Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date: \_\_\_\_\_\_\_\_\_\_\_ Section: \_\_\_\_\_\_\_\_\_

**Unit 2 Study Guide**

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| --- |
| **Topics:** Chemistry, Macromolecules Microscopy, Cells & Organelles, Levels of Cellular Organization |

***Directions:*** Use the following as a **guide** when you are studying. Be sure to references class notes, the textbook, distributed worksheets and handouts, labs, notes from lecture, etc. as you study.

**Relevant Vocabulary:**

You should be familiar with the following vocabulary terms taken from the textbook, from worksheets, and from lecture for this unit. All or some of these terms may end up on your exam. There may be some terms covered in class or in the textbook that are not listed below that may also show up on your exam. Add vocabulary to this list as needed as we progress through the unit.

|  |  |  |  |
| --- | --- | --- | --- |
| Matter | Atoms | Element | Atomic Number |
| Atomic Mass | Isotope | Radioactive Decay | Radioactive isotope |
| Valence Electrons | Molecule | Compound | Organic Compound |
| Inorganic compound | Covalent bond | Electronegativity | Periodic Trends |
| Nonpolar covalent bond | Polar covalent bond | Ionic Bond | Cation |
| Anion | Hydrogen Bond | Monomer | Polymer |
| Saturated fatty acids | Unsaturated fatty acids | Cholesterol | Phospholipid |
| Fluid mosaic model | Lipid bilayer | Selectively permeable | Primary structure (protein) |
| Secondary structure (protein) | Tertiary structure (protein) | Quaternary structure (protein) | DNA |
| Robert Hooke | Anton van Leewenhoek | Microbiology | Schleiden |
| Schwann | Virchow | Cell Theory | Simple Microscope |
| Compound Microscope | Light Microscope | Electron Microscope | Transmission Electron Microscope |
| Scanning Electron Microscope | Scanning Tunneling Microscope | Electromagnetic radiation | Magnification |
| Resolution | Contrast | Wavelength | Objective lens |
| Ocular lens | Diaphragm | Condenser | Coarse focus knob |
| Fine focus knob | Stage | Base | Body |
| Illuminator | Cell Wall | Cell membrane | Organ system |
| Prokaryote | Nucleus | Eukaryote |  |
| Phospholipid | Ribosomes | Deoxyribonucleic acid | Nuclear envelope |
| Nuclear pores | Rough endoplasmic reticulum | Smooth endoplasmic reticulum | Golgi body |
| Lysosomes | Vacuole | Mitochondria | Chloroplast |
| Centrioles | Cytoskeleton | Nucleoli | RNA |
| Chromatin | chromosomes | Endosymbiosis | Photosynthesis |
| Cellular respiration | vesicle | Tissue | Organ |
|  |  |  |  |

**Objectives:**

You should be able to answer the following questions covered in the textbook, on worksheets, and in lecture for this unit. ***Do not forget to review previous quizzes, handouts, classwork, labs, etc. for practice problems when studying.***

1. Draw a simple Bohr model of a nitrogen atom (7 protons, 7 neutrons, 7 electrons in 2 shells).
2. What are the six elements most commonly found in living things?
3. Elements on the periodic table are arranged in order of their \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
4. Answer the following questions based on the image below:



* 1. What is carbon’s atomic number?
	2. What is carbon’s atomic mass?
	3. How many electrons does a neutral atom of carbon have?
	4. How many neutrons does carbon have?
	5. Are there any isotopes of carbon you know of? Explain how they are used.
1. What is the importance of water in the body?
2. Draw a nonpolar covalent bond between two **hydrogen atoms** (1 proton, 1 electron for each H atom:
3. What causes water molecules to hydrogen bond to each other? Include the following terms: *electronegativity, partial positive and partial negative charges, hydrogen bonding*.
4. Are C-H bonds polar or nonpolar covalent? Why?
5. Are O-H bonds polar or nonpolar covalent? Why?
6. Chemically, why is water considered a universal solvent? What kinds of molecules can dissolve in water?
7. Fill in the following table:

|  |  |  |
| --- | --- | --- |
| **Macromolecule** | **Monomer** | **Atoms it is made up of** |
| Carbohydrates |  | C, H, O in a 1:2:1 ratio |
| Proteins |  |  |
|  | Fatty acids |  |
| Nucleic Acids |  |  |

1. Don’t forget to review macromolecule study guide!
2. What are the two main functions of carbohydrates?
3. Identify the molecule depicted below. Is it polar or nonpolar? Will it easily cross the phospholipid bilayer of cells? Why or why not?
4. What complex carbohydrate serves a structural role in plants?
5. What complex carbohydrates serves an energy storage role in plants?
6. What complex carbohydrate serves a structural role in animals?
7. What complex carbohydrate serves an energy storage role in animals?
8. Why is it not a good idea to eat a lot of salad when you are trying to carbohydrate load in preparation for a race? Why would it be better to eat starchy foods like potatoes and rice?
9. Lipids play a role in long-term \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
10. Are lipids primarily polar or nonpolar?
11. A triglyceride is an example of a fat. What is it composed of and chemically, how is it made?
12. A fatty acid is composed of two major components. What are they?
13. What type of lipid makes up the plasma membrane?
14. How does cholesterol influence fluidity of the membrane at different temperatures?
15. Draw the chemical structure of a fatty acid below:
16. Draw the general, chemical structure of an amino acid below:
17. What are the bonds between amino acids making up a polypeptide called? Are they covalent or ionic?
18. The \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ of a protein determines its function.
19. Draw the basic structure of a nucleotide (monomer of a nucleic acid). Label the three major components:
20. What are the four nitrogenous bases in DNA?
21. What are the four nitrogenous bases in RNA?
22. What are the differences between DNA and RNA? Include the following in your answer:
	1. Where are they located
	2. Functions
	3. Different nitrogenous bases and chemical structure of the sugars in their nucleotides
	4. Are they single or double stranded?
23. How are structure and function related in cells? Give examples i.e. neurons vs red blood cells
24. What did the advent of the microscope allow for? How did it contribute to the process of disproving the theory of spontaneous generation in the late 1600s – 1800s?
25. Who is the father of microscopy?
26. What concepts did Schleiden, Schwann and Virchow contribute to our understanding of cells?
27. What is the cell theory?
28. Compare and contrast light and electron microscopes. How do they work?
	1. What is the different between a simple and compound light microscope?
	2. What wavelength of visible light would help produce the best image in light microscopes? Why?
29. Understand the electromagnetic spectrum and what trends are associated with it regarding microscopy.
30. What are the four general principles of light and electron microscopy? How can we produce a “good” and clear image?
31. How do convex lenses magnify an image?
32. Which types of microscopes can you use to view **living** specimen?
33. Know how to label a monocular or binocular light microscope as well as the functions of each of the parts.
34. Be able to calculate total magnification for a light microscope.
35. Compare and contrast transmission electron microscopes, scanning electron microscopes, and scanning tunneling microscopes. How they are used to observe specimen? What features are best observed by each type? What kind of image does each produce?
36. Why are cells so small?
	1. How do they maximize surface area and minimize volume, and why is this advantageous?
37. What structures are common to all cells?
38. What characteristics are found in plant cells but NOT in animal cells?
39. Compare and contrast prokaryotes and eukaryotes.
40. Be able to label organelles and/or structures in a prokaryotic cell, animal cell, and plant cell and be able to describe the functions of each of the structures.
41. What is the purpose of the plasma membrane? What is it made of? How does the chemical composition of the plasma membrane contribute to its function? What is the fluid mosaic model?
42. Distinguish between membrane-derived organelles and bacteria-derived organelles and describe their functions.
43. Describe the endomembrane system. i.e. Describe how a protein would be produced, modified and distributed in cells.
44. Describe the theory of endosymbiosis.

*Remember the following:*

