

CHAPTER 6 REVIEW

Chemical Bonding**SECTION 1****SHORT ANSWER Answer the following questions in the space provided.**

1. _____ A chemical bond between atoms results from the attraction between the valence electrons and _____ of different atoms.
(a) nuclei (c) isotopes
(b) inner electrons (d) Lewis structures
2. _____ A covalent bond consists of
(a) a shared electron. (c) two different ions.
(b) a shared electron pair. (d) an octet of electrons.
3. _____ If two covalently bonded atoms are identical, the bond is identified as
(a) nonpolar covalent. (c) ionic.
(b) polar covalent. (d) dipolar.
4. _____ A covalent bond in which there is an unequal attraction for the shared electrons is
(a) nonpolar. (c) ionic.
(b) polar. (d) dipolar.
5. _____ Atoms with a strong attraction for electrons they share with another atom exhibit
(a) zero electronegativity. (c) high electronegativity.
(b) low electronegativity. (d) Lewis electronegativity.
6. _____ Bonds that possess between 5% and 50% ionic character are considered to be
(a) ionic. (c) polar covalent.
(b) pure covalent. (d) nonpolar covalent.
7. _____ The greater the electronegativity difference between two atoms bonded together, the greater the bond's percentage of
(a) ionic character. (c) metallic character.
(b) nonpolar character. (d) electron sharing.
8. The electrons involved in the formation of a chemical bond are called _____.
9. A chemical bond that results from the electrostatic attraction between positive and negative ions is called a(n) _____.

SECTION 1 *continued*

10. If electrons involved in bonding spend most of the time closer to one atom rather than the other, the bond is _____.

11. If a bond's character is more than 50% ionic, then the bond is called a(n) _____.

12. A bond's character is more than 50% ionic if the electronegativity difference between the two atoms is greater than _____.

13. Write the formula for an example of each of the following compounds:

Answers will vary.

_____ a. nonpolar covalent compound

_____ b. polar covalent compound

_____ c. ionic compound

14. Describe how a covalent bond holds two atoms together.

15. What property of the two atoms in a covalent bond determines whether or not the bond will be polar?

16. How can electronegativity be used to distinguish between an ionic bond and a covalent bond?

17. Describe the electron distribution in a polar-covalent bond and its effect on the partial charges of the compound.

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Chemical Bonding**SECTION 2****SHORT ANSWER** Answer the following questions in the space provided.

1. Use the concept of potential energy to describe how a covalent bond forms between two atoms.

2. Name two elements that form compounds that can be exceptions to the octet rule.

3. Explain why resonance structures are used instead of Lewis structures to correctly model certain molecules.

4. Bond energy is related to bond length. Use the data in the tables below to arrange the bonds listed in order of increasing bond length, from shortest bond to longest.

a.

Bond	Bond energy (kJ/mol)
H—F	569
H—I	299
H—Cl	432
H—Br	366

SECTION 2 *continued*

b.

Bond	Bond energy (kJ/mol)
C—C	346
C≡C	835
C=C	612

5. Draw Lewis structures to represent each of the following formulas:

a. NH₃b. H₂Oc. CH₄d. C₂H₂e. CH₂O

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Chemical Bonding**SECTION 3****SHORT ANSWER Answer the following questions in the space provided.**

- _____ The notation for sodium chloride, NaCl, stands for one
(a) formula unit. (c) crystal.
(b) molecule. (d) atom.
- _____ In a crystal of an ionic compound, each cation is surrounded by a number of
(a) molecules. (c) dipoles.
(b) positive ions. (d) negative ions.
- _____ Compared with the neutral atoms involved in the formation of an ionic compound, the crystal lattice that results is
(a) higher in potential energy. (c) equal in potential energy.
(b) lower in potential energy. (d) unstable.
- _____ The lattice energy of compound A is greater in magnitude than that of compound B. What can be concluded from this fact?
(a) Compound A is not an ionic compound.
(b) It will be more difficult to break the bonds in compound A than those in compound B.
(c) Compound B has larger crystals than compound A.
(d) Compound A has larger crystals than compound B.
- _____ The forces of attraction between molecules in a molecular compound are generally
(a) stronger than the attractive forces among formula units in ionic bonding.
(b) weaker than the attractive forces among formula units in ionic bonding.
(c) approximately equal to the attractive forces among formula units in ionic bonding.
(d) equal to zero.
6. Describe the force that holds two ions together in an ionic bond.

7. What type of energy best represents the strength of an ionic bond?

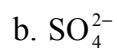
SECTION 3 *continued*

8. What types of bonds are present in an ionic compound that contains a polyatomic ion?

9. Arrange the ionic bonds in the table below in order of increasing strength from weakest to strongest.

Ionic bond	Lattice energy (kJ/mol)
NaCl	-787
CaO	-3384
KCl	-715
MgO	-3760
LiCl	-861

10. Draw Lewis structures for the following polyatomic ions:



11. Draw the two resonance structures for the nitrite anion, NO_2^- .

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Chemical Bonding**SECTION 4****SHORT ANSWER Answer the following questions in the space provided.**

1. _____ In metals, the valence electrons are considered to be
 - (a) attached to particular positive ions.
 - (b) shared by all surrounding atoms.
 - (c) immobile.
 - (d) involved in covalent bonds.
2. _____ The fact that metals are malleable and ionic crystals are brittle is best explained in terms of their
 - (a) chemical bonds.
 - (b) London forces.
 - (c) enthalpies of vaporization.
 - (d) polarity.
3. _____ As light strikes the surface of a metal, the electrons in the electron sea
 - (a) allow the light to pass through.
 - (b) become attached to particular positive ions.
 - (c) fall to lower energy levels.
 - (d) absorb and re-emit the light.
4. _____ Mobile electrons in the metallic bond are responsible for
 - (a) luster.
 - (b) thermal conductivity.
 - (c) electrical conductivity.
 - (d) All of the above.
5. _____ In general, the strength of the metallic bond _____ moving from left to right on any row of the periodic table.
 - (a) increases
 - (b) decreases
 - (c) remains the same
 - (d) varies
6. _____ When a metal is drawn into a wire, the metallic bonds
 - (a) break easily.
 - (b) break with difficulty.
 - (c) do not break.
 - (d) become ionic bonds.
7. Use the concept of electron configurations to explain why the number of valence electrons in metals tends to be less than the number in most nonmetals.

SECTION 4 continued

8. How does the behavior of electrons in metals contribute to the metal's ability to conduct electricity and heat?

9. What is the relationship between the enthalpy of vaporization of a metal and the strength of the bonds that hold the metal together?

10. Draw two diagrams of a metallic bond. In the first diagram, draw a weak metallic bond; in the second, show a metallic bond that would be stronger. Be sure to include nuclear charge and number of electrons in your illustrations.

a.

b.

Note: In the strong bond, the charge on the nucleus and the number of electrons must be greater than in the weak bond.

11. Complete the following table:

	Metals	Ionic Compounds
Components		
Overall charge		
Conductive in the solid state		
Melting point		
Hardness		
Malleable		
Ductile		

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Chemical Bonding

SECTION 5

SHORT ANSWER Answer the following questions in the space provided.

1. Identify the major assumption of the VSEPR theory, which is used to predict the shape of atoms.

2. In water, two hydrogen atoms are bonded to one oxygen atom. Why isn't water a linear molecule?

3. What orbitals combine together to form sp^3 hybrid orbitals around a carbon atom?

4. What two factors determine whether or not a molecule is polar?

5. Arrange the following types of attractions in order of increasing strength, with 1 being the weakest and 4 the strongest.

_____ hydrogen bonding

_____ ionic

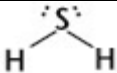
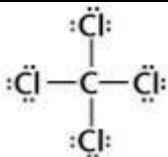
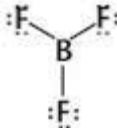
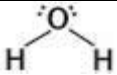
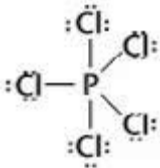
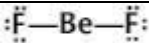
_____ dipole-dipole

_____ London dispersion

6. How are dipole-dipole attractions, London dispersion forces, and hydrogen bonding similar?

SECTION 5 continued

7. Complete the following table:

Formula	Lewis structure	Geometry	Polar
H ₂ S			
CCl ₄			
BF ₃			
H ₂ O			
PCl ₅			
BeF ₂			
SF ₆	