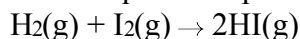


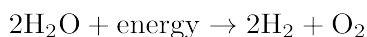
1. Given the equation representing a reaction:



Which statement describes the energy changes that occur in this reaction?

- A) Energy is absorbed as bonds are formed, only.
- B) Energy is released as bonds are broken, only.
- C) Energy is absorbed as bonds are formed, and energy is released as bonds are broken.
- D) Energy is absorbed as bonds are broken, and energy is released as bonds are formed.

2. Given the balanced equation representing a reaction:



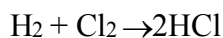
Which statement describes the changes in energy and bonding for the reactant?

- A) Energy is absorbed as bonds in H_2O are formed.
- B) Energy is absorbed as bonds in H_2O are broken.
- C) Energy is released as bonds in H_2O are formed.
- D) Energy is released as bonds in H_2O are broken.

3. What occurs in order to break the bond in a Cl_2 molecule?

- A) Energy is absorbed.
- B) Energy is released.
- C) The molecule creates energy.
- D) The molecule destroys energy.

4. Given the reaction:



Which statement best describes the energy change as bonds are formed and broken in this reaction?

- A) The breaking of the $\text{Cl}-\text{Cl}$ bond releases energy.
 - B) The breaking of the $\text{H}-\text{H}$ bond releases energy.
 - C) The forming of the $\text{H}-\text{Cl}$ bond absorbs energy.
 - D) The forming of the $\text{H}-\text{Cl}$ bond releases energy.
5. In a propanal molecule, an oxygen atom is bonded with a carbon atom. What is the total number of pairs of electrons shared between these atoms?
- A) 1
 - B) 2
 - C) 3
 - D) 4

6. 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) $\begin{array}{cc} \cdot\cdot & \cdot\cdot \\ : \text{Cl} : & : \text{Cl} : \end{array}$
- C) $\begin{array}{cc} \cdot\cdot & \cdot\cdot \\ : \text{Cl} : & : \text{Cl} : \\ \cdot\cdot & \cdot\cdot \end{array}$
- D) $\begin{array}{cc} \cdot\cdot & \cdot\cdot \\ : \text{Cl} : & \text{Cl} : \\ \cdot\cdot & \cdot\cdot \end{array}$

7. Which element has an atom with the greatest tendency to attract electrons in a chemical bond?

- A) carbon
- B) chlorine
- C) silicon
- D) sulfur

8. An element with an electronegativity of 0.9 bonds with an element with an electronegativity of 3.1. Which phrase best describes the bond between these elements?

- A) mostly ionic in character and formed between two nonmetals
- B) mostly ionic in character and formed between a metal and a nonmetal
- C) mostly covalent in character and formed between two nonmetals
- D) mostly covalent in character and formed between a metal and a nonmetal

9. Which compound contains a bond with the least ionic character?

- A) CO
- B) CaO
- C) K_2O
- D) Li_2O

10. In which compound does the bond between the atoms have the *least* ionic character?

- A) HF
- B) HCl
- C) HBr
- D) HI

11. Which Lewis electron-dot diagram correctly represents a hydroxide ion?

- A) $\left[\begin{array}{c} \cdot\cdot \\ : \ddot{\text{O}} : \text{H} \\ \cdot\cdot \end{array} \right]^{-}$
- B) $\left[\begin{array}{c} : \text{O} : \text{H} : \\ \cdot\cdot \end{array} \right]^{-}$
- C) $\left[\begin{array}{c} \cdot\cdot \\ : \ddot{\text{O}} :: \text{H} \\ \cdot\cdot \end{array} \right]^{-}$
- D) $\left[\begin{array}{c} : \text{O} : \ddot{\text{H}} : \\ \cdot\cdot \end{array} \right]^{-}$

12. The bond between which two elements is the *least* ionic in character?

- A) $\text{H}-\text{F}$
- B) $\text{H}-\text{Cl}$
- C) $\text{H}-\text{I}$
- D) $\text{H}-\text{O}$

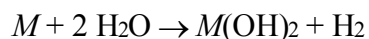
13. Sodium hydride and sodium chloride both have bonds which are predominantly

- A) metallic B) ionic
C) covalent D) network

14. Element X has an electron configuration of 2-8-3. This element will combine with the phosphate ion to form a compound with the formula

- A) XPO_4 B) $X(PO_4)_2$
C) X_2PO_4 D) $X_2(PO_4)_3$

15. Given the reaction:



The metal represented by M is most likely a metal from Group

- A) 1 B) 2 C) 11 D) 13

16. A sample of a substance has these characteristics:

- melting point of 984 K
- hard, brittle solid at room temperature
- poor conductor of heat and electricity as a solid
- good conductor of electricity as a liquid on in an aqueous solution

This sample is classified as

- A) a metallic element
B) a radioactive element
C) a molecular compound
D) an ionic compound

17. A solid substance was tested in the laboratory. The test results are listed below.

- dissolves in water

- is an electrolyte
- melts at a high temperature

Based on these results, the solid substance could be

- A) Cu B) $CuBr_2$
C) C D) $C_6H_{12}O_6$
-

18. The data table below represents the properties determined by the analysis of substances *A*, *B*, *C*, and *D*.

Substance	Melting Point (°C)	Boiling Point (°C)	Conductivity
<i>A</i>	-80	-20	none
<i>B</i>	20	190	none
<i>C</i>	320	770	as solid
<i>D</i>	800	1250	in solution

Which substance is an ionic compound?

- A) *A* B) *B* C) *C* D) *D*

19. A student determined the solubility of an unknown solid in various solvents as shown in the table below.

Solvent	Solubility
benzene	insoluble
water	soluble
ethanol	slightly soluble
toluene	insoluble

Based on these solubility results, the unknown solid is best described as

- A) ionic B) nonpolar
C) network D) metallic

20. A molecular compound is formed when a chemical reaction occurs between atoms of

- A) chlorine and sodium
B) chlorine and yttrium
C) oxygen and hydrogen
D) oxygen and magnesium

21. Which two substances are covalent compounds?

- A) $C_6H_{12}O_6$ (s) and KI(s)
B) $C_6H_{12}O_6$ (s) and HCl(g)
C) KI(s) and NaCl(s)
D) NaCl(s) and HCl(g)

22. Which compound contains only covalent bonds?

- A) NaOH B) $Ba(OH)_2$
C) $Ca(OH)_2$ D) CH_3OH

23. An unknown substance, liquid *X*, is tested in the laboratory. The chemical and physical test results are listed below.

- Nonconductor of electricity
- Insoluble in water
- Soluble in hexane
- Low melting point as a solid
- Combustion produces only CO_2 and H_2O

Based on these results, a student should conclude that liquid *X* is

- A) ionic and organic
B) ionic and inorganic
C) covalent and organic
D) covalent and inorganic

24. Which formula represents a molecular compound?

- A) Kr B) LiOH
C) N_2O_4 D) NaI

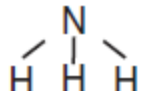
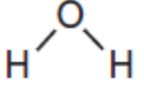
25. Which statement correctly describes diamond and graphite, which are different forms of solid carbon?

- 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.

26. The ability to conduct electricity in the solid state is a characteristic of metallic bonding. This characteristic is best explained by the presence of

- A) high ionization energies
- B) high electronegativities
- C) mobile electrons
- D) mobile protons

27. Which formula represents a nonpolar molecule containing polar covalent bonds?

- A) $\text{H}-\text{H}$ B) $\text{O}=\text{C}=\text{O}$
C)  D) 

28. The electronegativity difference between the atoms in a molecule of HCl can be used to determine

- A) the entropy of the atoms
- B) the atomic number of the atoms
- C) the first ionization energy of the atoms
- D) the polarity of the bond between the two atoms

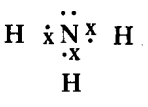
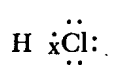
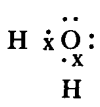
29. The bonds between hydrogen and oxygen in a water molecule are classified as

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

30. Which compound has molecules that form the strongest hydrogen bonds?

- A) HI B) HBr C) HF D) HCl

31. Which molecule contains a nonpolar covalent bond?

- A)  B) 
C)  D) 