

## Homework 5 Answer Key

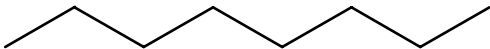
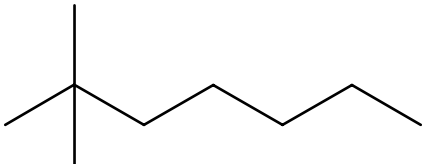
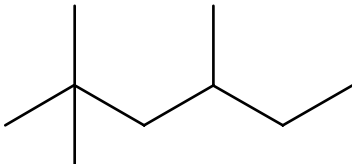
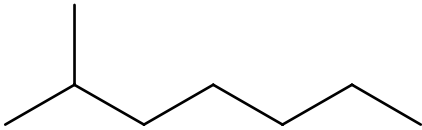
### Fingerprints

Could she have been in the car?

There are two possibilities. First, the finger prints could have evaporated.  
Second, the car could have been wiped down.

1) Both the adult's and the child's fingerprints will be dominated by London Dispersion forces. Although dipole forces are stronger, the length of the hydrocarbon chains is still sufficient to provide the dominant force in this case.

2) The adult will have ~ double the London forces since it was ~2x longer hydrocarbon chains. The adults finger prints should last significantly longer than the child's.

	Structure	Boiling Point (°C)
octane		125.6
2,2-dimethylhexane		107
2,2,4-trimethylpentane		99.2
2-methylheptane		117.7

### Ch. 3

27. This problem is best solved by looking at the periodic table and identifying the possible oxidation states for each element involved

$\text{AlCl}$  –  $\text{Al}^{+1}$ ,  $\text{Cl}^{-1}$  -  $\text{Al}^{+1}$  is not a stable oxidation state for Al.  $\text{AlCl}_3$

$\text{NaF}_2$  –  $\text{Na}^{+2}$ ,  $\text{F}^{-1}$  -  $\text{Na}^{+2}$  is not a stable oxidation state for Na.  $\text{NaF}$

$\text{Ga}_2\text{O}_3$  –  $\text{Ga}^{+3}$  and  $\text{O}^{-2}$  - Both of these are stable oxidation states. This is a correct formula.

$\text{MgS}$  –  $\text{Mg}^{+2}$  and  $\text{S}^{-2}$  - Both of these are stable oxidation states. This is a correct formula.

29.

- a)  $\text{Pb}(\text{NO}_3)_2$  – Lead Nitrate - One  $\text{Pb}^{+2}$  and two  $(\text{NO}_3)^-$
- b)  $\text{NiCO}_3$  – Nickel Carbonate – One  $\text{Ni}^{+2}$  and one  $(\text{CO}_3)^{-2}$
- c)  $(\text{NH}_4)_3\text{PO}_4$  – Ammonium Phosphate – Three  $(\text{NH}_4)^+$  and one  $(\text{PO}_4)^{-3}$
- d)  $\text{K}_2\text{SO}_4$  – Potassium Sulfate – Two  $\text{K}^+$  and one  $(\text{SO}_4)^{-2}$

36.

- a.  $(\text{NH}_4)_2(\text{CO}_3)$
- b.  $\text{CaI}_2$
- c.  $\text{CuBr}_2$
- d.  $\text{AlPO}_4$

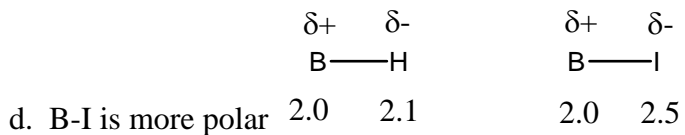
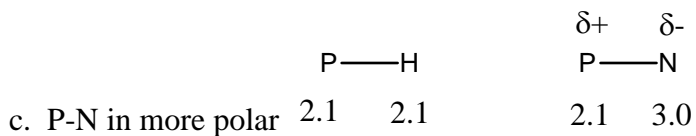
115. The key thing to remember is that electrons have a negative charge. For each negatively charged electron that is lost, a positive charge develops on the metal.

Ch. 8

45.

	$\delta^+$	$\delta^-$	$\delta^+$	$\delta^-$
	C	— O	C	— N
a. C-O is more polar	2.5	3.5	2.5	3.0

	$\delta^+$	$\delta^-$	$\delta^+$	$\delta^-$
	B	— O	P	— S
b. B-O is more polar	2.0	3.5	2.1	2.4



49.

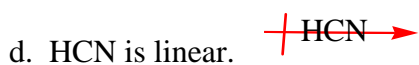
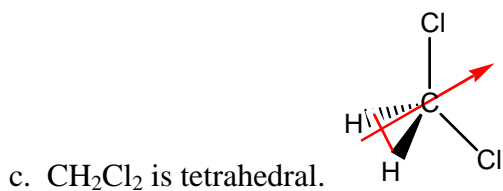
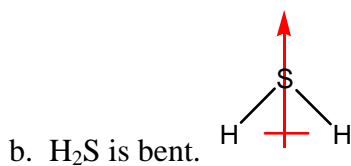
a. The C-H bonds are slightly polar. The hydrogens are slightly positive with respect to the carbons (delta of 0.4). The C=O is polar with the carbon positive with respect to oxygen (delta of 1.0). The carbon carbon bonds are non-polar.

b. The most polar bond is the C=O. The oxygen atom is the negative end of the bond.

Ch. 9

49.

a. XeF<sub>2</sub> is linear. There is no net dipole moment.



55.

- a. The group IV hydrogen compounds are dominated by an increase in London dispersion forces as you go down the column leading to an increase in boiling point.
- b. The group V hydrogen compounds from P to Sb are dominated by an increase in London dispersion forces as you go down the column leading to an increase in boiling point. The much higher boiling point of  $\text{NH}_3$  arises from hydrogen bonding.
- c. The group VI hydrogen compounds from S to Te are dominated by an increase in London dispersion forces as you go down the column leading to an increase in boiling point. The much higher boiling point of  $\text{H}_2\text{O}$  arises from hydrogen bonding.
- d. The group VII hydrogen compounds from Cl to I are dominated by an increase in London dispersion forces as you go down the column leading to an increase in boiling point. The much higher boiling point of  $\text{HF}$  arises from hydrogen bonding.

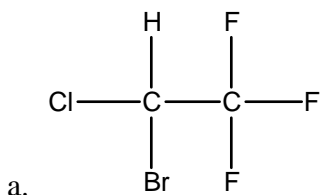
59.  $\text{Rn} > \text{Xe} > \text{Kr} > \text{Ar} > \text{Ne} > \text{He}$ . This trend is due to London dispersion forces increasing as you go down the column.

63. Alpha-tocopherol has a C13 hydrocarbon chain as well as methyl groups on an aromatic rings. Both of these features will make in the molecule soluble in fat, not water. The single  $-\text{OH}$  and ROR groups are not sufficient to counter act the other portions.

99.

- a. Hydrogen bonding
- b. a covalent bond
- c. NOT a hydrogen bond
- d. This interaction would have to be due to London dispersions forces. It is not a hydrogen bond.

103.



- b. The  $\text{CF}_3$  group of atoms is more electronegative than the  $\text{CHBrCl}$  group of atoms. The molecule will be polar with the dipole pointing towards the  $\text{CF}_3$ .

c. No. The C-H bond is covalent and does not participate in hydrogen bonding.

## Ch. 11

11.

a. Ethylene glycol is most similar to water and ethanol. The surface tension of ethylene glycol almost exactly the average of the surface tension of water and the surface tension of ethanol.

b. hexane is most similar to octane

c. gallium metal at 40 °C is most similar to mercury

15. The heat of vaporization is the amount of heat required (in Joules per mole) to convert a liquid into a gas. The heat of condensation is the amount of heat given off when a gas is converted into a liquid. Liquids can interact via a variety of interactions including London dispersion forces and dipole forces. Breaking these interactions requires energy thus the vaporization process is endothermic.

25. The vapor pressure of a liquid increases with temperature because more heat is available to break the interactions between the molecules. The greater the temperature, the greater the number of molecules which will be present above the liquid.