I. ELEMENTS AND MACROMOLECULES IN ORGANISMS: Most common elements in living things are carbon, hydrogen, nitrogen, and oxygen. These four elements constitute about 95% of your body weight. All compounds can be classified in two broad categories --- organic and inorganic compounds. Organic compounds are made primarily of carbon. Carbon has four outer electrons and can form four bonds. Carbon can also bond to other carbon molecules forming double, triple, or quadruple bonds. Organic compounds also contain hydrogen. Since hydrogen has only one electron, it can form only single bonds.

Each small organic molecule can be a unit of a large organic molecule called a macromolecule. There are four classes of macromolecules (polysaccharides or carbohydrates, triglycerides or lipids, polypeptides or proteins, and nucleic acids such as DNA & RNA). Carbohydrates and lipids are made of only carbon, hydrogen, and oxygen (CHO). Proteins are made of carbon, hydrogen, oxygen, and nitrogen (CHON). Nucleic acids such as DNA and RNA contain carbon, hydrogen, oxygen, nitrogen, and phosphorus (CHON P). The body also needs trace amounts of other elements such as calcium, potassium, and sulfur for proper functioning of muscles, nerves, etc.

The four main classes of organic compounds (carbohydrates, lipids, proteins, and nucleic acids) that are essential to the proper functioning of all living things are known as polymers or macromolecules. All of these compounds are built primarily of carbon, hydrogen, and oxygen but in different ratios. This gives each compound different properties.

Questions:
1. What are the 4 main elements that make up 95% of an organism?
2. What are macromolecules?
3. Name the 4 classes of macromolecules:
4. What are the building blocks or subunits of macromolecules called?
5. Name 3 elements (symbols) your body needs trace amounts of for proper functioning

II. CARBOHYDRATES: are used by the body for energy and structural support in cell walls of plants and exoskeletons of insects and crustaceans. They are made of smaller subunits called monosaccharides. Monosaccharides have carbon, hydrogen, and oxygen in a 1:2:1 ratio. Monosaccharides or simple sugars include glucose, galactose, and fructose. Although their chemical formulas are the same, they have different structural formulas. These simple sugars combine to make disaccharides (double sugars like sucrose) and polysaccharides (long chains like cellulose, chitin, and glycogen).

Task: Color code the glucose molecule to the right (carbon-black, hydrogen-yellow, and oxygen-red).

Questions:
6. Name 2 ways our body uses carbohydrates.
7. What are the monomers (subunits) that make up carbohydrates?
8. Monosaccharides are ______________ sugars
9. Name 3 monosaccharides
10. What are disaccharides? Give an example
11. Long chains of sugar are ___________________, Name 3
III. **PROTEINS**: are made of subunits called **amino acids** and are used to build cells and do much of the work inside organisms. They also act as **enzymes** helping to control metabolic reactions in organisms. Amino acids contain two functional groups, the carboxyl group (-COOH) and the amino group (-NH₂).

**Task**: **Color code** the amino acid to the right ------------------
(carbon-black, hydrogen-yellow, and oxygen-red).

IV. **ENZYMES**: are protein molecules that act as **biological catalysts**. Cells contain **thousands** of different enzymes to control the functions of the cell. Enzymes must physically fit a specific **substrate(s)** to work properly. Substrates are the reactants in chemical reactions. The place where a substrate fits an enzyme to be catalyzed is called the **active site**. **Changes in temperature and changes in pH** from **neutral** can **denature** (change the shape) of enzymes and their active sites so the enzyme is unable to work.

**Task**: **Color** the enzyme **purple**, the substrate **yellow**. Also **label** the active site.

**Questions**:
12. What monomers (subunits) make up proteins? ____________________________
13. What is the primary job of a protein? ________________________________
14. Proteins also act as ________________ in cells to control reactions and act as biological ________________
15. Enzymes have attachment sites called the ______________ site for the ______________ to join
16. The ______________ are the reactants
17. Why are enzymes important to organisms? ________________________________
18. What does it mean when an enzyme is **denatured**?
19. What is the effect of excess heat or a change in pH on an enzyme? ____________________________

V. **LIPIDS**: are large, **nonpolar** (won’t dissolve in water) molecules. **Phospholipids** make up cell membranes. Lipids also serve as waxy coverings (cuticle) on plants, **pigments** (chlorophyll), and **steroids**. Lipids have more carbon and hydrogen atoms than oxygen atoms. Fats are made of a **glycerol** (alcohol) and three **fatty acid chains**. This subunit is called a **triglyceride**. **Color** the glycerol molecule using the same colors for carbon, hydrogen, and oxygen as you did before. The fatty acid chains may be **saturated** (only single bonds between carbons) or **unsaturated** (contain at least one double bond). A **carboxyl functional group** (-COOH) is found on the end of the fatty acid that does NOT attach to glycerol.

**Task**: **On the next page, circle** the carboxyl groups in the 2 fatty acids. **Color** the fatty acid chains (C- **black**, H- **yellow**, O-red)
Questions:
20. Lipids are nonpolar. What does this mean?
21. ________________ makes up cell membranes
22. Name a waxy lipid covering plants ________________
23. Fats are made of an alcohol called ________________ and 3 _____________ __________ chains. This is known as a ____________

VI. NUCLEIC ACIDS: carry the genetic information in a cell. DNA or deoxyribose nucleic acid contains all the instructions for making every protein needed by a living thing. RNA copies and transfers this genetic information so that proteins can be made. The subunits that make up nucleic acids are called nucleotides.

Task: Color AND label the parts of a nucleotide
- sugar (pentagon)- green
- phosphate group (circle)- yellow
- nitrogen base (hexagon)- blue.

Questions:
24. Nucleic acids carry ________________ information in a molecule called _______ or ________
25. DNA has the instructions for making _________________.
26. RNA _______________ and _______________ genetic information so that _______________ can be made
27. What are the subunits of nucleic acids? ________________
28. The 3 parts of a nucleotide are a 5 carbon ________________, a phosphate and a nitrogen ________________.