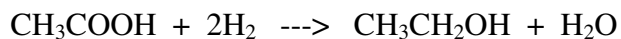


Chem 161
Exam #2

Name _____
November 10, 2003

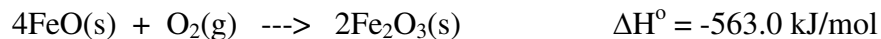
Show your work and box your answers. Be sure to use the correct number of significant figures and the correct units.

1. (10) (a) Use the bond energy values provided to calculate the enthalpy change for the reaction



(b) Is bond breaking an exothermic or an endothermic process? No explanation required.

2. (5) Iron (II) oxide can be oxidized to iron (III) oxide according to the following equation:



Given that ΔH_f° of $\text{FeO}(s) = -272.0 \text{ kJ/mol}$, what is ΔH_f° of $\text{Fe}_2\text{O}_3(s)$?

3. (8) It's a hot day, and you need a cool, refreshing drink. You fill a glass with 252 g of water from the tap and note (being the observant person that you are) that its temperature is 16.4°C . You take several ice cubes (mass = 91.3 g, $T = 0.0^\circ\text{C}$) out of the freezer and add them to the water. After some of the ice has melted, you observe that the temperature of the water/ice mixture is 0.0°C . How many grams of ice have melted? Assume that no heat has entered the water or ice from the surroundings.

4. (8) Choose the compound in each pair with the property indicated, and explain.

(a) Greater (more negative) lattice enthalpy: MgO or NaF

(b) Stronger bond: NaCl or NaBr

5. (7) Use Lewis dot structures to compare the bonding in O_2 and O_2^{2-} . Which will have the longer O-O bond? Which will have the stronger O-O bond?

6. (17) (a) Draw Lewis structures for the following molecules and ions. Give the shape of each molecule or ion, and the approximate bond angles. State the hybridization on each central atom.



(b) For each neutral molecule, state whether the molecule will be polar or non-polar.

7. (6) A molecule with one fluorine, one nitrogen, and one oxygen atom can be drawn with F, O, or N as the central atom. In fact, only one of these arrangements is stable. Experiment with Lewis structures for the three possibilities, and determine which arrangement would be stable.

8. (13) Describe the bonding in acetylene (HCCH). Begin by drawing a Lewis structure for the molecule. What is the hybridization of each carbon atom? How many sigma and pi bonds does the molecule contain? State which orbitals are used in forming each bond.

9. (14) Consider the compounds CF_4 and CH_3F in their liquid states.

(a) What forces (bonds and/or specific intermolecular forces) must be overcome in order to vaporize each substance?

(b) Why might CF_4 be expected to have the higher boiling point?

(c) Why might CH_3F be expected to have the higher boiling point?

(d) Will the compound with the higher boiling point also have the higher vapor pressure? Why or why not?

10. (12) Consider the compounds Cl_2O , H_2O , and Na_2O in their solid forms.

(a) Identify each solid as ionic, molecular, network covalent, or metallic.

(b) For each compound, indicate what forces (bonds and/or specific intermolecular forces) will be disrupted when the compound melts.

(c) Arrange the three compounds in order of increasing melting point, and explain briefly.