

Chemical Level of Organization  
Chapter Two Study Guide  
Tortora & Derrickson

1. What is matter?
2. What are the three “states” of matter? (Hint: think about water)
3. What are the “building blocks” of matter?
4. What are the three “atomic particles” of an atom?
5. What are the characteristics of each atomic-particle?
6. What is the difference between an atom and element?
7. What atom is the “key building block” for life?
8. What is the significance of the “Periodic Table of Elements”?
9. What is the difference between the atomic number and atomic weight (mass)?  
Significance?
10. How are the electrons arranged in an atom?
11. How are the protons arranged in an atom?
12. How are the neutrons arranged in an atom?
13. How many electrons are in each orbit (shell)?
14. What do we call the electrons in the outer orbit?
15. What atomic particle “defines” the “quality or characteristic” of the element?
16. What feature determines how different atoms may bond to each other?
17. What is the octet rule? Significance?
18. What is an isotope?
19. How may we use C14 to “measure time”?
20. What is an ion?
21. What do we call an atom that loses an electron?
22. What do we call an atom that gains an electron?
23. What are electrolytes? How is this related to an EKG?
24. What is a “hydration shell”? (Hint: think about what happens when you put table salt into water)
25. Can a macromolecule be “ionized”? Have a hydration shell around the macromolecule? Significance?
26. What is a free radical? Are they good or bad? Explain
27. How are free radicals produced?
28. What are “antioxidants”? Function? Good or bad?
29. What is the primary antioxidant in the human body?
30. What is a “common secondary” antioxidant that you might consume as a breakfast drink?
31. What is a molecule?
32. What is the difference between an ionic, covalent, polar covalent, and hydrogen bond?
33. Why are glucose and fructose isomers?
34. What are the three types of mixture? What criteria is used to classify mixtures?
35. What is diffusion?
36. What is osmosis?
37. What is filtration?

38. What is a semi permeable membrane? Significance and example.
39. How do colloids interact with a semi permeable membranes?
40. What type of bond holds water molecules together?
41. What do we call a substances that readily dissolve in water? (Hint: means likes water) Give an example.
42. What do we call a substances that do not readily dissolve in water? (Hint: means fears water) Give an example.
43. When water evaporates off our skin, what is the net effect to body temperature? (one milliliter of perspiration evaporating = loss of 500 cal of heat) Do you think it is a good idea to wipe perspiration from your skin after vigorous exercise? Explain.
44. What is a salt? Example:
45. What is an acid? Example:
46. What is a base? Example:
47. Pure water is a mixture of H<sub>2</sub>O molecules plus equal amounts of H<sup>+</sup> and OH<sup>-</sup> ions. Why is pure water not an acid or a base? What is the pH number of water?
48. What is the pH scale?
49. What is the pH of pure water?
50. What is the pH of blood?
51. What is the significance of pH 1 vs pH14?
52. What is a buffer?
53. This is one of the most significant chemical reaction in human physiology: CO<sub>2</sub> + H<sub>2</sub>O -----> H<sub>2</sub>CO<sub>3</sub> -----> HCO<sub>3</sub>(negative charge) + H(positive charge).

Please memorize this formula and the name of the compounds (carbon dioxide + water forms carbonic acid which dissociates into bicarbonate ion plus a hydrogen ion). You will see this formula repeatedly used by cells of many different organ systems. It explains how your stomach makes acid, how oxygen dissociates from hemoglobin, and how acid is “excreted” by our respiratory system.

54. What is the significance of the “law of mass action”?
55. What is a catalyst? What is an example of a biocatalyst?
56. What is an oxidation reaction?
57. What is reduction reaction?
58. Why do oxidation and reduction reactions occur together?
59. How is oxidation-reduction reactions related to catabolism and anabolism?
60. What can we tell about the energy of a molecule by comparing the relative number of carbons, oxygens, and hydrogen atoms?
61. Organic chemistry is the study of the compounds with carbon and hydrogen. You need to be able to identify the chemical structure of the follow compounds: carbohydrates, lipids (fat), proteins, and nucleic acids. (see Know Your Molecules – Web site powerpoint)
62. How are monomers and polymers related? Examples
63. What are the monomers to the four important organic polymers?
64. How do lipids react in water?
65. How do phospholipids react in water?

66. The yolk of an egg contains the phospholipid lecithin. Why do we add the yolk of an egg to the batter when we bake a cake?
67. What is a gel state?
68. What occurs to a protein when it is denatured? What type of chemical bond is broken?
69. How can you denature a protein? (three ways)
70. What is an enzyme? Nickname?
71. What is ATP? Nickname? Significance.
72. What is glycolysis? Location? How is glycolysis characterized?
73. What is the Krebs Cycle? Location? How is the Krebs cycle characterized?
74. What is the Electron Transport Chain? Locations? Significance of H<sup>+</sup> (protons)? Explain metabolic water?
75. What are the four biologic macromolecules?
76. What are the monomers of the four primary macromolecules?
77. What macromolecule is used to “store information”? Location?
78. What molecule is stored in adipocytes?
79. What molecule is the primary source of energy for most of your cells when you are at rest? During vigorous exercise?