

Chemical Level of Organization
Chapter Two Study Guide
Tortora & Derrickson

1. What is an atom?
2. What is an element?
3. What is the significance of the “Periodic Table of Elements”?
4. What is the difference between the atomic mass and atomic number?
Significance?
5. What atom is the “key” building block for life?
6. What are the “atomic particles”? Their characteristics?
7. How are the particles of an atom arranged?
8. How many electrons may fit into the first two orbits for atoms that obey the octet rule?
9. What do we call the electrons in the outer orbit?
10. What is an isotope?
11. Why can we use C14 to “measure time”?
12. What is an ion?
13. What do we call an atom that loses an electron?
14. What do we call an atom that gains an electron?
15. What is a “hydration shell”?
16. Can a macromolecule be “ionized”?
17. What are electrolytes? How is this related to an EKG?
18. What is a free radical? (Use oxygen in this answer) Where are free radicals produced? Are they good or bad? Why?
19. How do “antioxidants” protect us from free radicals?
20. What is a “common” antioxidant that you might consume in a breakfast drink?
21. What is a molecule?
22. What holds molecules together?
23. Why are glucose and fructose isomers?
24. What is the difference between an ionic, covalent, polar covalent, and hydrogen bond?
25. What is a mixture? How are mixtures classified?
26. What does it mean to be a semi permeable membrane? What is the significance of colloid mixtures?
27. What type of bond holds water molecules together?
28. What do we call substances that readily dissolve in water? Give an example.
29. What do we call substances that do not readily dissolve in water? Give an example.
30. When water evaporates off our skin, what is the net effect? (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.
31. What is a salt? Example:
32. What is an acid? Example:
33. What is a base? Example:

34. Pure water is a mixture of H₂O molecules plus equal amounts of H⁺ and OH⁻ ions. Why is pure water not an acid or a base?
35. What is the pH scale? What is the significance of pH 1 vs pH 14
36. What is a buffer?
37. What is energy?
38. What is the difference between potential and kinetic energy? Is heat potential or kinetic energy?
39. One of the most fundamental chemical reaction in human physiology is CO₂ + H₂O
-----> H₂CO₃ -----> HCO₃^(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.

40. What is the significance of the “law of mass action”?
41. What is a catalyst? Biocatalyst?
42. What is an oxidation reaction?
43. What is reduction reaction?
44. Why do oxidation and reduction reactions occur together?
45. How is oxidation-reduction reactions related to catabolism and anabolism?
46. What can we tell about the energy of a molecule by comparing the relative number of carbons, oxygens, and hydrogen atoms?
47. 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.
48. How are monomers and polymers related? Examples
49. *What is the basic shape of important biological molecules? (See “Know Your Molecules” PowerPt posted on Web site)*
50. How do lipids react in water?
51. How do phospholipids react in water?
52. 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?
53. What are proteoglycans? Where are they in our body?
54. What is a gel state?
55. What happens to a protein when it is denatured?
56. How are proteins denatured?
57. What is an enzyme?
58. What is ATP? Explain its function.
59. What are nucleic acids? How are they used in our body?
60. What are the four primary macromolecules?
61. What are the monomers of the four primary macromolecules?
62. What molecule is stored in adipocytes and is the primary source of energy when you are at rest?
63. What term describes the transition from a polymer into a monomer?