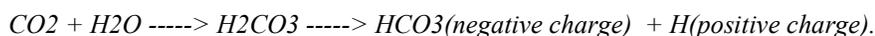


Chemical Level of Organization

Chapter Two Study Guide

1. What is matter?
2. What are the different “states” of matter? (Hint: think about water)
3. What is an atom?
4. What are the sub-atomic particles of an atom? Draw and label the Bohr atomic model for hydrogen, helium, and sodium.
5. What are the characteristics of the sub-atomic particles?
6. What atomic particles are at the center of an atom?
7. What atomic particle is not in the center of an atom?
8. What is the numeric relationship between the different sub-atomic particles?
9. What fundamental particles make up the sub-atomic particles? (Hint: only three)
10. What is the numeric relationship between protons, neutrons, and electrons?
11. What is an element?
12. How are compounds different than molecules?
13. What is an isomer?
14. What is the significance of the “Periodic Table of Elements”?
15. What is the significance of the atomic number?
16. What is the significance of the atomic weight?
17. What atom is the main building block of life? How many other atoms play an important role in living systems? (Key idea: a lot or very few?)
18. How many electrons fit into the first orbit around the nucleus?
19. How many electrons fit into the second orbit?
20. What is the significance of the octet rule?
21. What do we call the electrons in the outer orbit?
22. What atomic particle determines the physical properties of an element?
23. What atomic particle determines chemical bonds between two atoms?
24. What is the difference between an ionic bond, covalent bond, polar covalent bond, and a hydrogen bond? Give examples of each bond type.
25. What chemical bond does not hold individual atoms together but holds molecules “weakly to attract to each other” or allows different areas of a macromolecule to “weakly attract to each other”? Give an example how this bond plays a significant role in your physiology.
26. What is an isotope?
27. What is the difference between beta decay and positron decay?
28. What is an ion?
29. What is a neutral atom called if the atom loses an electron?
30. What is a neutral atom called if the atom gains an electron?
31. What is a salt? What type of chemical bond holds salt crystals together?
32. What is a “hydration shell”? Illustrate this phenomena by using sodium chloride.
33. Is it possible for a macromolecules to be “ionized”?
34. What are electrolytes? How is this related to an Electro-cardio-gram (EKG)?
35. What is a free radical? Are they good or bad?
36. How are free radicals produced in our cells?
37. What are “antioxidants”? Are they good or bad?

38. What is the most important antioxidant?
39. What breakfast drink contains a vitamin used to “re-energize” the most important antioxidant?
40. What is an isomer? Why are glucose and fructose isomers?
41. What are the three types of mixtures? What criteria is used to classify mixtures?
42. What is a semi permeable membrane? Significance as applied to mixtures?
43. What occurs when a semi permeable membrane separates a colloid mixture and pure water?
44. What type of bond hold two water molecules together? What type of line indicates this type of bond? Significance?
45. What is an acid? Why?
46. What is a base? Why?
47. Water is a mix of molecular water (i.e. H₂O) plus equal amounts of H⁺ ions and OH⁻ ions. Why is pure water not an acid or a base?
48. What is the pH scale? What is measured to determine pH?
49. What is the significance of pH 0 vs pH14? Give an example of a strong acid and a strong base?
50. What is a buffer?
51. When water evaporates off our skin, how does this affect our physiology? (note: one milliliter of perspiration that evaporates off surface of skin = loss of 500 cal of heat) Do you think it is a good idea to wipe perspiration from your skin after vigorous exercise? Why?
52. What is metabolism?
53. What is catabolism?
54. What is anabolism?
55. *This is one of the most fundamental chemical reaction in all of human physiology: (What enzyme makes this chemical reaction possible?*



*Please memorize this formula and the name of the compounds (carbon dioxide + water covalently bond together to form carbonic acid which dissociates into bicarbonate ion (i.e. a weak base) plus a hydrogen ion (i.e. the acid). This reaction is catalyzed by **carbonic anhydrase**. You will see this formula used repeatedly by cells in many different organ systems. It explains how your stomach makes acid, how oxygen dissociates from hemoglobin, how acid is “excreted” by our respiratory system, and many other physiologic events. This is testable information in all four units!*

56. What is the “law of mass action”? Significance as applied to question above?
57. What is a catalyst?
58. What molecule is a biocatalyst? Function? Macromolecule type?
59. What is an oxidation reaction?
60. What is reduction reaction?
61. Why do oxidation and reduction reactions occur together?
62. How is oxidation-reduction reactions related to catabolism and anabolism?
63. What can we tell about the energy of a molecule by comparing the relative number of carbons, oxygens, and hydrogen atoms? Hint: compare glucose to lipid chemical structure.

64. What are the four primary macromolecules? Functions? *(See the powerpoint presentation "Know Your Molecules" on my Web site)*
65. What are the monomers for each of the four primary macromolecules?
66. What macromolecule is stored in adipocytes and is the primary source of energy when you are at rest?
67. How do lipids react in water? Why?
68. How do phospholipids react in water? Why?
69. What are the two structures that may form when phospholipids are placed in water?
70. What glucose polymer is used to store energy in the human body? Location(s)?
71. What glucose polymer is used to store energy in plants?
72. What glucose polymer forms the stems and leaves of plants? Can humans use the energy trapped in this polymer? What is the chemical name and common name for this polymer?
73. The yolk of an egg contains the phospholipid lecithin. When you bake a cake, why do we add the yolk of an egg to the batter?
74. What are proteoglycans? Where are they located in our body? Where are they made?
75. Which proteoglycan has the nickname, "the glue that holds our cells together"?
76. What is a gel state? Kitchen example? Where are gel states found in the human body?
77. What occurs when a protein is denatured? How may this happen? (three ways)
78. What is ATP? Function? Nickname?
79. What term describes the transition from a polymer into a monomer? Significance of water?
80. What term describes the transition from a monomer into a polymer? Significance of water?
81. What is the purpose of a metabolic pathway? What type of molecules make metabolic pathways possible?
82. What are the two metabolic pathways that catabolize glucose to form ATP? Where is each metabolic pathway located? What are the requirements for each pathway? What are the end products for each metabolic pathway? Which pathway is anaerobic? Which pathway requires oxygen? How is the oxygen used?