**Unit 4 Bonding Exam** **Name _____**

**Multiple Choice – 2 pts. each**

1) Which of the following bonds exhibits the *greatest* ionic character?

a) H - F b) H - I c) H - Br d) H - Cl

2) Generally, how many valence electrons are needed for atoms to be *most* stable?

a) 8 b) 6 c) 32 d) 18

3) Which type of bonding is characteristic of a substance that has a high melting point and electrical conductivity only in the liquid phase?

a) ionic b) metallic c) nonpolar covalent d) polar covalent

4) Which compound is ionic?

a) $CaCl_2$ b) $N_2O$ c) HCl d) $SO_2$

5) In which compound do the atoms have the greatest difference in electronegativity?

a) $AlCl_3$ b) NaBr c) KF d) LiI

6) What type of bonds are present in a strip of magnesium ribbon?

a) metallic b) covalent c) ionic d) London dispersion

7) Which particles may be gained, lost, or shared by an atom when it forms a chemical bond?

a) nucleons b) neutrons c) protons d) electrons

8) Two atoms with an electronegativity difference of 0.4 form a bond that is

a) ionic, because electrons are transferred
b) covalent, because electrons are shared
c) ionic, because electrons are shared
d) covalent, because electrons are transferred

9) Which type of bonds are formed when calcium atoms react with oxygen atoms?

a) hydrogen b) coordinate covalent c) polar covalent d) ionic

10) Which type of bond is formed by the transfer of electrons from one atom to another?

a) an ionic bond c) a covalent bond
b) a hydrogen bond d) a coordinate covalent bond

11) Which atoms are most likely to form covalent bonds?

a) nonmetal atoms that share electrons

b) metal atoms that share protons
c) nonmetal atoms that share protons
d) metal atoms that share electrons

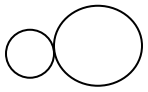
12) Which compound contains *both* covalent and ionic bonds?
a) $CCl_4$ b) KCl c) $MgCl_2$ d) $NH_4Cl$

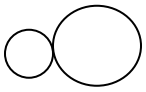
13) Oxygen, nitrogen, and fluorine bond with hydrogen to form molecules. These molecules are attracted to each other by
a) coordinate covalent bonds
b) electrovalent bonds
c) ionic bonds
d) hydrogen bonds

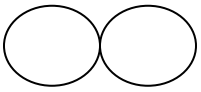
14) The bond between hydrogen and oxygen in a water molecule is classified as
a) covalent and nonpolar
b) ionic and nonpolar
c) ionic and polar
d) covalent and polar

15) Which is a nonpolar molecule containing a nonpolar covalent bond?
a) $I_2$ b) $CO_2$ c) $NH_3$ d) $H_2O$

16) Which diagram *best* represents a polar covalent molecule?

a)  HCl

b)  NaCl

c)  $Cl_2$

d)  $H_2$

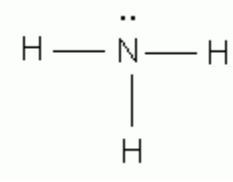
17) Which molecule is nonpolar due to a symmetrical distribution of charge?
a) $CO_2$ b) $NH_3$ c) HCl d) $H_2O$

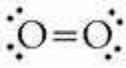
18) The unusually high boiling point of water is due to the
a) network bonds between the molecules
b) nonpolar character of the molecules
c) hydrogen bonds between the molecules
d) linear structure of the molecules

19) Which substance will conduct electricity in *both* the solid phase and the liquid phase?
a) AgCl b) HCl c) Ag d) $H_2$

20) Which formula represents a molecular substance?
a) $Al_2O_3$ b) CO c) CaO d) $Li_2O$

21) Which molecule contains a polar covalent bond?





a) :N≡N: b) c) H—H d)

22) The electrons in a bond between two iodine atoms ($I_2$) are shared
   a) unequally, and the resulting bond is polar
   b) equally, and the resulting bond is polar
   c) unequally, and the resulting bond is nonpolar
   d) equally, and the resulting bond is nonpolar

23) Which of the following solid substances contains positive ions immersed in a sea of mobile electrons?

a) $O_2$ b) Cu c) CuO d) $SiO_2$

## Short Answer Questions:

24) In the boxes below, draw a correct Lewis electron-dot structure for: (3 pts.)

(1) an atom of hydrogen
(2) an atom of oxygen
(3) a molecule of water ($H_2O$)

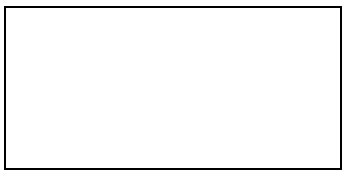
(1) hydrogen (2) oxygen (3) water

25) H ---- Cl Br ---- Br

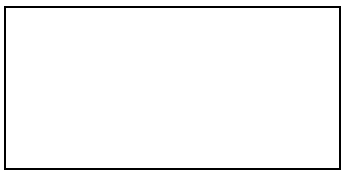
Bond A Bond B

a) State *one* way in which bond A and bond B (above) are the same and *one* way in which they are different. (2 pts.)

b) Draw the Lewis electron-dot diagrams for the two molecules above. Label any partial charges. (2 pts.)



HCl



$Br_2$

c) Is HCl a polar or nonpolar molecule? [Explain why.] (2 pts.)

26) Write the correct IUPAC chemical formula for the following compounds (1 pt. each)

1) barium chloride _____

2) iron (III) bromide _____

3) dihydrogen monoxide _____

4) magnesium nitrate _____

5) sodium bromide _____

27) Write the correct IUPAC chemical names for the following compounds (1 pt. each)

1) $CF_4$ _____

2) $N_2S_3$ _____

3) $MgO$ _____

4) $NaOH$ _____

28) Metals like copper are often used in electrical wiring.

a) Name *two* properties of metals that makes them useful in electrical wiring (2 pts.)

b) Explain how metallic bonding between copper atoms can account for each of these properties (1 pt.)

29) Describe the role of valence electrons in: (1 pt. each)

1) an ionic bond

2) a covalent bond

3) a metallic bond

30) In the laboratory, a student compares the properties of two unknown solids. The results of his experiment are reported in the data table below.

| | **Substance A** | **Substance B** |
|---|---|---|
| **Melting Point** | low | high |
| **Solubility in Water** | nearly insoluble | soluble |
| **Hardness** | soft, waxy crystals | hard crystals |
| **Electrical Conductivity** | poor conductor in both solid and aqueous states | poor conductor in the solid state, but good conductor in the aqueous state |

Predict the type of bonding in substance A. (1 pt.)

31) Given the binary compound formed from magnesium and chlorine:

a) Write the correct IUPAC name for this compound (1 pt.)

b) Write the correct chemical formula for this compound (1 pt.)

c) What type of bond forms between magnesium and chlorine? [*Give one reason to support your answer.*] (2 pts.)

d) In the boxes below, draw the Lewis electron-dot structures for the elements Mg and Cl. (2 pts.)

magnesium chlorine

e) In the box below, draw the Lewis electron-dot structure for the compound formed from magnesium and chlorine. [*Include any charges or partial charges.*] (1 pt.)

32) Explain, in terms of electronegativity, why an H-F bond is expected to be more polar than an H-I bond. (2 pts.)

## BONUS Questions – 1 pt. each

33) Given the reaction: $H_2 + Cl_2 \rightarrow 2HCl$

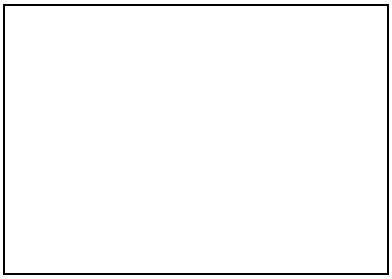
Which statement best describes the energy change as bonds are formed and broken in this reaction?

a) The forming of the H-Cl bond releases energy
b) The forming of the H-Cl bond absorbs energy
c) The breaking of the H-H bond releases energy
d) The breaking of the Cl-Cl bond releases energy

34) When phosphorus and chlorine atoms combine to form a molecule of $PCl_3$, 6 electrons will be

a) shared equally b) shared unequally c) lost d) gained

35) In the box below, draw a Lewis electron-dot structure for a molecule of hydrogen.



hydrogen

1. ____
2. ____
3. ____
4. ____
5. ____
6. ____
7. ____
8. ____
9. ____
10. ____
11. ____
12. ____
13. ____
14. ____
15. ____
16. ____
17. ____
18. ____
19. ____
20. ____
21. ____
22. ____
23. ____

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(3) a molecule of water ($H_2O$)

(1) hydrogen (2) oxygen (3) water

25) H ---- Cl (Bond A) Br ---- Br (Bond B)

a) State *one* way in which bond A and bond B (above) are the same and *one* way in which they are different. (2 pts.)

_____

_____

b) Draw the Lewis electron-dot diagrams for the two molecules above. Label any partial charges. (2 pts.)

HCl $Br_2$

c) Is HCl a polar or nonpolar molecule? [Explain why.] (2 pts.)

_____

_____

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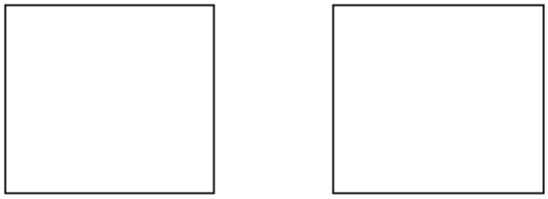
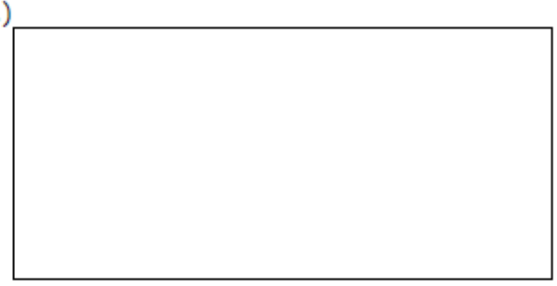


magnesium chlorine

e) In the box below, draw the Lewis electron-dot structure for the compound formed from magnesium and chlorine. [*Include any charges or partial charges.*] (1 pt.)



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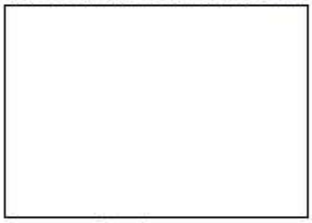

hydrogen

**REGENTS CHEMISTRY** **Bonding & Naming Practice Test** **Name** DOLGOS
**Mr. Dolgos** **Period** ____

1. a
2. a
3. a
4. a
5. c
6. a
7. d
8. b
9. d
10. a
11. a
12. d
13. d
14. d
15. a
16. a
17. a
18. c
19. c
20. b
21. b
22. d
23. b

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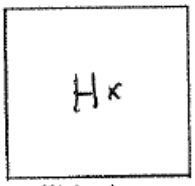
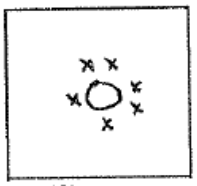
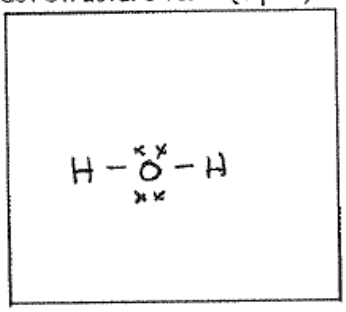

(1) hydrogen


(2) oxygen

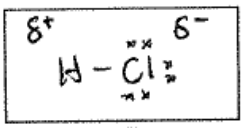

(3) water

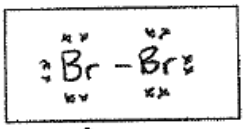
25) H ---- Cl (Bond A) Br ---- Br (Bond B)

a) State *one* way in which bond A and bond B (above) are the same and *one* way in which they are different. (2 pts.)

Both covalent
H-Cl = polar bond Br-Br = nonpolar bond

b) Draw the Lewis electron-dot diagrams for the two molecules above. Label any partial charges. (2 pts.)


HCl


$Br_2$

c) Is HCl a polar or nonpolar molecule? [Explain why.] (2 pts.)

Polar b/c H & Cl have different electronegativities

26) Write the correct IUPAC chemical formula for the following compounds (1 pt. each)

1) barium chloride $BaCl_2$
2) iron (III) bromide $FeBr_3$
3) dihydrogen monoxide $H_2O$
4) magnesium nitrate $Mg(NO_3)_2$
5) sodium bromide $NaBr$

27) Write the correct IUPAC chemical names for the following compounds (1 pt. each)

1) $CF_4$ Carbon tetrachloride
2) $N_2S_3$ Dinitrogen trisulfide
3) $MgO$ Magnesium oxide
4) $NaOH$ Sodium Hydroxide

28) Metals like copper are often used in electrical wiring.

a) Name *two* properties of metals that makes them useful in electrical wiring (2 pts.)
Malleable, ductile, good conductors

b) Explain how metallic bonding between copper atoms can account for each of these properties (1 pt.)
Conductor = sea of mobile valence $e^-$
Malleable/ductile = no rigid crystal structure

29) Describe the role of valence electrons in: (1 pt. each)

1) an ionic bond
Transferred from one atom to another

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Shared between atoms

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Sea of mobile valence $e^-$

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Predict the type of bonding in substance A. (1 pt.)

Covalent

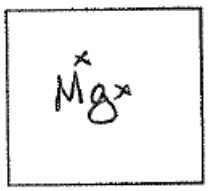
31) Given the binary compound formed from magnesium and chlorine:

a) Write the correct IUPAC name for this compound (1 pt.) $MgCl_2$

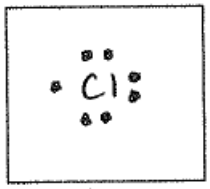
b) Write the correct chemical formula for this compound (1 pt.) Magnesium chloride

c) What type of bond forms between magnesium and chlorine? [*Give one reason to support your answer.*] (2 pts.) Ionic b/c $e^-$ transferred from Mg to Cl

d) In the boxes below, draw the Lewis electron-dot structures for the elements Mg and Cl. (2 pts.)



magnesium



chlorine

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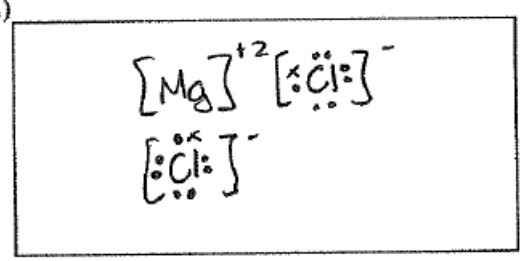

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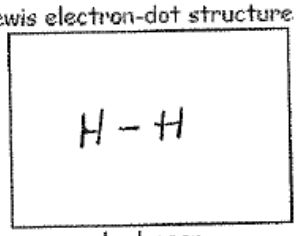


hydrogen