

NAME _____

Biochemistry has a lot to do with both chemistry and biology. Put your name on your paper!

Water

1. List a few reasons why water is such an important molecule to living things?
2. Describe the chemical make up and type of bonding found in water molecules.
3. Explain why the hydrogen and oxygen atoms don't share electrons equally in a water molecule.
4. What is the effect of this uneven sharing of electrons in water?
5. Sketch a molecule of water showing the internal charges on the molecule.
6. What is the overall charge on a water molecule? Explain why.
7. Define polar compound and give an example other than water.
8. Water's polarity makes it a very effective _____ to many biological solutes.
9. Name 2 types of compounds that dissolve well in water.
10. What happens when an ionic compound such as sodium chloride (table salt) dissolves in water?
11. Water molecules are _____ to other water molecules.
12. What type of bonding holds 2 or more water molecules together?

13. Are hydrogen bonds strong or weak bonds? Can they be easily broken compared to covalent bonds?
14. Water molecules sticking to other water molecules is called _____.
15. Cohesion of water molecules produces _____ tension making water seem like it has a "skin" on it. Surface tension enables some _____ to walk across the surface of the water.
16. Water molecules sticking to other types of molecules is called _____.
17. Adhesion and cohesion together enable water molecules to move _____ through narrow tubes against the force of gravity.
18. What effect does heating water have on the hydrogen bonds holding the water molecules together? What happens to the speed at which the molecules are moving?

Carbon Compounds

19. What is an organic compound?
20. Besides carbon, name 3 other elements that make up most organic compounds.
21. How many electrons are in the outermost energy level of carbon? How many does it need to have this energy level filled?
22. How many covalent bonds can carbon form?
23. Name 3 structural shapes that form whenever carbon atoms bond to other carbon atoms.
24. How many electrons are being shared in a single covalent bond? double covalent bond? triple covalent bond?

25. Draw the 3 molecules glucose, pyruvic acid (pyruvate) and ethanol. Then circle examples of a single bond, double bond, and a triple bond in your drawings.
26. Explain what is meant by a functional group, & tell what effect they have on the molecules they are attached to.
27. Write the formula for these functional groups --- hydroxyl, carboxyl, phosphate group, amino group, and methyl group.
28. Hydroxyl groups attached to carbon atoms forms an _____.
29. Large carbon molecules are built from smaller, simpler molecules called _____.
30. Large carbon molecules made of monomers are called _____.
31. What type of reaction links monomers to make polymers?
32. Sketch a molecule of sucrose (table sugar) formed from dehydration synthesis (condensation). Name the 2 sugars that were combined to form sucrose.
33. Dehydration synthesis/condensation reactions involve the removal of a molecule of _____.
34. What reaction is used to breakdown polymers? Is water added or removed? How does this compare to condensation?

Macromolecules

35. Name the 4 main classes of macromolecules (organic molecules) & tell what 3 elements all of these contain.

Carbohydrates store energy, provide energy and are structural components for organisms!

36. In what ratio are hydrogen & oxygen atoms in carbohydrates?
37. In what 3 forms do carbohydrates exist?
38. What are the monomers of carbohydrates called? What is their common name? Give the ratio of carbons, hydrogens, & oxygens.
39. Name 3 common monosaccharides.
40. Sketch & label a molecule of each of these monosaccharides. How do they compare? Write the chemical formula for all three.
41. Because glucose and fructose have the same chemical, but different structural formulas, they are called _____.
42. What are double sugars called? Name & describe the process that forms them.
43. Name a disaccharide.
44. What forms a polysaccharide? Name a polysaccharide found in animals. Name 2 found in plants?
45. What chemical reaction formed these large molecule? What reaction would be needed to break these molecules?

Proteins do stuff in life!

46. What are the 4 main elements making up proteins? How many covalent bonds does each of these elements form?

47. Sketch these two amino acids --- glycine & alanine. Circle the center carbon, place a triangle around the amino group, and put a box around the carboxyl group.
48. What are the monomers of proteins called? How many are there? Name the 4 things bonded to the center carbon of this monomer.
49. The main difference among amino acids is their _____. What is the R-group on glycine? on alanine?
50. Differences in R-groups give different proteins different _____.
51. How does a dipeptide form? Sketch the dipeptide formed from glycine and alanine. What molecule had to be removed to join these 2 amino acids?
52. What do you call the covalent bonds that hold amino acids together? Put a box around these bond in the sketch you did on question 54.
53. Long chains of amino acids are called _____ and these join together to make a _____.
54. Hydrogen bonding among individual amino acids in a chain cause what effect on the protein's shape?
55. What is the effect of temperature on protein shape? Give an example of this.
56. Most proteins act as biological catalysts or _____ inside of cells.
- Lipids include fats and oils, steroids and cholesterol, waxes, and phospholipids!**
57. Are lipids polar or nonpolar? What happens to lipids when they are placed in water?

58. Compared to carbohydrates, what is true about the ratio of carbon & hydrogen atoms to oxygen atoms? If a compound has more bonds, what can it store more of in those bonds?
59. Many lipids are made of _____ acids. Describe their shape. What functional group is found on the head end of the molecule?
60. Sketch these 2 fatty acids --- palmitic & linoleic (look them up on the internet). Circle the carboxyl group on the "head" of the molecule. Is this end polar or nonpolar? Will this end be attracted to or repelled by water?
61. Are both ends of a fatty acid polar? Explain.
62. Hydrophilic means water _____. Which end of a fatty acid is hydrophilic. The nonpolar end of a fatty acid is said to be _____ or "water fearing".
63. Which end of a fatty acid chain WOULD dissolve in water? Which WOULDN'T?
64. In what type of fatty acid are there only single bonds in the carbon chain? Name one such fatty acid.
65. What type of bond appears in an unsaturated fatty acid? Give an example of an unsaturated fatty acid. Go back to your fatty acid drawings in question 68 and put a box around the double bond in the unsaturated fatty acid.
66. Name the 3 groups of complex lipids.
67. What makes up a triglyceride? What is the difference between a saturated & unsaturated triglyceride?
68. What type of triglycerides tend to be solids at room temperature & why? Which are liquids & why?
69. What types of triglycerides would these substances be: vegetable oil? butter?

70. What makes up a phospholipid? How are they different from triglycerides? What main part of a cell is made of phospholipids?

71. What is meant by a lipid bilayer? What makes this such an effective barrier between the inside & the outside of the cell?

72. Wax is another complex lipid. Describe its structure.

73. Waxes are highly _____. Explain how plants make use of this property? animals?

74. What makes up steroids? To what group of organic compounds do steroids belong? How are they used in animals?

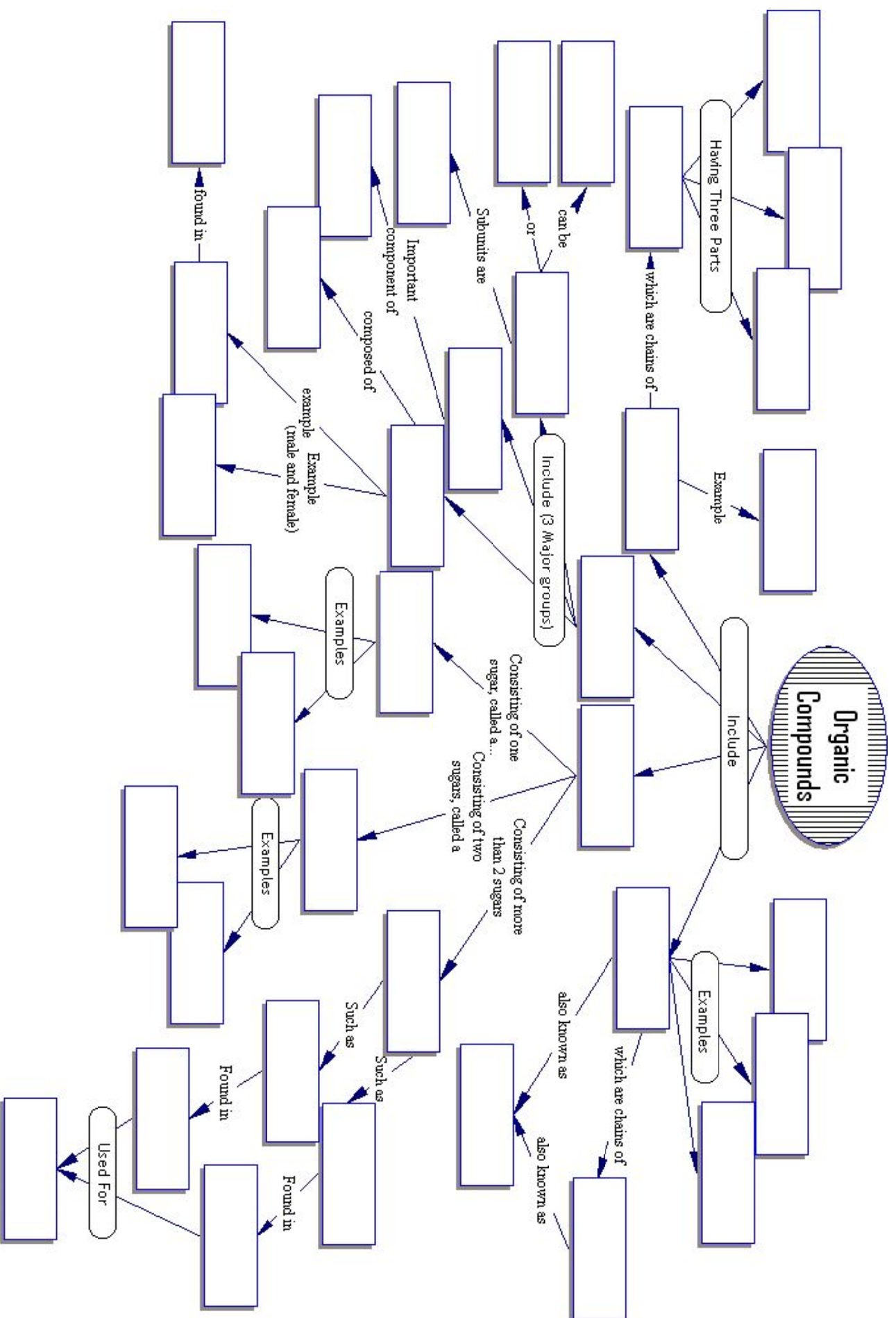
75. Name a steroid made by the body & used by nerve cells.

Nucleic acids store genetic information for cells!

76. Give the name & abbreviation for 2 nucleic acids found in cells.

77. DNA and RNA are both examples of _____ made of linked monomers called _____. The instructions in these molecules is used to make _____.

78. Name the 3 parts to a nucleotide then draw and label one.



WORD BANK

Amino acids, animals, Carbohydrates, Cell membrane, Cholesterol, DNA, Disaccharide, Meat, Energy storage, Enzymes, Fats, Fatty acid, Fructose, Glucose, Glycogen, Hemoglobin, Hormones, Insulin, Lactose, Lipids, Monosaccharide, Nitrogen Base, Nucleotide, Nucleic Acids, Phosphate Group, Phospholipid, Plants, Polypeptides, Polysaccharides, Proteins, Saturated, Starch, Steroids, Sucrose, Unsaturated, 4 rings of carbon, 5 carbon sugar