Name: **Bonding Review**

___ 1. Given the balanced equation representing a reaction:
$Cl_2 \rightarrow Cl + Cl$

What occurs during this reaction?

1) A bond is broken as energy is absorbed.
2) A bond is broken as energy is released.
3) A bond is formed as energy is absorbed.
4) A bond is formed as energy is released.

___ 2. Which statement describes what occurs as two atoms of bromine combine to become a molecule of bromine?

1) Energy is absorbed as a bond is formed.
2) Energy is absorbed as a bond is broken.
3) Energy is released as a bond is formed.
4) Energy is released as a bond is broken.

___ 3. Which of these elements has an atom with the most stable outer electron configuration?

1) Ne 2) Cl 3) Ca 4) Na

___ 4. When a sodium atom reacts with a chlorine atom to form a compound, the electron configurations of the ions forming the compound are the same as those in which noble gas atoms?

1) krypton and neon
2) krypton and argon
3) neon and helium
4) neon and argon

___ 5. Which element has an atom with the greatest attraction for electrons in a chemical bond?

1) As 2) Bi **3) N** 4) P

___ 6. Based on electronegativity values, which type of elements tends to have the greatest attraction for electrons in a bond?

1) metals **3) nonmetals**
2) metalloids 4) noble gases

___ 7. Which term indicates how strongly an atom attracts the electrons in a chemical bond?

1) alkalinity
2) atomic mass
3) electronegativity
4) activation energy

___ 8. Which bond is *least* polar?

1) As–Cl 3) P–Cl
2) Bi–Cl **4) N–Cl**

___ 9. Given the electron dot diagram:

The electrons in the bond between hydrogen and fluorine are more strongly attracted to the atom of

1) hydrogen, which has the higher electronegativity
2) fluorine, which has the higher electronegativity
3) hydrogen, which has the lower electronegativity
4) fluorine, which has the lower electronegativity

___ 10. An ionic compound is formed when there is a reaction between the elements

1) strontium and chlorine
2) hydrogen and chlorine
3) nitrogen and oxygen
4) sulfur and oxygen

___ 11. Which formula represents an ionic compound?

1) H_2 3) CH_3OH
2) CH_4 **4) NH_4Cl**

___ 12. Which Lewis electron-dot diagram correctly represents a hydroxide ion?

1) 

3) 

2) 

4) 

13. Which type of bond results when one or more valence electrons are transferred from one atom to another?

1) a hydrogen bond
2) an ionic bond
3) a nonpolar covalent bond
4) a polar covalent bond

14. Based on bond type, which compound has the highest melting point?

1) CH_3OH **3) $CaCl_2$**
2) C_6H_{14} 4) CCl_4

15. Which substance is an electrolyte?

1) CH_3OH 3) H_2O
2) $C_6H_{12}O_6$ **4) KOH**

16. 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

1) Cu 3) C
2) $CuBr_2$ 4) $C_6H_{12}O_6$

17. Which compound has both ionic and covalent bonding?

1) $CaCO_3$ 3) CH_3OH
2) CH_2C1_2 4) $C_6H_{12}O_6$

18. Which element is composed of molecules that each contain a multiple covalent bond?

1) chlorine 3) hydrogen
2) fluorine **4) nitrogen**

19. As a bond between a hydrogen atom and a sulfur atom is formed, electrons are

1) shared to form an ionic bond
2) shared to form a covalent bond
3) transferred to form an ionic bond
4) transferred to form a covalent bond

20. What is the total number of electrons shared in the bonds between the two carbon atoms in a the molecule shown below?

H—C≡C—H

1) 6 2) 2 3) 3 4) 8

21. Which formula represents a molecular compound?

1) Kr **3) N_2O_4**
2) LiOH 4) NaI

22. In which material are the particles arranged in a regular geometric pattern?

1) $CO_2(g)$ 3) $H_2O(\ell)$
2) NaCl(aq) **4) $C_{12}H_{22}O_{11}(s)$**

23. What is the maximum number of covalent bonds that a carbon atom can form?

1) 1 2) 2 3) 3 **4) 4**

24. Which type of bond is found between atoms of solid cobalt?

1) nonpolar covalent
2) polar covalent
3) metallic
4) ionic

25. A solid substance is an excellent conductor of electricity. The chemical bonds in this substance are most likely

1) ionic, because the valence electrons are shared between atoms
2) ionic, because the valence electrons are mobile
3) metallic, because the valence electrons are stationary
4) metallic, because the valence electrons are mobile

26. Which substance contains metallic bonds?

1) $Hg(\ell)$ 3) NaCl(s)
2) $H_2O(\ell)$ 4) $C_6H_{12}O_6(s)$

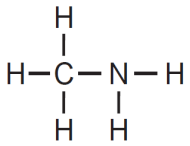
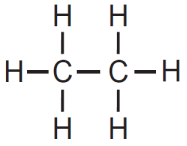
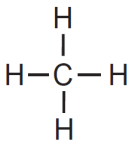
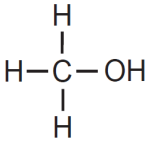
___ 27. A chemist performs the same tests on two homogeneous white crystalline solids, *A* and *B*. The results are shown in the table below.

	Solid A	**Solid B**
Melting Point	High, 801°C	Low, decomposes at 186°C
Solubility in H_2O (grams per 100.0 g H_2O at 0°C)	35.7	3.2
Electrical Conductivity (in aqueous solution)	Good conductor	Nonconductor

The results of these tests suggest that

1) both solids contain only ionic bonds
2) both solids contain only covalent bonds
3) solid *A* contains only covalent bonds and solid *B* contains only ionic bonds
4) solid *A* contains only ionic bonds and solid *B* contains only covalent bonds

___ 28. Which formula represents a molecule having a nonpolar covalent bond?

1) 
3) 
2) 
4) 

___ 29. The chemical bond between which two atoms is most polar?

1) C–N
2) H–H
3) S–Cl
4) Si–O

___ 30. Which compound has hydrogen bonding between its molecules?

1) CH_4
2) CaH_2
3) KH
4) NH_3

___ 31. Which formula represents a nonpolar molecule containing polar covalent bonds?

1) H_2O
2) CCl_4
3) NH_3
4) H_2

___ 32. Which formula represents a polar molecule?

1) H_2
2) H_2O
3) CO_2
4) CCL_4

___ 33. Which formula represents a nonpolar molecule?

1) HCl
2) H_2O
3) NH_3
4) CH_4

___ 34. At STP, fluorine is a gas and bromine is a liquid because, compared to fluorine, bromine has

1) stronger covalent bonds
2) stronger intermolecular forces
3) weaker covalent bonds
4) weaker intermolecular forces

___ 35. The four single bonds of a carbon atom in CH_4 are directed toward the corners of a

1) square
2) tetrahedron
3) rectangle
4) parallelogram

Base your answers to questions **36** and **37** 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

____ 36. In the space *in your answer booklet*, draw a Lewis electron-dot diagram for CF_4.

____ 37. State evidence that indicates NH_3 has stronger intermolecular forces than CF_4.

Base your answers to questions **38** and **39** on the information below.

In 1864, the Solvay process was developed to make soda ash. One step in the process is represented by the balanced equation below.

$$NaCl + NH_3 + CO_2 + H2O \rightarrow NaHCO_3 + NH_4Cl$$

____ 38. In the space draw a Lewis electron-dot diagram for the reactant containing nitrogen in the equation.

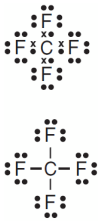
____ 39. Explain, in terms of electronegativity difference, why the bond between hydrogen and oxygen in a water molecule is more polar than the bond between hydrogen and nitrogen in an ammonia molecule.

___ 40. Draw a Lewis electron-dot diagram for a molecule of phosphorus trichloride, PCl_3

Answer Key
Bonding Review

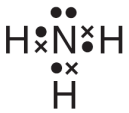
1. **1**
2. **3**
3. **1**
4. **4**
5. **3**
6. **3**
7. **3**
8. **4**
9. **2**
10. **1**
11. **4**
12. **1**
13. **2**
14. **3**
15. **4**
16. **2**
17. **1**
18. **4**
19. **2**
20. **1**
21. **3**
22. **4**
23. **4**
24. **3**
25. **4**
26. **1**
27. **4**
28. **3**
29. **4**
30. **4**
31. **2**
32. **2**
33. **4**
34. **2**
35. **2**

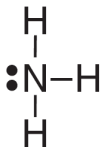
36.



37. Acceptable responses include, but are not limited to: • At standard pressure, NH_3 has a higher boiling point than CF_4. • The melting point of CF_4 is lower.

38.





39. – The electronegativity difference is 1.4 for H and O, which is higher than the 0.9 for H and N. – The difference in electronegativity between hydrogen and oxygen is greater than that for hydrogen and nitrogen.

40.