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:

BO_3^{3-}	total # of e^- pairs	
	σ bonding pairs	
	lone pairs	
	π bonding pairs	
	base shape	
	actual shape	
oxidation state of B	approx. bond angles	

SF_4	total # of e^- pairs	
	σ bonding pairs	
	lone pairs	
	π bonding pairs	
	base shape	
	actual shape	
oxidation state of S	approx. bond angles	

NO_3^{1-}	total # of e^- pairs	
	σ bonding pairs	
	lone pairs	
	π bonding pairs	
	base shape	
	actual shape	
oxidation state of N	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:

- H_2O (water)
- SF_6 (sulphur(VI) fluroide)
- Ag (silver)
- CH_3COOH (acetic acid)
- KI (potassium iodide)
- C_4H_{10} (butane)
- $HCCl_3$ (chloroform)
- C_n (diamond)
- CH_3OH (methyl alcohol)
- Li_2O (lithium oxide)
- $C_6H_5CH_3$ (toluene)
- CO_2 (carbon dioxide)
- SiO_2 (quartz)
- NH_4NO_3 (ammonium nitrate)
- HF (hydrogen fluoride)
- $Cu_{0.85}Zn_{0.10}Sn_{0.05}$ (brass)
- KNO_3 (potassium nitrate)
- PCl_3 (phosphorus trichloride)
- CF_4 (carbon tetrafluoride)
- $H_5C_2OC_2H_5$ (diethyl ether)

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. 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 as well as any other forces that may be present 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) NH_3 vs CH_4

b) Sc vs K

c) CO_2 vs SiO_2

d) $H_5C_2OC_2H_5$ vs C_5H_{12}

4. Match each definition with the word it best describs:

___	electrons that do not affect the shape of a molecule	1.	anisotropic
___	an intramolecular force that is influenced by the number of electrons available in the valence shell	2.	coordinate covalent bond
___	a term used to describe the ability of double bond electrons in graphite planes to flip location	3.	delocalized
___	necessary for hydrogen bonding to occur	4.	discrete covalent molecule
___	uneven electron pair sharing	5.	electronegativity
___	type of energy associated with the strength of a solid ionic crystal	6.	exposed proton
___	an intermolecular force that is influenced by the total number of electrons found in a discrete covalent molecule	7.	hydration
___	describes a feature of conductivity that is unique to graphite	8.	lattice
___	type of energy associated with the interaction between water molecules and dissolved ions	9.	lone pair
___	a property used to determine the degree of polarization within a single covalent bond	10.	macromolecule
___	unspecified and large number of atoms or ions bonded together by an intramolecular force	11.	metallic
___	produces difference between actual shape and base electron shape	12.	pi
___	type of covalent bond that is used by halogens and halogen like oxygens	13.	sigma
___	must be present before intermolecular forces can be considered	14.	tetrahedral
___	most common place base shape	15.	van der Waals

5. Organize the following list in order of decreasing solubility in water. Give some clear reasoning behind your choice using the appropriate vocabulary from this unit.

alcohol, aldehyde, alkane, carboxylic acid, alkyne, ether, ketone, alkene

6. Explain the reason for the observed conductivity or lack there of in the following substance (note the states):

iron (s)
NaCl (aq)
graphite (s)
NaCl (s)
SiO_2 (s)
$C_{25}H_{52}$ (l)

7. Provide any and all information that you possibly can about the substance ammonium nitrate (NH_4NO_3). This is an open ended question. Here are some ideas, but feel free to add more! What force, or forces are present in the solid state? What type of compound is this? What are the individual units within the solid lattice structure? What are the shape details of these units? What is the solubility of the this substance in water or in non-polar substances such as hexane. Use point form and diagrams. Some marks are for presentation.