Name: _____ Period: _____ Date: _____

Basic Chemistry (for Biology), Student Learning Guide

Getting to the tutorials.

- Go to www.sciencemusicvideos.com; Use the College Bio, AP Bio, or Learning Guide Menus to find "Basic Chemistry"
- Start with "1. Basic Chemistry Overview and Prequiz"

Note from Mr. W: The videos in these tutorials incorrectly use the term "orbitals" to describe "electron energy levels" (also known as "shells" or "orbits."). So when you hear "orbital," think "energy level" or "shell."

Introduction: Basic Chemistry Overview and Prequiz

1. Skim the introduction, and answer the following questions

a. Biology is the science of _____. Chemistry is the study of _____.

Write a one sentence summary of the two examples showing how biology is based on chemistry:

Example 1:

Example 2:

2&3. Skim the outline. Take the quiz. ***Make sure that you're logged in.***

Follow the link to "Atoms (the first…)"

Tutorial 1: Atoms

If you haven't already done so, watch the movie

Section 1. *Complete the* Interactive Reading: Understanding Atoms. *As you do, answer the questions that follow:*

1. What are atoms? How small are they?

2a. Complete the following table:

Particle	Charge	Location in the atom
proton		
neutron		
electron		outside the nucleus

2b. What's an energy level?

2c. . What's the relationship between the number of protons and number of electrons:

3a. What's an element?

3b. What's the chemical symbol for Carbon: _____; Gold:_____; Nitrogen:_____.

Section 2: Read the about the Periodic Table.

4a. What changes as you move from left to right in each row of the periodic table?

4b. **Fill in and complete:** The elements in the same column have similar _____ because …

Section 3. Complete the Quiz about the periodic table. It took you _____ tries to answer all 4 questions correctly.

Section 4: Read The Summary: Eight Things To Know…

Section 5: Flashcards. When you can complete every card perfectly, put a smiley face in this box.

☐

Tutorial 2: Drawing Atoms

Either follow the link from Tutorial 1, Atoms, or

1. Go to sciencemusicvideos.com, 2. Click on "4. Basic Chemistry…". From the next menu, click "3. Drawing Atoms"

Section 1. Drawing the Simplest Atoms…

1.1. What's the most common element in the universe?

1.2. In the space below, copy the diagram of the hydrogen atom.

1.3. BEFORE clicking "show the answer," draw a helium atom. Then check your work.

Section 2. The Octet Rule

In the space below, complete the following:

2.1. The first energy level can hold up to _____ electrons

2.2. The second and third energy levels can hold up to _____ electrons

2.3. BEFORE clicking "show the answer," draw a lithium atom. Then check your work.

Read about the simplified way of drawing atoms, and study the diagram of lithium

2.4. BEFORE clicking "show the answer," draw a boron, carbon, and nitrogen atom. USE THE NEW WAY OF REPRESENTING the nucleus, as shown for lithium. Then check your work.

Boron:

Carbon:

Nitrogen:

2a. Elements 3 through 10…

Study the table and make sure you understand it. When you understand, check this box.

☐

2b. Elements 11 through 20…

2b.1. BEFORE clicking "show the answer," draw an aluminum atom. Then check your work.

2b.2. Study the tables of elements 11 through 20. Make sure the electron arrangement makes sense. If it does, check this box.

☐

Section 3. Review

Read the four items in this section. If you completely understand them, check this box.

☐

Section 4. Checking Understanding (Flashcards). Complete your drawings in the spaces below. Show the nucleus and all electrons in the proper energy levels

4.1. Draw carbon	4.2. Draw sodium
4.3. Draw oxygen	4.4. Draw phosphorus
4.5. Draw potassium	4.6. Draw nitrogen

5. Quiz: Structure of Atoms. Go through the quiz until you can get every question right on the first try. Then check this box

☐

If your instructor is available, call him/her over for a high 5, additional praise and more positive reinforcement.

Next step: follow the link to **Elements, Compounds, and Molecules**

If this is a new session, then 1. Go to www.sciencemusicvideos.com,
2. Click "AP Biology," then "Module 3. Basic Chemistry," then select

Tutorial 3: Elements, Compounds, Molecules, and Formulas

1. Introduction

Read the introduction. When you're done, check this box. ☐

2. Learning the Symbols

Read the text and work the flashcards. When you've mastered the flashcards (100% mastery) check this box.
☐

3. Interactive Reading: Compounds, Molecules, and Formulas.

Read the following questions first. Answer as you go…
3.1. What's a compound?

3.2. What's a molecule?

3.3. The chemical formula $C_6H_{12}O_6$ tells you that in a molecule of this compound, there are _____ atoms of _____, are _____ atoms of _____, and are _____ atoms of _____.
3.4. What's a chemical formula?

4. Compounds, Molecules, Formulas Flashcards

When you've mastered the flashcards (100% mastery) check this box. ☐

Continue to Tutorial 4: Ionic Bonds

1. Atoms are only "happy" when…

1.1. Copy the diagram of the argon atom.

List the three conditions that make atoms happy:
1. _____
2. _____
3. _____

1.2-1.3. Draw sodium (11p, 12n, 11e). Then click "show the answer" to check your work.

Why is sodium unhappy?

1.4 – 1.5. Draw chlorine (17p, 18n, 17e). Then click "show the answer" to check your work.

Why is chlorine unhappy?

1.5 Do the matching. When you get it right, check this box.
☐

1.6 Flashcards: Happy and Unhappy Atoms. Record your answers below

Element	Happy/ Unhappy	Reason
Neon		
Lithium		
Fluorine		
Potassium		
Argon		

2. Ionic Bonding Involves Trading Electrons

Read the text and complete the sentences below to very briefly explain how the bond between sodium and chlorine comes about:
First, sodium gives_____

This makes both atoms happy because they
_____

Sodium gains a charge of _____

Chlorine gains a charge of _____

The sodium ion and chlorine ion stick together because
_____
_____

In the space below, copy the diagram "Ionic Bonding 4"

2.8. COMPLETE: A salt crystal is actually ….

3. A few more points about ionic bonding

Read the text and answer the questions below.

3.1. Atoms will trade _____, ____, and even _____ electrons, but never _____.

3.2. If an atom loses one electron, its charge will be _____. If an atom gains an electron, its charge will be _____.

3.3-3.5. Read these examples.

3.4. Why does a magnesium ion have a + 2 charge?

3.5 Copy the diagram of Sodium Sulfide, Na_2S

4. Checking Understanding

Repeat the quiz until you get 100%. Then put a smiley face, a pumpkin, or a checkmark in this box.

☐

If your teacher is available, call him or her over for additional positive reinforcement.

5. The Importance of Ions…

5.1. Why are ions important when you feel or think?

5.2. Why are ions important to the shape of molecules like myoglobin?

Continue to Tutorial 5: Covalent Bonds

1. In covalent bonds, atoms share electrons

1.1.Why is a hydrogen **atom** unhappy?

In the space below, draw a hydrogen **molecule**.

What's holding these two atoms together?

1.2. Draw methane (make your drawing very small). Then click "show the answer" to see if you got it right.

2. Structural Formulas

2.1-2.3.Use the information and diagrams to complete the table below:

Structural Formula	Structural Formula
Hydrogen gas (H_2)	Methane (CH_4)

2.4. Draw ethane. Then click "show the answer" to see if you got it right.

Structural Formula	Diagram showing Energy Levels
Ethane	Ethane

3. Single, Double, and Triple Bonds

From the examples and diagrams, draw one molecule that shows single bonds, a second that shows double bonds, and a third that shows triple bonds. Draw the structural formula of the entire molecule, and label it.

single bond	
double bond	
triple bond	

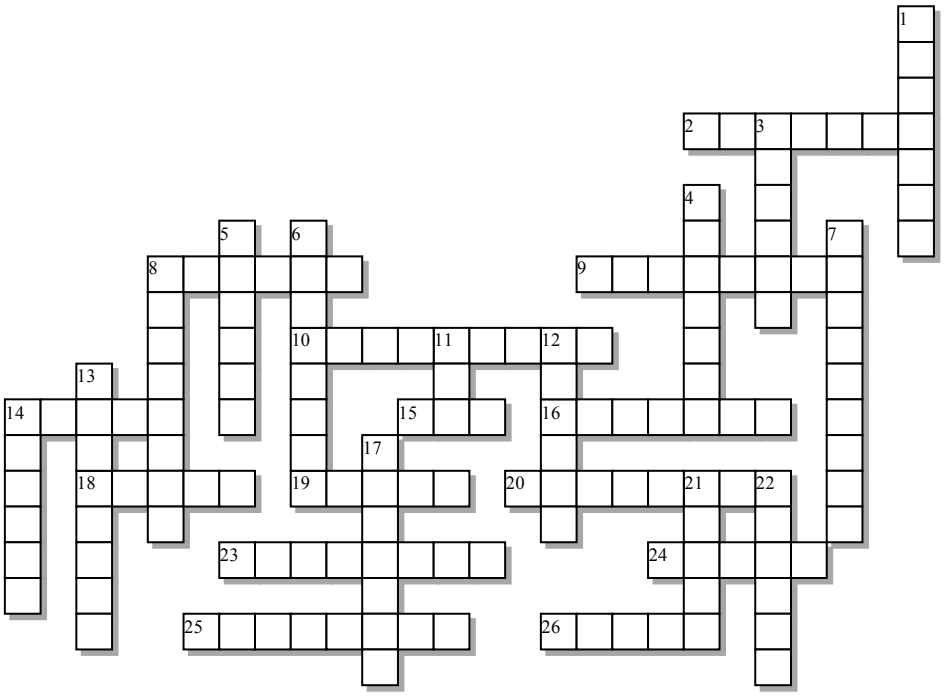
5. Checking Understanding

When you've mastered the flashcards (100% mastery) check this box. ☐

LAST STEP: Take the Basic Chemistry Final Quiz (# 7 on the Basic Chemistry Menu)

This score counts. Take the quiz until you get 100%. Then check this box. ☐

Chemistry for Biology Students



Across:

2 - A substance that cannot be chemically broken down into a simpler substance
8 - This is element number six, and it's the most important element in living things.
9 - The most common element in our universe
10 - Negatively charged sub-atomic particles found outside the nucleus
14 – An energy level can also be referred to as an electron _____.
15 - When an atom gains or loses an electron, it becomes a charged _____.
16 - When a carbon atom bonds with four hydrogen atoms, it forms _____, the main molecule in natural gas.
18 - A bond formed when atoms trade electrons
19 - In an uncharged atom, the number of electrons is _____ to the number of protons.
20 - Sub-atomic particles in the nucleus that lack an electrical charge
23 - In the periodic table, the vertical columns represent chemical _____: elements with similar chemical properties.
24 - The building blocks of matter
25 - A substance composed of two or more atoms that are chemically bonded together
26 - The second and third energy levels of an atom can hold up to _____ electrons.

Down:

1 - Positively charged sub-atomic particles in the nucleus
3 - Electrons are found in _____ levels.
4 - A chemical _____ shows the number of atoms of each element that make up a molecule.
5 - A _____ bond forms when atoms share three pairs of electrons
6 - The smallest piece of a compound that still has all the properties of that compound
7 - As you move from left to right in the periodic table, the atomic number _____.
8 - A bond formed when atoms share electrons
11 - The first energy level's capacity is _____ electrons.
12 - An element's atomic _____ tells you how many protons are found in its nucleus.
13 - This table organizes the elements.
14 - A _____ bond involves one shared pair of electrons.
17 - The part of the atom that contains protons and neutrons
21 - The _____ rule explains how electrons are organized into energy levels.
22 - Every element is represented by a one or two letter chemical _____.

Possible Answers:

Atoms, Carbon, Compound, Covalent, Eight, Electrons, Element, Energy, Equal, Families, Formula, Hydrogen, Increases, Ion, Ionic, Methane, Molecule, Neutrons, Nucleus, Number, Octet, Periodic, Protons, Single, Symbol, Triple, Two, shell