Bonding Practice Problems NAME _____

____1. When compared to H_2S, H_2O has a higher boiling point because H_2O contains stronger
(A) metallic bonds (B) covalent bonds
(C) ionic bonds (D) hydrogen bonds

____2. Which kinds of bonds are found in a sample of liquid H_2O?
(A) covalent bonds, only
(B) hydrogen bonds, only
(C) both covalent and hydrogen bonds
(D) both ionic and hydrogen bonds

____3. Hydrogen bonds are formed between molecules in which hydrogen is covalently bonded to an element having
(A) low electronegativity
(B) high electronegativity
(C) low ionization energy
(D) high atomic mass

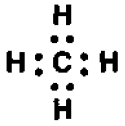
____4. Which compound is the most polar?
(A) H_2O
(B) H_2S
(C) H_2Te
(D) H_2Se

____5. Argon has a higher boiling point than neon because argon has
(A) fewer electrons in its 2nd principal energy level
(B) more electrons in its outermost principal energy level
(C) weaker intermolecular forces of attraction
(D) stronger intermolecular forces of attraction

____6. At 25ºC, F_2 is a gas but I_2 is a solid. This is most likely due to the fact that
(A) F_2 is a dipole but I_2 is not
(B) I_2 is a dipole but F_2 is not
(C) F_2 molecules have stronger intermolecular attractions
(D) I_2 molecules have stronger intermolecular attractions

____7. Which bond is *least* polar?
(A) As–Cl (B) Bi–Cl
(C) P–Cl (D) N–Cl

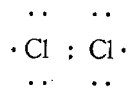
____8. Given the Lewis electron-dot diagram:



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

____9. 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?
(A) krypton and neon (B) krypton and argon
(C) neon and helium (D) neon and argon

____10. Which is the correct electron-dot formula for a molecule of chlorine, Cl_2?



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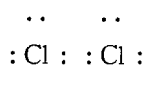

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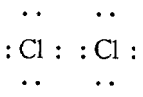

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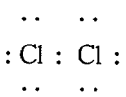
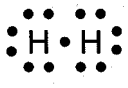


(D)

____11. Which electron-dot diagram represents H_2?

(A)

(B)



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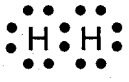


(D)

____12. Which bond has the least ionic character?
(A) KBr (B) HF
(C) MgO (D) BrCl

____13. Based on electronegativity values, which type of elements tends to have the greatest attraction for electrons in a bond?

(A) metals (B) metalloids
(C) nonmetals (D) noble gases

____14. Based on the values in your table of electronegativities, 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

____15. Given the electron dot diagram:

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

(A) hydrogen, which has the higher electronegativity
(B) fluorine, which has the higher electronegativity
(C) hydrogen, which has the lower electronegativity
(D) fluorine, which has the lower electronegativity

____16. Which of the following elements has the greatest ability to attract electrons?

(A) Li (B) Be
(C) Na (D) Mg

____17. 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 nonmetal
(D) mostly covalent in character and formed between a metal and a nonmetal

____18. Electronegativity is a measure of an atom's ability to

(A) attract the electrons in the bond between the atom and another atom
(B) repel the electrons in the bond between the atom and another atom
(C) attract the protons of another atom
(D) repel the protons of another atom

____19. Which type of bonding is usually exhibited when the electronegativity difference between two atoms is 1.1?

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

____20. Which compound has the least ionic character (Cl = chlorine)?

(A) KCl
(B) $CaCl_2$
(C) $AlCl_3$
(D) CCl_4

____21. Which pair of elements below will form a compound with the greatest ionic character?

(A) Pb and F (B) Ca and O
(C) Na and Cl (D) Cs and N

____22. Given the electron dot formula:

Which atom represented as *X* would have the *least* attraction for the electrons that form the bond?

(A) F (B) Cl
(C) I (D) Br

____23. In which compound do the atoms have the greatest difference in electronegativity?

(A) NaBr
(B) $AlCl_3$
(C) KF
(D) LiI

____24. Which substance contains metallic bonds?

(A) $Hg(\ell)$ (B) $H_2O(\ell)$
(C) NaCl(s) (D) $C_6H_{12}O_6(s)$

Bonding Practice Problems

____25. Which substance contains bonds that involved the transfer of electrons from one atom to another?

(A) CO_2
(B) NH_3
(C) KBr
(D) Cl_2

____26. Which type of bond is found in sodium bromide?

(A) covalent (B) hydrogen
(C) ionic (D) metallic

____27. Compared to a calcium atom, the calcium ion Ca^{2+} has

(A) more protons (B) fewer protons
(C) more electrons (D) fewer electrons

____28. Which elements combine by forming an ionic bond?

(A) sodium and potassium
(B) sodium and oxygen
(C) carbon and oxygen
(D) carbon and sulfur

____29. An ionic compound consists of positive and negative ions each with 10 electrons. Half of these ions have a charge of 1^+ and the other half have a charge of 1^-. What is the formula of this compound?

(A) KF (B) KCl
(C) NaF (D) NaCl

____30. Element *X* is in Group 2 and element *Y* is in Group 17. What happens when a compound is formed between these two atoms?

(A) *X* loses electrons to *Y* to form an ionic bond.
(B) *X* loses electrons to *Y* to form a covalent bond.
(C) *X* gains electrons from *Y* to form an ionic bond.
(D) *X* gains electrons from *Y* to form a covalent bond.

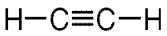
____31. When a potassium atom reacts with bromine, the potassium atom will

(A) lose only 1 electron (B) lose 2 electrons
(C) gain only 1 electron (D) gain 2 electrons

____32. What is the total number of pairs of electrons shared in a molecule of N_2?

(A) one pair (B) two pairs
(C) three pairs (D) four pairs

____33. What is the total number of electrons shared in the bonds between the two carbon atoms in a the molecule shown below?



(A) 6 (B) 2
(C) 3 (D) 8

____34. Which compound contains only covalent bonds?

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

____35. The bond between Br atoms in a Br_2 molecule is

(A) ionic and is formed by the sharing of two valence electrons
(B) ionic and is formed by the transfer of two valence electrons
(C) covalent and is formed by the sharing of two valence electrons
(D) covalent and is formed by the transfer of two valence electrons

____36. Which element has atoms that can form single, double, and triple covalent bonds with other atoms of the same element?

(A) hydrogen (B) oxygen
(C) fluorine (D) carbon

____37. Which molecule contains a triple covalent bond?

(A) H_2
(B) N_2
(C) O_2
(D) Cl_2

____38. Which pair of atoms is held together by a covalent bond?

(A) HCl (B) LiCl
(C) NaCl (D) KCl

Bonding Practice Problems

____39. In which compound do atoms form bonds by sharing electrons?

(A) H_2O
(B) Na_2O
(C) CaO
(D) MgO

____40. Which molecule will have a double covalent bond?

(A) F_2
(B) O_2
(C) Cl_2
(D) N_2

____41. 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

____42. Conductivity in a metal results from the metal atoms having

(A) high electronegativity
(B) high ionization energy
(C) highly mobile protons in the nucleus
(D) highly mobile electrons in the valence shell

____43. The high electrical conductivity of metals is primarily due to

(A) high ionization energies
(B) filled energy levels
(C) mobile electrons
(D) high electronegativities

____44. Which element consists of positive ions immersed in a "sea" of mobile electrons?

(A) sulfur (B) nitrogen
(C) calcium (D) chlorine

____45. Which factor distinguishes a metallic bond from an ionic bond or a covalent bond?

(A) the mobility of electrons
(B) the mobility of protons
(C) the equal sharing of electrons
(D) the unequal sharing of electrons

____46. Which type of bonding involves positive ions immersed in a sea of mobile electrons?

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

____47. Which type of bond is present in copper wire?

(A) covalent (B) ionic
(C) electrovalent (D) metallic

____48. A diamond is an example of

(A) a supercooled liquid (B) an ionic compound
(C) a metallic substance (D) a network solid

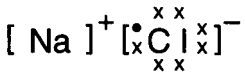
____49. Which formula represents a nonpolar molecule containing polar covalent bonds?

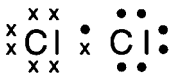
(A) H_2O
(B) CCl_4
(C) NH_3
(D) H_2

____50. 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

____51. Which electron-dot formula represents a substance that contains a nonpolar covalent bond?

(A) 

(B) 

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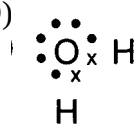
(D) 

____52. Which molecule is nonpolar?

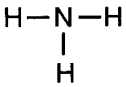
(A) H_2O
(B) NH_3
(C) CO
(D) CO_2

____53. Which structural formula represents a nonpolar molecule?

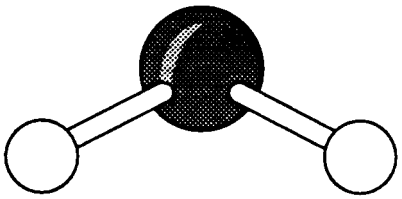
(A) H—Cl

(B)


(C) H—H

(D)


____54. The diagram below represents a water molecule.



This molecule is best described as

(A) polar with polar covalent bonds
(B) polar with nonpolar covalent bonds
(C) nonpolar with polar covalent bonds
(D) nonpolar with nonpolar covalent bonds

____55. Which sequence of Group 18 elements demonstrates a gradual *decrease* in the strength of the London dispersion forces?

(A) Ar(ℓ), Kr(ℓ), Ne(ℓ), Xe(ℓ)
(B) Kr(ℓ), Xe(ℓ), Ar(ℓ), Ne(ℓ)
(C) Ne(ℓ), Ar(ℓ), Kr(ℓ), Xe(ℓ)
(D) Xe(ℓ), Kr(ℓ), Ar(ℓ), Ne(ℓ)

____56. Nitrogen gas, N_2, will become a liquid at low temperatures primarily because of

(A) London dispersion forces
(B) hydrogen bonding
(C) covalent bonding
(D) dipole-dipole interactions

Bonding Practice Problems
Answer Key

1. D
2. C
3. B
4. A
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8. C
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13. C
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52. D
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55. D
56. A

Bonding Practice Problems

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