

Leslie J. Wiemerslage
STUDENT STUDY GUIDE

INQUIRY

INTO LIFE

Sylvia S. Mader Sixth Edition



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INQUIRY INTO LIFE

Sixth Edition

Sylvia S. Mader

Revised by Leslie J. Wiemerslage

Belleville Area College



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To the Student

Study Guide

This *Study Guide* was designed to accompany your text, *Inquiry into Life*. A set of exercises has been prepared for each corresponding text chapter, and a review exam has been provided for each part.

Chapter Outline: This outline correlates with the text to provide a quick, comprehensive overview of the lecture material. From this outline, you can identify the important features that will be studied.

Chapter Review: This new addition to the *Study Guide* correlates specific questions to a particular page within the chapter. They are written with three objectives in mind:

- You may use it as you read the text material to answer pertinent questions.
- You may write out the answers to the questions before (preferably) or after the instructor lectures on the topic. This provides very useful information for review prior to and in preparation of the test.
- The answers may be written out as an extra assignment or for extra credit when requested by the instructor. Some instructors may even wish to have them completed and turned in prior to the lecture.

Objective Chapter Test: This part of the *Study Guide* was designed to allow you to test yourself. Completion questions, matching questions, true-false questions, labeling diagrams, and multiple choice questions were incorporated to provide a thorough evaluation of your newly acquired knowledge. However, you may also use this section as a means to review important ideas from the chapter.

Subjective Chapter Test: One to three subjective short answer questions are provided per chapter. Some of the questions involve critical thinking.

Answers: Answers are provided for all objective and subjective questions at the end of each chapter. However, be sure to give your own answers first. The questions will be of little help to you if you simply fill in your *Study Guide* with the answers provided.

Review Exams: These exams help you review several chapters at a time. They can be especially helpful as you study for a comprehensive exam.

The authors sincerely hope that you will find your study of biology both successful and enjoyable. Read through the *Helpful Study Hints* on page *vii* for additional suggestions on how to be more efficient and successful.

The Text

Inquiry into Life also has many student aids that you should be sure to utilize. These will allow you to accentuate the benefit you receive from the *Study Guide*.

History of Biology End Sheets: The front and back cover list major contributions to the field of biology in a concise, chronological manner.

Text Introduction: The introductory chapter surveys the field of biology as a whole and prepares the student for study of its individual portions. In particular, it discusses the characteristics of life and the scientific method.

Part Introductions: An introduction for each part highlights the central ideas of that part and specifically tells the reader how the topics within each part contribute to biological knowledge.

Chapter Concepts: Each chapter begins with a list of concepts stressed in the chapter. This listing introduces the student to the chapter by organizing its content into a few meaningful sentences. The concepts provide a framework for the content of each chapter.

Chapter Outlines: In addition to the chapter concepts, each chapter has a chapter outline. These will allow students to tell at a glance how the chapter is organized and what major topics have been included in the chapter. The chapter outlines include the first- and second-level heads for the chapter.

Readings: Two types of boxed readings are included in the text. Readings chosen from popular magazines illustrate the applications of concepts to modern concerns. These spark interest by illustrating that biology is an important part of everyday life. The second type of reading, usually written by the author, is designed to expand, in an interesting way, on the core information presented in each chapter. Topics such as coronary heart disease and endometriosis are addressed in these readings.

Critical Thinking Questions: New to this edition are critical thinking boxes containing questions that require the student to form a hypothesis, come to a conclusion, or apply information in a new and different way. The critical thinking questions are placed in the margin next to pertinent text material and are designed to increase the active participation of students in the learning process.

Tables and Illustrations: Numerous tables and illustrations appear in each chapter and are placed near their related textual discussion. The tables clarify complex ideas and summarize sections of the narrative. Once students have achieved an understanding of the subject matter by examining the chapter concepts and the text, these tables can be used as an important review tool. The photographs and drawings have been selectively chosen and designed to help students visualize structures and processes.

Boldfaced Words: New terms appear in boldface print as they are introduced within the text and are immediately defined in context. If any of these terms are reintroduced in later chapters, they are italicized. Key terms are defined in the end-of-chapter glossary and all boldface terms are in the text glossary, where a phonetic pronunciation is given with the appropriate page reference.

Internal Summary Statements: Summary statements are placed at strategic locations throughout the chapter. These immediately reinforce the concept that has just been discussed. The summary statements will aid student retention of the chapter's main points.

Chapter Summaries: Chapter summaries offer a concise review of material in each chapter. Students may read them before beginning the chapter to preview the topics of importance, and they may also use them to refresh their memories after they have a firm grasp of the concepts presented in each chapter.

Chapter Questions: Study questions and objective questions are at the close of each chapter. The study questions allow students to test their understanding of the information in the chapter. The objective questions allow students to quiz themselves with short fill-in-the-blank questions. Labeling exercises have been added to the objective questions section.

Chapter Glossary: Major boldfaced terms within the chapter are defined at the end of each chapter for more convenient review. Selected key terms are listed with their phonetic pronunciation, carefully defined, and page referenced. All boldface terms are still listed alphabetically with their pronunciations, definitions, and page references in the text glossary at the end of the book.

Further Readings: For those students who would like more information about a particular topic or are seeking references for a research paper, each part ends with a listing of articles and books to help them get started. Usually the entries are *Scientific American* articles and speciality books that expand on the topics covered in the chapter.

Appendix and Glossary: The appendix contains optional information for student referral. It includes a Periodic Table of the Elements and a review of the metric system. An important part of the appendix is the Classification System of Organisms used in the text.

The text glossary defines the terms most necessary for making the study of biology successful. By using this tool, students can review the definitions of the most frequently used terms.

Index: The text also includes an index in the back of the book. By consulting the index it is possible to determine on what page or pages various topics are discussed.

Computerized Student Aid: A student computer software program called QuizPak is also available to your instructor. QuizPak provides true-false and multiple choice questions for each chapter in the text. Ask your instructor about using this program in the Learning Resource Center to help prepare you for examinations.

Helpful Study Hints

Learning how to study efficiently is a prerequisite to being a successful student. The following concepts are meant to be an aid in helping you study more productively. Please realize that this list is not all-inclusive and that it may not apply to all individuals who come to this course with different backgrounds, interests, and abilities.

I. Be motivated. This attitude can not be taught to you by an instructor or learned from a textbook but must come from within yourself. It requires commitment, discipline, and perseverance on your part even when you do not feel like studying. Maintain a high expectation on your part. Think positively.

II. Set aside several hours at a particular time of the day to go over old and new material. Preview and review your assigned material; repetition of the material and consistency in your study habits combine for successful learning. Review every chance you have. Try to stay one lecture ahead of the instructor. Study in a quiet, well-lit room away from distractions.

III. Try to grasp the big picture as well as the details in every chapter. Try to understand how it is related to the rest of the textbook. Whenever possible, try to attach concepts to “silly” images and build upon them for better recall. Make up rhymes by using the first letter of each word.

IV. Continually ask yourself questions. Although it may be boring to remember some things, asking questions will keep yourself mentally alert. After each paragraph or main idea, you should ask: “What does this mean?” “How does this relate to what I’ve already learned?” “How can I put that idea into my own words?” or “How can I apply that concept?” Try to relate the information to your past experiences. Make sure you know the definitions of key words that are usually boldfaced or italicized in the text. Read the first and last paragraph of the chapter, then the first and last sentence of each paragraph, and then change the statements in the paragraph into questions and answers. Draw a line on a paper and write the question on one side and the answer on the other side.

V. Have a positive attitude. Even though all of us have personal problems that may interfere with learning, look at it as a growing experience. A positive attitude means that you should not give up just because the instructor is poor or you think the textbook is poorly written. Sometimes you will have to dig the information out of the textbook by yourself. After all, that is what learning is ultimately all about: it is a life-long process that we have to achieve basically by ourselves.

VI. Have someone ask you questions. Asking and responding to questions from another person will improve one’s thinking and understanding of the material. Cover up definitions to a word and see if you can answer them correctly. Ask the instructor if you can use a tape recorder in class and then listen to the lecture again at another time. Don’t be embarrassed to ask the instructor during or after class about things that you do not understand. Most instructors will be glad to help you. Use any other available study aids such as the QuizPaks, Study Guides, and the Chapter Outlines. Perhaps rewriting your notes into an outline format will be helpful as well.

VII. Learn as much as possible while in class. Perhaps you may even avoid taking notes in class. Instead, listen very attentively, follow along with the instructor from the material in the textbook, and highlight key words that the instructor mentions. If you have previewed the lecture material, you will know where to find the information that is being discussed in class. If you do take lecture notes, be selective and do not try to take notes on everything mentioned. Abbreviate words and fill them in immediately after class. Review the same material from the textbook as soon as possible. Try to grasp the big picture given in class.

VIII. On the night prior to the test, make sure you get a good sleep. When taking the test, try to relax by taking several deep breaths or by tightening up your muscles and then slowly relaxing them. When reading the questions, make sure you understand exactly what the teacher wants to know AND read carefully to understand any limitations placed upon the question. On essay questions that are very broad, limit your answer to what the teacher felt was relevant in the class. Make a quick outline of the salient, major points and then fill in the details as you write your essay. When exams are returned, review them so that you can learn from your mistakes. That information may be on the final comprehensive test.

Above all, keep things in perspective. Even if you do fail a test, it is not the end of the world. Learn from your mistakes and do the best you can. Good luck!

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1 Chemistry and Life

I. Chapter Outline

- A. Atoms
 - 1. Isotopes
- B. Reactions between Atoms
 - 1. Ionic Reactions
 - 2. Covalent Reactions
 - 3. Oxidation-Reduction Reactions
- C. Inorganic Chemistry versus Organic Chemistry
- D. Some Important Inorganic Molecules
 - 1. Water
 - 2. Acids and Bases
 - 3. Salts
- E. Some Important Organic Molecules
 - 1. Proteins
 - 2. Carbohydrates
 - 3. Lipids
 - 4. Nucleic Acids

II. Chapter Review

Page	Questions
17	1. Give the definition for an atom.
17	2. Compare the protons, neutrons, and electrons as to location, charge, and weight within an atom.
18	3. What is the difference between the atomic number of an element and its atomic weight?
19	4. How is the isotope of carbon 12 different from carbon 14?
19	5. Define the octet rule.
19	6. What is the difference between a molecule and a compound?
19	7. How do ions become either positively or negatively charged?
20	8. Define an ionic bond. What type of atoms react in an ionic bond?
21	9. Covalent bonds occur between _____ when electrons are _____ between atoms.
23	10. What is the difference between a structural formula and a molecular formula?
23	11. Distinguish between a double and a triple covalent bond.
23	12. What is the difference between oxidation and reduction? Do they occur concurrently?
24	13. Which type of chemistry is characterized by always containing carbon and hydrogen?
24	14. Why is water considered to be a polar molecule? What holds water molecules together?
24	15. Explain why ice floats on liquid water. What value does this have?
25	16. Distinguish between an acid and a base. Give an example of each.
28+	17. Solutions with a pH of less than 7 are termed _____ whereas those solutions with a pH greater than 7 are termed _____. As the pH scale decreases, there is a _____ fold increase in the hydrogen ion concentration for every pH unit.
28	18. What is the function of a buffer in a solution?
28	19. What is a salt?
29	20. Distinguish between dehydration synthesis and hydrolysis.
31	21. What are the 2 functional groups in amino acids? How do amino acids differ?
31	22. What type of bond holds amino acids together? Describe which parts are joined.
31	23. Compare a dipeptide, a polypeptide, and a protein molecule.
31	24. Distinguish between the primary, secondary, tertiary, and quaternary structure of a protein.
33+	25. What is the difference among monosaccharides, disaccharides, and polysaccharides?

- 33+ 26. List 2 sugars each for monosaccharides, disaccharides, and polysaccharides.
- 34+ 27. What is the role of starch, glycogen, and cellulose in cells?
- 37 28. Distinguish between fats and oils as types of lipid. How are they formed?
- 37+ 29. Explain the difference between a saturated and unsaturated fatty acid.
- 38 30. Give the definition of a soap. What is meant by emulsification?
- 39 31. What property of phospholipids makes them so important in cellular membranes?
- 39 32. What is unique about the structure of steroids? List several examples of steroids.
- 40 33. List 2 types of nucleic acids.
- 40 34. Give the components of every nucleotide. What distinguishes DNA from RNA?

III. Objective Chapter Test

Completion and Short Answer Questions

1. What is the octet rule?

I	II	III	IV	V	VI	VII	VIII
1 H hydrogen 1							2 He helium 4
3 Li lithium 7	4 Be beryllium 9	5 B boron 11	6 C carbon 12	7 N nitrogen 14	8 O oxygen 16	9 F fluorine 19	10 Ne neon 20

2. From the simplified picture of the Periodic Table shown above,
- circle the atomic numbers.
 - underline the atomic weights.
 - place a check next to the figure for the number of protons.
 - put an X beside the figure that tells you the number of electrons.
 - calculate and add to each block the number of neutrons.

3. For each horizontal group of the Periodic Table shown above, complete the following chart:

Group Number	Number of outermost shell electrons present	Number of electrons lost, added to, or shared in outermost shell
I		
II		
III		
IV		
V		
VI		
VII		
VIII		

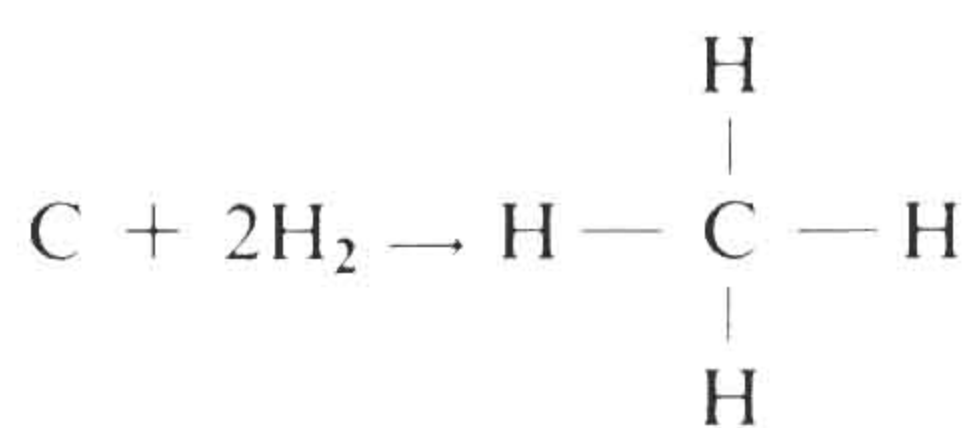
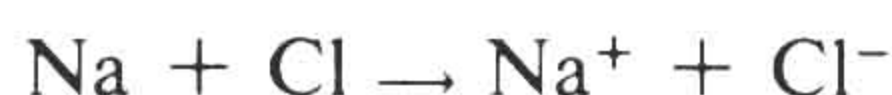
4. The atomic number for oxygen is 8 and its atomic weight is 16. For magnesium, the atomic number is 12 and the atomic weight is 24. To the left below, draw the diagram of oxygen, putting in the nucleus and shells. Add to your diagram the number of protons and the number of neutrons. Put in dots to indicate the electrons. On the right side below, draw the diagram of magnesium using the same directions.

5. Define ionic and covalent bonds.

- a. ionic _____
- b. covalent _____

6. Lithium(Li), sodium(Na), magnesium(Mg), aluminum(Al), potassium(K), and calcium(Ca) are classified as metals, which tend to lose electrons and become positively charged. Nonmetals tend to gain electrons and become negatively charged. When nonmetals react with nonmetals, no charge results. Complete the following reactions by giving the product. Indicate ionic bonds by giving the proper charges. Indicate covalent bonds by drawing straight lines.

Examples:



Practice reactions:

- | | |
|---|--|
| a. $\text{Li} + \text{F} \rightarrow$ | g. $\text{H}_2 + \text{O} \rightarrow$ |
| b. $\text{C} + \text{O}_2 \rightarrow$ | h. $\text{C} + 2\text{Cl}_2 \rightarrow$ |
| c. $\text{N} + 3\text{H} \rightarrow$ | i. $\text{Cl} + \text{Cl} \rightarrow$ |
| d. $\text{Mg} + \text{O} \rightarrow$ | j. $\text{N} + \text{N} \rightarrow$ |
| e. $2\text{Al} + 3\text{O} \rightarrow$ | k. $\text{Mg} + 2\text{Cl} \rightarrow$ |
| f. $\text{K} + \text{Cl} \rightarrow$ | l. $\text{Si} + \text{O}_2 \rightarrow$ |

7. Oxidation-reduction. For each of the ionic reactions in the above question, underline the atom that was oxidized and circle the atom that was reduced upon completion of the reaction.

8. Isotopes. Circle the heavy isotopes below.



9. Define an acid, base, and salt.

- a. acid _____
- b. base _____
- c. salt _____

10. If the hydrogen ion concentration $[H^+]$ of 10^{-7} has a pH of 7, what is the pH of the following concentrations?

$[H^+]$	pH	Acid or Base
a. 10^{-4}		
b. 10^{-6}		
c. 10^{-10}		
d. 10^{-14}		

11. Which of the numbers above represents the largest $[H^+]$? _____

12. What is the importance of pH to biological systems? _____

13. How do living things prevent rapid and drastic changes in pH? _____

14. If the description below is true of inorganic compounds, place an **I** in the space provided. If it is true of organic compounds, place an **O** in the space provided.

- _____ a. contain a small number of atoms
- _____ b. are often associated with living organisms
- _____ c. always form covalent bonds
- _____ d. usually contain metals and nonmetals
- _____ e. always contain carbon and hydrogen

15. What 4 atoms are most often found in organic molecules? _____

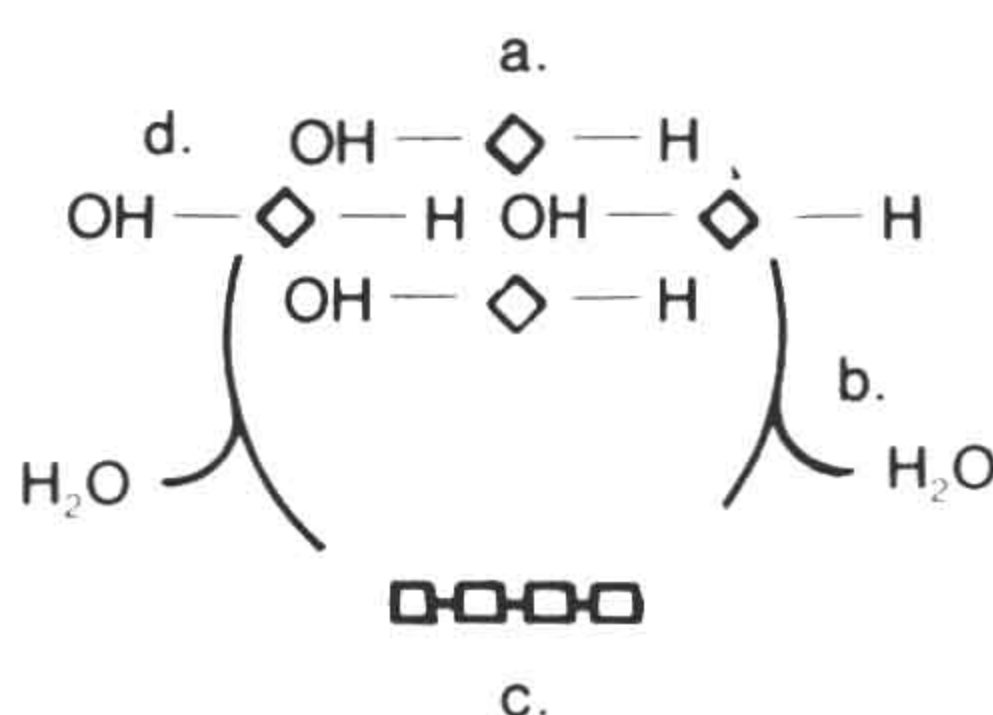
16. Which of the atoms in question 15 is unique to amino acids and nucleotides? _____

17. What are the 4 classes of organic compounds? _____

18. Of the classes in answer 17, which:

- a. are *most* concerned with energy? _____
- b. one forms most enzymes? _____
- c. one makes up genes? _____

19. Label one side of this diagram synthesis and the other side hydrolysis.



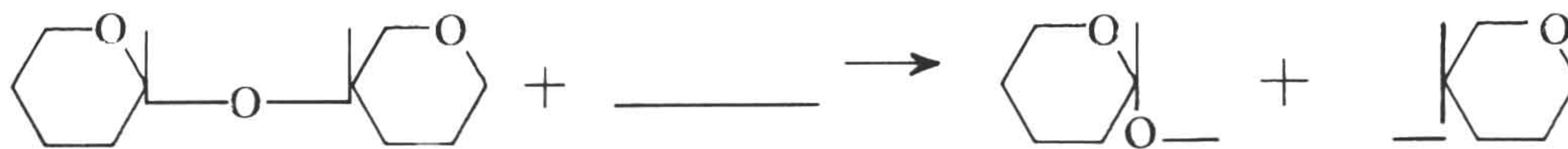
Which 5 molecules in question 19 would be associated with part (a) in this diagram? _____

Which 4 molecules would be associated with part (c) in this diagram? _____

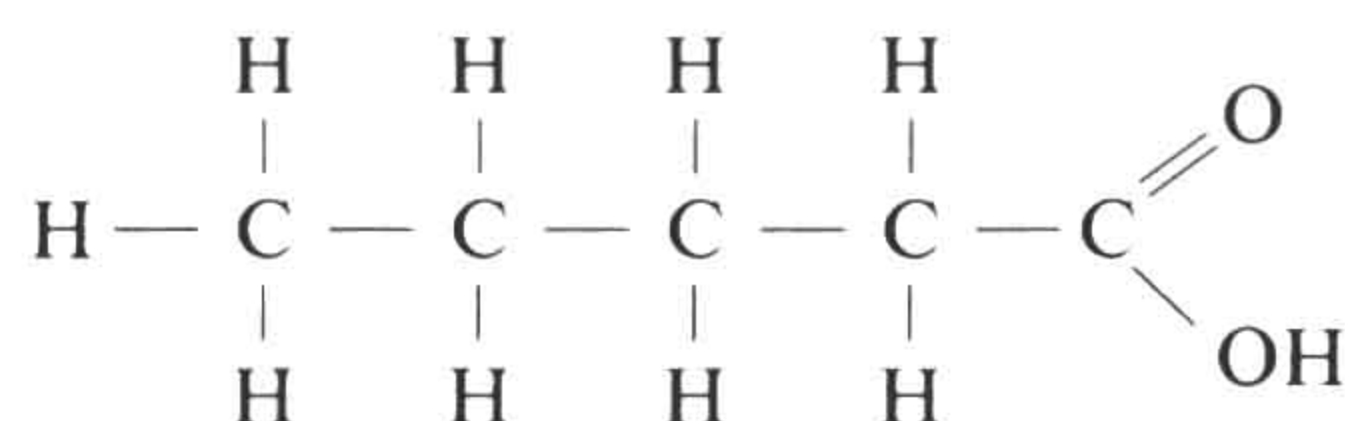
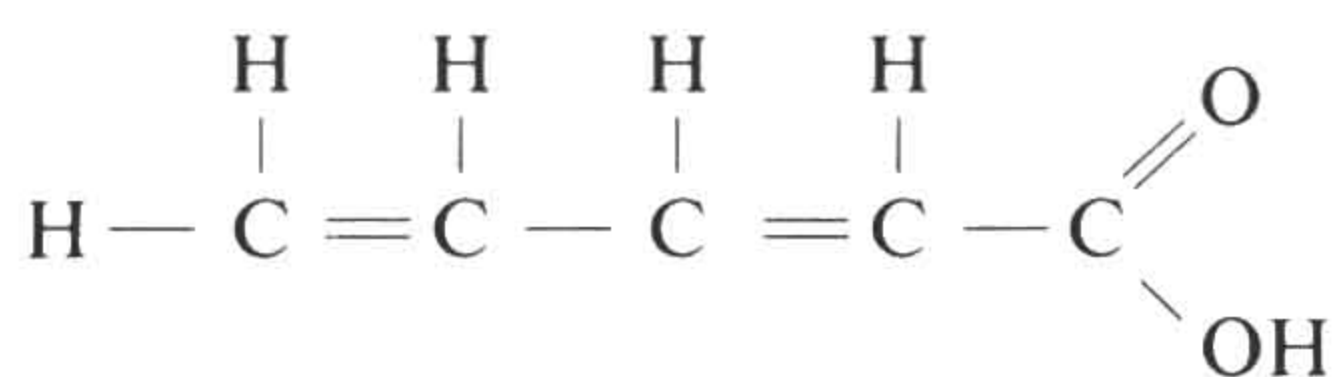
At points (b) and (d) in the above diagram, indicate the correct direction of the arrows.

20. When many glucose molecules are joined, the macromolecule _____ results. When many amino acids are joined, the macromolecule _____ results. When glycerol and fatty acids are joined, _____ results. When nucleotides join, the macromolecule _____ results.

21. In this hydrolytic reaction, write in the name of the molecule required on the left and the atoms required on the right.



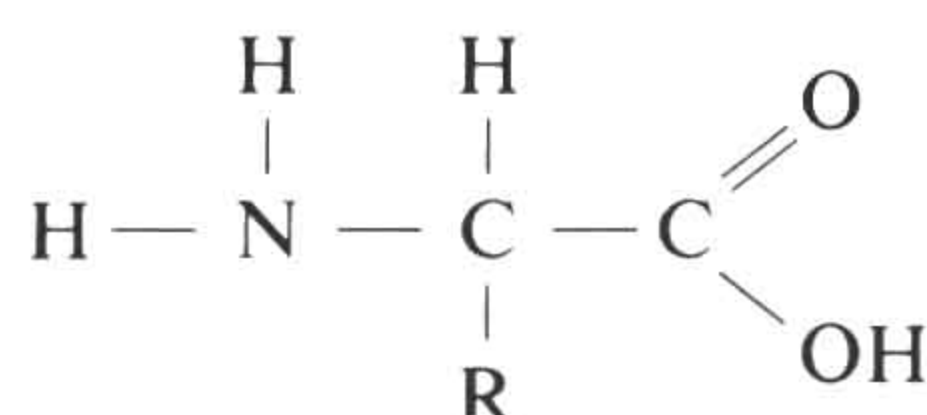
22. Write the word *saturated* and the word *unsaturated* beneath the appropriate structure.



a. _____

b. _____

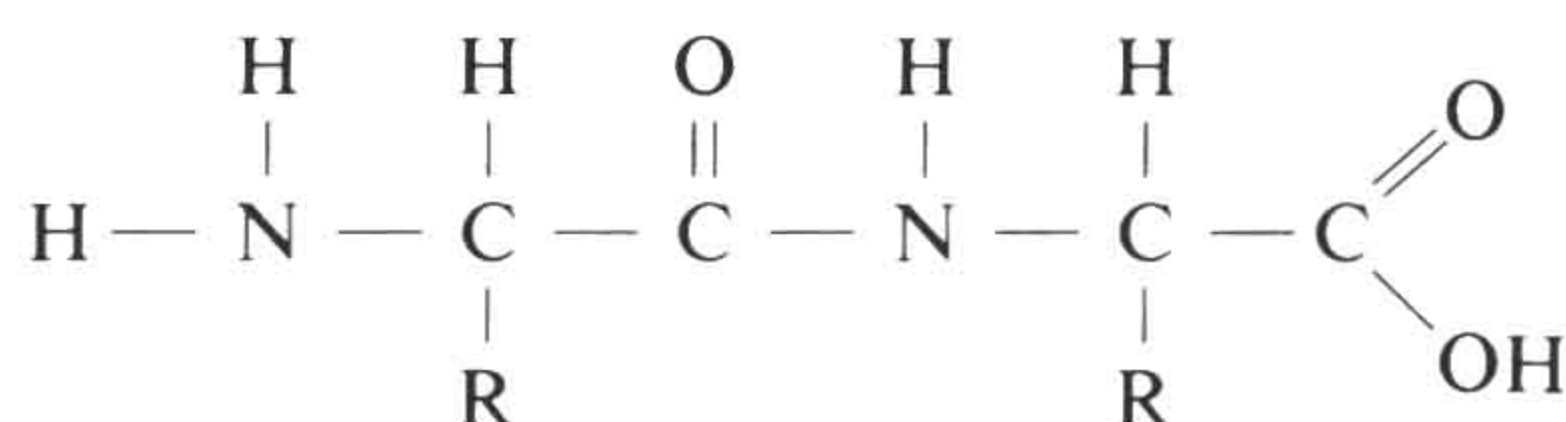
23. The diagram below is an amino acid. Write the word *amino* and the word *acid* on the appropriate line.



a. _____

b. _____

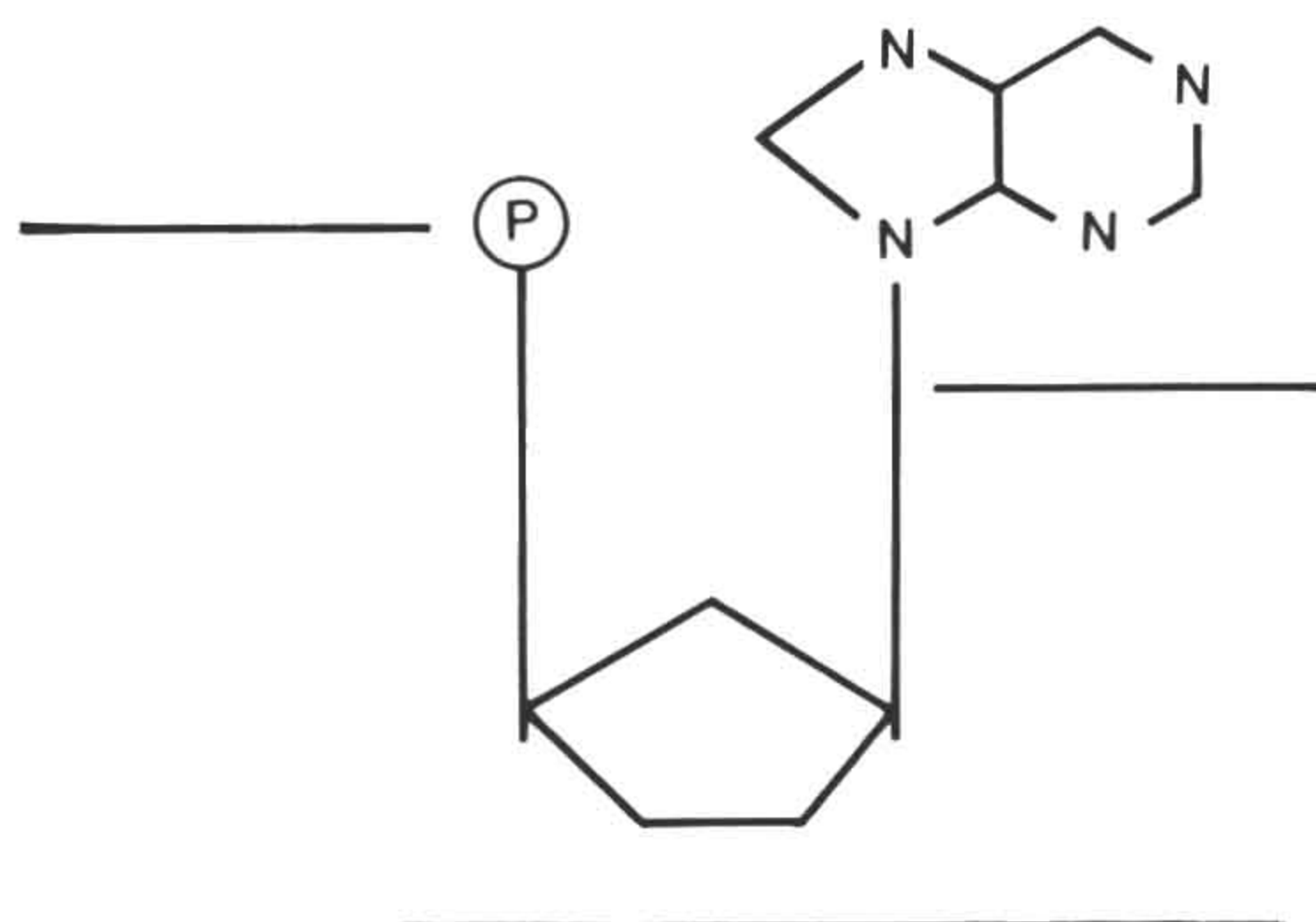
24. The diagram below is a dipeptide. Circle the peptide bond.

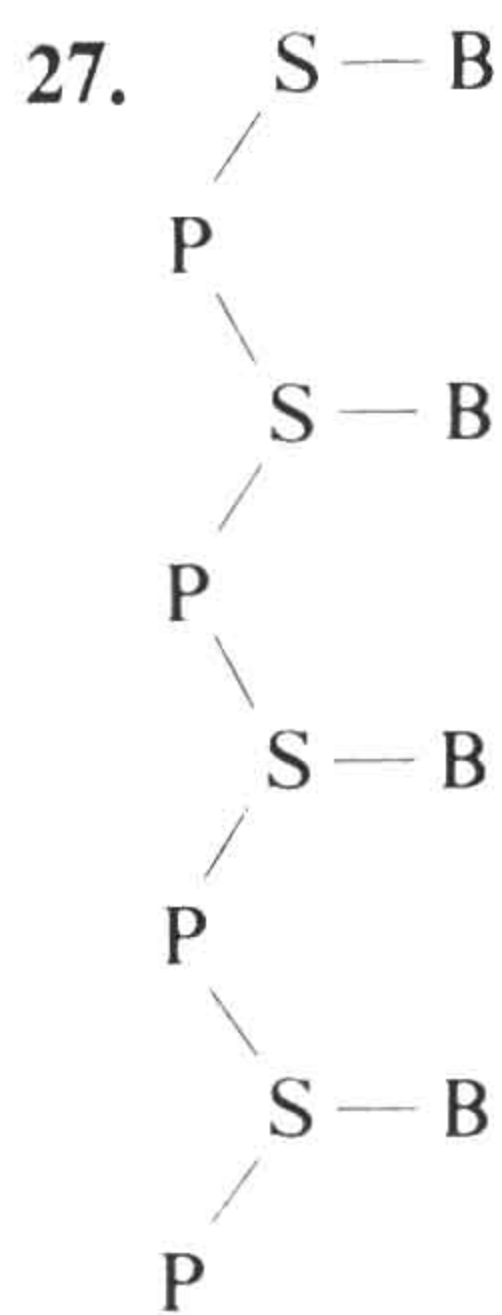


25. Levels of protein structure.

The linear sequence of amino acids in a protein constitutes the (a) _____ structure. The type of bond that links the amino acids together is a (an) (b) _____ bond. The functional groups on an amino acid that will join to form this bond are termed (c) _____ and (d) _____. The group that represents the side chains on the protein molecule is the (e) _____ group.

26. The diagram below represents the structure of a nucleotide. Write the words *base*, *sugar*, and *phosphoric acid* beside the appropriate structures.





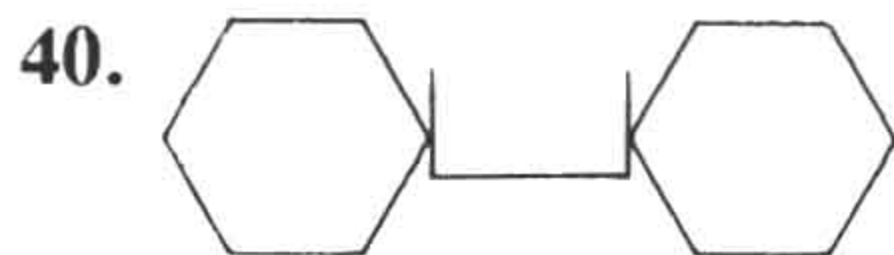
- a. This is the primary structure of a (an) _____ strand.
Which letters represent the backbone? _____
Which letter(s) represent(s) the nitrogenous bases? _____
- b. Which molecule would the letter S stand for? _____
What specific molecule is S in DNA? _____
What specific molecule is S in RNA? _____
Which nucleic acid would require a double strand? _____

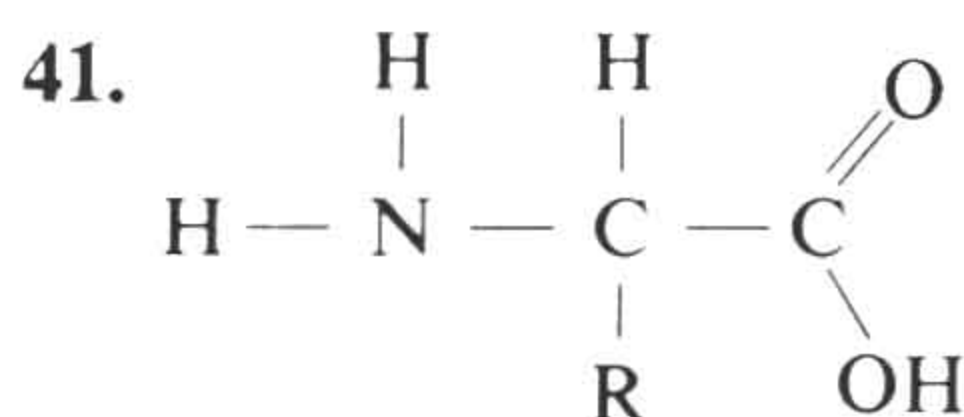
28. The atomic number for carbon is 6; therefore, a carbon atom that is electrically neutral has _____ protons and _____ electrons.
29. The compound K^+Cl^- is a (an) _____ compound and K^+ and Cl^- are _____.
30. Which of the ions in the above question has lost an electron? _____ Which has been oxidized? _____
31. The compound CH_4 is a (an) _____ compound, in which the atoms _____ electrons.
32. Acids have a pH that is _____ than 7, whereas bases have a pH that is _____ than 7.
33. At pH 7, $[H^+] = [OH^-]$. Below pH 7, which of these is greater? _____
34. An unsaturated fatty acid contains less _____ than a saturated fatty acid.
35. When glycerol combines with 3 fatty acids, a (an) _____ molecule results.
36. _____ are lipids containing phosphorus that are very important in cell membranes.
37. _____ are atoms that have the same number of protons and electrons but differ in the number of neutrons.
38. _____ is the splitting of a bond within a larger molecule by the addition of water.
39. _____ is the act of dispersing one liquid in another, as fat in water.

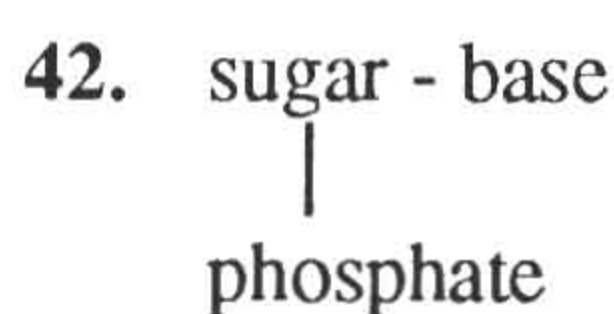
Matching. For questions 40 - 44, match the following answers to the diagrams below.

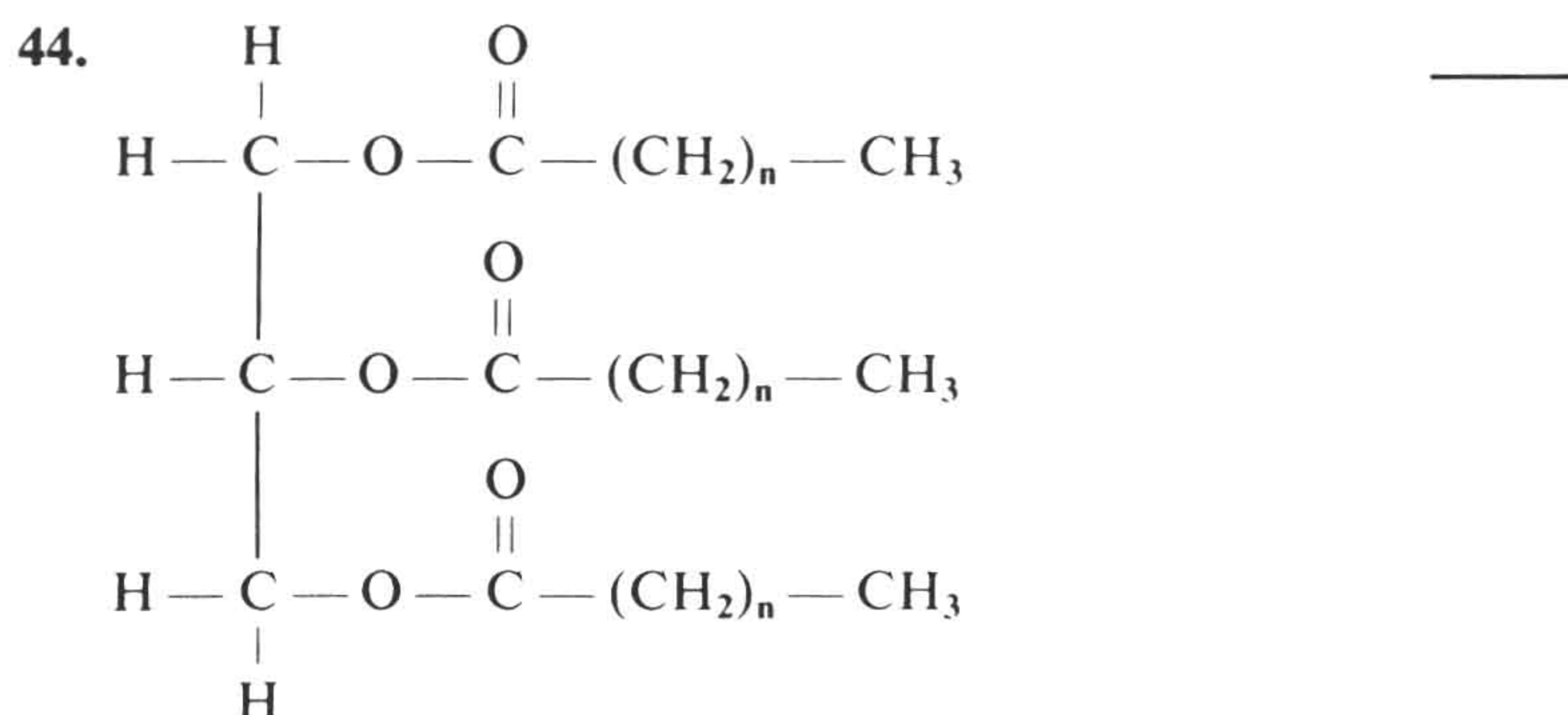
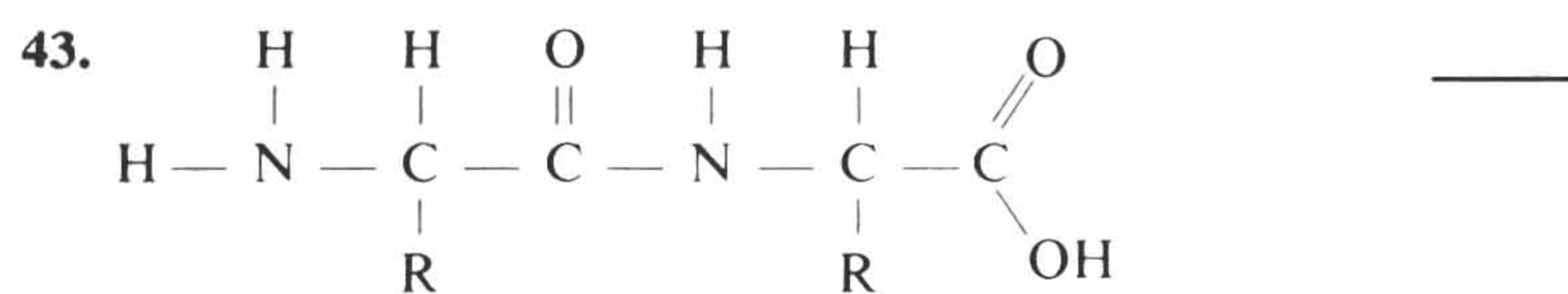
- | | |
|----------------------------------|----------------------------------|
| a. amino acid (or more than one) | d. glycerol |
| b. glucose (or more than one) | e. fatty acid |
| c. nucleotide (or more than one) | f. both glycerol and fatty acids |

Answer









Matching. For questions 45 - 47, match the following answers to one or more of the words below.

- | | |
|----------------------------------|----------------------------------|
| a. amino acid (or more than one) | d. glycerol |
| b. glucose (or more than one) | e. fatty acid |
| c. nucleotide (or more than one) | f. both glycerol and fatty acids |

45. nucleic acid _____, protein _____, polysaccharide _____, polypeptide _____, disaccharide _____, cellulose _____
46. gene _____, quick energy _____, enzyme _____, long-term stored energy _____, plant cell wall _____
47. peptide bond _____, unsaturated _____, ribose _____, glycogen _____, hydrogen bond _____, hydrocarbon (only carbon and hydrogen) chain _____

Multiple Choice Questions

48. Chlorine has an atomic number of 17. How many electrons are in the outermost shell?
- 1
 - 7
 - 8
 - 5
 - none
49. When chlorine becomes the chloride ion, its charge is
- plus 1.
 - plus 7.
 - minus 1.
 - minus 7.
 - minus 8.
50. When hydrochloric acid, a strong acid, is added to water, the pH
- goes up.
 - stays the same.
 - goes down.
 - goes first up and then down.
 - cannot be determined.
51. When two nonmetal oxygen atoms (atomic number = 8) react with each other, they
- each give up 2 electrons.
 - each take 2 electrons.
 - each need 6 electrons.
 - each need 8 electrons.
 - share electrons.
52. In this reaction, $\text{K} + \text{Cl} \rightarrow \text{K}^+\text{Cl}^-$, which element has been reduced?
- potassium
 - chlorine
 - both potassium and chlorine
 - sodium
 - None of the above are correct.
53. The bond that occurs between a carbon atom of one amino acid and the nitrogen atom of a second amino acid is termed a (an) _____ bond.
- hydrogen
 - weak
 - peptide
 - ionic
 - covalent

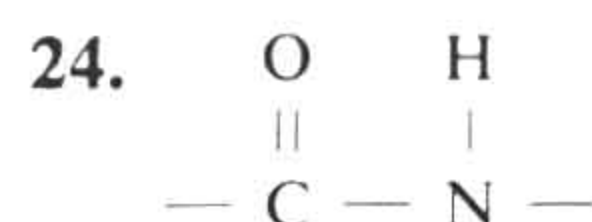
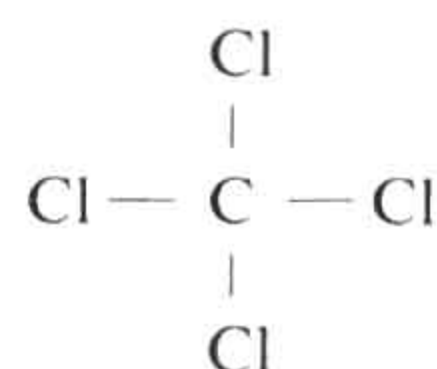
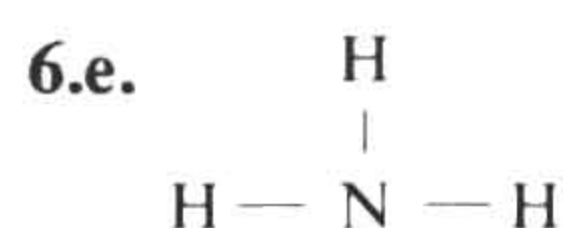
54. Which one molecule would be used repeatedly to form a nucleic acid?
- nucleotide
 - amino acid
 - glucose
 - glycerol
 - fatty acid
55. The backbone of a nucleic acid would be composed of
- the nitrogen bases.
 - sugar-phosphate-sugar-phosphate, etc.
 - sugar-phosphate-base-sugar-phosphate-base, etc.
 - sugar-base-sugar-base, etc.
 - the R groups.
56. Which pair below is mismatched?
- amino acid — protein
 - glycerol — glycogen
 - glucose — starch
 - phosphoric acid — nucleotide
57. A hydrogen atom in a hydrogen bond
- will always be covalently bonded to an oxygen atom.
 - will have a small positive charge compared to the atom to which it is bonded.
 - must be part of a water molecule.
 - must be a hydrogen ion.
58. Proteins are polymers of _____, which sometimes function to _____.
- amino acids; catalyze chemical reactions
 - nucleotides; convey genetic information
 - fatty acids; transport substances through membranes
 - nucleotides; provide energy for cellular processes

IV. Subjective Chapter Test

59. It has been said that life as we know it could not exist without the element carbon. Explain why you agree or disagree with this statement.
60. What type of organic molecule will not be utilized fully in the human digestive tract if the gallbladder, which produces bile, is removed? Explain why.

Answers to Chapter Test

1. All atoms desire 8 electrons in the outermost shell 2. for carbon: a. 6 b. 12 c. 6 d. 6X e. $12 - 6 = 6$ 3. Group I: 1; lose 1, gain 7, share none. Group II: 2; lose 2, gain 6, share none. Group III: 3; lose 3, gain 5, share none. Group IV: 4; lose 4, gain 4, share 4. Group V: 5; lose 5, gain 3, share 3. Group VI: 6; lose 6, gain 2, share 2. Group VII: 7; lose 7, gain 1 share 1. Group VIII: 8; no change
4. see text figure 1.4 5.a. Ionic bond: attraction between oppositely charged ions; b. covalent bond: occurs when electrons are shared between atoms. 6.a. Li^+F^- (Li-oxidized; F-reduced); b. $\text{O}=\text{C}=\text{O}$; c. see below; d. $\text{Mg}^{++}\text{O}^{--}$ (Mg-oxidized; O-reduced); e. $\text{Al}_2^{3+}\text{O}_3^{2-}$ (Al-oxidized; O-reduced); f. K^+Cl^- (K-oxidized; Cl-reduced); g. $\text{H}-\text{O}-\text{H}$; h. see below; i. $\text{Cl}-\text{Cl}$; j. $\text{N}=\text{N}$; k. $\text{Mg}^{++}\text{Cl}_2^-$ (Mg-oxidized; Cl-reduced); l. $\text{O}=\text{Si}=\text{O}$ 7. already recorded in above answers 8. (T. A. 1.16b) 9. see glossary 10.a. 4, acid; b. 6, acid; c. 10, base; d. 14, base 11. 10^{-4} 12. They require a neutral pH. 13. buffers 14.a. I b. O c. O d. I e. O 15. C, H, O, N 16. nitrogen 17. carbohydrate, fat, protein, nucleic acid 18.a. carbohydrates, fats b. protein c. nucleic acid 19. right-hydrolysis, left-synthesis; with (a): glucose, amino acids, glycerol and fatty acid, nucleotides; with (c): starch (or glycogen), protein, fat, nucleic acid (or DNA and RNA); see fig. 1.16 in text 20. starch or glycogen; protein; fat; DNA or RNA 21. molecule required: water; atoms required: H, OH 22.a. unsaturated b. saturated 23.a. amino b. acid 24. see below 25.a. primary b. peptide c. acid group of one amino acid and the d. amino group of another amino acid e. R 26. see text fig. 1.32 27.a. nucleic acid; P-S-P-S, etc.; B b. S=sugar; in DNA = deoxyribose; in RNA = ribose; DNA 28. 6, 6 29. inorganic or ionic, ions 30. K^+ , K^+ 31. organic or covalent, share 32. less, more 33. $[\text{H}^+]$ 34. hydrogen 35. fat 36. Phospholipids 37. Isotopes 38. Hydrolysis 39. Emulsification 40. b 41. a 42. c 43. a 44. f 45. c, a, b, a, b, b 46. c, b, a, f, b 47. a, e, c, b, a and c, e 48. b 49. c 50. c 51. d 52. chlorine 53. c 54. a 55. b 56. b 57. b 58. b 59. Agree because the organic building blocks of life (carbohydrates, fats, proteins, nucleic acids) all contain carbon. 60. Fats, because the bile from the gall bladder will no longer be available for emulsification of the fats.



2 Cell Structure and Function

I. Chapter Outline

- A. The Cell Theory
 - 1. Microscopy
 - 2. Types of Cells
- B. Eukaryotic Cell Organelles
 - 1. The Nucleus
 - 2. Membranous Canals and Vacuoles
 - 3. Energy-Related Organelles
 - 4. The Cytoskeleton
 - 5. Centrioles and Related Organelles
- C. Cellular Comparisons
 - 1. Prokaryotic Cells versus Eukaryotic Cells
 - 2. Plant Cells versus Animal Cells

II. Chapter Review

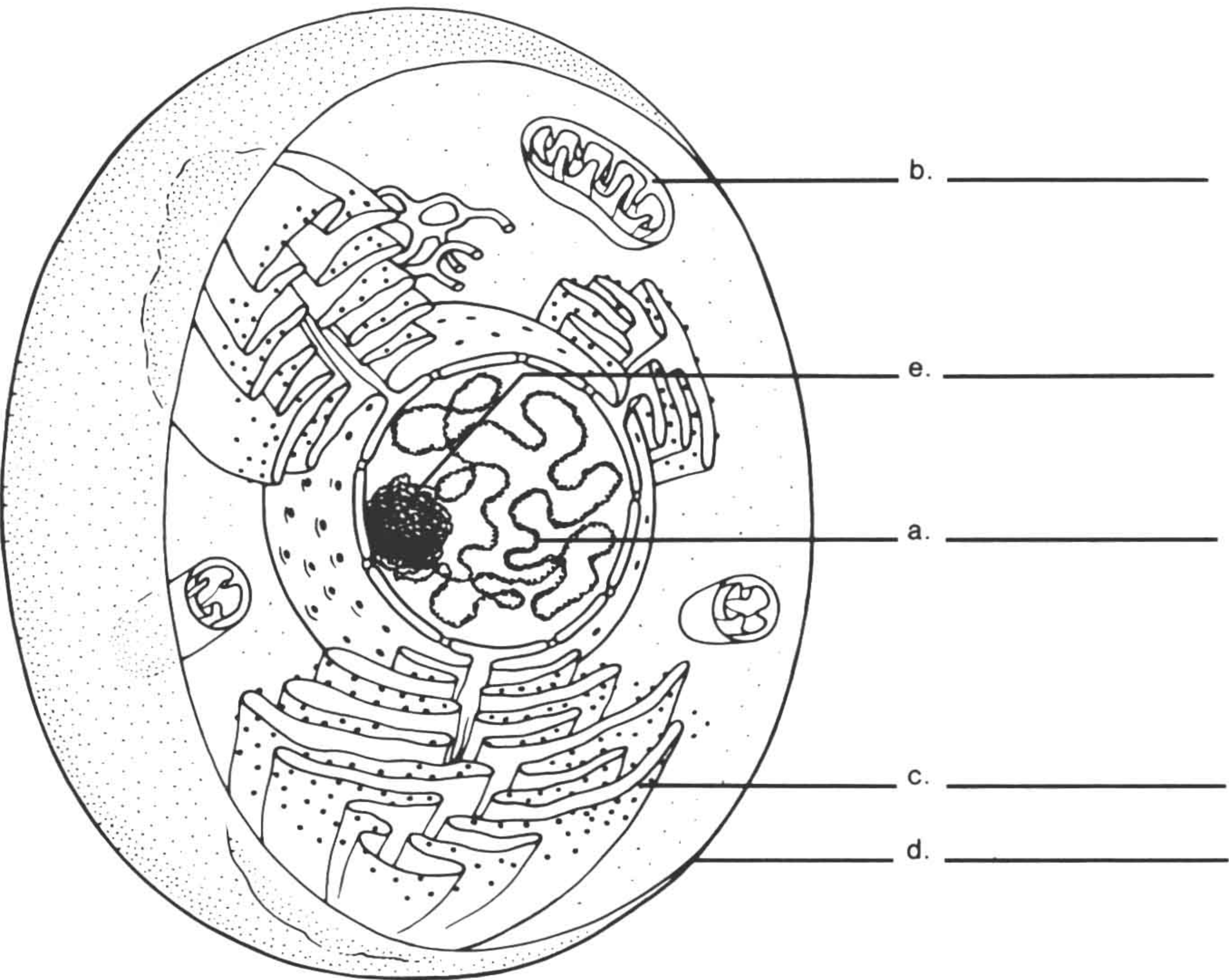
Page	Questions
44	1. Define the cell theory.
44	2. What is meant by the resolving power of a microscope?
44	3. Why does an electron microscope have a much greater resolving power than the light microscope?
46	4. Describe the fluid-mosaic model of the cell membrane.
49	5. What part of the cell functions as a control center to oversee metabolic functioning and to determine the cell's characteristics?
49	6. What is the difference between chromatin and chromosomes?
49	7. What is the function of DNA in chromosomes of the cell?
49+	8. What is the role of the nucleoli in the cell?
50	9. What is the structural difference between rough and smooth endoplasmic reticulum?
50	10. List 2 functions of smooth endoplasmic reticulum.
51	11. What role do peroxisomes have in a cell?
51	12. _____ are dense granules composed of ____ subunits that contain both RNA and _____. They function in the production of _____.
51	13. Ribosomes attached to endoplasmic reticulum produce protein that is destined for _____, whereas free ribosomes produce protein that is used _____ the cell.
51	14. Distinguish between a ribosome and a polysome.
51+	15. Describe the appearance and give the function of the Golgi apparatus.
52	16. What is the difference between a vacuole and a vesicle?
52	17. Vacuoles serve as _____ for various kinds of molecules; in plants, the large central vacuole gives added _____ to the cell.
52+	18. List 2 functions of the lysosome. Why are they able to carry out these functions?
53	19. List the 2 energy-related organelles of the cell. Which is unique to plants?
54	20. Describe the structure of mitochondria. Why is it important to the cell?
54	21. Write the overall reaction for cellular respiration.
54	22. What are the internal components of a chloroplast? Define each.
55	23. What is the function of chlorophyll in the chloroplast?
54	24. Write the overall equation for photosynthesis.
55	25. What is the function of a cell's cytoskeleton?
55+	26. Compare microfilaments to microtubules for structure and function.
57	27. Describe the structure and location of centrioles and then give its function.
57+	28. Provide 3 examples where cilia and flagella are used.
58	29. Describe the microtubular arrangement in cilia and flagella.
59	30. What is the difference between prokaryotic cells and eukaryotic cells?

- 59
31. Give an example of a prokaryotic cell and 2 examples of eukaryotic cells.
- 60
32. List 3 major differences between plant and animal cells.

III. Objective Chapter Test

Completion and Short Answer Questions

1. Nucleus. The nucleus is enclosed by the (a) _____ , which contains (b) _____ that open into the cytoplasm. At the time of cell division, chromatin (c) _____ to form chromosomes. The relationship between the nucleoli and ribosomes is (d) _____. DNA within the nucleus controls (e) _____ .
2. On the lines provided here, name the organelles in this drawing of an animal cell .



<u>Unit of Measurement</u>	<u>Symbol</u>	<u>Seen by</u>
Centimeter	cm = 0.01 m (meter)	naked eye
Millimeter	mm = 0.1 cm	naked eye
Micrometer	um = 0.001 mm	light microscope
Nanometer	nm = 0.001 um	electron microscope

3. Measurement. Which of the following structures (cell, cell nucleus, endoplasmic reticulum, mitochondria, ribosomes) would be visible
- a. with the naked eye? _____
- b. with the compound light microscope? _____
- c. with the electron microscope? _____
- d. A student reports that an object seen under the microscope is 10 micrometers. How many nanometers is this? _____
- e. A row of 30 cells seen under the microscope is 1.2 mm. How wide is each cell in micrometers? _____