Chemistry 275
Exam #1
September 16, 2015

Name: Key

ID#: _____

Clearly print your name in the space provided.

Clearly print your student ID number in the space provided.

Maintain appropriate security over your exam.

PERIODIC TABLE OF THE ELEMENTS

1A	2A	3B	4B	5B	6B	7B	8B	8B	8B	1B	2B	3A	4A	5A	6A	7A	8A
1 **H** 1.01																	2 **He** 4.00
3 **Li** 6.94	4 **Be** 9.01											5 **B** 10.81	6 **C** 12.01	7 **N** 14.01	8 **O** 16.00	9 **F** 19.00	10 **Ne** 20.18
11 **Na** 22.99	12 **Mg** 24.31											13 **Al** 26.98	14 **Si** 28.09	15 **P** 30.97	16 **S** 32.07	17 **Cl** 35.45	18 **Ar** 39.95
19 **K** 39.10	20 **Ca** 40.08	21 **Sc** 44.96	22 **Ti** 47.88	23 **V** 50.94	24 **Cr** 52.00	25 **Mn** 54.94	26 **Fe** 55.85	27 **Co** 58.93	28 **Ni** 58.69	29 **Cu** 63.55	30 **Zn** 65.39	31 **Ga** 69.72	32 **Ge** 72.61	33 **As** 74.92	34 **Se** 78.96	35 **Br** 79.90	36 **Kr** 83.80
37 **Rb** 85.47	38 **Sr** 87.62	39 **Y** 88.91	40 **Zr** 91.22	41 **Nb** 92.91	42 **Mo** 95.94	43 **Tc** (98)	44 **Ru** 101.07	45 **Rh** 102.91	46 **Pd** 106.42	47 **Ag** 107.87	48 **Cd** 112.41	49 **In** 114.82	50 **Sn** 118.71	51 **Sb** 121.76	52 **Te** 127.60	53 **I** 126.90	54 **Xe** 131.3
55 **Cs** 132.91	56 **Ba** 137.33	57 **La** 138.91	72 **Hf** 178.49	73 **Ta** 180.95	74 **W** 183.85	75 **Re** 186.21	76 **Os** 190.2	77 **Ir** 192.22	78 **Pt** 195.08	79 **Au** 196.97	80 **Hg** 200.59	81 **Tl** 204.38	82 **Pb** 207.19	83 **Bi** 208.98	84 **Po** (209)	85 **At** (210)	86 **Rn** (222)
87 **Fr** (223)	88 **Ra** 226.03	89 **Ac** (227)	104	105	106	107	108	109									

1. Write out the electron configuration for the following elements. (9 pts)

a) Sulfur in it ground state

$1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^4$

b) Mg^{2+} ion

$1s^2\ 2s^2\ 2p^6$

c) N^{-3} ion

$1s^2\ 2s^2\ 2p^6$

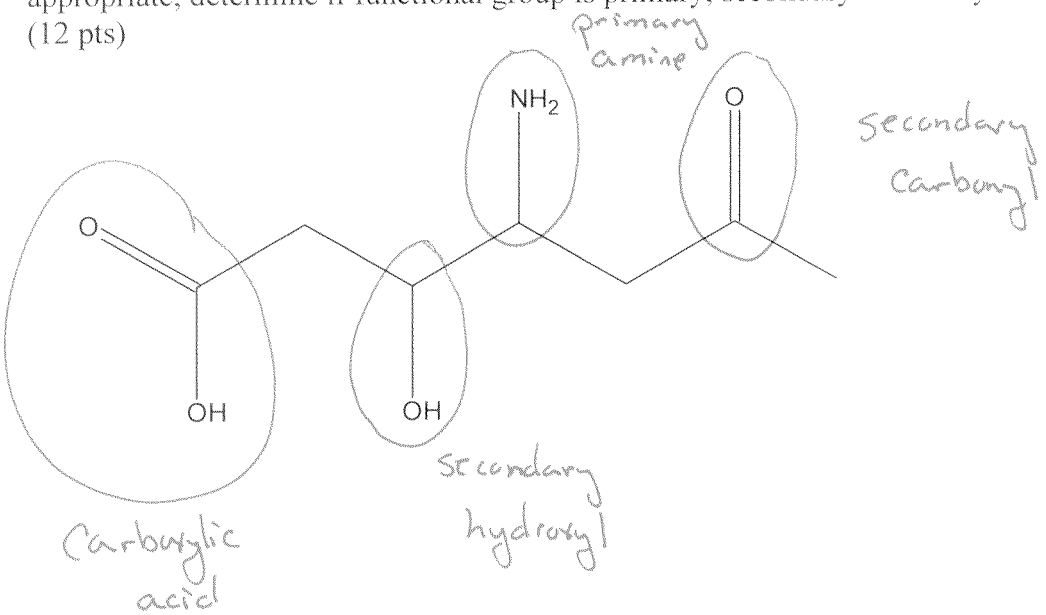
2. Draw the Lewis Dot structure of OCl^{-1}. Calculate the formal charge on both the oxygen and the chlorine. Show your work. (6 pts)

Cl	7e⁻
O	6e⁻
1e⁻	1e⁻
	14 val. electrons

Cl: $7-(6+\frac{1}{2}(2))=0$

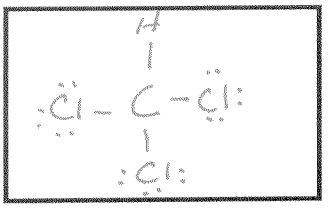
O: $6-(6+\frac{1}{2}(2))=-1$

3. Circle and identify the functional groups in the following molecule. When appropriate, determine if functional group is primary, secondary or tertiary. (12 pts)



4. Draw the Lewis Dot structure for the following molecules. Calculate the number of valence electrons, determine the geometry and hybridization of each specified atom and determine whether the molecule is either polar or nonpolar. (20 pts)

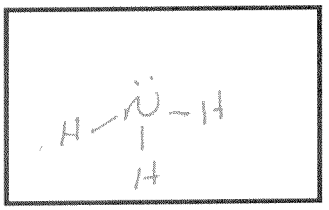
a) $CHCl_3$



Lewis Structure

Valence electrons	26
Molecular geometry	tetrahedral
Hybridization of ~~boron~~ carbon	sp^3
Polar or Non-polar	polar

b) NH_3



Lewis Structure

Valence electrons	8
Molecular geometry	trigonal pyrmidal
Hybridization of nitrogen	sp^3
Polar or Non-polar	polar

5. Which direction would the following equilibrium lie? (4 pts)

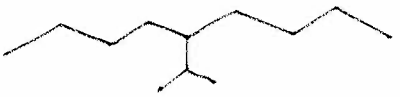
$$CH_3CH_2CH_2COO^- + C_6H_5OH \leftrightarrows C_6H_5O^- + CH_3CH_2CH_2COOH$$

$CH_3CH_2CH_2COOH$: $K_a = 1.51 \times 10^{-5}$ ← stronger acid

C_6H_5OH: $K_a = 1.00 \times 10^{-10}$

6. Draw the line angle formula for following compounds. (15 pts)

a) 5-isopropyl nonane

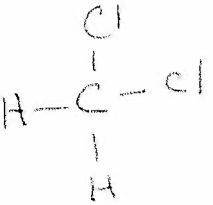


b) $(CH_3)_3CCH_2CH(CH_3)_2$

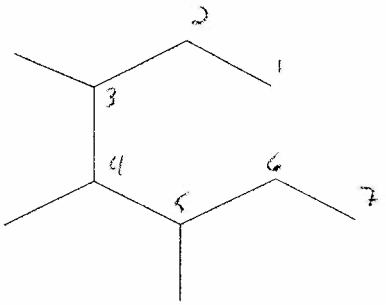
c) dichloromethane

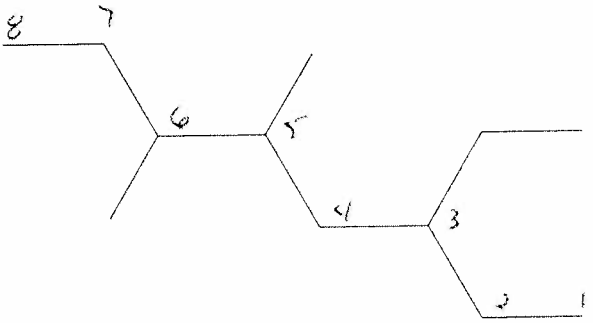
[redacted]

[redacted]



7. Name the following hydrocarbons. (20 pts)

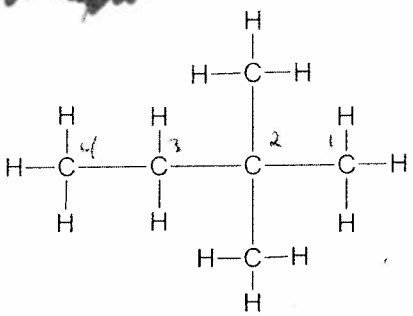


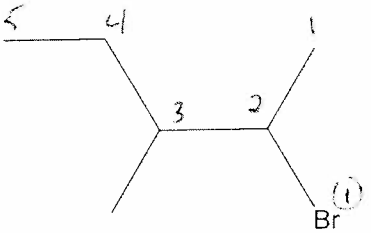


3,4,5-trimethyl heptane

3-ethyl -5,6-dimethyl octane

[redacted]





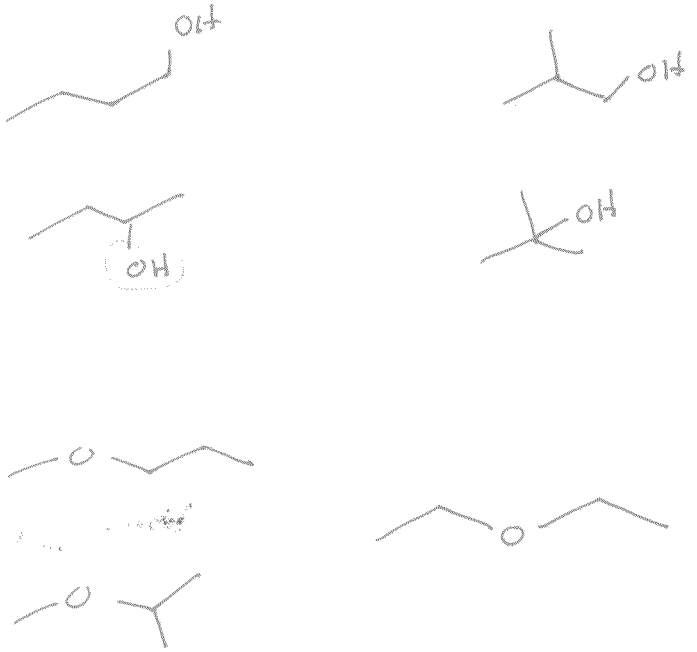
2,2-dimethyl butane

2-bromo- 3-methyl pentane

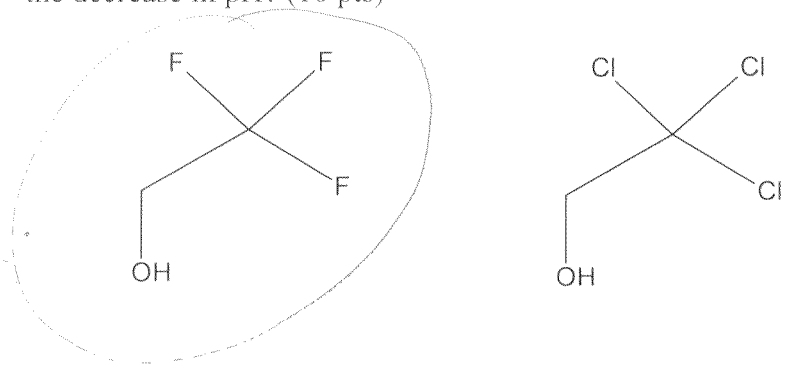
8. Draw all possible constitutional isomers of $C_4H_{10}O$. (30 pts)

7 isomers

4 pts each
2 pts for trying



9. Circle the acid which would be the strongest. What effect is responsible for the decrease in pH? (10 pts)



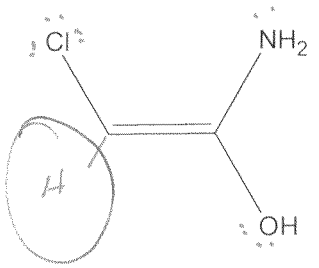
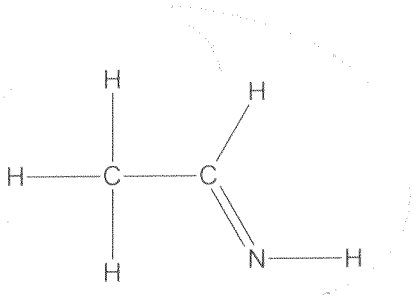
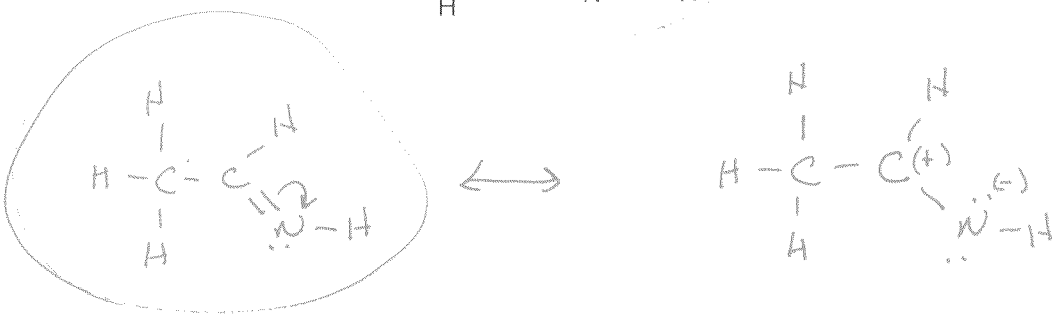
The fluorines are more electronegative hence the inductive effect is stronger

10. Determine how many of the following there are in the molecule below. (12 pts)

lone pair of electrons 6 (12)

sigma bonds 8

pi bonds 1



11. Draw all possible resonance structures of the organic molecule below. Be sure to draw in all lone pairs of electrons in each structure. Of the structures you have drawn circle the most stable structure. (12 pts)