

Concept Review

Section: A Guided Tour of the Periodic Table

1. Write the chemical symbol for each of the following elements:

- | | |
|--------------------|------------------|
| _____ a. manganese | _____ d. uranium |
| _____ b. lead | _____ e. radon |
| _____ c. carbon | _____ f. silver |

2. State the importance of valence electrons in the organization of the periodic table.

3. Describe the difference between the atomic number and the mass number of an atom.

4. **Understanding Systems** Why do atoms of Group 1 elements lose electrons to form cations, whereas atoms of Group 17 elements gain electrons to form anions?

5. **Create** a chart that shows the different isotopes of hydrogen. State the name of each isotope, and write the number of protons, neutrons, and electrons found in each isotope.

6. **Explain** how the relative abundance of each hydrogen isotope affects hydrogen's average atomic mass.

Skills Worksheet

Concept Review

Section: Families of Elements

1. Classify each of the following elements as an alkali metal, alkaline-earth metal, transition metal, or semiconductor based on its position in the periodic table.

_____ **a.** rubidium, Rb

_____ **b.** silicon, Si

_____ **c.** silver, Ag

_____ **d.** barium, Ba

2. Classify each of the following elements as a halogen, noble gas, or other nonmetal based on its position in the periodic table.

_____ **a.** carbon, C

_____ **b.** chlorine, Cl

_____ **c.** radon, Rn

_____ **d.** phosphorus, P

3. Predict which of the following ions would be likely to form:

_____ **a.** Na^{2+}

_____ **d.** Br^-

_____ **b.** Cl^+

_____ **e.** Ne^-

_____ **c.** Ca^{2+}

_____ **f.** Ne^+

4. Explain why chlorine, Cl, is very reactive, whereas argon, Ar, is unreactive.

5. Analyze the following pairs of elements, and determine whether each pair has similar or different reactivities.

_____ **a.** potassium, K, and rubidium, Rb

_____ **b.** calcium, Ca, and barium, Ba

_____ **c.** sodium, Na, and chlorine, Cl

_____ **d.** helium, He, and krypton, Kr





Chapter Test

Atoms and the Periodic Table

In the space provided, write the letter of the term or phrase that best completes each statement or best answers each question.



- _____ 1. Dalton's atomic theory stated that every element was made of atoms that could not be subdivided, atoms of the same element are alike, and
- atoms are made of protons, neutrons, and electrons.
 - the nucleus is the center of the atom.
 - atoms can join to form molecules.
 - atoms are constantly in motion.
- _____ 2. Which statement about the atomic nucleus is correct?
- The nucleus is made of protons and neutrons and has a negative charge.
 - The nucleus is made of protons and neutrons and has a positive charge.
 - The nucleus is made of electrons and has a positive charge.
 - The nucleus is made of electrons and has a negative charge.
- _____ 3. According to Bohr's model of the atom, electrons behave like
- planets orbiting the sun.
 - waves on a vibrating string.
 - light energy in a vacuum.
 - planets rotating on their axes.
- _____ 4. The order of elements in the periodic table is based on
- the number of protons in the nucleus.
 - the electric charge of the nucleus.
 - the number of neutrons in the nucleus.
 - atomic mass.
- _____ 5. Ionization refers to the process of
- changing from one period to another.
 - losing or gaining protons.
 - turning lithium into fluorine.
 - losing or gaining electrons.
- _____ 6. Oxygen's atomic number is 8. This means that an oxygen atom has
- eight neutrons in its nucleus.
 - a total of eight protons and neutrons.
 - eight protons in its nucleus.
 - a total of eight neutrons and electrons.

Chapter Test *continued*

- _____ 7. Which statement about an element's average atomic mass is correct?
- It is determined by counting the number of isotopes in a sample of the element.
 - It is equal to one-twelfth the mass of the most common isotope.
 - It is a weighted average, so common isotopes have a greater effect than uncommon ones.
 - It is based on an isotope's charge, so negatively charged isotopes have a greater effect than positive ones.
- _____ 8. Which statement about the alkali metals is correct?
- They are located in the left-most column of the periodic table.
 - They are extremely nonreactive.
 - They are usually gases.
 - They form negative ions with a 1- charge.
- _____ 9. Which statement about noble gases is correct?
- They form compounds with very bright colors.
 - They exist as single atoms rather than as molecules.
 - They are highly reactive with both metals and nonmetals.
 - They are extremely rare in nature.
- _____ 10. Group 18 noble gases are inert because
- they readily form positive ions.
 - they can have either a positive or a negative charge.
 - their outermost energy level is missing one electron.
 - their outermost energy level is full.
-  _____ 11. A mole is an SI base unit that describes the
- | | |
|---------------------------|------------------------------------|
| a. mass of a substance. | c. volume of a substance. |
| b. amount of a substance. | d. electric charge of a substance. |
-  _____ 12. If the atomic mass of carbon is 12 amu, 1 mole of pure carbon will have a mass of
- | | |
|-----------|------------|
| a. 6 g. | c. 12 g. |
| b. 6 mol. | d. 12 mol. |
-  _____ 13. The average atomic mass of potassium is approximately 39 amu. What is the mass of 2.0 mol of potassium?
- | | |
|-----------|---------|
| a. 0.39 g | c. 39 g |
| b. 0.78 g | d. 78 g |
-  _____ 14. You have 6.50 mol of chromium, which has a molar mass of approximately 52 g/mol. What is the mass in grams of this amount of chromium?
- | | |
|-----------|------------|
| a. 3.38 g | c. 338 g |
| b. 33.8 g | d. 3.38 kg |

Chapter Test *continued*

Read each statement and write in the blank the word or words that best completes the statement.

15. The word *atom* comes from a Greek word that means “unable to be _____.”
16. The nucleus of an atom has a(n) _____ electric charge.
17. Bohr’s model of the atom compares electrons to _____.
18. The order of elements in the periodic table is based on the number of _____ in the nucleus.
19. Some elements are highly _____ because their outermost energy levels are only partially filled.
20. Isotopes of an element have the same atomic _____ but different atomic _____.
21. The _____ are located in the center of the periodic table.
22. Noble gases are nonreactive gaseous elements that are located in Group _____ of the periodic table.
-  23. The _____ is the SI unit that is used for counting small particles, such as atoms.
-  24. The molar mass of krypton is 83.80 g/mol. The mass of 5.00 mol of krypton is _____ g.

Read the statement, and write your response in the space provided.

25. Explain the major differences between Bohr’s model of the atom and the modern model.

Skills Worksheet

Concept Review

Section: Compounds and Molecules

1. **Explain** why it is more difficult to separate the elements of a compound than the substances in a mixture.

2. **Write** the numbers and kinds of atoms or ions contained in the following compounds:

- _____ a. NaCl
- _____ b. CO₂
- _____ c. KBr
- _____ d. NH₃
- _____ e. MgO

3. **Describe** the difference between a ball-and-stick model and a space-filling model of a compound.

4. **Explain** why a substance with a network structure has a high melting point.

5. **Contrast** the structure of table salt and table sugar.

6. **Predict** whether a compound with a boiling point of 68°C is likely to be a network solid or in the form of individual molecules.

Skills Worksheet

Concept Review

Section: Ionic and Covalent Bonding

1. **Explain** why atoms will often join together to form bonds.

2. **Explain** why table salt does not melt easily.

3. **Contrast** ionic and covalent bonds.

4. **Explain** why a triple bond between two nitrogen atoms is stronger than a double bond between two oxygen atoms.

5. **Explain** how it is possible for a compound to have both ionic and covalent bonds.

6. **Predict** whether a gold ring would be a good conductor of electricity. What kind of bonds does gold have? How do these bonds explain gold's properties?

Skills Worksheet

Concept Review

Section: Compound Names and Formulas

1. **Explain** the difference between iron(II) nitrate and iron(III) nitrate. What is the significance of the Roman numerals?

2. **Name** the following ionic compounds, keeping in mind that a transition metal cation must include its charge.

- _____ a. TiO_2
- _____ b. BaCl_2
- _____ c. CuCl_3
- _____ d. KI
- _____ e. SrCl_2
- _____ f. CuBr_2

3. **Describe** how covalent compounds are named.

4. **Write** the chemical formulas for the following compounds:

- _____ a. lithium oxide (ionic)
- _____ b. carbon monoxide (covalent)
- _____ c. carbon tetrachloride (covalent)
- _____ d. nitrogen trifluoride (covalent)
- _____ e. calcium chloride (ionic)

5. **Contrast** molecular formulas and empirical formulas.

Chapter Test

In the space provided, write the letter of the term or phrase that best completes each statement or best answers each question.

- _____ 1. A mixture is different from a compound because each substance in a mixture
- a. retains its own properties.
 - b. changes its electric charge.
 - c. forms an ion.
 - d. changes from a solid to a liquid.
- _____ 2. Each molecule of hydrochloric acid, HCl, contains one atom of hydrogen and
- a. one atom of chlorine.
 - b. one atom of oxygen.
 - c. two atoms of chlorine.
 - d. two atoms of oxygen.
- _____ 3. In which substance do the molecules have the strongest attractions to one another?
- a. sugar, a solid
 - b. hydrogen, a gas
 - c. sulfuric acid, a liquid
 - d. water, a liquid
- _____ 4. Often atoms join so that each atom will have
- a. an even number of electrons.
 - b. an outermost energy level that is full of electrons.
 - c. an equal number of protons and electrons.
 - d. more electrons than either protons or neutrons.
- _____ 5. In a metallic bond, the nucleus of one atom is attracted by a nearby atom's
- a. nucleus.
 - b. negative ion.
 - c. energy structure.
 - d. electrons.
- _____ 6. Solid ionic compounds have very high melting points because they
- a. are positively charged.
 - b. contain metallic elements.
 - c. are made of elements that are solid at room temperature.
 - d. contain charged ions that are locked tightly together.
- _____ 7. The name for the compound with the formula CuBr_2 would be written as
- a. copper(II) bromide.
 - b. copper(I) bromide.
 - c. copper bromine.
 - d. copper(III) bromide.
- _____ 8. Formaldehyde, CH_2O , and acetic acid, $\text{C}_2\text{H}_4\text{O}_2$, have the same empirical formula but different
- a. kinds of cations.
 - b. kinds of anions.
 - c. kinds of atoms.
 - d. molecular formulas.

Chapter Test *continued*



- _____ **9.** The simplest organic compound is
a. aspirin. **c.** salt.
b. table sugar. **d.** methane.
- _____ **10.** Polymers are large organic molecules that are made of
a. cations. **c.** carbon and oxygen only.
b. anions. **d.** repeating units.
- _____ **11.** A protein is a polymer that is made of
a. simple sugars. **c.** amino acids.
b. nitrogen and carbon dioxide. **d.** DNA.

Read each statement and write in the blank the word or words that best completes the statement.

- 12.** Unlike a mixture, a compound has a(n) _____ that is always the same.
- 13.** Formula units of salt, NaCl, contain equal numbers of _____ and _____.
- 14.** A _____ formula resembles a ball and stick model of a compound except chemical symbols are used to represent the atoms.
- 15.** In ionic compounds, the positively charged ions are formed from _____ elements.
- 16.** A(n) _____ bond is formed by the attraction between positively charged metal ions and the _____ around them.
- 17.** A compound consisting of Br⁻ and Cd²⁺ ions would be named _____.
- 18.** The simplest formula for a covalent compound is its _____ formula.
- 19.** _____ are compounds that have repeating subunits.

Read the statement, and write your response in the space provided.

- 20.** Describe how ionic, covalent, and metallic bonds differ from each other.
