Name _____ Date _____ Class _____

24 THE CHEMISTRY OF LIFE

SECTION 24.1 A STRATEGY FOR LIFE (pages 763–765)

This section describes the structure of a typical eukaryotic cell. It also explains the relationship between photosynthesis and all life on Earth.

▶ The Structure of Cells (pages 763–764)

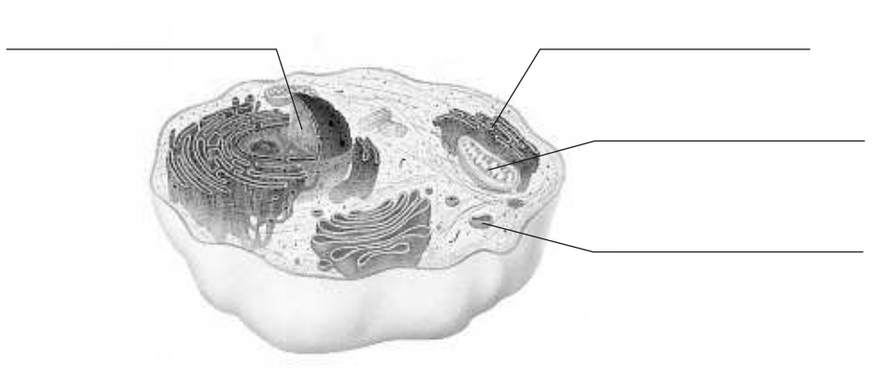
1. What are the two major types of cell design?

a. _____ **b.** _____

2. Which of the two cell types are found in humans?

_____

3. Fill in the missing labels for structures in the drawing of a eukaryotic cell.



4. Is the following sentence true or false? Both cell types are surrounded by a cell membrane that acts as a selective barrier to the passage of chemicals into or out of the cell. _____

5. Only eukaryotic cells contain membrane-enclosed _____ in which specialized functions of the cell occur.

Match the organelle to its function.

_____	**6.** mitochondrion	**a.**	manufacture of proteins
_____	**7.** nucleus	**b.**	cell reproduction
_____	**8.** lysosome	**c.**	energy production
_____	**9.** endoplasmic reticulum	**d.**	digestion

Name _____ Date _____ Class _____

▶ Energy and Carbon Cycle (pages 764–765)

10. What is the source of all energy for life on Earth? _____

11. Circle the letter of the process by which organisms capture solar energy and use it to make food.

a. oxidation **b.** photosynthesis **c.** digestion **d.** respiration

12. How do plants use the energy they obtain from sunlight?

_____

13. Explain how animals obtain the energy they need.

_____

_____

14. What are the products of the oxidation of glucose?

_____

15. Is the following sentence true or false? The destruction of forests and pollution of the oceans has no effect on the survival of animal life.

_____

SECTION 24.2 CARBOHYDRATES (pages 766-768)

This section describes the important structural characteristics of monosaccharides, disaccharides, and polysaccharides. It also lists the sources and uses for a number of important carbohydrates.

▶ Monosaccharides (pages 766–767)

1. Carbohydrates are made from aldehydes and ketones that contain many _____ groups.

2. Name the three elements present in carbohydrates.

a. _____ **b.** _____ **c.** _____

3. What is the general formula for a carbohydrate? _____

4. What is another name for simple sugars? _____

5. Circle the letter of each simple sugar.

a. glucose **b.** sucrose **c.** fructose **d.** starch

▶ Disaccharides and Polysaccharides (pages 767–768)

6. Sugars formed by linking two monosaccharides are called _____ .

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7. What compound is lost in the reaction that links two monosaccharides?

_____

8. Is the following sentence true or false? Sucrose, or table sugar, is formed by the polymerization of two glucose molecules. _____

9. What are polysaccharides? _____

_____

10. Complete the following table about polysaccharides.

Polysaccharide	Source	Function
starch		
		energy storage
	plants	

SECTION 24.3 AMINO ACIDS AND THEIR POLYMERS (pages 769–773)

This section explains how to write a general formula for an amino acid and describes the bonding between amino acids. It also describes the effect of enzymes on biochemical reactions.

▶ Amino Acids (pages 769–770)

1. What is an amino acid? How many amino acids are found in living organisms?

_____

_____

_____

2. What determines the physical and chemical properties of an amino acid?

_____

Match the amino acid to its abbreviation.

_____ **3.** Glutamine	**a.** Ile
_____ **4.** Isoleucine	**b.** Trp
_____ **5.** Methionine	**c.** Pro
_____ **6.** Proline	**d.** Gln
_____ **7.** Tryptophan	**e.** Met

▶ Peptides (page 770)

8. What is a peptide?

_____

_____

9. The bond between amino acids is called a(n) _____ bond.

10. Is the following sentence true or false? The bond between amino acids always involves the side chains. _____

11. The formula for peptides is written so that the free _____ group is on the left end and the free _____ group is on the right end.

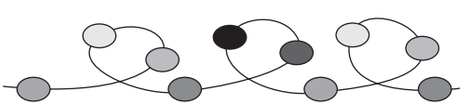
12. Is the following sentence true or false? The order of the amino acids in a peptide can be reversed and still represent the same peptide. _____

▶ Proteins (pages 770–771)

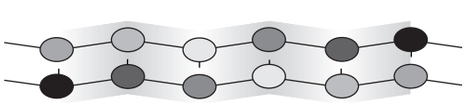
13. A(n) _____ contains more than ten amino acids, but a(n) _____ has more than 100 amino acids.

14. The chemical and physiological properties of a protein are determined by its _____ sequence.

15. Name each type of structure that can be formed by folding long peptide chains.



_____



_____

16. What types of bonds maintain the three-dimensional shape of a folded protein? _____

_____

17. Is the following sentence true or false? A single protein can be made from separate polypeptide chains, held together by bonds between side-chain groups. _____

▶ Enzymes (pages 772–773)

18. What are enzymes?

_____

Name _____ Date _____ Class _____

19. What three properties of a catalyst do enzymes have?

a. _____

b. _____

c. _____

20. Is the following sentence true or false? Because an active site fits a specific substrate, each enzyme catalyzes only one chemical reaction.

_____

21. What is the enzyme molecule joined to its substrate molecule called?

_____

Match the enzyme to its substrate.

_____ **22.** urease

_____ **23.** carbonic anhydrase

_____ **24.** catalase

a. carbonic acid

b. hydrogen peroxide

c. urea

25. What is a coenzyme? Give two examples. _____

_____

SECTION 24.4 LIPIDS (pages 775–777)

This section characterizes the molecular structure of triglycerides, phospholipids, and waxes. It also describes the functions of phospholipids and proteins in cell membranes.

▶ Triglycerides (pages 775–776)

1. Fats provide an efficient means of _____ for your body.

2. What are lipids? _____

3. Triglycerides are triesters of one _____ molecule and three _____ molecules.

4. Complete the following table about two types of triglycerides.

Triglyceride Type	State at Room Temperature	Primary Source
fats		
		plants

5. Circle the letter of the process used to make soap.

a. hydrogenation

b. saponification

c. denaturation

d. polymerization

▶ Phospholipids (pages 776–777)

6. What is the molecular structure of a phospholipid?

_____

7. How does the chemical nature of a phospholipid affect its solubility?

_____

_____

8. When phospholipids are added to water, they spontaneously form a lipid _____ , with the hydrophobic tails located in the _____ .

9. How does a cell membrane accomplish selective absorption?

_____

_____

_____

▶ Waxes (page 777)

10. What is the molecular structure of waxes?

_____

11. Is the following sentence true or false? Waxes are liquid at room temperature.

_____

12. Name two functions of waxes in plants.

_____

SECTION 24.5 NUCLEIC ACIDS (pages 778–785)

This section describes the structural components of nucleotides and nucleic acids, including DNA, and gives simple examples of genetic mutations. It also explains what is meant by recombinant DNA technology.

▶ DNA and RNA (pages 778–779)

1. What are the functions of the two types of nucleic acids?

_____

_____

2. The monomers that make up nucleic acids are called _____ .

Name _____ Date _____ Class _____

3. Name the three parts of a nucleotide.

a. _____ **b.** _____ **c.** _____

4. What nitrogen bases are found in DNA? in RNA?

_____

_____

5. DNA molecules consist of two chains of nucleotides that are bound together into a double _____ .

6. Name the complementary base pairs found in DNA.

a. _____ **b.** _____

▶ The Genetic Code (pages 780–781)

7. What is a gene?

_____

8. How many nucleotides are needed to code for one amino acid? _____

9. The _____ is the arrangement of code words in DNA that provides the information to make specific proteins.

10. Is the following sentence true or false? Each amino acid has only one DNA code word. _____

11. Use Table 24.2 on page 781. Which amino acids are coded in the nucleotide sequence TACAGCCTCGACAAG?

_____

12. Circle the letter of each code word that represents a termination signal.

a. ATT **b.** AAC **c.** ATC **d.** AAT

▶ Gene Mutations (pages 782–783)

13. Circle the letter of each event that could cause a gene mutation.

a. substitution of one or more nucleotides

b. addition of one or more nucleotides

c. deletion of one or more nucleotides

14. What is the effect of mutations on the production of proteins?

_____

_____

_____

15. Is the following sentence true or false? Diseases resulting from gene mutations are called inborn errors. _____

16. Name two diseases that are caused by mutations in the hemoglobin gene.

_____

▶ DNA Fingerprinting (pages 783–784)

17. DNA base sequences differ for everyone except _____ .

18. Complete the flowchart about DNA fingerprinting.

Obtain a small sample of DNA from _____ .

↓

_____ the amount of DNA by millions of times.

↓

Use _____ to cut the DNA into fragments.

↓

Separate and _____ the fragments.

↓

Compare the DNA fingerprint, or _____ , with a DNA sample from a known individual.

19. What are the disadvantages of DNA fingerprinting in criminal cases?

_____

_____

▶ Recombinant DNA Technology (pages 784–785)

20. Describe the three steps in the production of recombinant DNA.

a. _____

b. _____

c. _____

21. Name three medicines that are produced by recombinant DNA technology.

a. _____ **b.** _____ **c.** _____

22. What is a clone? _____

Name _____ Date _____ Class _____

SECTION 24.6 METABOLISM (pages 786–790)

This section describes the role of ATP in energy production and energy use in the cell. It also defines metabolism and explains the relationship between catabolism and anabolism.

▶ ATP (pages 786–787)

1. What is ATP and what is its function?

_____

2. Energy is captured when a _____ group is added to adenosine diphosphate (ADP).

3. **a.** How much energy is stored when one mole of ATP is produced? _____

b. How much energy is released when one mole of ATP is hydrolyzed back to ADP? _____

4. ATP is important because it occupies an _____ position between higher-energy _____ reactions and other cellular processes.

▶ Catabolism (pages 787–788)

5. The entire set of all chemical reactions that are carried out in a living organism is called _____ .

6. What is catabolism? _____

_____

7. Circle the letter of each product of catabolism.

a. heat **c.** complex biological molecules

b. ATP **d.** building blocks for new compounds

8. One of the most important catabolic processes is the complete oxidation of _____ to form _____ and water.

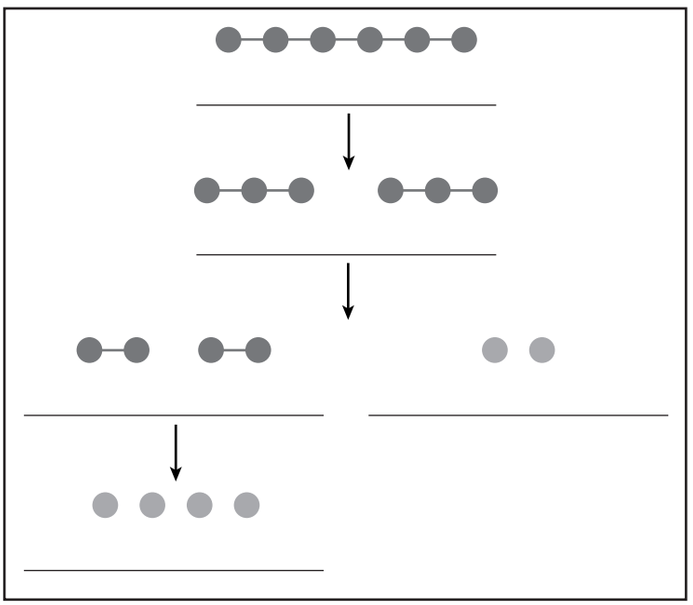
9. How much energy is released by the complete combustion of one mole of glucose? _____

10. How many moles of ATP are produced by the complete oxidation of one mole of glucose? _____

11. Is the following sentence true or false? All the reactions involved in the complete oxidation of glucose are shown in Figure 24.25.

_____

12. Use Figure 24.25 to fill in the names of the carbon-containing molecules and ions represented.



▶ Anabolism (page 788)

13. Anabolic reactions are _____ reactions that produce more-complex biological molecules.

14. Catabolic reactions _____ energy, whereas anabolic reactions _____ energy.

15. Look at Figure 24.26. Explain why all the terms that appear in the yellow ovals also appear in the blue ovals.

_____

_____

_____

▶ The Nitrogen Cycle (pages 789–790)

16. A family of plants called legumes reduces atmospheric nitrogen to ammonia in a process called _____ .

17. Certain bacteria reduce atmospheric nitrogen into ammonia in a process called _____ .

Name _____ Date _____ Class _____

18. How do nitrogen fertilizers enter the biosphere?

_____

_____

Reading Skill Practice

By looking carefully at photographs and drawings in your textbook, you can better understand what you have read. Look carefully at Figure 24.27 on page 789. What important ideas does this drawing communicate? Do your work on a separate sheet of paper.