1. Water has many characteristics beneficial to life. Because of (a) __________ bonding between water molecules, it is a liquid at temperatures suitable for life. Water is considered a universal (b) ______________ that facilitates chemical reactions inside and outside the cell. Although water molecules are (c) __________, that is, cling together, they allow dissolved and suspended molecules to be evenly distributed throughout a system, such as in blood vessels. Water is able to absorb a great deal of (d) ______________ before it boils, while being able to hold that heat for a long period of time. This helps organisms maintain their normal internal temperature. In order for evaporation of water to occur, a large amount of heat is needed to break the hydrogen bonds. This high heat of (e) ______________ allows animals in a hot environment to release excess body heat, thus cooling the body. As water cools and reaches the freezing temperature, water expands and makes ice less (f) ______________. Aquatic organisms are protected with the ice on top of the water during winter.

2. The chemical bond that will form between the molecules in the diagram is a(n):

   ![Diagram](image)

   A. Ionic bond  
   B. Peptide bond  
   C. Covalent bond  
   D. Hydrogen bond

3. Label the following diagram of the pH curve with the following terms: basic, acidic, neutral, hydrogen ion concentration and hydroxide ion concentration:

   ![Diagram](image)

   a. __________  
   b. __________  
   c. __________  
   d. __________  
   e. __________
4. The solution in the beaker below has a pH of 7:

Which of the following diagrams correctly represents a solution with a pH less than 7:

5. As the pH of a solution changes from 7.5 to 8.9, it becomes more (a) _______.
   At a pH of 7, the number of hydrogen ions (b) ______________ the number of hydroxide ions. A pH of 6 has (c) _______ times as much hydrogen ions as a pH of 8. The pH curve starts at (d) _____ and goes to (e) _____. As the pH of a solution increases, the number of hydrogen ions (f) _________________ (increases / decreases). As the pH of a solution increases, the number of hydroxide ions (g) ________________ (increases / decreases). (h) __________________ help to prevent any change in blood pH.

6. The four classes of organic molecules associated with living things are:

   a) ____________________________
   b) ____________________________
   c) ____________________________
   d) ____________________________

   Organic molecules always contain (e) _______________ and hydrogen atoms.
7. Label each of the following structures with one of the following terms: phospholipid, cholesterol, amino acid, fat (triglyceride), glucose, nucleotide.

8. Utilize the following terms to label the diagram below: hydrolysis, condensation, H₂O, disaccharide, and monosaccharide.

9. Label the following M if it is a monomer, and P if it is a polymer:

   ____ Polysaccharide
   ____ Glucose
   ____ Triglyceride
   ____ Nucleotide
   ____ Nucleic Acid
   ____ Protein
CARBOHYDRATES:

10. Match the following terms to one of the statements below: glucose, cellulose, sucrose, maltose, glycogen, and fructose.

A disaccharide found in table sugar
A hexose found in fruits
Monsaccharide used by cells as their primary energy source
A polysaccharide found in plant cell walls
Hydrolysis of this disaccharide yields two glucose units
Storage form of glucose in animal cells

11. This diagram shows a molecule that is found in the:

A Liver  B Blood  C Pancreas  D Gall bladder

12. Identify the molecule below:

CH₂OH

a. What is the general term given to polymers formed from this molecule: ______

b. List two biological functions of these polymers: ____________________________

13. Which of the following molecules is a carbohydrate:

A  C₃H₇O₂N  B  C₆H₁₂O₆  C  C₁₃H₂₆O₂  D  C₂₀H₄₀O₂
LIPIDS:

14. Match the following terms to one of the statements below: *triglyceride, phospholipid, fat, fatty acid, unsaturated fatty acids, and saturated fatty acids.*

- Hydrocarbon chain that has double bonds
- Used for long-term energy storage, insulation, and protection
- Hydrocarbon chain that accounts for the solid nature of butter
- Hydrocarbon chain that ends with acidic group – COOH
- Hydrolysis of this molecule yields glycerol and 3 fatty acids
- Found in the cell membrane of cells

PROTEINS:

15. Match the following terms to one of the statements below: *enzymes, amino acids, R groups, secondary structure, polypeptide, and tertiary structure.*

- Protein’s final three-dimensional shape
- Accounts for differences in amino acids
- A single chain of amino acids
- Alpha helix of polypeptide strand
- Monomer subunit of a protein
- Proteins that speed up chemical reactions

16. The diagram below illustrates a step in the:

A  Hydrolysis of a protein  
B  Synthesis of an enzyme  
C  Production of nucleic acid  
D  Conversion of glucose molecules to starch

17. This molecule is part of a(n):

A  Fat  
B  Protein  
C  Nucleic acid  
D  Carbohydrate

18. The diagram below represents which level of
**PROTEIN STRUCTURE:**

A  Tertiary  
B  Primary  
C  Secondary  
D  Quaternary

19. The diagram below indicates which level of structure:

A  Only primary  
B  Primary and Secondary  
C  Primary, secondary, and tertiary  
D  Primary, secondary, tertiary and quaternary

**NUCLEIC ACIDS:**

20. Match the following terms to one of the statements below: DNA, RNA, and nucleotide – some answers may be used more than once.

__________  Monomer of nucleic acid  
__________  Works with DNA to bring about protein synthesis  
__________  Composed of deoxyribose sugar and is double stranded  
__________  Held together by hydrogen bonds  
__________  Composed of a pentose sugar, a phosphate group, and a nitrogen base

21. When an acid is added to a solution, the:

A  $[H^+]$ increases and raises the pH  
B  $[H^+]$ increases and lowers the pH  
C  $[H^+]$ decreases and raises the pH  
D  $[H^+]$ decreases and lowers the pH
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22. Which of these molecules is a building block or monomer of RNA?

A.  

B.  

C.  

D.  

23. When a base is added to a solution, the:

A  $[\text{OH}^+]$ increases and raises the pH  
B  $[\text{OH}^+]$ increases and lowers the pH  
C  $[\text{OH}^+]$ decreases and raises the pH  
D  $[\text{OH}^+]$ decreases and lowers the pH

24. The bond that occurs between a carbon atom of one amino acid and the nitrogen atom of a second amino acid is termed a(n):

A Hydrogen bond  
B Weak bond  
C Peptide bond  
D Ionic bond  
E Covalent bond

25. The backbone of a nucleic acid is composed of:

A Nitrogen bases  
B Sugar – phosphate – sugar – phosphate  
C Sugar – base – sugar – base  
D Phosphate – base – phosphate – base  

26. Which of the following pairs is mismatched:

A Amino acid – protein  
B Glycerol – glycogen  
C Glucose – starch  
D Phosphate – nucleotide  
E Cholesterol – steroid hormones
27. Proteins, when exposed to extreme heat and pH, will:

A  Denature  
B  Ionize  
C  Dissociate  
D  Polymerize  
E  Form peptide bonds

28. What characteristics do all lipids have in common:

A  Contain fatty acids and glycerol  
B  Contain phosphate  
C  Provide a large amount of energy  
D  Subunits combined by peptide bonds  
E  Do not dissolve in water

29. Which of the following pairs is mismatched:

A  Carbohydrates – quick energy  
B  Fats – long-term energy  
C  Proteins – cellular structure  
D  Nucleic acids – protein synthesis  
E  Lipids – make up genes

30. Soaps and water mix but oil and water do not mix. Explain why, when soap is added to oil, the oil will then mix with water.