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Accelerated Chemistry

Assessment

# Chemical Bonding

## Section 6-1 Quiz: Introduction to Chemical Bonding

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

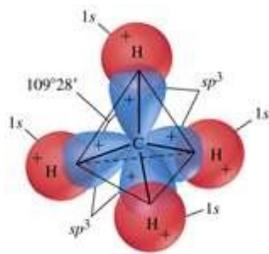
- \_\_\_\_\_ 1. Ionic bonds form as a result of the electrostatic attraction between
- dipoles.
  - electrons.
  - ions.
  - nuclei.
- \_\_\_\_\_ 2. A single covalent bond involves the sharing of
- only one electron.
  - two electrons.
  - three electrons.
  - a variable number of electrons, which depends on the bonding atoms.
- \_\_\_\_\_ 3. Use the table below to choose the pair of elements that will most likely have the *least* ionic character.

| Element | Electronegativity | Element | Electronegativity |
|---------|-------------------|---------|-------------------|
| Na      | 0.9               | O       | 3.5               |
| Cl      | 3.0               | H       | 2.1               |

- Na and Cl
  - O and Cl
  - H and O
  - Na and O
- \_\_\_\_\_ 4. Use the table below to choose the pair of elements that will most likely have the *greatest* ionic character.

| Element | Electronegativity | Element | Electronegativity |
|---------|-------------------|---------|-------------------|
| K       | 0.8               | N       | 3.0               |
| Br      | 2.8               | S       | 2.5               |

- K and N
- K and S
- N and Br
- S and Br



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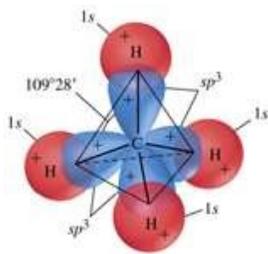
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## Section 6-1 Quiz, *continued*

- \_\_\_\_\_ 5. The measure of an atom's ability to attract electrons is its
- electronegativity
  - polarization.
  - ionization
  - electron affinity
- \_\_\_\_\_ 6. Atoms that are bonded with an electronegativity difference of 0 to 0.3 are generally considered to be
- negatively charged compounds.
  - nonpolar-covalent compounds.
  - polar-covalent compounds.
  - ionic compounds.
- \_\_\_\_\_ 7. What is the apparent charge on the chlorine atom in the molecule HCl?
- +1
  - 1
  - $\delta^+$
  - $\delta^-$
- \_\_\_\_\_ 8. Atoms seldom exist as independent particles in nature because
- as single particles, most atoms have low potential energy.
  - their electronegativity is much lower when they combine with other atoms.
  - atoms are more stable when they combine with other atoms.
  - neutral particles are rare.
- \_\_\_\_\_ 9. When an atom completely gives up its valence electrons to another atom, they form a bond that is considered to be
- purely ionic.
  - partially ionic.
  - polar-covalent.
  - nonpolar-covalent.
- \_\_\_\_\_ 10. You can estimate the degree to which a bond between two atoms is ionic or covalent by calculating the
- distance between the atoms' nuclei.
  - difference in the atoms' electronegativities.
  - atoms' atomic radii.
  - number of atoms in the compound.



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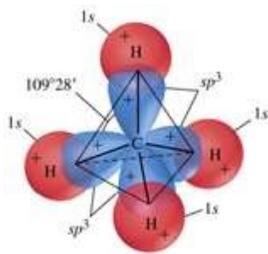
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## Chemical Bonding

### Section 6-2 Quiz: Covalent Bonding and Molecular Compounds

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

- \_\_\_\_\_ 1. If two covalently bonded atoms move closer than a distance of the bond length, the potential energy of the atoms
  - a. becomes negative.
  - b. decreases.
  - c. increases.
  - d. remains constant.
  
- \_\_\_\_\_ 2. The electrons involved in the formation of a covalent bond are
  - a. transferred from one atom to another.
  - b. found only in the s orbitals.
  - c. valence electrons.
  - d. in filled orbitals.
  
- \_\_\_\_\_ 3. Bond energy is the energy
  - a. absorbed as a molecule forms.
  - b. change as atoms get closer together.
  - c. required to break a chemical bond and form separate, neutral atoms.
  - d. of two covalently bonded atoms.
  
- \_\_\_\_\_ 4. Bond length between two bonded atoms is
  - a. twice the diameter of the molecular orbital.
  - b. the separation at which their potential energy is minimum.
  - c. the separation at which the motion of each atom stops.
  - d. the sum of the diameters of each of the two overlapping electron clouds.
  
- \_\_\_\_\_ 5. Which compound most likely has the greatest bond energy?
  - a. HF; H—F bond length = 92 pm
  - b. I<sub>2</sub>; I—I bond length = 266 pm
  - c. Cl<sub>2</sub>; Cl—Cl bond length = 199 pm
  - d. HCl; H—Cl bond length = 127 pm



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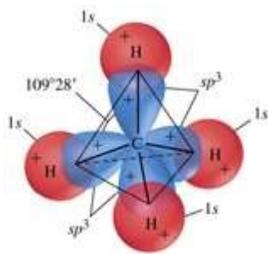
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### Section 6-2 Quiz, *continued*

- \_\_\_\_\_ 6. The Lewis structure of which of the following compounds does not follow the octet rule?
- NH<sub>3</sub>
  - BF<sub>3</sub>
  - CCl<sub>4</sub>
  - H<sub>2</sub>O
- \_\_\_\_\_ 7. In a double covalent bond,
- one atom has more than eight valence electrons.
  - one atom loses a pair of electrons.
  - two atoms share eight valence electrons.
  - two atoms share two pairs of electrons.
- \_\_\_\_\_ 8. Which of the following is not a resonance structure of SO<sub>3</sub>?
- a.**

**c.**
- b.**

**d.**
- \_\_\_\_\_ 9. How many double bonds are in the Lewis structure for hydrogen fluoride, HF?
- none
  - one
  - two
  - three
- \_\_\_\_\_ 10. To draw a Lewis structure, it is *not* necessary to know
- the length of the bonds.
  - the types of atoms in the molecule.
  - the number of valence electrons for each atom.
  - the number of atoms in the molecule.



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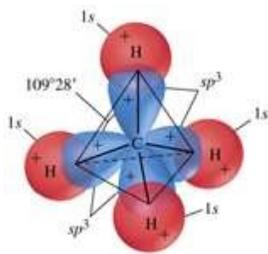
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## Chemical Bonding

### Section 6-3 Quiz: Ionic Bonding and Ionic Compounds

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

- \_\_\_\_\_ 1. An ionic compound is not represented by a molecular formula because an ionic compound
- does not contain bonds.
  - can form crystalline solids.
  - has no net charge.
  - lacks molecules.
- \_\_\_\_\_ 2. Compared with the energies of neutral atoms that form the ions, a crystal lattice has
- zero potential energy.
  - higher potential energy.
  - lower potential energy.
  - equal potential energy.
- \_\_\_\_\_ 3. The salts  $\text{NaCl}(s)$  and  $\text{CaCl}_2(s)$
- are good conductors of electricity.
  - are positively charged.
  - are held together by ionic bonds.
  - Both (a) and (b)
- \_\_\_\_\_ 4. Compared with solid ionic compounds, solid molecular compounds generally
- have lower melting points.
  - are more brittle.
  - are harder.
  - conduct electricity as liquids.
- \_\_\_\_\_ 5. Because strong attractive forces hold the layers in an ionic crystal in relatively fixed positions, ionic compounds
- are hard.
  - are brittle.
  - are not electrical conductors as solids.
  - All of the above



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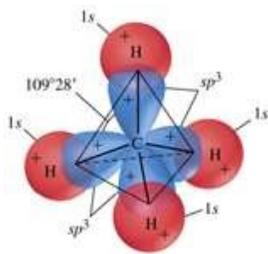
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### Section 6-3 Quiz, *continued*

- \_\_\_\_\_ 6. In a crystal of sodium chloride, how many oppositely-charged ions does each  $\text{Na}^+$  and  $\text{Cl}^-$  ion have clustered around it?
- 1
  - 2
  - 4
  - 6
- \_\_\_\_\_ 7. The arrangement of ions within a crystal structure and the strengths of the attractions between them vary with the
- sizes of the ions.
  - charges of the ions.
  - numbers of ions of different charges.
  - All of the above
- \_\_\_\_\_ 8. The energy released when one mole of an ionic crystalline solid is formed from ions in the gas state is known as
- thermal energy.
  - lattice energy.
  - ionization energy.
  - radiant energy.
- \_\_\_\_\_ 9. Some ionic compounds do not dissolve in water because
- the attractions between the water molecules and the ions are not as strong as the attractions between the ions.
  - they are less dense than water and float on the surface.
  - water is a covalent compound and covalent compounds cannot dissolve ionic compounds.
  - water molecules cannot fit in the spaces between the ions in the crystal lattice.
- \_\_\_\_\_ 10. A charged group of covalently bonded atoms is known as a(n)
- anion.
  - polyatomic.
  - formula unit.
  - cation.



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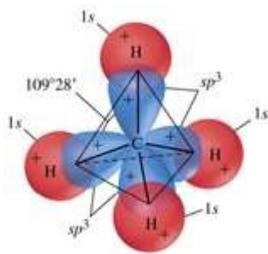
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## Chemical Bonding

### Section 6-4 Quiz: Metallic Bonding

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

- \_\_\_\_\_ 1. Chemical bonding in metals is
  - a. the same as ionic bonding.
  - b. the same as covalent bonding.
  - c. a combination of ionic and covalent bonding.
  - d. different from ionic or covalent bonding.
- \_\_\_\_\_ 2. The valence electrons in a metallic bond
  - a. move freely throughout the network of metal atoms.
  - b. are held tightly by the most positively charged atom.
  - c. are shared equally between two metal atoms.
  - d. continuously move from one energy level to another.
- \_\_\_\_\_ 3. Within a metal, the vacant orbitals in the atoms' outer energy levels
  - a. repel valence electrons.
  - b. attract other metal atoms.
  - c. overlap.
  - d. diffract light.
- \_\_\_\_\_ 4. Which of the following properties is *not* explained by metallic bonding?
  - a. electrical conductivity
  - b. thermal conductivity
  - c. brittleness
  - d. ductility
- \_\_\_\_\_ 5. Which of the following is the result of visible light absorbed by a metal?
  - a. Electrons move to higher energy levels and remain there.
  - b. Light at a frequency similar to the absorbed frequency is emitted.
  - c. Electrons fill the vacant orbitals.
  - d. Light is given off as a line spectrum.



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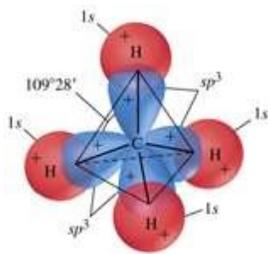
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### Section 6-4 Quiz, *continued*

- \_\_\_\_\_ 6. Metals are malleable because when struck, one plane of metal atoms
- can slide past another plane without breaking bonds.
  - cannot easily move out of the way.
  - moves in a way that maximizes the repulsive forces within the metal.
  - bonds to the plane directly beneath it.
- \_\_\_\_\_ 7. Which is a measure of metallic bond strength?
- electron affinity
  - electronegativity
  - specific heat capacity
  - enthalpy of vaporization
- \_\_\_\_\_ 8. In general, as you move from right to left across any row of the periodic table, the strength of a metallic bond
- increases.
  - decreases.
  - stays the same.
  - shows no trend.
- \_\_\_\_\_ 9. Which of these is responsible for the good electrical conductivity of metals?
- the arrangement of metal atoms in separate layers
  - the high density of metals atoms in the crystal lattice
  - the ability of electrons to move freely about the crystal structure
  - the fact that metal atoms contain many orbitals separated by very small energy
- \_\_\_\_\_ 10. The arrangement of valence electrons in a metallic bond is best described as
- fixed positions in a lattice.
  - a sea of free-moving electrons.
  - concentrated electron density around specific atoms.
  - electron pairs existing in multiple bonds.



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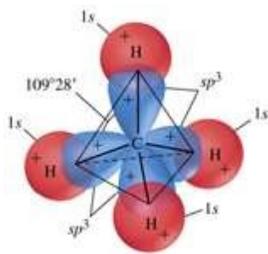
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## Chemical Bonding

### Section 6-5 Quiz: Molecular Geometry

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

- \_\_\_\_\_ 1. VSEPR theory
- predicts the shape of some molecules.
  - is limited to polar molecules.
  - assumes that pairs of valence electrons surrounding an atom repel each other.
  - Both (a) and (c)
- \_\_\_\_\_ 2. The shape of molecules that contain only two atoms is
- linear.
  - bent.
  - trigonal planar.
  - Either (a) or (b)
- \_\_\_\_\_ 3. According to VSEPR theory, which molecule has a bent shape?
- CO<sub>2</sub>
  - H<sub>2</sub>O
  - CS<sub>2</sub>
  - HF
- \_\_\_\_\_ 4. VSEPR theory predicts that the shape of carbon tetrachloride, CCl<sub>4</sub>, is
- linear.
  - bent.
  - trigonal planar.
  - tetrahedral.
- \_\_\_\_\_ 5. Which of the following molecules is polar?
- C<sub>2</sub>H<sub>2</sub>
  - H<sub>2</sub>O
  - BF<sub>3</sub>
  - CO<sub>2</sub>



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### Section 6-5 Quiz, *continued*

- \_\_\_\_\_ 6. The structure of which of the following compounds suggests that it has the highest boiling point?
- CH<sub>4</sub>
  - CO<sub>2</sub>
  - NaCl
  - O<sub>2</sub>
- \_\_\_\_\_ 7. The VSEPR formula for a molecule of type AB<sub>2</sub>E<sub>2</sub> tells you that the molecule is made up of
- a central atom A, with two B atoms and two E atoms bonded to it.
  - a central atom A, with two B atoms bonded to it and two unshared electron pairs.
  - a central atom A, with two B atoms bonded to it by two bonding electron pairs.
  - two central atoms B, with an atom A and two atoms E bonded to it.
- \_\_\_\_\_ 8. Orbitals of equal energy produced by the combination of two or more orbitals on the same atom are called
- bonding orbitals.
  - valence orbitals.
  - hybrid orbitals.
  - high-energy orbitals.
- \_\_\_\_\_ 9. The effects of hydrogen bonding will cause which compound to have the highest boiling point?
- H<sub>2</sub>O
  - PH<sub>3</sub>
  - H<sub>2</sub>S
  - HCl
- \_\_\_\_\_ 10. Which are the intermolecular forces that can act between non-polar molecules?
- covalent bonds
  - hybridization
  - hydrogen bonds
  - London dispersion forces