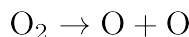


_____ 1. As a chemical bond forms between two hydrogen atoms in a system, energy is released and the stability of the system

- A) decreases
B) **increases**
C) remains the same

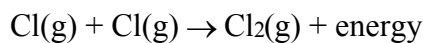
_____ 2. Given the balanced equation representing a reaction:



What occurs during this reaction?

- A) **Energy is absorbed as bonds are broken.**
B) Energy is absorbed as bonds are formed.
C) Energy is released as bonds are broken.
D) Energy is released as bonds are formed.

_____ 3. Given the reaction:



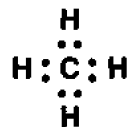
Which statement best describes the reaction?

- A) A bond is formed and energy is absorbed.
B) **A bond is formed and energy is released.**
C) A bond is broken and energy is absorbed.
D) A bond is broken and energy is released.

_____ 4. Which is the correct electron-dot formula for a molecule of chlorine?

- A) $\begin{array}{cc} \cdot\cdot & \cdot\cdot \\ \cdot\text{Cl} & ; \text{Cl}\cdot \\ \cdot\cdot & \cdot\cdot \end{array}$ B) $\begin{array}{cc} \cdot\cdot & \cdot\cdot \\ & :\text{Cl} : \\ & \cdot\cdot & \cdot\cdot \end{array}$
C) $\begin{array}{cc} \cdot\cdot & \cdot\cdot \\ :\text{Cl} : & ; \text{Cl} : \\ \cdot\cdot & \cdot\cdot \end{array}$ D) $\begin{array}{cc} \cdot\cdot & \cdot\cdot \\ :\text{Cl} : & \text{Cl} : \\ \cdot\cdot & \cdot\cdot \end{array}$

_____ 5. Given the Lewis electron-dot diagram:



Which electrons are represented by all of the dots?

- A) the carbon valence electrons, only
B) the hydrogen valence electrons, only
C) **the carbon and hydrogen valence electrons**
D) all of the carbon and hydrogen electrons

_____ 6. The elements Li and F combine to form an ionic compound. The electron configurations in this compound are the same as the electron configurations of atoms in Group

- A) 1 B) 14 C) 17 D) **18**

_____ 7. Which compound would most likely have the greatest ionic character?

- A) CO B) **KF** C) CaO D) LiH

_____ 8. Based on your Reference Tables, the atoms of which of these elements have the strongest attraction for electrons in a chemical bond?

- A) **N** B) Na C) P D) Pt

_____ 9. Which atom has the *least* attraction for the electrons in a bond between that atom and an atom of hydrogen?

- A) **carbon** B) nitrogen
C) oxygen D) fluorine

_____ 10. Which kind of compound generally results when nonmetal atoms chemically combine with metal atoms?

- A) network B) **ionic**
C) molecular D) metallic

_____ 11. Which atom will form an ionic bond with a Br atom?

- A) N B) **Li** C) O D) C

_____ 12. Which compound contains ionic bonds?

- A) N₂O B) **Na₂O**
C) CO D) CO₂

CHEMICAL BONDING REVIEW

13. Which type of bonds are formed when calcium atoms react with oxygen atoms?
- A) polar covalent
B) coordinate covalent
C) ionic
D) hydrogen
14. Given the reactions:
- $$2 X(s) + 2 H_2O(\ell) \rightarrow 2 X^+(aq) + 2 OH^-(aq) + H_2(g)$$
- $$2 Y(s) + 2 H_2O(\ell) \rightarrow 2 Y^+(aq) + 2 OH^-(aq) + H_2(g)$$
- The unknowns, X and Y , are most likely
- A) metallic elements in the same group**
B) metallic elements in the same period
C) nonmetallic elements in the same group
D) nonmetallic elements in the same period
15. When metals combine with nonmetals, the metallic atoms tend to
- A) lose electrons and become positive ions**
B) lose electrons and become negative ions
C) gain electrons and become positive ions
D) gain electrons and become negative ions
16. Which Lewis electron-dot diagram correctly represents a hydroxide ion?
- A) $[\ddot{O}:H]^-$ B) $[:O:H:]^-$
C) $[\ddot{O}::H]^-$ D) $[:O:\ddot{H}]^-$
17. As $NaC_2H_3O_2(s)$ is stirred into water and dissolves, the electrical conductivity of the solution
- A) decreases
B) increases
C) remains the same
18. The water solution of which of the following substances is the best conductor of electricity?
- A) KCl** B) $C_6H_{12}O_6$
C) CO_2 D) CO
19. A crystalline solid has a high melting point and is a good conductor of electricity in the liquid state. This solid could be
- A) CO_2 B) Hg
C) $C_6H_{12}O_6$ D) **KCl**
20. In which compound do atoms form bonds by sharing electrons?
- A) H_2O** B) Na_2O
C) CaO D) MgO
21. An oxygen molecule contains a double bond because the two atoms of oxygen share a total of
- A) 1 electron B) 2 electrons
C) 3 electrons D) **4 electrons**
22. Which type of bond is found in one molecule of methane, CH_4 ?
- A) a covalent bond**
B) a hydrogen bond
C) an ionic bond
D) a metallic bond
23. Which compound has both ionic and covalent bonding?
- A) $CaCO_3$** B) CH_2Cl_2
C) CH_3OH D) $C_6H_{12}O_6$
24. Which molecule will have a double covalent bond?
- A) F_2 **B) O_2** C) Cl_2 D) N_2
25. What is the number of electrons shared between the carbon atoms in a molecule of ethyne?
- A) 6** B) 2 C) 8 D) 4
26. Which formula represents a molecular compound?
- A) Kr B) $LiOH$
C) N_2O_4 D) NaI

CHEMICAL BONDING REVIEW

- _____ 27. Which statement correctly describes diamond and graphite, which are different forms of solid carbon?
- A) They differ in their molecular structure, only.
 - B) They differ in their properties, only.
 - C) They differ in their molecular structure and properties.**
 - D) They do not differ in their molecular structure or properties.
- _____ 28. Which characteristic is a property of molecular substances?
- A) good heat conductivity
 - B) good electrical conductivity
 - C) low melting point**
 - D) high melting point
- _____ 29. Which kind of bond is formed between a proton (H^+) and a water molecule in the production of a hydronium ion?
- A) nonpolar covalent
 - B) coordinate covalent**
 - C) electrovalent
 - D) ionic
- _____ 30. What occurs when a coordinate covalent bond is formed between nitrogen and hydrogen in the ammonium ion, NH_4^+ ?
- A) Hydrogen provides a pair of electrons to be shared with nitrogen.
 - B) Nitrogen provides a pair of electrons to be shared with hydrogen.**
 - C) Hydrogen transfers a pair of electrons to nitrogen.
 - D) Nitrogen transfers a pair of electrons to hydrogen.
- _____ 31. Which compound contains both ionic and covalent bonds?
- A) ammonia
 - B) methane
 - C) sodium nitrate**
 - D) potassium chloride
- _____ 32. Magnesium nitrate contains chemical bonds that are
- A) covalent, only
 - B) ionic, only
 - C) both covalent and ionic**
 - D) neither covalent nor ionic
-

CHEMICAL BONDING REVIEW

33. The table below lists the melting points of various substances.

SUBSTANCE	PHASE CHANGE (solid – liquid)	MELTING POINT (K)
chlorine	$\text{Cl}_2 - \text{Cl}_2(\ell)$	172
water	$\text{H}_2\text{O}(\text{s}) - \text{H}_2\text{O}(\ell)$	273
sodium chloride	$\text{NaCl}(\text{s}) - \text{NaCl}(\ell)$	1073
copper	$\text{Cu}(\text{s}) - \text{Cu}(\ell)$	1356

Based on this table, which type of substance has the highest melting point?

- A) nonpolar covalent B) polar covalent
C) ionic D) **metallic**

34. Which substance at STP conducts electricity because the substance contains mobile electrons?

- A) H B) He C) **K** D) Kr

35. Metallic bonding occurs between atoms of

- A) fluorine B) neon
C) sulfur D) **copper**

36. Which compound is a network solid at STP?

- A) CO_2 B) H_2O
C) **SiC** D) NaH

37. The bonds in all network solids are

- A) **covalent** B) ionic
C) metallic D) nonpolar

38. Which compound forms a network solid?

- A) calcium bromide
B) hydrogen bromide
C) **silicon dioxide**
D) carbon dioxide

39. Which electron-dot diagram represents a molecule that has a polar covalent bond?

- A) $\text{H} \times \ddot{\text{Cl}} :$ B) $\text{Li}^+ [\times \ddot{\text{Cl}} :]^-$
C) $\begin{array}{c} \times \times \\ \times \times \end{array} \ddot{\text{Cl}} \times \ddot{\text{Cl}} \times \times$ D) $\text{K}^+ [\times \ddot{\text{Cl}} :]^-$

40. Which type of bond exists between an atom of carbon and an atom of fluorine?

- A) ionic
B) metallic
C) **polar covalent**
D) nonpolar covalent

41. Which type of bond is formed between the carbon atom and the oxygen atom in CH_3OH ?

- A) ionic
B) electrovalent
C) **polar covalent**
D) nonpolar covalent

42. Base your answer to the following question on the number of the substance, chosen from the table below, that best answers that question.

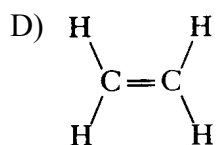
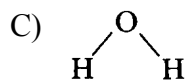
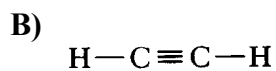
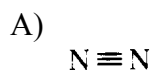
Substance	Melting Point $^{\circ}\text{K}$.	Boiling Point $^{\circ}\text{K}$.
(1) sodium chloride	1,074	1,686
(2) helium	1	4
(3) diamond	3,773	4,473
(4) water	273	373

Which substance forms a molecular solid made up of polar molecules?

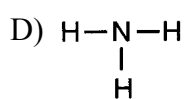
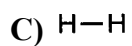
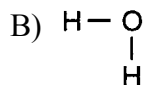
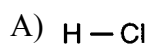
- A) 1 B) 2 C) 3 D) **4**

CHEMICAL BONDING REVIEW

43. Which structural formula represents a linear nonpolar molecule containing two polar bonds?



44. Which structural formula represents a nonpolar molecule?



CHEMICAL BONDING REVIEW

45. Base your answer to the following question on the information below and on your knowledge of chemistry.

The formulas and the boiling points at standard pressure for ethane, methane, methanol, and water are shown in the table below.

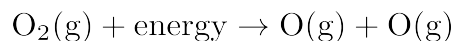
Information for Four Compounds

Name	Formula	Boiling Point (°C)
ethane	$\begin{array}{c} \text{H} \quad \text{H} \\ \quad \\ \text{H}-\text{C}-\text{C}-\text{H} \\ \quad \\ \text{H} \quad \text{H} \end{array}$	-88.6
methane	$\begin{array}{c} \text{H} \\ \\ \text{H}-\text{C}-\text{H} \\ \\ \text{H} \end{array}$	-161.5
methanol	$\begin{array}{c} \text{H} \\ \\ \text{H}-\text{C}-\text{OH} \\ \\ \text{H} \end{array}$	64.6
water	$\begin{array}{c} \text{H}-\text{O} \\ \\ \text{H} \end{array}$	100.0

Explain, in terms of molecular polarity, why the solubility of methanol in water is greater than the solubility of methane in water.

46. Base your answer to the following question on the information below and on your knowledge of chemistry.

The balanced equation below represents a reaction.



Draw a Lewis electron-dot diagram of one oxygen atom.

CHEMICAL BONDING REVIEW

Base your answers to questions 47 and 48 on the information below.

Physical Properties of CF_4 and NH_3 at Standard Pressure

Compound	Melting Point (°C)	Boiling Point (°C)	Solubility in Water at 20.0°C
CF_4	-183.6	-127.8	insoluble
NH_3	-77.7	-33.3	soluble

_____ 47. In the space *in your answer booklet*, draw a Lewis electron-dot diagram for CF_4 .

_____ 48. State evidence that indicates NH_3 has stronger intermolecular forces than CF_4 .