Exam 3
CEM 151
Wednesday, November 8, 2006

Name_____
Section_____
PID_____

Multiple choice (3 points each).

1. Which of the following has the largest atomic radius?

| | | | |
|---|---|---|---|
| a. Al | c. Na | e. Ca | g. They are all equal |
| b. Ti | d. Ar | f. Mg | h. Can't predict |

2. Which of the following electrons feels the highest effective nuclear charge (EFF)?

a. The 3s electron in Na
b. The 3p electrons in P
c. The 3p electrons in Cl
d. The 2s electrons in Be
e. The 6p electrons in At
f. Not enough information

3. Which of the following lists properly ranks the ionization energy (from lowest to highest) of the elements?

a. Cl F Be Li Rb
b. F Cl Be Li Rb
c. Rb Li Be Cl F
d. Li Rb Be Cl F
e. Rb Li Be F Cl
f. Li Be Cl F Rb
g. Li Be Rb Cl F
h. Li Be Rb F Cl

4. Which of the following has the lowest (most negative) electron affinity?

| | | | |
|---|---|---|---|
| a. I | c. Ne | e. Na | g. Al |
| b. F | d. Li | f. Mg | h. They are all the same |

5. Which of the following have the highest (most positive) electron affinity?

a. Na c. Al e. S g. They are all the same
b. Mg d. Si f. Cl h. Not enough information

6. Which of the following have the smallest radius?

a. Li c. $Mg^{2+}$ e. Si g. $Cl^-$
b. $Na^+$ d. $Al^{3+}$ f. Cl

7. Which of the following gives the number of valence electrons for the following elements:
$As^{3+}$, $Zn^{2+}$, Ca, Mn, $Cl^-$

a. 2, 2, 2, 7, 8
b. 5, 2, 2, 8, 8
c. 2, 10, 2, 7, 8
d. 3, 10, 2, 5, 7
e. 2, 2, 2, 5, 7
f. .2, 10, 2, 5, 8
g. 2, 3 , 4, 5, 6
h. 2, 2, 2, 2, 2
i. None of the above

8. Which of the following would you expect to have the largest dipole moment?

a. $NF_3$ c. $NF_4^+$ e. $NI_3$ g. none have dipole moments
b. $NCl_3$ d. $NH_3$ f. $BH_3$ h. They are all equal

9. Using the table of bond energies given, estimate the ΔH for the following reaction:

$CH_4 + 2O_2$ -----> $CO_2$ + $2H_2O$

a. -1305 kJ c. -379 kJ e. -421 kJ g. -421 J
b. -808 kJ d. -910 J f. -1105 J h. -1000 kJ

10. Which element do you predict will have the highest electronegativity?

a. N c. C e. O g. S
b. P d. As f. Se h. Cs

For the following, draw correct Lewis structures showing any formal charges and resonance structures. For each molecule, give the geometry, shape and hybridization of the molecule and whether the molecule is polar or non-polar (has a dipole moment). Show the most negative end of the molecule if it is polar. (7 points each)

11. $XeF_2$

12. $BrF_5$

13. $SF_3Cl$

14. $B(OH)_3$

15. $SO_3^{-2}$

16. NO

17. $N_2O$

18. $N_3^-$

19. $BrF_3$

20. $O_3$

21. $ClO_4^-$

## TABLE 8.4 Average Bond Enthalpies (kJ/mol)

### Single Bonds

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| C—H | 413 | N—H | 391 | O—H | 463 | F—F | 155 |
| C—C | 348 | N—N | 163 | O—O | 146 | | |
| C—N | 293 | N—O | 201 | O—F | 190 | Cl—F | 253 |
| C—O | 358 | N—F | 272 | O—Cl | 203 | Cl—Cl | 242 |
| C—F | 485 | N—Cl | 200 | O—I | 234 | | |
| C—Cl | 328 | N—Br | 243 | | | Br—F | 237 |
| C—Br | 276 | | | S—H | 339 | Br—Cl | 218 |
| C—I | 240 | H—H | 436 | S—F | 327 | Br—Br | 193 |
| C—S | 259 | H—F | 567 | S—Cl | 253 | | |
| | | H—Cl | 431 | S—Br | 218 | I—Cl | 208 |
| Si—H | 323 | H—Br | 366 | S—S | 266 | I—Br | 175 |
| Si—Si | 226 | H—I | 299 | | | I—I | 151 |
| Si—C | 301 | | | | | | |
| Si—O | 368 | | | | | | |
| Si—Cl | 464 | | | | | | |

### Multiple Bonds

| | | | | | |
|---|---|---|---|---|---|
| C=C | 614 | N=N | 418 | $O_2$ | 495 |
| C≡C | 839 | N≡N | 941 | | |
| C=N | 615 | N=O | 607 | S=O | 523 |
| C≡N | 891 | | | S=S | 418 |
| C=O | 799 | | | | |
| C≡O | 1072 | | | | |