Name:_____

SCH 4U Unit Test
Forces and Molecular Properties

1. Fill in each table as done on the assignment. Including the oxidation state of the central atom:

PO_4^{3-}	total # of e^- pairs	
	σ bonding pairs	
	lone pairs	
	π bonding pairs	
	base shape	
	autual shape	
	approx. bond angles	

XeF_4	total # of e^- pairs	
	σ bonding pairs	
	lone pairs	
	π bonding pairs	
	base shape	
	autual shape	
	approx. bond angles	

NO_2^{1-}	total # of e^- pairs	
	σ bonding pairs	
	lone pairs	
	π bonding pairs	
	base shape	
	autual shape	
	approx. bond angles	

2. Classify each of the following formula according to type of forces by placing each formula in the correct place in the table:

- NH_3 (ammonia)
- $AsCl_5$ (arsenic(V) chloride)
- BaF_2 (barium fluoride)
- CuSn (bronze)
- C_3H_7COOH (butanoic acid)
- 24Cr (chromium)
- $C_{10}H_{22}$ (decane)
- C_n (diamond)
- H_2CCl_2 (dichloromethane)
- C_2H_5OH (ethyl alcohol)
- LiF (lithium fluoride)
- $C_6H_4(CH_3)_2$ (para-xylene)
- $COCl_2$ (phosgene)
- SiO_2 (quartz)
- Na_2SO_4 (sodium sulphate)
- H_2O (water)

Ionic Crystals (including crystals containing polyatomic ions)	Covalently Bonded Compounds				Metallic Crystals
	Covalent Network Crystals	Discrete Covalent Molecules			
		van der Waal (intermolecular force)	dipole inter-action (intermolecular force)	hydrogen bond (intermolecular force)	

3. How is it possible to have an ionic solid (high M.P and B.P. dissolves in water, crystal structure) that is composed entirely of non-metal atoms. An example would help.

4. Fill in the blanks! Be sure to use the word that best suits the particular situation. This may include N.A.

a) The intermolecular forces between gas molecules is

_____

b) The intermolecular force within a diamond lattice is

_____

c) In ammonium nitrate (NH_4NO_3), what occupies the lattice points _____

d) A type of force that is present between molecules in any molecular solid or molecular liquid _____

e) A type of force that requires strong molecular polarization and lone pair interaction _____

f) A type of force that is required before van der Waals, dipole interactions or hydrogen bonding are possible

_____

g) A particular type of covalent bonding that makes possible the anisotropic (means different in different directions) conductivity observed in a 2-dimensional network solids such as graphite _____

h) A type of bond that does not alter the number of valence electrons around the central atom in a discrete covalent molecule or polyatomic ion _____

i) Is based on electronegativity and tells you how many electrons a atom can lay claim to.

5. For each pair of compounds, circle the one with the higher melting and/or boiling point. In the space provided give the rational for your choice. Including precise reference to the attractive forces that must be overcome to melt or boil each compound and why this leads to the choice you have made. Be specific as to whether the forces that must be overcome are intramolecular or intermolecular. Include any additional relevant information that has helped your choice. Use point form.

a) H_2O vs H_2S

b) CO_2 vs SiO_2

c) Na vs Al

d) C_4H_{10} vs C_6H_{14}

6. For each of the following substances, state if it dissolves in water or not. If it does dissolve in water, what is the smallest unit or units that will be present in water. If it does not dissolve in water, why not.

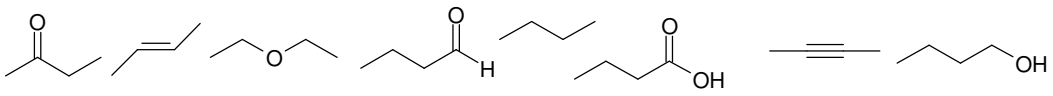
Substance	Dissolves in Water (Yes or No)	Smallest Units When Dissolved or Why Not Soluble in Water
Ethyl Alcohol (C_2H_5OH)		
Octane (C_8H_{18})		
Gold (Au)		
Ammonium Chloride (NH_4Cl)		

7. Both diamond and ice can form clear solids. The covalent bonds present in ice are 1.33 times stronger than the covalent bonds present in diamond. How then is it possible that ice has a much lower melting point (100 °C) than diamond (approx 4000 °C). Make precise reference to the units present at the lattice points in both crystals and all forces involves in both solids. Diagrams may help.

8. State the conductivity observed for each of the following substances. Very briefly explain the observed conductivity.

Au(s)
$C_{diamond}(s)$
$C_{graphite}(s)$

9. For each of the following substances, organize in order of increasing melting and boiling point (lowest melting point to the left). State the intermolecular forces at play for each substance. It is possible that some of these compounds have roughly the same M.P. and B.P.



10. Many solid compounds exhibit the property of cleavage. What is this property and how does it work? What are two examples of substances that exhibit cleavage that do not share the same type of bonding