

Diagnostic/Introductory Activity



Word Search

Find any 10 of the first 20 elements.

Q H Z S B N Q J B C N P K M A
A M M O O A O E C H E H H U A
T L R U X D R E V L G O N I D
I O U E I Y I Z N O O S M L L
N U P M L S M U N R R P D E V
L F J L I E S E M I D H N H C
M U I S E N G A M N Y O U R T
M U Q R O O U S T E H R C O S
M T F B R W U M E O S U K I U
B U R T O X Y G E N P S L V L
O A I F L O U R I N E I X A F
C N D H N Q F M U I C L A C U
P E T T T H I P K O G A Z A R
D K G K Z I E A N A Q E R J T
E S M W X R L N O G R A K X N

ALUMINUM
ARGON
BERYLLIUM
BORON
CALCIUM
CARBON
CHLORINE
FLOURINE
HELIUM
HYDROGEN
LITHIUM
MAGNESIUM
NEON
NITROGEN
OXYGEN
PHOSPHORUS
POTASSIUM
SILICON
SODIUM
SULFUR



Symbols, Formula, and Models

Suggested time: 1.2 Hours

What's important in this lesson:

- write symbols/formulae for some common elements and compounds (e.g., H, Mg, S, N and NaCl, O₂, H₂O, CO₂);
- construct molecular models of simple molecules (e.g., H₂, O₂, H₂O, NH₃, CH₄, CO₂).

Complete these steps:

1. Complete the Diagnostic/Introductory Activity. Get this checked as being completed on your Course Checklist.
2. Get a textbook or a Periodic Table and get started on the student handout. If you are having difficulty with a section, note this in the section below: Questions for teacher and move on to the next activity in your student handout.
3. Once the student handout is complete check your answers or your teacher will with the Answer Key. Get this checked as being completed on your Course Checklist.
4. You'll need at least 10-15 minutes to complete the quiz on the material you've reviewed today. If you've got at least that much time ask your teacher for the quiz and hand the quiz in when you're done. If you don't have enough time move on to the Reflective Activity and try the quiz next day.
5. Complete the Reflective Activity. Get this checked as being completed on your Course Checklist.

Hand-in the following to your teacher:

1. The lesson quiz.

Questions for the teacher:



Symbols, Formula, and Models

Chemical Symbols and Formulas

A chemical symbol is a one or two letter abbreviation for each element. The first letter is always capitalized and if a second letter is present it is always lower case. For example the chemical symbol for cobalt is Co. The chemical symbols for each element can be found on the Periodic Table of the Elements. Your teacher may have given one or you may need to find one in *Science 9 Concepts and Connections* pg 314 of *Science 9 inside back cover*.

- Find the chemical symbol for the following elements.

helium	sodium
sulfur	chlorine
silicon	argon
silver	lead

- Find the elements that have the following symbols

H	I
O	Ni
C	Ca
K	Kr

- Determine the word hidden in the element code. Using only chemical symbols for the elements decode the following:

carbon oxygen indium	C O In	coin
polonium iodine sulfur oxygen nitrogen		
barium selenium		
potassium nickel iron		
barium lanthanum nitrogen cerium		

Student Handout: Unit 1 Lesson 3



Just as chemical symbols can be used to represent elements, combinations of symbols can be used to represent compounds. For example water, H_2O , is a compound made of 2 hydrogen and 1 oxygen. Hydrogen peroxide a disinfectant has the formula H_2O_2 . This compound is made of 2 oxygen and 2 hydrogen.

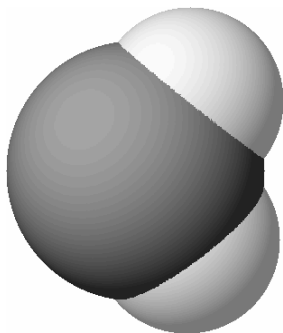


Figure 1 H_2O

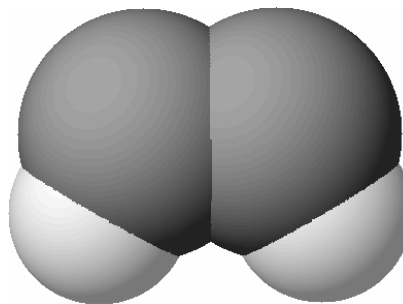


Figure 2 H_2O_2

4. Complete the table below

Name	Formula	No. and type of atoms
water	H_2O	1 oxygen, 2 hydrogen
table salt	$NaCl$	
methane	CH_4	
acetic acid (vinegar)	$C_2H_4O_2$	
calcium carbonate	$CaCO_3$	
ammonium nitrate	NH_4NO_3	
carbon monoxide		1 carbon, 1 oxygen
carbon dioxide		1 carbon, 2 oxygen
glucose		6 carbon, 12 hydrogen, 6 oxygen



How Elements Combine

Atoms are rarely found alone, they often combine with others to form compounds. You have probably noticed by now the number of atoms varies from compound to compound. The number of atoms in a compound is determined by the combining capacity of the elements involved. These combining capacities are listed in Tables 2 and 3: Combining Capacities.

In the example below, calcium has a combining capacity of 2 (hence 2 hooks), and chlorine has a combining capacity of 1 (hence 1 hook). If one calcium atom combined with just one chlorine, then calcium would be unsatisfied as in Figure 3. However if a second chlorine is added, both substances are satisfied as in Figure 4. Hence the formula for calcium chloride is CaCl_2 .

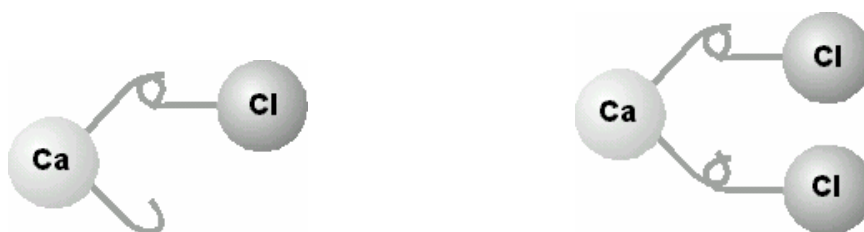


Figure 3 Unsatisfied “Ball and Hook” Model Figure 4 Satisfied “Ball and Hook” Diagram

When naming a chemical the metal part is listed first and the non-metal part second. The ending of the non-metal always finishes with “ide”. As a result CaCl_2 is called calcium chloride. See table 3 for other examples of the “ide” ending.

Table 2 Combining Capacity of Some Metals

Element	Symbol	Combining Capacity
silver	Ag	1
sodium	Na	1
potassium	K	1
zinc	Zn	2
calcium	Ca	2
aluminum	Al	3

Table 3 Combining Capacity of Some Non-metals

Element	Symbol	Combining Capacity	Compound Name
chlorine	Cl	1	chloride
bromine	Br	1	bromide
hydrogen	H	1	hydride
iodine	I	1	iodide
sulfur	S	2	sulfide
oxygen	O	2	oxide
nitrogen	N	3	nitride
carbon	C	4	carbide

Student Handout: Unit 1 Lesson 3



5. Complete Table 4 by providing the missing information. Be sure to use Tables 2 and 3 to determine the correct formula and drawing the “Ball and Hook” model.

Table 4 Chemical Formulas

Name	Formula	Ball and Hook Model
calcium oxide	CaO	
	AlCl ₃	
	Na ₂ O	
	ZnBr ₂	
silver bromide		
sodium sulfide		
silver oxide		
aluminum oxide		

In some compounds two non-metals can combine such as in water, H₂O, and in some situations non-metals can combine with themselves to form diatomic (2-atom) molecules

Student Handout: Unit 1 Lesson 3



such as H_2 , and O_2 . Drawing these compounds follow the same rules, every atoms combining capacity must be filled.

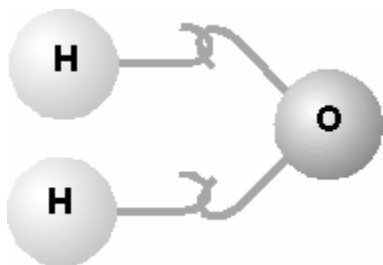


Figure 5 Ball and Hook Model of H_2O

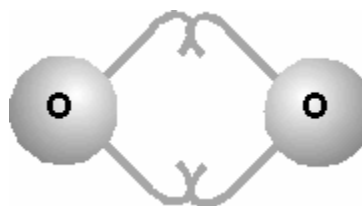


Figure 6 Ball and Hook Model of O_2

6. Draw the Ball and Hook Model of some of the following common compounds

Table 5 More Molecular Models

Common name	Formula	Ball and Hook Model
ammonia	NH_3	
methane	CH_4	
carbon dioxide	CO_2	
hydrogen gas	H_2	
nitrogen gas	N_2	

Assessment and Evaluation: Unit 1 Lesson 3



Modified True/False

Indicate whether the sentence or statement is true or false. If false, change the identified word or phrase to make the sentence or statement true.

- ___ 1. The chemical symbol for sodium is S.
- ___ 2. Hydrogen atoms and oxygen atoms always combine in a 2:1 ratio in water

Short Answer

3. State the number and types of atoms present in the following molecules: potassium sulfate (K_2SO_4) and sodium bicarbonate ($NaHCO_3$).
4. Complete the table below. The combining capacities are available at the end of this quiz on Tables 1 and 2 to help you.

formula	name	ball and hook model
ZnS		
	aluminum iodide	
	oxygen gas	

Assessment and Evaluation: Unit 1 Lesson 3



5. The following molecule was constructed using a model kit. The colours represent different elements. White - hydrogen, Black - oxygen and Gray - carbon. Give the formula of this molecule

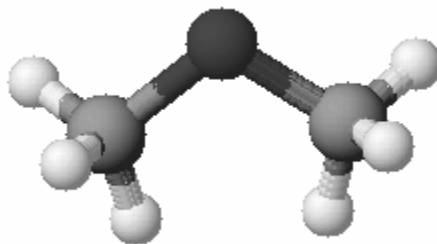


Table 1 Combining Capacity of Some Metals

Element	Symbol	Combining Capacity
silver	Ag	1
sodium	Na	1
potassium	K	1
zinc	Zn	2
calcium	Ca	2
aluminum	Al	3

Table 2 Combining Capacity of Some Non-metals

Element	Symbol	Combining Capacity	Compound Name
chlorine	Cl	1	chloride
bromine	Br	1	bromide
iodine	I	1	iodide
sulfur	S	2	sulfide
oxygen	O	2	oxide

Reflection Activity: Unit 1 Lesson 3



Elements have been named for many reasons. Using a Periodic Table of the elements, find one example of each of the following. There is a Periodic Table on the back cover of either *Science 9* or *Science 9 Concepts and Connections*.

(a) an element named after a place

(b) an element named after a famous scientist

(c) an element named after a planet