Chemistry of Life Study Guide Biology

List and briefly describe the 7 characteristics of life:

Put the following in order according to the organization of matter: **cells**, **organisms**, **molecules**, **tissues**, **elements**, **organs**, **organ systems**. Start with the smallest unit.

What are the 6 main elements of life?

What is a covalent bond? What is happening with the electrons in this bond?

What is an ionic bond? What is happening with the electrons in this bond?

Answer the questions about the elements below.



- Atomic Number:
- How many electrons?
- How many protons?
- · How many neutrons?
 - How many bonds can it form?
- What type of bond is it most likely to form?

NaCl

- · How many Sodiums?
- · How many Chlorines?
- Draw a Lewis Dot Structure:
- · What kind of bond is this?
 - How do you know?

Organic Chemistry

- 1. Why is carbon the best atom for bonding?
- 2. What is cohesion? Adhesion? Be sure to mention hydrogen bonding in your response.
- 3. What makes water polar?

- 4. What are the 4 macromolecules of life?
- 5. Explain the difference between organic and inorganic compounds:
- 6. Why is all life on earth is carbon-based?
- 7. What are the 4 macromolecules of life?

Carbohydrates

- 8. What elements are of carbohydrates made of?
- 9. Draw a skeleton model of a monosaccharide.

- 10. Draw a skeleton model of a disaccharide.
- 11. What is a sugar? Give examples of types of sugar. Ex: glucose
- 12. What is the ratio of atoms in carbohydrates? Explain the significance of this ratio in identifying carbohydrates when compared to lipids.
- 13. What are the main functions of carbohydrates?
- 14. What are the monomers of carbohydrates called?
- 15. What are 2 examples of monosaccharides? (names of molecules)
- 16. What types of food products contain monosaccharides? Which monosaccharides do they contain?
- 17. What are short chains of two monomers of carbohydrates called?
- 18. What types of chemical bond is found between 2 monomers of carbohydrates?

19. List 2 examples of disaccharides.

20. What are chains of 3 or more monosaccharides called?

21. What are some physiological functions (how they function in organisms) of these molecules?

22. What are the polymers of carbohydrates called?

23. List 3 examples of polysaccharides. What is the function of each of these polysaccharides?

24. What polysaccharides are used for energy?

25. What polysaccharides are used for structural support?

26. What polysaccharide provides energy for animals? plants?

27. What polysaccharide provides structural support for plants?

28. What types of food products contain polysaccharides?

<u>Lipids</u>

- 29. What elements are found in lipids?
- 30. How can you differentiate between carbohydrates and lipids when looking at a molecule or given a chemical formula?
- 31. What are 3 types of lipids (molecules)?
- 32. What are the main functions of lipids?
- 33. Are lipids polar or non-polar? How does this affect their interaction with water? Be sure to mention hydrogen bonding in your response.
- 34. Explain the structure of triglycerides.
- 35. Draw the skeleton structure of triglycerides.

36. What is the main function of triglycerides.

37. Compare saturated and unsaturated fatty acids (number of hydrogen atoms, physical state at room temperature, single or double bonds between carbon atoms, sources found in food)

Nucleic Acids

38. What is the elemental composition of nucleic acids?

- 39. Draw and label nucleotide.
- 40. Draw a simple nucleic acid with 3 nucleotides. Circle the monomers.
- 41. What is the main function of nucleic acids?
- 42. What are the monomers of nucleic acids?
- 43. What are the polymers of nucleotides called?
- 44. What are two examples of nucleic acids?
- 45. Where is DNA found?
- 46. What is the function of ATP? What happens when ATP gets converted to ADP?

Proteins

47. What elements are found in proteins?

48. Draw an amino acid. Label the amino group, R-group, and carboxyl group.

49. Draw a polypeptide. Label the peptide bonds. Circle each amino acid in the chain.

50. What are the functions of proteins?

51. Where can proteins be found in organisms?

52. What foods are high in protein?

53. What are the monomers of proteins?

54. What are polymers of amino acids called?

55. What is the basic structure of an amino acid?

56. What differentiates amino acids from one another?

57. What is formed by a strand of one or more polypeptides?

58. What is protein denaturation?

- 59. What is the effect of denaturation of proteins?
- 60. What are some causes of protein denaturation?
- 61. Using everything that you have learned about elements and macromolecules, describe the following statement: "you are what you eat."



Enzymes

62. What are the functions of enzymes?

63. How do enzymes function? Make an illustration of how an enzyme works with a substrate.

64. Give 2 examples of enzymes. What molecules do they break down?

65. What is an active site?

66. What is a substrate?

67. What is lactase? Describe the reaction that it facilitates. Why is lactase important?

68. What is the relationship between enzymes and activation energy?

69. What is an enzyme-substrate complex? Draw this structure.

70. Why are enzymes like a "lock and key?"

71. What is enzyme denaturation? How do enzymes become denatured?

72. How does enzyme concentration affect enzyme action/the speed of the chemical reaction?