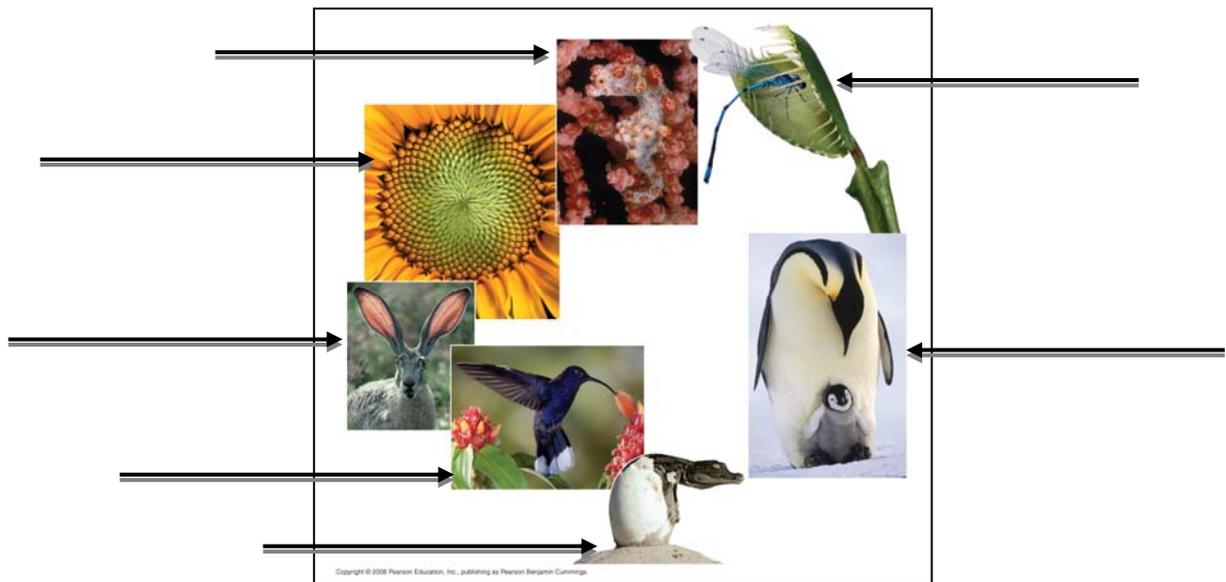


Name _____ Period _____

Chapter 1: Introduction: Themes in the Study of Life

Begin your study of biology this year by reading Chapter 1. It will serve as a reminder about biological concepts that you may have learned in an earlier course and give you an overview of what you will study this year.

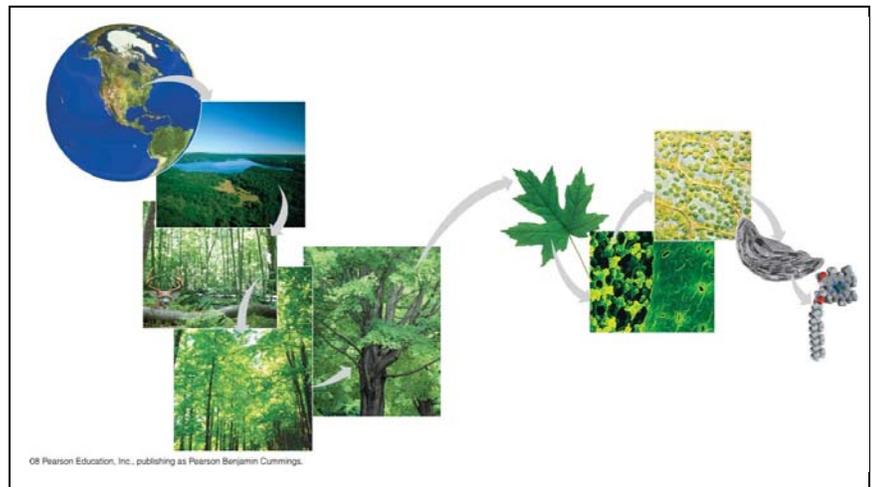
1. In the overview, Figure 1.3 recalls many of the properties of life. Label the seven properties illustrated here, and give a *different* example of each.



Concept 1.1 Themes connect the concepts of biology

2. What are **emergent properties**? Give two examples.

3. Life is organized on many scales. Figure 1.4 zooms you in from viewing Earth from space all the way to the level of molecules. As you study this figure, write in a brief definition of each level.



biosphere

ecosystem

community

population

organism

organs/organ systems

tissues

cells

organelles

molecules

4. Our study of biology will be organized around recurring themes. Make a list here of the themes that are presented, and give an example that illustrates each theme. Watch for these themes throughout your study this entire year. This will help you see the big picture and organize your thinking. (Go to the *Summary of Key Concepts* at the end of the chapter for a concise look at the themes.)

<i>Theme 1</i>	<i>Example</i>
<i>Theme 2:</i>	
<i>Theme 3:</i>	
<i>Theme 4:</i>	
<i>Theme 5:</i>	
<i>Theme 6:</i>	
<i>Theme 7: (Find it in 1.2.)</i>	

5. As you read this section, you will be reminded of things you may have studied in an earlier course. Since this material will be presented in detail in future chapters, you will come back to these ideas, so don't fret if some of the concepts presented are unfamiliar. However, to guide your study, define each of the terms in bold as you come to them.

eukaryotic cell

prokaryotic cell

DNA

genes

genome

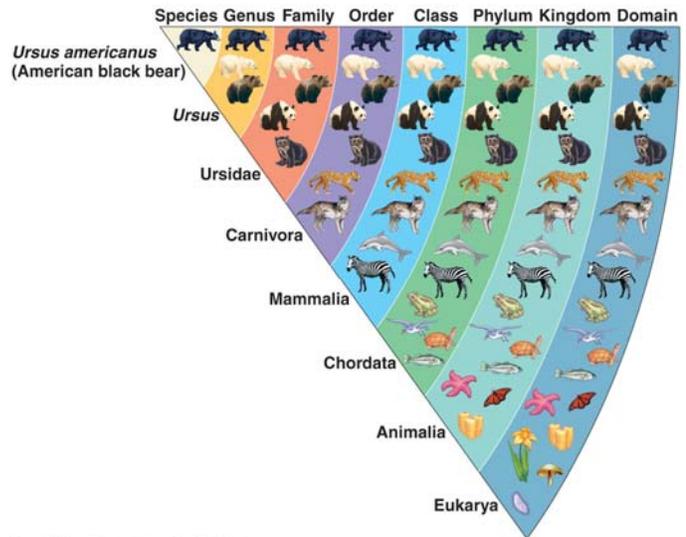
negative feedback/positive feedback

Concept 1.2 The Core Theme: Evolution accounts for the unity and diversity of life

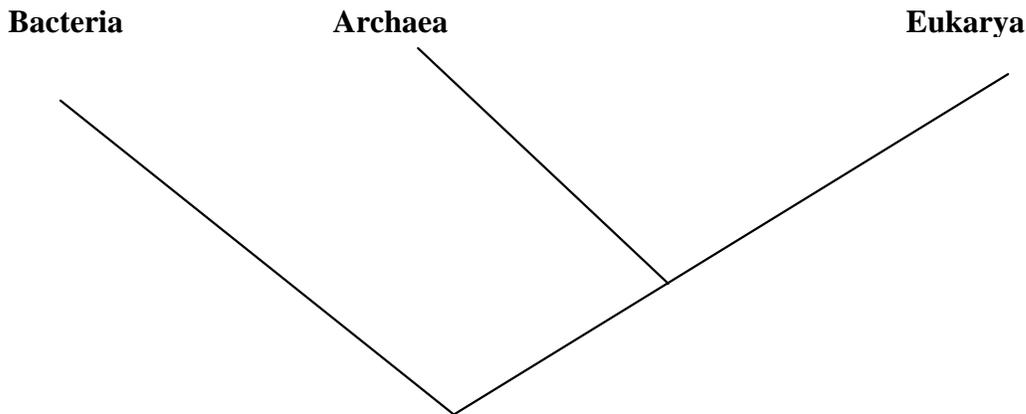
6. Life is organized into groups. Study Figure 1.14.

- Which level contains the greatest diversity of organism?
- The least?
- Write out the levels of organization in order.

- Most people use a mnemonic device to remember these levels. If you have one, write it here.



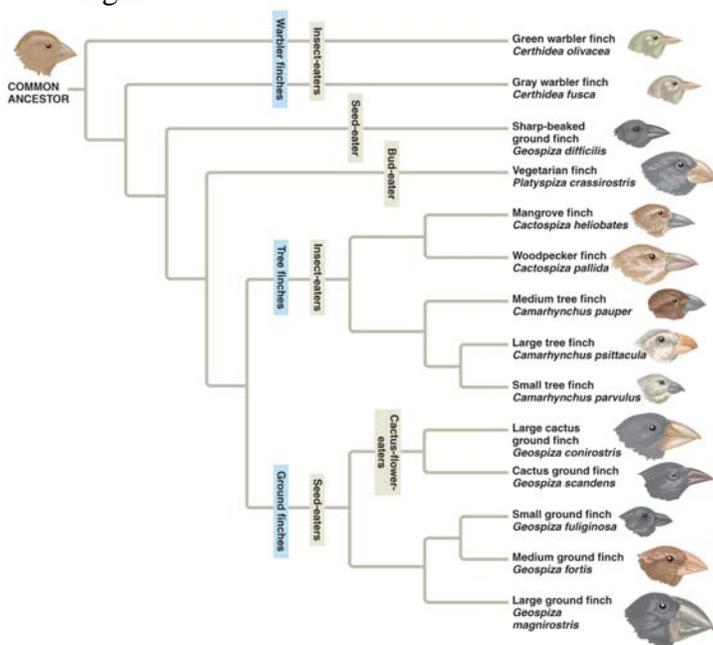
7. Taxonomy is the branch of biology that names and classifies organisms. Because of new molecular information, there have been many changes in placement of certain groups in recent years. Notice that all life is now organized in your text into 3 domains rather than the 5 kingdoms you may have learned earlier. Put the kingdoms mentioned in the text in the space above the proper domain names shown here.



8. What two main points were articulated in Darwin’s *The Origin of Species*?

9. What did Darwin propose as the mechanism of evolution? Summarize this mechanism.

10. Study Figure 1.22, which shows an evolutionary “tree.” What is indicated by each twig? What do the branch points represent? Where did the “common ancestor” of the Galápagos finches originate?



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Concept 1.3 Scientists use two main forms of inquiry in their study of nature

11. What are the two main types of scientific inquiry? Give an example of each.

12. What is *data*?

13. Distinguish between quantitative and qualitative data. Which type would be presented in a data chart and could be graphed? Which type is found in the field sketches made by Jane Goodall?

14. In science, how do we define *hypothesis*?

15. A scientific hypothesis has two important qualities. The first is that it is *testable*. What is the second?

16. Are scientific hypotheses proved? Explain your answer!

17. Look at Figure 1.24. Use it to write a hypothesis using the “If . . . then . . .” format.

18. What is a *controlled experiment*?

19. The text points out a common misconception about the term “controlled experiment”. In the snake mimicry experiment, what factors were held *constant*?

20. Why are supernatural explanations outside the bounds of science?

21. Explain what is meant by a scientific *theory* by giving the three ways your text separates a theory from a hypothesis or mere speculation.

1.

2.

3.

Testing Your Knowledge: Self-Quiz Answers

Now you should be ready to test your knowledge. Place your answers here:

1. _____

2. _____

3. _____

4. _____

5. _____

6. _____

7. _____

8. _____

9. _____

10. _____

Name _____ Period _____

Chapter 2: The Chemical Context of Life

This chapter covers the basics that you may have learned in your chemistry class. Whether your teacher goes over this chapter, or assigns it for you do review on your own, the questions that follow should help you focus on the most important points.

Concept 2.1 Matter consists of chemical elements in pure form and in combinations called compounds

1. Define and give an example of the following terms:
matter

element

compound
2. What four elements make up 96% of all living matter?
3. What is the difference between an *essential element* and a *trace element*?
essential element

trace element

Concept 2.2 An element's properties depend on the structure of its atoms

4. Sketch a model of an atom of helium, showing the electrons, protons, neutrons, and atomic nucleus.
5. What is the atomic number of helium? _____ Its atomic mass? _____
6. Here are some more terms that you should firmly grasp. Define each term.
neutron

proton

electron

atomic number

atomic mass

isotope

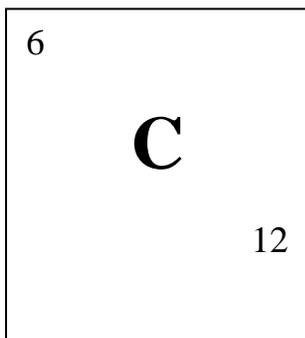
electron shells

energy

7. Consider this entry in the periodic table for carbon.

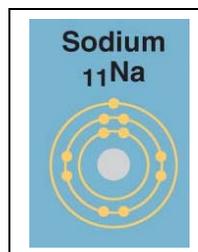
What is the atomic mass? _____ atomic number? _____

How many electrons does carbon have? _____ neutrons? _____



8. Which is the only subatomic particle that is directly involved in the chemical reactions between atoms?
9. What is *potential energy*?
10. Explain which has more potential energy in each pair:
- a. boy at the top of a slide/boy at the bottom
 - b. electron in the first energy shell/electron in the third energy shell
 - c. water/glucose

11. What determines the chemical behavior of an atom?
12. Here is an electron distribution diagram for sodium:
- a. How many valence electrons does it have? _____ Circle the valence electron(s).
- b. How many protons does it have? _____



Concept 2.3 The formation and function of molecules depend on chemical bonding between atoms

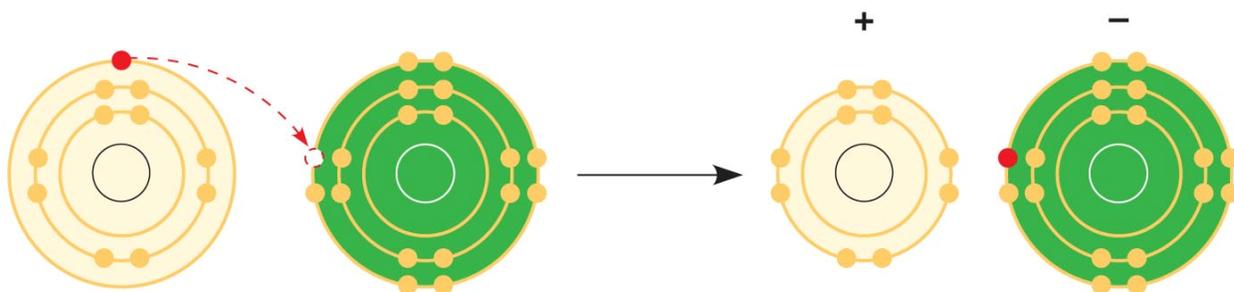
13. Define *molecule*.
14. Now, refer back to your definition of a *compound* and fill in the following chart:

	Molecule? (y/n)	Compound? (y/n)	Molecular Formula	Structural Formula
Water				
Carbon dioxide				
Methane				
O ₂			O ₂	

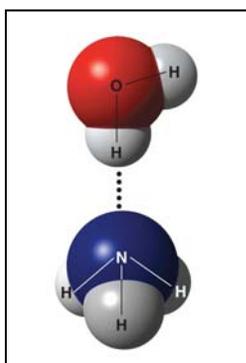
15. What type of bond is seen in O₂? Explain what this means.
16. What is meant by *electronegativity*?
17. Explain the difference between a *nonpolar covalent bond* and a *polar covalent bond*.

18. Make an electron distribution diagram of water. Which element is most electronegative? Why is water considered a *polar* molecule? Label the regions that are more positive or more negative. (This is a very important concept. Spend some time with this one!)

19. Another bond type is the *ionic bond*. Explain what is happening in the figure below (2.14):



20. What two elements are involved above?
21. Define *anion* and *cation*. In the preceding example, which is the anion?
22. What is a *hydrogen bond*? Indicate where the hydrogen bond occurs in this figure.



23. Explain *van der Waals interactions*. Though they represent very weak attractions, when these interactions are numerous they can stick a gecko to the ceiling!

24. Here is a list of the types of bonds and interactions discussed in this section. Place them in order from the strongest to the weakest: hydrogen bonds, van der Waals interactions, covalent bonds, ionic bonds.

STRONG



WEAK

25. Use morphine and endorphins as examples to explain why molecular shape is crucial in biology.

Concept 2.4 Chemical reactions make and break chemical bonds

26. Write the chemical shorthand equation for photosynthesis. Label the *reactants* and the *products*.
27. For the equation you just wrote, how many molecules of carbon dioxide are there? _____
How many molecules of glucose? _____ How many elements in glucose? _____
28. What is meant by *dynamic equilibrium*? Does this imply equal concentrations of each reactant and product?

Testing Your Knowledge: Self-Quiz Answers

Now you should be ready to test your knowledge. Place your answers here:

1. _____ 2. _____ 3. _____ 4. _____ 5. _____ 6. _____ 7. _____ 8. _____