02_ Chemistry of Life questions

For all questions select all answers that apply (some questions may have more than one correct answer)

1) In a single molecule of water, two hydrogen atoms are bonded to a single oxygen atom by _____.
    a. hydrogen bonds
    b. nonpolar covalent bonds
    c. polar covalent bonds
    d. ionic bonds

2) Which of the following is NOT one of the four emergent properties of water that facilitate life on Earth?
    a. Cohesion and adhesion due to hydrogen bonding, enabling water to move through capillary action in plants and form droplets.
    b. High specific heat capacity, which allows water to absorb and release large amounts of heat with minimal temperature change, stabilizing environments.
    c. Expansion upon freezing, which causes ice to be less dense than liquid water, allowing it to float and insulate aquatic ecosystems.
    d. Ability to dissolve nonpolar substances better than polar substances, showcasing its versatility as a solvent.

3) Water molecules are polar because:
    a. Electrons are equally shared between oxygen and hydrogen, creating an even charge distribution.
    b. Electrons spend more time near the oxygen atom due to its higher electronegativity, creating an uneven charge distribution.
    c. The oxygen atom is slightly positive, and the hydrogen atoms are slightly negative.
    d. Water molecules form ionic bonds with each other, making them polar.

4) Which of the following statements correctly describes the relationship between thermal energy, temperature, and heat?
    a. Thermal energy is the transfer of kinetic energy between molecules, while temperature measures the total heat in a system.
    b. Temperature represents the average kinetic energy of molecules, and heat is the transfer of thermal energy between matter.
    c. Heat is the random motion of molecules, and thermal energy is the average kinetic energy of those molecules.
    d. Thermal energy is the total kinetic energy of molecules, while temperature measures the transfer of heat between systems.>

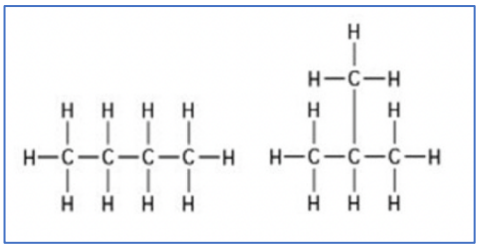
5) To act as an effective coolant in a car's radiator, a substance has to have the capacity to absorb a great deal of heat. You have a reference book with tables listing the physical properties of many liquids. In choosing a coolant for your car, which table would you check first?
    a. pH
    b. density at room temperature

c. heat of vaporization
d. specific heat

6) Low humidity in the atmosphere on a hot day _____.
   a. helps in cooling because skin absorbs water from the atmosphere
   b. does not help in cooling because water evaporates from the skin faster
   c. helps in cooling because water evaporates from the skin faster
   d. does not help in cooling because skin absorbs water from the atmosphere

7) Why is carbon so important in biology?
   a. It is a common element on Earth.
   b. It has very little electronegativity, making it a good electron donor.
   c. It bonds to only a few other elements.
   d. It can form a variety of carbon skeletons and host functional group.

8) The two molecules shown in the figures are best described as _____.



   a. enantiomers
   b. structural isomers
   c. *cis-trans* isomers
   d. chain length isomers

9) Which of the following molecules is polar?
C_3H_7OH C_2H_5COOH

   a. C3H7OH and C2H5COOH are both polar molecules.
   b. Neither C_2H_5COOH or C_3H_7OH is polar.
   c. C_2H_5COOH is polar, but C_3H_7OH is not polar.
   d. C_2H_5COOH is not polar, but C_3H_7OH is polar.

10) What did Stanley Miller's classic experiment demonstrate, and how does it support theories about the origin of life?
   a. It showed that organic compounds cannot form without biological processes, disproving abiotic synthesis.
   b. It proved that all organic compounds on Earth originated from extraterrestrial sources.
   c. It demonstrated the abiotic synthesis of organic compounds, supporting the idea that organic molecules could have formed before life emerged.
   d. It confirmed that only inorganic molecules can form abiotically, while organic molecules require living organisms.
   e. It revealed that organic compounds can only form under high-pressure conditions, such as those found deep in the ocean.