

Name: _____

Chemistry 112

Final Exam

Remember- Show all work for partial credit.

2 points for your name. All problems are worth 14 points. You may skip one question from the non-comprehensive part of this test (if you do all 8 questions I will throw out the worst one.)

1. Give the electron configurations of the following atoms or ions

Mg

Cr

Pb⁺²

2. Order the following atoms by their periodic properties

Atomic radius

C, Ca, Br Largest _____ Smallest

Ionization energy

Na, Kr, F Largest _____ Smallest

Least exothermic to most exothermic electron affinity

S, As, F Least _____ Most

Electronegativity

Cl, As, Se Most electronegative _____ Least electronegative

3. Below are several ions and atoms. Rank these ions and atoms in order of increasing size

Na⁺, Ca²⁺, Al³⁺, N³⁻, Se²⁻, Cl, He, Ar

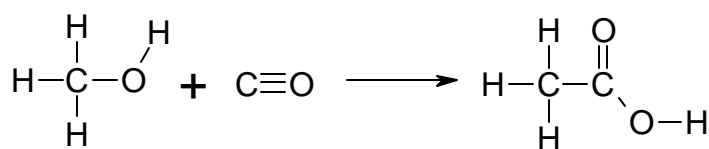
Smallest _____ Largest

4. As expected from general periodic trends, Li is the alkali metal with the highest ionization energy, and Cs has the lowest, hence Cs is should be more reactive than Li. However, when reacting with water in the reaction $2M(s) + 2H_2O(l) \rightarrow H_2(g) + 2M^+(aq) + 2OH^-(aq)$ we find that the order of reactivity is $Li > K > Na$. Explain.

5. Use the following data to estimate ΔH_f^0 for sodium chloride ($Na(s) + 1/2Cl_2(g) \rightarrow NaCl(s)$)

Lattice energy	-786 kJ/mol
Ionization energy for Na	+495 kJ/mol
Electron affinity of Cl	-349 kJ/mol
Bond Energy of Cl_2	+239 kJ/mol
Enthalpy of sublimation for Na	+109 kJ/mol

6. Estimate ΔH_{rxn} of the following reaction:



O-H 467 C≡C 839

Given the following Bond energies

H-H	432	O-O	146
C-H	413	C=C	614
C-C	347	C=O	745
C-O	358	C≡O	1072

7. Give the Lewis structure, electron geometry, molecular geometry and bond angles for the following three compounds. Also determine if the compounds are polar or nonpolar.

OCN⁻
(C in central atom)

IF₅

AsF₅

8. Find at least 2 non-equivalent Lewis structures for NO₄³⁻ and use formal charge to determine which is the better structure.