PRELIM ASSIGNMENT #2
PHYSIOLOGICAL & BIOLOGICAL PSYCHOLOGY

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SUBJ CODE: PY48

UNIT 1 TOPIC:

A. The study of body functions
B. Chemical Composition of the Body
C. Cell Structure and Genetic Control
D. Enzymes & Energy
E. Cell respiration & metabolism
F. Interactions between cells & the extracellular environment

GUIDE QUESTIONS:

1. Describe the structure of an atom and ion and the nature of covalent, ionic, and hydrogen bonds.
    - Protons, neutrons, and electrons are subatomic particles that make up an atom. An atom's basic structure consists of a tiny, relatively massive nucleus that contains at least one proton and, more often than not, one or more neutrons. Energy levels (also known as shells) contain one or more electrons and are located outside of the nucleus. Rings are another name for energy levels. Neutrons are the most massive and have no charge. Protons are positively charged and have slightly less mass than neutrons. Electrons are negatively charged and have almost no mass. Electrons move in energy levels around the nucleus. The Bohr model of the atom is the simplest way to show where the various parts of an atom are located.
    - An ion is an atom that has lost or gained one or more electron
    - Covalent chemical bonds involve the sharing of a pair of valence electrons by two atoms, in contrast to the transfer of electrons in ionic bonds. Such bonds lead to stable molecules if they share electrons in such a way as to create a noble gas configuration for each atom
    - In chemical bonds, atoms can either transfer or share their valence electrons. In the extreme case where one or more atoms lose electrons and other atoms gain them in order to produce a noble gas electron configuration, the bond is called an ionic bond.
    - Hydrogen bonding differs from other uses of the word "bond" since it is a force of attraction between a hydrogen atom in one molecule and a small atom of high electronegativity in another molecule. That is, it is an intermolecular force, not an intramolecular force as in the common use of the word bond. As such, it is classified as a form of van der Waals bonding, distinct from ionic or covalent bonding
2. Explain the meaning of the terms polar and nonpolar; hydrophilic and hydrophobic.
    - A polar molecule is typically formed when one end of the molecule has a greater number of positive charges and the opposite end of the molecule has negative charges, resulting in the formation of an electrical pole. When a molecule is said to have a polar bond, the center of

negative charge is on one side and the center of positive charge is on the other. The molecule as a whole will be polar.

- Non-Polar Molecules, A molecule that does not have charges at the end due to electrons being finely distributed and those that symmetrically cancel out each other. A polar molecule and a non-polar molecule cannot coexist in a solution. Consider water and oil as two examples. Water acts as a polar molecule in this solution, whereas oil acts as a non-polar molecule. Because they cannot be combined, these two molecules do not form a solution.
- Hydrophilic means “loving water,” implying that hydrophilic substances are chemically attracted to water. Because water is polar and attracts charges, hydrophilic substances are typically polar. Hydrophilic substances are those that can dissolve in water. Hydrophobic means “fearful of water,” which means that hydrophobic substances repel water and are insoluble. They will not dissolve in water, but will instead separate from it. Nonpolar molecules are hydrophobic, and all lipids are hydrophobic as well. Because the attraction between nonpolar molecules is so weak, the substances separate.

3. Define acid and base and explain the pH scale.
    - Any hydrogen-containing substance capable of donating a proton (hydrogen ion) to another substance is referred to as an acid. A base is a molecule or ion that can accept hydrogen ions from acids.
    - The pH scale (where pH stands for ‘potential of hydrogen’) can be used to determine the numerical value of a substance’s acidity or basicity. The pH scale is the most widely used and trusted method of determining how acidic or basic a substance is. A pH scale can range from 0 to 14, with 0 being the most acidic and 14 being the most basic. Litmus paper can also be used to determine whether a substance is acidic or basic. To identify acids and bases, two types of litmus paper are available: red litmus paper and blue litmus paper. When exposed to acidic conditions, blue litmus paper turns red, while red litmus paper turns blue when exposed to basic or alkaline conditions.
4. Identify the characteristics of organic molecules.

    1 . They all contain carbon.

    2 . Most of them are flammable.

    3 . They are all soluble in non-polar solvents.

    4 . They are most, if not all, are covalently bonded molecules.

5. Identify the different types of carbohydrates and lipids, and give examples of each type.

    Carbohydrates are classified into three types:

- Sugars. Because they are in their most basic form, they are also known as simple carbohydrates. They can be found in foods such as candy, desserts, processed foods, and regular soda. They also include sugars that occur naturally in fruits, vegetables, and milk.
- Starches. They are complex carbohydrates made up of many simple sugars strung together. To use starches as energy, your body must first break them down into sugars. Bread, cereal, and pasta are examples of starches. They also include vegetables such as potatoes, peas, and corn.
- Fiber. It is a complex carbohydrate as well. Because most fibers cannot be broken down by the body, eating fiber-rich foods can help you feel full and reduce your tendency to overeat. Fiber-rich diets have additional health benefits. They may aid in the prevention of stomach or intestinal issues such as constipation. They may also aid in the reduction of cholesterol and blood sugar levels. Fiber can be found in a variety of plant-based foods, including fruits, vegetables, nuts, seeds, beans, and whole grains.

6. Explain how dehydration synthesis and hydrolysis reactions occur in carbohydrates and triglycerides.
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7. Describe the nature of phospholipids and prostaglandins.
   - Phospholipids are lipids composed of three components: a diglyceride, a phosphate group, and another organic molecule, such as choline, to form phosphatidylcholine. Phospholipids, which can form bilayers, are a major component of all cellular membranes.
   - Prostaglandins are a type of lipid that is produced at sites of tissue damage or infection and is involved in the healing process after injury or illness. They regulate processes such as inflammation, blood flow, the formation of blood clots, and the induction of labor.
8. Describe amino acids and explain how peptide bonds between them are formed and broken.
   - Amino acids are small molecules that serve as the foundation for proteins. Proteins provide structural support within the cell and participate in a variety of critical chemical reactions. Each protein is a molecule composed of various combinations of 20 different types of smaller, simpler amino acids. Protein molecules are three-dimensional three-dimensional chains of amino acids.
   - Peptide bonds can be used to connect many amino acids together to form long chain polypeptides. The amide bond can only be broken by amide hydrolysis, in which the bonds are cleaved with the addition of a water molecule. Protein peptide bonds are metastable and will spontaneously break in a slow process. Enzymes in living organisms can both form and break peptide bonds.
9. Describe the different orders of protein structure, the different functions of proteins, and how protein structure grants specificity of function.
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10. Describe the structure of nucleotides and distinguish between the structure of DNA and RNA
    - A nucleotide consists of three components: a phosphate group, a 5-carbon sugar, and a nitrogenous base. Adenine, cytosine, guanine, and thymine are the four nitrogenous bases found in DNA. Instead of thymine, RNA contains uracil. The genetic material of all known living things is made up of nucleotides in a chain. Outside of genetic information storage, they also function as messengers and energy moving molecules.

- There are two differences that distinguish DNA from RNA: (a) RNA contains the sugar ribose, while DNA contains the slightly different sugar deoxyribose (a type of ribose that lacks one oxygen atom), and (b) RNA has the nucleobase uracil while DNA contains thymine.

11. Explain the law of complementary base pairing, and describe how that occurs between the two strands of DNA.
    - Chargaff's rule, also known as the complementary base pairing rule, states that DNA base pairs are always adenine with thymine (A-T) and cytosine with guanine (C-G). A purine always pairs with a pyrimidine and vice versa. However, A doesn't pair with C, despite that being a purine and a pyrimidine.
    - Two complementary strands of DNA join together due to hydrogen bonding between nitrogenous bases, which allows DNA to form a ladder-like structure that twists into the well-known double-helix.