

Honors Chemistry Ch 8 Covalent Bonding REVIEW**Matching**

Match each item with the correct statement below.

- | | |
|-----------------------------|-------------------------|
| a. coordinate covalent bond | d. single covalent bond |
| b. double covalent bond | e. polar bond |
| c. structural formula | f. hydrogen bond |

- _____ 1. a depiction of the arrangement of atoms in molecules and polyatomic ions
- _____ 2. a covalent bond in which only one pair of electrons is shared
- _____ 3. a covalent bond in which two pairs of electrons are shared
- _____ 4. a covalent bond in which the shared electron pair comes from only one of the atoms
- _____ 5. a covalent bond between two atoms of significantly different electronegativities
- _____ 6. a type of bond that is very important in determining the properties of water and of important biological molecules such as proteins and DNA

Multiple Choice

Identify the choice that best completes the statement or answers the question.

- _____ 7. Which is a typical characteristic of an ionic compound?
- Electron pairs are shared among atoms.
 - The ionic compound has a low solubility in water.
 - The ionic compound is described as a molecule.
 - The ionic compound has a high melting point.
- _____ 8. What is shown by the structural formula of a molecule or polyatomic ion?
- | | |
|------------------------------------|-------------------------------------|
| a. the arrangement of bonded atoms | c. the number of metallic bonds |
| b. the number of ionic bonds | d. the shapes of molecular orbitals |
- _____ 9. Which of these elements does not exist as a diatomic molecule?
- | | |
|-------|------|
| a. Ne | c. H |
| b. F | d. I |
- _____ 10. How do atoms achieve noble-gas electron configurations in single covalent bonds?
- One atom completely loses two electrons to the other atom in the bond.
 - Two atoms share two pairs of electrons.
 - Two atoms share two electrons.
 - Two atoms share one electron.
- _____ 11. Why do atoms share electrons in covalent bonds?
- to become ions and attract each other
 - to attain a noble-gas electron configuration
 - to become more polar
 - to increase their atomic numbers

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- ___ 12. Which of the following elements can form diatomic molecules held together by triple covalent bonds?
- carbon
 - oxygen
 - fluorine
 - nitrogen
- ___ 13. Which elements can form diatomic molecules joined by a single covalent bond?
- hydrogen only
 - halogens only
 - halogens and members of the oxygen group only
 - hydrogen and the halogens only
- ___ 14. Which of the following is the name given to the pairs of valence electrons that do not participate in bonding in diatomic oxygen molecules?
- unvalenced pair
 - outer pair
 - inner pair
 - unshared pair
- ___ 15. Which of the following electron configurations gives the correct arrangement of the four valence electrons of the carbon atom in the molecule methane (CH_4)?
- $2s^2 2p^2$
 - $2s^1 2p^1 3s^1$
 - $2s^1 2p^2 3s^1$
 - $2s^1 2p^3$
- ___ 16. Which of the following diatomic molecules is joined by a double covalent bond?
- O_2
 - Cl_2
 - N_2
 - He_2
- ___ 17. A molecule with a single covalent bond is ____.
- CO_2
 - Cl_2
 - CO
 - N_2
- ___ 18. When one atom contributes both bonding electrons in a single covalent bond, the bond is called a(n) ____.
- one-sided covalent bond
 - unequal covalent bond
 - coordinate covalent bond
 - ionic covalent bond
- ___ 19. Once formed, how are coordinate covalent bonds different from other covalent bonds?
- They are stronger.
 - They are more ionic in character.
 - They are weaker.
 - There is no difference.
- ___ 20. When H^+ forms a bond with H_2O to form the hydronium ion H_3O^+ , this bond is called a coordinate covalent bond because ____.
- both bonding electrons come from the oxygen atom
 - it forms an especially strong bond
 - the electrons are equally shared
 - the oxygen no longer has eight valence electrons
- ___ 21. Which of the following bonds is the least reactive?
- $\text{C}-\text{C}$
 - $\text{H}-\text{H}$
 - $\text{O}-\text{H}$
 - $\text{H}-\text{Cl}$

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- _____ 22. In which of the following compounds is the octet expanded to include 12 electrons?
a. H_2S c. PCl_5
b. PCl_3 d. SF_6
- _____ 23. According to VSEPR theory, molecules adjust their shapes to keep which of the following as far apart as possible?
a. pairs of valence electrons c. mobile electrons
b. inner shell electrons d. the electrons closest to the nuclei
- _____ 24. The shape of the methane molecule is called _____.
a. tetrahedral c. four-cornered
b. square d. planar
- _____ 25. What causes water molecules to have a bent shape, according to VSEPR theory?
a. repulsive forces between unshared pairs of electrons
b. interaction between the fixed orbitals of the unshared pairs of oxygen
c. ionic attraction and repulsion
d. the unusual location of the free electrons
- _____ 26. A bond formed between a silicon atom and an oxygen atom is likely to be _____.
a. ionic c. polar covalent
b. coordinate covalent d. nonpolar covalent
- _____ 27. Which of the following covalent bonds is the most polar?
a. $\text{H}-\text{F}$ c. $\text{H}-\text{H}$
b. $\text{H}-\text{C}$ d. $\text{H}-\text{N}$
- _____ 28. When placed between oppositely charged metal plates, the region of a water molecule attracted to the negative plate is the _____.
a. hydrogen region of the molecule c. $\text{H}-\text{O}-\text{H}$ plane of the molecule
b. geometric center of the molecule d. oxygen region of the molecule
- _____ 29. What is thought to cause the dispersion forces?
a. attraction between ions c. sharing of electron pairs
b. motion of electrons d. differences in electronegativity
- _____ 30. Which of the forces of molecular attraction is the weakest?
a. dipole interaction c. hydrogen bond
b. dispersion d. single covalent bond
- _____ 31. What causes dipole interactions?
a. sharing of electron pairs
b. attraction between polar molecules
c. bonding of a covalently bonded hydrogen to an unshared electron pair
d. attraction between ions
- _____ 32. What are the weakest attractions between molecules?
a. ionic forces c. covalent forces
b. Van der Waals forces d. hydrogen forces

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- _____ 33. What causes hydrogen bonding?
- attraction between ions
 - motion of electrons
 - sharing of electron pairs
 - bonding of a covalently bonded hydrogen atom with an unshared electron pair
- _____ 34. Why is hydrogen bonding only possible with hydrogen?
- Hydrogen's nucleus is electron deficient when it bonds with an electronegative atom.
 - Hydrogen is the only atom that is the same size as an oxygen atom.
 - Hydrogen is the most electronegative element.
 - Hydrogen tends to form covalent bonds.
- _____ 35. Which type of solid has the highest melting point?
- | | |
|------------------|----------------------|
| a. ionic solid | c. metal |
| b. network solid | d. nonmetallic solid |
- _____ 36. What is required in order to melt a network solid?
- | | |
|---------------------------------|----------------------------|
| a. breaking Van der Waals bonds | c. breaking hydrogen bonds |
| b. breaking ionic bonds | d. breaking covalent bonds |

Numeric Response

- How many valence electrons does an iodine atom have?
- What is the total number of covalent bonds normally associated with a single carbon atom in a compound?
- How many electrons are shared in a single covalent bond?
- How many electrons does a nitrogen atom need to gain in order to attain a noble-gas electron configuration?
- How many unshared pairs of electrons does the nitrogen atom in ammonia possess?
- How many electrons does carbon need to gain in order to obtain a noble-gas electron configuration?
- How many electrons are shared in a double covalent bond?
- How many covalent bonds are in a covalently bonded molecule containing 1 phosphorus atom and 3 chlorine atoms?
- How many unshared pairs of electrons are in a molecule of hydrogen iodide?
- What is the bond angle in a water molecule?

Essay

- What is bond dissociation energy, and how does it affect carbon compounds?

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48. Explain what is meant by VSEPR theory. Give an example of how VSEPR theory can be applied to predict the shape of a molecule.
49. Explain what a polar molecule is. Provide an example.
50. What determines the degree of polarity in a bond? Distinguish between nonpolar covalent, polar covalent, and ionic bonds in terms of relative polarity.
51. What are dispersion forces? How is the strength of dispersion forces related to the number of electrons in a molecule? Give an example of molecules that are attracted to each other by dispersion forces.
52. Describe a network solid and give two examples.