

Objectives for Test One: Chapters 1-3 and part of 29 (29.5 - 29.6)
Chemistry, Water, Organic Molecules, and Transpiration in Plants

You should be able to:

1. Identify the levels of organization of living things.
2. Explain how life differs from non-life.
3. Identify the characteristics of all living things.
4. Distinguish between a scientific theory and a theory the police may have on how a crime was committed.
5. Identify the top four elements that make up living things; why is iodine termed a "trace element?"
6. Demonstrate a basic understanding of the trends evident in Periodic Table of Elements.
7. Describe the structure of an atom. Distinguish among atomic number, atomic mass, and number of neutrons; obtain and work with this information from a periodic table.
8. Describe isotopes, including radioisotopes. List several uses of radioisotopes.
9. Define electronegativity and discuss the effect increasing number of protons and increasing number of electron shells have on the value of electronegativity.
10. As an electron moves from an inner electron shell to an outer one, explain whether energy is required or released.
11. Explain the formation ionic bonds, covalent bonds and hydrogen bonds. Relate these bond types to electronegativity.
12. Explain when a covalent bond is polar and when it is non-polar.
13. Identify the many properties of water and explain how most are related to the hydrogen bonding of water molecules. Give concrete examples of each property "in action" in living things and their interactions with the environment.
 - a. cohesion (and capillarity)
 - b. adhesion
 - c. surface tension
 - d. low density of ice
 - e. high heat of vaporization/high specific heat
 - f. incompressibility
 - g. versatile solvent
14. Distinguish the molecular differences between an acidic solution and basic solution. Summarize the pH scale. Compare the concentration of H⁺ at various pH values.
15. Describe the effect of buffers on pH
16. (From your reading, page 36-37) Explain the source of acid precipitation and why it is detrimental to forests and coral reefs. Can you work with the graph (see the questions) on pg. 37 in your text?
17. Distinguish between inorganic and organic compounds.
18. List characteristics of carbon that make it useful as a basis of organic molecules.
19. Presented with diagrams, identify structural isomers, geometric isomers (cis- and trans-), and enantiomers.
20. For each of the main function groups, identify the functional characteristic they confer:
 - a. -OH
 - b. -COOH
 - c. -NH₂
 - d. -SH
 - e. -PO₄³⁻
 - f. -CH₃
21. Compare the process of hydrolysis and dehydration synthesis (condensation).
22. For three main groups of organic compounds, carbohydrates, lipids and proteins, (this obj. is HUGE)
 - a. identify the monomer(s) and their relationship with the polymer(s)
 - b. list the main functions
 - c. explain how structural characteristics promote the function of these molecules
 - d. name/describe examples of these molecules
23. Explain two isomers
24. Explain the structural and functional differences between saturated and unsaturated fats.
25. Explain why a trans-fat is less healthy than the cis-form of a similar fat.
26. Recognize the structural formulas of the various organic molecules. (See the practice page in your binder)
27. Explain how a phospholipid can be both hydrophilic and hydrophobic at the same time.
28. Explain the role cholesterol plays in cell membranes.

29. Using knowledge of functional groups, predict whether an R group on an amino acid will be hydrophobic or hydrophilic, acid or basic.
30. Identify glycosidic linkages (between sugars), ester linkages (between glycerol and fatty acid), and peptide bonds.
31. Explain the four levels of protein structure.
32. Explain why the amino acid cysteine, with the –SH group as part of its variable group, is particularly important to the tertiary structure of proteins.
33. Identify the relationship between the function of proteins, shape, and denaturation.
34. On a diagram of leaf epidermis, identify stomates, guard cells, and epidermal cells.
35. Briefly summarize how guard cells change their shape in order to open stomates.
36. Explain the TACT (transpiration, adhesion, cohesion, and tension) mechanism of water transport in plants. Explain the importance of water's ability to form hydrogen bonds to water transport in plants.
37. Predict the effect each of the following will have on the rate of transpiration compared to a control plant. Given a graph of the control plant's transpiration rate, draw a line to represent your prediction for each of the following.
 - a. increased humidity
 - b. decreased light intensity
 - c. increased temperature
 - d. increased wind speed
 - e. removal of half the leaves of a plant
 - f. a plant that evolved in hot, dry (desert) conditions
38. Describe specific adaptations desert dwelling plants have to reduce water loss.
39. Based on your understanding on the properties of water and on water transport, would you expect a tree's diameter to be larger or smaller in the day compared to the night. (Hint – because water is adhesive, what is it doing to the xylem walls as it evaporates?)
40. **Calculate** the density of stomates while looking at a high or low power field of view. (Hint: The diameter of high power is about 500 microns and the diameter of low power is about 2000 microns.)
41. Explain and use a process for determining the total surface area of a plant without measuring each individual leaf. Relate leaf surface area to transpiration rate. Use the density of stomata and total surface area to **calculate** the total number of stomata on a plant.
42. Identify the steps involved in the scientific process.
43. Illustrate the correct form for writing a hypothesis.
44. Given an experimental procedure, identify the independent variable, the dependent variable, items that should remain constant, and the control set up.
45. Given an independent variable, design a controlled experiment to test its effect on seed germination.
46. Demonstrate a working knowledge of graphs including
 - a. given some data, determine which type of graph to use (bar vs line)
 - b. labels and units of Y and X axis
 - c. proper form for a descriptive title
 - d. appropriate scales on the axes
47. Each chapter has some multiple choice questions and a few other additional questions at its end. Give these a try. You might see them again! Don't forget your Study Guide for extra credit!

Some Examples of Short Free Response Questions: (2-3 sentences): These might be the actual questions.

1. Explain how cohesion is involved in the transport of water up plants.
2. Explain how the R groups of the amino acids composing a protein create the tertiary structure of proteins.
3. Explain one way to measure the transpiration rate of a plant.
4. A group of students designed an experiment to measure transpiration in a particular species of herbaceous plant. Plants were divided into three groups and were exposed to the following conditions: Group I - Room conditions with increased humidity; Group II - Room conditions with increased air movement (fan); Group III - Room conditions with additional light. This experiment is missing a control. Explain why a control is needed and describe what would be an appropriate control. Be specific.
5. Explain how the guard cells can help regulate the internal water balance of a plant.
6. Describe two different levels of protein structure.
7. Explain how a plant's need to exchange gases affects its transpiration.
8. Describe two adaptations that affect the transpiration rate in desert plants.
9. Explain how the hydrogen bonding of water molecules contributes to the ability of water to moderate temperature within living organisms and in organisms' environment.