



2.2 \_\_\_\_\_ [what is the title of the second section of the chapter]

**Learning Objectives.** By the end of this session, you will be able to:

1. \_\_\_\_\_

[Underline or highlight the task words in the learning objective above.]

- \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_
  - Fig 2.10 \_\_\_\_\_
- \_\_\_\_\_
  - Fig 2.11 \_\_\_\_\_
- \_\_\_\_\_
  - Fig 2.12 \_\_\_\_\_

**Key Terms**

---

---

---

---

---

---

---

---

2.3 \_\_\_\_\_

**Learning Objectives.** By the end of this session, you will be able to:

1. \_\_\_\_\_

2. \_\_\_\_\_

3. \_\_\_\_\_

4. \_\_\_\_\_

[Underline or highlight the task words in the learning objective above.]

- \_\_\_\_\_
- \_\_\_\_\_
  - Fig 2.13 \_\_\_\_\_
  - Fig 2.14 \_\_\_\_\_
- \_\_\_\_\_
  - Fig 2.15 \_\_\_\_\_
  - Fig 2.16 \_\_\_\_\_
- \_\_\_\_\_
  - Fig 2.18 \_\_\_\_\_
  - Fig 2.19 \_\_\_\_\_

**Key Terms**

---

---

---

---

---

---

---

---

---

---

- \_\_\_\_\_
  - Fig 2.20 \_\_\_\_\_
  - Evolution in Action \_\_\_\_\_
  - \_\_\_\_\_
  - Fig 2.21 \_\_\_\_\_
- \_\_\_\_\_
  - Fig 2.22 \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_

---

---

---

---

---

---

---

---

---

---

**Questions.** [Take the next few minutes to come up with some questions you have after previewing the chapter. What caught your attention? Were any of the words strange or interesting? The goal is to find the things you were most curious about to help keep your attention focused while you read the actual text.]

**Make a Plan.** [Use the space below to make a plan for when you will read the chapter and complete the reading guide. Consider breaking it up into two blocks of time, one for section 2.1 and 2.2, and a second session for section 2.3. Consider reviewing Spaced Study Sessions in the 'How To' guide.]

**READING ACTIVITY** Now that you are familiar with what is covered in this chapter and have a few questions, it's time to dig into reading. Check out the 'How To' guide for more information on using this guide.

**2.1 The Building Blocks of Molecules** [in 1-2 sentences summarize the paragraph first paragraph]

**Atoms.** Look back at the Learning Objectives for section 2.1, What should you be able to do after reading this section?

\_\_\_\_\_ matter and elements

There are many important terms introduced in this subsection. Using Figure 2.2 as a guide, draw an atom, and label all of its parts. Write descriptions of each piece as you go and try to connect these terms to the concept of matter and elements. [TIP: consider using different colors for the different parts.]

**Evolution in Action: Carbon Dating**

Carbon dating is an excellent way to explore isotopes (and radioisotopes). Watch the video → and read the sections on isotopes and the Evolution in Action box, then paraphrase below.

[TIP: If you still have questions, be sure to highlight them below so you can seek further help with this topic.]



Isotope Simulator

**Chemical Bonds.** Look back at the Learning Objectives for Section 2.1, What should you be able to do after reading this section?

\_\_\_\_\_ the interrelationship between protons, neutrons, and electrons, and the ways in which electrons can be donated or shared between atoms

Watch the video at right and read page 33 of the textbook and summarize it below.

[REMEMBER: to write a summary, paraphrase each paragraph in 1-2 sentences.

Pay special attention to bolded terms.]

Start Here:  
Chemistry  
Overview



**Types of Chemical Bonds.** Explore the four types of chemical bonds by completing the table below. Define each type of bond and use the corresponding figures to help you draw out the bond. Be sure to label where and how the bond holds two atoms together. Use the box at the bottom to describe the similarities and differences for the bonds.

Video	Ionic:	Covalent (Figure 2.6):
 Ionic v. Covalent		
 Hydrogen Bonds	Hydrogen (Figure 2.7):	van der Waals Interactions:
Compare the types of bonds [TIP: include any questions you still have]:		

## 2.2 Water

Look back at the Learning Objectives for Section 2.2.  
What should you be able to do after reading this section?

Start Here:  
Water  
Overview



\_\_\_\_\_ the properties of water that are critical to maintaining life.

**Properties of Water.** Watch the video and read pages 34–37, then complete the table below.

Property of Water	Description in your own words
Water is Polar	
Water Stabilizes Temperature	
Water is an excellent solvent	
Water is cohesive	

**Buffers, pH, Acids, and Bases.** Read this last subsection on pages 37–38 and summarize below. You may also find it interesting to watch the experiment to the right. It's an easy one to do at home that will be enjoyed by all!

pH Indicator  
Experiment  
that you can  
do at home



**Congratulations!** You've finished 2.1 and 2.2. Now take a moment and reflect on what you've learned. Look back over the activity and see if you have any questions or if there is anything you want to ask about during the next class, in office hours, or on a class discussion board. Put them in the box below.

	<p><b>Planning:</b> Make a plan to complete Sec. 2.3. <b>[TIP:</b> take a 15-minute break before starting the next section]</p>
--	---

This is a good place to stop and take a break. Go out for a walk, do a short meditation, rest your eyes and drink some water. Keep those neurons fueled!

## 2.3 Biological Molecules [in 1-2 sentences summarize the paragraph that begins, 'The large molecules']

**Carbon and Carbon Bonding.** Look back at the Learning Objectives for Section 2.3. What should you be able to do after reading this section?

\_\_\_\_\_ the ways in which carbon is critical to life.

Carbon and its bonding were topics in the 'Chemistry Overview' video in the Chemical Bonding section. Consider reviewing the video before starting this section. Then read the sections on Carbon and Carbon Bonding (page 39) and answer the Learning Objective by summarizing how carbon is critical to life below.

Your book has a series of sections on the biological macromolecules. Before you read through these sections, watch the video at right, and describe the four major types of biological molecules in the table below. This will also answer the third Learning Objective for this section.



### Overview of the four major types of biological molecules:

Biological Molecule	Description [TIP: draw the basic structure]

Look back at the Learning Objectives for Section 2.3. We're moving through the learning objectives a little out of order. This next section is going to address the specific function of each of the four biological molecules. What should you be able to do after reading this section?

\_\_\_\_\_ the functions of the four major types of biological molecules

**Carbohydrates.** Read the section on carbohydrates (pages 40-42).

Define the following terms and then summarize the section in the table below.

[TIP: Even if you aren't required to draw the different sugars, consider drawing them here. The act of drawing the structures will build stronger neural connections, which will enhance your understanding and memory of the topic.]

Monosaccharides	
Disaccharides	
Polysaccharide	
Starch	
Glycogen	
Cellulose	
Chitin	
Summary and any questions you have:	

**Lipids.** Define these important terms with examples, and where indicated, compare and contrast the types of lipids.

Lipid:	
Fat:	Compare to Oil:
Triglyceride:	
Saturated fatty acids:	How do these two differ?
Unsaturated fatty acid:	
Hydrogenation (trans-fat):	
Phospholipid:	Compare to a Triglyceride:
Steroid:	
Wax:	
Questions:	

**Proteins** have many different functions, check out the video, and read the section on proteins (page 45–48). List the range of functions, be sure to include enzymes and hormones and go into more detail about their specific functions:



All proteins are made up of different arrangements of the same 20 kinds of amino acids. Complete the table below.

Describe and draw the basic structure of an amino acid and label the different parts:	Describe the different types of R groups:
Describe how individual amino acid monomers join (bond) to form polypeptides.	

Protein shape is critical to its function.

Describe the factors that impact protein shape:	Describe the levels of protein structure:
---	---



Look back at the Learning Objectives for Section 2.3. What is the task for the second Learning Objective? Check out the video at left for a cool example of this Learning Objective.

\_\_\_\_\_ the impact of slight changes in amino acids on organisms.

Describe the possible impacts of a single amino acid change on a living organism.

--

**Nucleic Acids** have a critical function in living organisms. What are the two types of nucleic acid and what are their functions:

Draw the structure and label the parts:	Draw the structure and label the parts:
How do the two types of nucleic acid differ from each other structurally?	

**DNA Double-Helical Structure.** Describe the double-helix and how it was discovered.  
[HINT: you will need to watch the video to complete the second part].

	
--	---

**Congratulations!** You've finished the last section of chapter 2. Now take a moment and reflect on what you've learned. Look back over the activity and see if you have any questions or if there is anything you want to ask about during the next class, in office hours, or on a class discussion board. Put them in the box below.

--

**Reflection.** Good job, you finished the first reading guide for Concepts of Biology. This type of learning is often new to students and can take time to become accustomed to the amount of effort needed to learn the material.

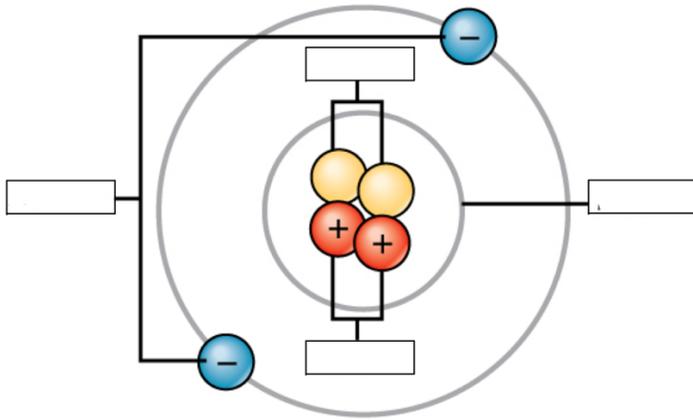
Take a few minutes to think and write about your experience with this first chapter.

**Planning.** Students new to taking science courses often underestimate the amount of time that will be needed to prepare for class and complete the assignments. Take a few minutes and plan for the next week or so, when can you make time to do practice problems for Chapter 2? When will you be able to start working on Chapter 3? By keeping a plan, you'll find it easier to see if you're getting your work done. [See the 'How To' guide for an example.]

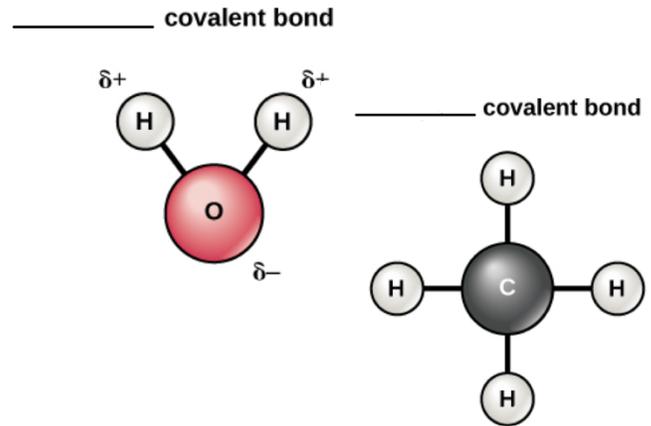
Research shows that multiple rounds of retrieval practice are more effective than rereading the chapter. Complete the three retrieval activities in separate sessions. They will be most effective if spaced out. They also increase in difficulty as you go, so be sure to complete them in order and without referring to your notes. Treat this as a quiz, anything you aren't able to answer, you can look up after you finish.

**RETRIEVAL ACTIVITY #1**

1. Label the parts of an atom:



2. Indicate the type of chemical bond:



3. List the four properties of water that are critical to maintaining life:

- \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_

4. Define:

pH: \_\_\_\_\_

Acid: \_\_\_\_\_

Base: \_\_\_\_\_

Buffer: \_\_\_\_\_

5. Answer the following questions about the biological macromolecules:

- a) An amino acid is a monomer of \_\_\_\_\_
- b) This macromolecule consists of a phosphate group, a sugar, and a nitrogenous base: \_\_\_\_\_
- c) This macromolecule is hydrophobic: \_\_\_\_\_
- d) This macromolecule provides energy to animals and structure to plants: \_\_\_\_\_

**Reflect and Review** Now that you've finished the first retrieval exercise correct your work, refer to the book, and your Reading Activity answers. List any of the topics you were not able to recall in the box below; these are areas you need to spend more time reviewing. This exercise focused on **direct recall of knowledge**, a good way to improve this level of information is by using flashcards with definitions, and outlines of the lists.

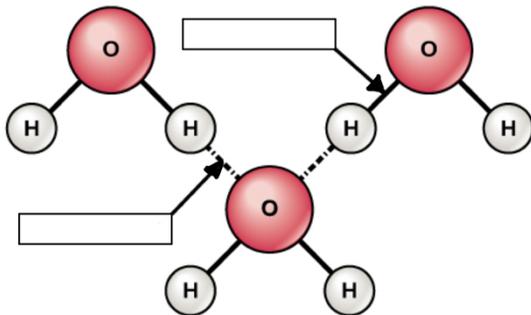
	Plan when you'll do the next exercise:
--	--

**RETRIEVAL ACTIVITY #2** Before beginning this activity, make sure you have reviewed any of the content you had trouble with on the previous activity. This activity focuses on the next level of content knowledge: **Understanding**, which means you need to have more than just a grasp of the definitions.

1. There are four types of chemical bond, list and define them, taking care to describe how the electrons are shared.

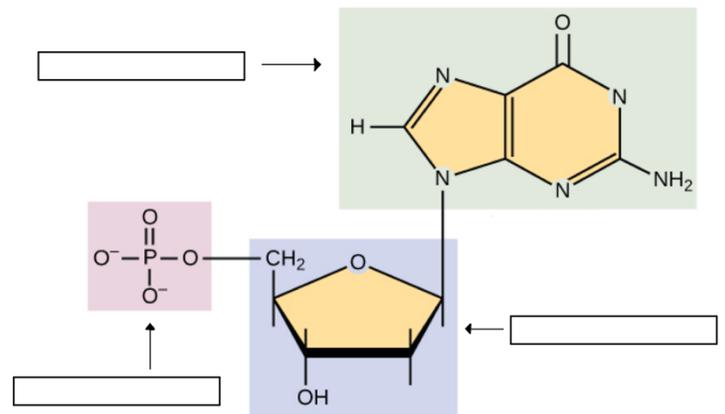
- \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_

2. There are two types of bonds shown in the figure below, label them.



3. Define: **hydrophilic** and **hydrophobic**:

4. Label the parts of a nucleic acid:



5. Complete the Table:	Carbohydrates	Proteins	Lipids	Nucleic Acids
Monomers (single units)	Sugar molecules, like glucose			
Name the Polymers		The polymer of protein is a polypeptide		
Major Function(s)			Form cell membranes and signaling molecules like testosterone and estrogen	

**Reflect and Review** Correct your work. If you had any difficulty with the questions above, indicate the topics you want to review in the box below. This exercise focused on your **understanding** of the chapter content. Activities you can do to improve this level of knowledge include: making concept maps, writing about the different topics in your own words without referring to your notes, creating a study guide, and finding a friend to talk about the chapter with.

	Plan when you'll do the next exercise:
--	--

**RETRIEVAL ACTIVITY #3** Before beginning this activity, make sure you have filled any gaps in your knowledge that were revealed by the previous two retrieval activities. This activity focuses on your ability to **apply** what you have learned. An excellent way to prepare for this third activity is to pretend you are going to be teaching this chapter to a class or your study group partners. Review examples provided and try to come up with some of your own.

1. Describe the role hydrogen bonding plays in the properties of water that are critical to maintaining life:

2. Compare and contrast the function of carbohydrates in animals and plants:

3. Fats are often regarded as bad for your health, explain why this is a common misconception, and explain why some fats are not only good for you but essential to your health:

4. Proteins consist of chains of amino acids; the properties of these amino acids determine the shape and function of the protein. Describe the potential consequences if one amino acid is changed and include an example:

5. There are two types of nucleic acid, DNA and RNA. Explain how they differ structurally and their function in the cell:

**Reflect and Review** Congratulations, you have finished the last and most difficult of the retrieval exercises. Now your task is to correct your work. You may not be able to find all of the exact answers in the book or your notes. An excellent way to work through this last activity is to get together with a group from your class and discuss your answers. Explain to each other why you think your answer is correct. At the end, if you have any that you are uncertain about or have more questions, write them in the box below and bring them to class, office hours, or your campus tutoring center.

Questions you still have:

**Reflection** Think about your experience with chapter 2, did you plan enough time to learn the material? Are there any new study strategies you want to try to chapter 3? What are your goals for Chapter 3?

**Make a Plan** In the box plan when you are going to work in time to start chapter 3 (it's quite long) and continue to review chapters 1 and 2. One of the keys to success on exams is to practice regularly and to keep looking over past material. That will make studying for your exams much easier since you won't be relearning the material.

