Module 02: Chemistry of Life — Study Questions

Atomic Structure

1. What three subatomic particles make up an atom, and where is each located?
2. An element has 8 protons. How many electrons does a neutral atom of this element have? What element is this?
3. What is the difference between atomic number and mass number?
4. Carbon-12 and Carbon-14 are isotopes. What makes them different, and what makes them the same?
5. Why are carbon, hydrogen, oxygen, and nitrogen the most abundant elements in living organisms?

Chemical Bonding

1. What is the difference between an ionic bond and a covalent bond?
2. Water molecules contain polar covalent bonds. What does "polar" mean in this context?
3. Why are hydrogen bonds considered "weak" bonds, and why are they still important in biology?
4. How does the electronegativity of atoms determine what type of bond forms between them?
5. Give an example of how weak bonds (like hydrogen bonds) hold biological structures together.

Properties of Water

1. Explain how hydrogen bonding between water molecules creates cohesion.

2. Why does ice float on liquid water, and why is this property biologically important?
3. How does water's high specific heat benefit living organisms?
4. What makes water an excellent solvent for many substances?
5. Why do some insects walk on water? Which property of water allows this?

Acids, Bases, and pH

1. What is the pH scale, and what do the numbers represent?
2. A solution has a pH of 3. Is it acidic or basic? How does it compare to a solution with pH 7?
3. What happens to the concentration of hydrogen ions when you add an acid to a solution?
4. How do buffers help maintain stable conditions inside cells?
5. Blood pH is normally around 7.4. What might happen if blood pH dropped to 6.8?

Organic Chemistry

1. What is unique about carbon that allows it to form the backbone of so many different molecules?
2. What is the difference between organic and inorganic compounds?
3. Name three functional groups commonly found in biological molecules and describe one property of each.
4. Why is understanding chemistry important for understanding how living organisms function?