branches, lots of alpha glucose in more branches, lots of beta glucose in organized lattice respectively.
    - Starch — plant food reserve
    - Glycogen — animal energy reserve
    - Cellulose — cell wall in plants
- Set 2, lipids. See Luke De's video + KBhBIO101Lipids
  - *Triglyceride vs. fatty acid vs. phosophilid* see KBhBIO101StructuresofCarbs
    - Glycerol => a fatty acid
    - Triglyceride => three of 'em above
    - Phospholipid => two fatty acid + phosphate head
  - *Saturated vs unsaturated fatty acids* see also KBhBIO101StructuresofCarbs
    - Saturated Fats => no double bonds in the carbon chain of fatty acids — think! butter
    - Unsaturated Fats => double bonds in the carbon chain of fatty acids — think! olive oil
- Identify functional groups
  - Amino acid groups — see KBhBIO101AminoAcids
    - carboxyl/carboxylic acid — H-O-C=O (left side of backbone) Screen Shot 2020-10-12 at 2.29.28 PM
    - carbonyl — C=O — part of carboxyl
    - amide — RC(=O)NR′R″ (frequently shown in side chains of amino acids — see Amine)
    - amino/amine — H3N+ (right side of backbone)
    - hydroxyl — OH group. Need I say more?
    - ester — take a carboxylic acid and replace the hydrogen with anything else #ASK. => What join fatty acid chains with the glycerol to make trigrcyeride
    - ether — R-O-R structure. => glycocidic bonds are formed by ether bonds
    - alcohol group (H-O-R) as part of the carboxyl
- Monomers vs Polymers KBhBIO101StructuresofCarbs
  - Monomer — single molecule (such as a monosacchride) that could be chained together to make polymers
  - Polymers — complex molecues built from monomers
  - Building polymers — dehydration reaction — taking out water molecules
  - Destructing polymers — hydration reaction — adding in water molecules

1.2 | **Cell Structures**

- Prokaryotic vs. Eukaryotic
  - Prokaryotic cells — often in single-cellular cells, has a cell wall, and contained in capsules
  - Eukaryotic cells — in multicellular cell elements, contains a plasma membranes and nucleus
- Compare and contrast a typical animal cell with a typical plant cell. Be able to label diagrams of each. (See… problem set 1)
  - Animal Cell
    - No cell wall
    - No chloroplast
    - Has Cytoplasm
    - Has Ribosomes
    - Has Mitochondria
    - No plastids — organelle pigments
    - Has Cilla — Hair-like items on the outer surface
  - Plant Cell
    - Has cell wall
    - Has chloroplast — photosynthesis
    - Has cytoplasm
    - Has Ribosomes
    - Has Mitochondria
    - Has plastics — organelle pigments
    - Mostly has no Cilla
- Endosymbiotic theory
  - Endosymbiotic theory states that organelles within our current eukaryotic cells — the mitochondria and chloroplasts — are originally prokaryotic cells in their own right. This is because they divide independently through binary fission, and also contains circular DNA that is independent of the main cell itself.
- Organizing organelles based on membranes #ASK
  - Used as a gauge to sort the evolutional history of cells
  - Membranous organelles — possess own plasma => regulates own macromolecure consumption, hormones, etc. Perhaps original prokarotic cells
    - Double membranes, evolved later
      - Endoplasmic reticulum => forms the network of transferring proteins and other elements
      - Golgi body/Gioli apparatus => packs, sorts, and modifies proteins and other elements throughout the cell
    - Double membranes, prokarotic orginially
      - Mitochrondria => store ATP and extract energy from ATP
      - Chloroplasts => Does photosynthesis
    - Single membranes => probably originally fragments of prokaryotic cells
      - Vesticles
      - Lysomoes => breaking stuff down and garbage dumps
      - Vacuoles => storing water, nutrients, waste

  - Non-membranous organelles — does not posess own plasma => mostly part of the cytoskeleton of a cell
    * Ribosomes => protein synthesizer in the cell
    * Centrosome => forms flangella, cilla, and handles cells divisions
    * Plastids => creates colours displayed in the chromoplasts

- Cell Components. Basicall all of these exist only in Eukareotic cells
  - chloroplast and mitochondria
    * Chloroplast — found in plants + does photosynthesis
    * Mitochondria — found in animals + store ATP and extract energy from ATP
  - cell wall and plasma membrane
    * Cell Wall — found in plants => surround the cell: hard
    * Plasma membrane — found in animals => surround the cell: soft KBhBIO101Lipids
  - rough endoplasmic reticulum (ER) and smooth ER
    * Rough ER — covered by ribosomes and folds KBhBIO101Proteins
    * Smooth ER — not covered by ribosomes and makes KBhBIO101Lipids
  - cytosol, cytoplasm and cytoskeleton
    * Cytosol => liquid found inside cells; the ”cytoplasm” floats within it
    * Cytoplasm => all the stuff within the cell
    * Cytoskeleton => complex network of proteins + fibres that organize the rest of the cell
  - nucleus and nucleolus
    * nucleus => centre of the cell, stores DNA
    * nucleolus => largest part of the nucleous that makes ribosomes
  - lysosomes and food vacuoles
    * Lysosomes => vesticles that contains enzymes that breaks down biomolecules
    * Food Vacoules => vesticels that stores food and other resources
  - cytoskeleton and microtubules
    * Cytoskeleton => complex network of proteins + fibres that organize the rest of the cell
    * Microtubulues => Polymers of tubulin protein that provides the main structure of eukarotic cells
  - flagella and cilia
    * Flagella => a bacteria’s tail — allow them to move and also act as an sensory organ. longer than a cilla, and moves in sinosoidial pattern.
    * Cilium => a cell’s ”hair” — provides sensory and communications functions. Motil cilla could move about to ”grab” things, and non-motile cilla can’t move. more abundant that the flagella, and moves in circular pattern if they do move, and moves in circular pattern if they do move
  - Ribosomes and Golgi apparatus
    * Ribosomes => synthesizes proteins
    * Golgi apparatus => packs, modifying, and moving proteins

1.3 | **Plasma Membrane Structure + transport**

- Lipid structure and substructures: KBhBIO101Lipids
- Functions of cell membrane
  - Phosophilid structures KBhBIO101StructuresOfLipids
  - Transmembrane proteins KbhBIO101CellTransport
  - Hydrophobic + hydrophillic parts of a phosophilid KBhBIO101StructuresOfLipids
    - KBhBIO101FluidMosaic
- Passive + active transport KbhBIO101CellTransport
- Cell transport process
  - Simple diffusion => things just spread out from high concentration to low concentrations
  - Passive diffusion => non-polar molecules needed ”fall in” through the phosolipid bi-layer
  - Facilitated diffusion => specific polar molecules go along the gradient to get into the cell through transporter proteins. Osmosis is the facilitated diffusion, just of water + auquaporin.
  - Phagocytosis => take a piece of the membrane with you to form a vesticle to introduce large solid elements, recycling the membrane after done — ”cell eating”
  - Pinocytosis => take a piece of the membrane with you to form a vesticle to introduce large area of the ”outside” in — fluid and solid and all, recycling the membrane after done — ”cell drinking”
  - Endocytosis => Phagocytosis + Pinocytosis
  - Extocytosis => opposite of endocytosis
- Defining…
  - Isotonic => inside and outside have the same level of ”osmolarity”: probablility for osmosis to happen through a semipermiable membrane
  - Hypertonic => inside has less osmolarity than the outside: water/other elems will flow out of the cell
  - Hypotonic => outside has less osmolarity than the inside: water/other elems will flow into the cell

1.4 | **Proteins Structures and Function**

- Overall structure, monomers/building blocks, functions, and examples of proteins => KBhBIO101Proteins
- ”peptide” => a chain of amino-acids
- Polymerization via dehydration
  - Take two amino acids, take the H-O out of the alcahol, take the H out of the Amine. Fill the hole with the other one
- Protein structure
  - Primary structure, secondary structure => KBhBIO101Proteins
  - Amino acids, N & C terminus => KBhBIO101AminoAcids. N terminus (Amine), C terminus (Carbolixic.)
  - Secondary structure — H bonds between H-O, H-N
  - Tertiary structure => see the KBhBIO101Proteins articles

- The functions of proteins are varied because the primary sequence can be varied, effectively building any shape protein to do its specific function
- Form = function is the idea that the shape or form a protein takes through the combination of primary, secondary, tertiary, or quaternary structure determines how it will then function. Any changes to the structure will have some impact on its function and the more the structure is affected the more the function is likely to impacted
- Functions => defense, movement, structure, transport, cell to cell signaling, etc.

1.5 | Cell Structure

- Enzymes? KBhBIO101Enzymes

OK, so. Apparently Paul just answered the rest of his questions.

And I quote

“”

Enzymes are catalysts. They speed reaction rates but do not affect the change in free energy of the reaction (the difference in potential energy between reactants and products).

- Activation energy is the amount of kinetic energy required to reach the transition state of a reaction.
- Enzymes speed up a reaction by lowering the activation energy, often with the help of cofactors or coenzymes.
- **Enzymes lower the activation energy by some combination of…**
  - Orienting the reactions substrate(s) to promote more effective collisions (and therefore reactions
  - Stressing or straining bonds to temporarily and/or slightly lower the strength of attraction to allow the bond to break more easily
  - Involving amino acid R-groups or sidechains in creating the transition state between reactants and products

Enzymes have active sites that bring substrates together and may change shape to stabilize the transition state; known as Induced Fit upon binding active site and slight change in enzyme shape.

Most enzymes are proteins, and thus their activity can be directly influenced by modifications or environmental factors, such as temperature and pH, that alter their three-dimensional structure.

Enzyme activity may be regulated/inhibited by molecules that compete with substrates to occupy the active site (competitive inhibitor) or alter enzyme shape so that substrates become unable to enter the active site (non-competitive inhibitor).

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