General Chemistry Review for Organic Chemistry 1

1. Provide Lewis structures for the following molecules, including all major resonance contributors

a) N2

b) CH3CO2Na

c) O3

1. Provide orbital drawings of the following molecules. (Don’t forget to shade the p orbitals appropriately!) Indicate the hybridization and bond angle at each non-hydrogen atom. Indicate the sigma and pi bonds and all lone pairs of electrons.



1. BeCl2
2. H2C= C=O
3. Calculate ∆H for each of the following reactions
4. CH3CH2Cl + HI 🡪 CH3CH2I + HCl
5. CH3CH2OH + HBr 🡪 CH3CH2Br + H2O
6. The equilibrium constant for the ring inversion of fluorocyclohexane is 1.5 at 25 C.
7. What does the equilibrium constant indicate?
8. Write the equilibrium equation for this equation



1. Suppose that a simple reaction (A 🡪 products) has ∆H° = 25 kJ/mole and Ea = 75 kJ/mole. ***Sketch*** and ***clearly label*** a ***reaction coordinate diagram*** for this reaction. Draw a second diagram showing the effect of adding a catalyst.
2. Draw the reaction coordinate diagram for a two-step endothermic reaction in which the first step is exothermic and the second step is the slow step. Label the following points and features on your diagram:
	1. reactants
	2. product
	3. transition state for rate determining step
	4. reaction intermediate
	5. ΔH
	6. E act
3. The conjugate base of H2CF2 is\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_. The conjugate acid of HAsO32- is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
4. **SHOW ALL WORK.** At 400 °C, Kc = 2.50 x 108 for the following reaction. At this temperature, 0.50 moles of **B** and 0.25 moles of **C** are combined in a 1.00-L container and the system is allowed to reach equilibrium. Determine the equilibrium concentration of **A**. (Clearly state and justify any assumptions that you make.)

3 **A**(g) 🡨 🡪 2 **B**(g) + **C**(g)

1. Using acid-base concepts, predict the logical products of the following reaction in aqueous solution. Write ***Lewis electron dot formulas*** (including formal charges and/or resonance forms if needed) for all reactants and products. *Clearly indicate which* *reactant is the Lewis acid and which is the Lewis base*. Use arrow(s) to illustrate the formation and breaking of any bonds as the reaction proceeds from left to right.

NO2- (aq) + HCN(aq) 🡨 🡪

1. Define the meaning of pKa and explain the trend in pKa in terms of acidity.
2. Consider the following reaction and the related thermodynamic data.

3 SO2(g) + 2 NO2(g) 🡪3 SO3(g) + N2O(g)

|  |  |  |
| --- | --- | --- |
| Compound | Standard Heat ofFormation (∆H°f) in kJ/mole | Standard Entropy(S°) in J/mole×K |
| NO2(g) | 33 | 240 |
| N2O(g) | 82 | 221 |
| SO2(g) | - 297 | 248 |
| SO3(g) | - 396 | 257 |

1. **SHOW ALL WORK.** Is the above reaction spontaneous at 25 °C? Calculate the appropriate thermodynamic quantity that is required in order to answer this question.
2. **SHOW ALL WORK.** Calculate the ***equilibrium constant*** (Kp) for the above reaction at 750 °C. (∆H and ∆S are relatively independent of temp)

