Review for Molecular Biology Test

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# 2.1 Molecules to Metabolism

1. Remember c connecting to n.

2. Anabolism is the synthesis of complex molecules into simpler molecules using condensation reaction. Catabolism is the breakdown of complex molecules into simpler molecules using hydrolysis reaction. Metabolism is the web of all enzyme- catalyzed reactions in a cell or organism. Anabolism+ Catabolism= Metabolism.

# 2.2 Water

3. Hydrogen bonds are the attraction of a hydrogen atom with a partially positive charge with another atom with a partially negative charge.

4. Stable temperature helps less extreme changes. Solvent removes waste, such as urea. Density helps larger organisms float.

5. Glucose is freely soluble and carried through blood plasma. Amino acids are soluble enough to be carried dissolved in blood plasma. Oxygen is sparingly dissolvable and as water temperatures rise, solubility decreases. Cholesterol is not soluble and is carried with fats in lipoprotein complexes. Fats are also not dissolvable in water and are carried in lipoprotein complexes.

# 2.3 Carbohydrates and Lipids

6. A monosaccharide is a single sugar unit; they are also monomers of carbohydrates. They are linked together to form larger carbohydrates by condensation reaction. Examples of monosaccharides are glucose, fructose, and galactose.

7. Disaccharides are two monosaccharides linked together. Some examples are maltose, sucrose, and lactose. Maltose is made by glucose+glucose. Lactose is made by glucose+galactose. Sucrose is made by glucose+fructose.

8. Polysaccharides are multiple monosaccharides linked together. Cellulose and starches are both a source of plants, whereas glycogen is a source of animals. Starch has both amylose 1-4 and amylopecetin 1-4 and 1-6. These are both alpha glucose and have bonds ranging from 1-4 and 1-6. Cellulose is beta glucose and has bonds 1-4. Glycogen is alpha glucose and has both 1-4 and 1-6 bonds.

9. Carbs have a short-term memory storage. They tend to have less osmotic effect but are easily digested. Carbs are also water soluble. Lipids have long-term storage and more osmotic effect. They are not easily digested and not water soluble.

# 2.4 Proteins

10. Amino acids are linked together by a peptide bond by condensation reaction

11. The primary structure describes the order in which amino acids in a protein are determined.

12. A proteome is all proteins produced by a cell, tissue, or organism. The proteome is variable because different cells in an organism make different proteins.

# 2.5 Enzymes

13. Enzymes only catalyze one biochemical reaction and thousands of these reactions need to be catalyzed. The Locke and Key model demonstrated that each enzyme binds to only one substrate to catalyze one specific reaction. In the induced fit model, as the substrate approaches the enzyme, it has a conformation change in the active site; this changes shape to fit the substrate.

14. Enzymes catalyze chemical reactions by lowering activation energy threshold.

# 2.6 Structure of DNA and RNA

15. Phosphate is circle, base is pentagon. DNA-> there is H in the lower right corner, RNA –> OH in the lower right corner.

16. DNA is double stranded, RNA is single stranded. DNA’s sugar is deoxyribose, RNA’s sugar is ribose. Base for DNA is thymine, base for RNA is uracil.

# 2.7 DNA Replication, Transcription, and Translation

17. DNA polymerase synthesizes new strands from templates strands. Nucleotides with three phosphate groups then align opposite with their complimentary base. The DNA polymerase then cleaves the two excess phosphates and uses the energy released to link the nucleotide to new strand. This works only from a 5’ to 3’ direction. DNA polymerase also proofreads the new DNA strand to make sure there are no errors.

18. Able to code for mRNA, state functions of codons, determine amino acids sequence.

19. Translation is the process where nucleic acids are changed into amino acids. This process is divided into 3 parts: initiation, elongation, and termination. Initiation is where the small and large subunits of a ribosome attach to the strand of mRNA. Elongation is another tRNA with a matching codon that brings in an amino acid, thus forming a peptide bonds between two amino acids. Termination is when the ribosome encounters a stop codon, and a release factor is brought in and binds causing the release of the mRNA strand. Start codon (AUG) allows for the beginning of translation as the first tRNA carries it.

# 2.8 Cell Respiration

20. The role of oxygen in aerobic respiration is that it uses oxygen to breakdown glucose to make ATP. Oxygen is the H+ ion acceptor, if there is no oxygen, the pH would change as ATP is being produced.

21. There are 3 phases aerobic transportation uses to break down glucose: glycolysis, Krebs Cycle, and electron transport chain. Glycolysis occurs in cytoplasm. Glycolysis breaks down glucose to produce 2 molecules: pyruvate and ATP and NADH. The Krebs’s cycle occurs in the mitochondria and starts with the conversion of pyruvate into citric acid, then enters Krebs Cycle and converts into CO2, ATP, NADH, AND FADH2. The electron transport chain takes NADH AND FADH2 and put it through the chain so that the energy can be used to convert ADP into ATP. This requires oxygen. The oxygen accepts the H+ ions to form water, which occurs in the mitochondria.

# 2.9 Photosynthesis

22. Photolysis uses light energy from the sun to break apart water into hydrogen, oxygen, and electrons. The electrons then enter the electron transport chain.

23. Water is important in photosynthesis because the water absorbs the light in a light-dependent reaction, which is then split to produce oxygen and hydrogen. Electrons are produced, which is significant because this is what enters the electron transport chain.

24. Photosynthesis makes glucose by using energy from sunlight to produce glucose from carbon dioxide and water. The carbon dioxide gains electrons, thus creating glucose. Photoystem II uses light energy provided by the sun to break water into hydrogen, oxygen and electrons, known as photolysis, the electrons then enter an electron transport chain. Photosystem 1 picks up the electrons from the electron transport chain and uses as well as hydrogen to make ATP and NADH, which is an energy carrier. The Calvin Cycle is a set of reactions that uses energy in ATP and NADH to convert carbon dioxide into glucose.