

Time: 2 hours

Chemistry 200

August 31, 1996

Final Exam

Family Name:

First Name:

Student Number:

Major:

Grading

I	/120
II	/ 80
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Total	/200

Useful data: K_f of $H_2O = 1.86$

Gas Constant $R = 0.0821 \frac{L \cdot atm}{K \cdot mole}$

vapor pressure of H_2O at $35^\circ C = 42.2 \text{ mmHg}$.

1) Circle the letter preceding the correct answer in each of the following. There is one correct answer, no double penalty.

* Which one of the following molecules is the most polar

- a. C_2H_2
- b. CO_2
- c. H_2O
- d. OF_2

* Among the following the compound that shows the highest conductivity is:

- a. NaCl
- b. H_2O
- c. Cu
- d. C

* Among the following solutions, the one that contains the largest number of equivalents is

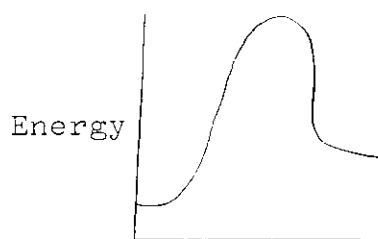
- a. 0.200 moles of H_2SO_4
- b. 4.90 g of H_2SO_4
- c. 100 mls of 0.100M H_2SO_4
- d. 125 mls of 0.100N H_2SO_4

* Which of the following contains the largest number of molecules

- a. 1.10 moles of CO_2
- b. 12.3 L of N_2 gas at STP
- c. 3.0 g of H_2O
- d. 16.4 L of O_2 gas at $80.0^\circ C$ and 750 mmHg.

* The energy diagram represents:

- a. an exothermic reaction
- b. an endothermic reaction
- c. two steps mechanism: reaction
- d. slow reaction that needs a catalyst to go faster



* Among the following, the gas that has the highest density at STP is

- a. HCl
- b. CH_2ClBr
- c. HBr
- d. H_2S

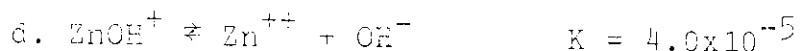
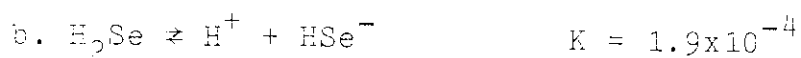
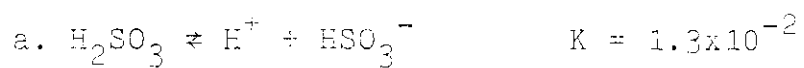
* 3.20 g of an unknown was dissolved in 125 g of H_2O , the resulting solution has a freezing point of -1.10°C , the molecular weight of the unknown is:

- a. 43.3
- b. 86.6
- c. 21.8
- d. 30.9

* To prepare 2.00 M H_2SO_4 solution, 50 ml of 3.50 M H_2SO_4 must be diluted to:

- a. 97.0 ml
- b. 87.5 ml
- c. 0.069 ml
- d. 44.2 ml

* Starting with equimolar solutions of each of the following species at the extreme left of the following equilibria, and given the equilibrium constants, which one will have the lowest pH.



* A 0.25 M HCN solution has pH = 5.0, K_a of HCN is:

a. 4.9×10^{-9}

b. 5.2×10^{-10}

c. 4.3×10^{-8}

d. 4.0×10^{-10}

* 15.6g of oxygen gas were collected over water at 35.0°C and 760mmHg, the volume occupied by the gas is:

a. 1.15 L

b. 13.0 L

c. 25.3 L

d. 12.2 L

* The solubility of $\text{SrCrO}_4(\text{s})$ in one liter of 0.50M Na_2CrO_4 is:
(K_{sp} of $\text{SrCrO}_4(\text{s}) = 3.6 \times 10^{-5}$)

a. 7.2×10^{-3}

b. 7.2×10^{-5}

c. 3.6×10^{-5}

d. 6.0×10^{-3}

* The concentration of hydroxyl ion in a solution which has a pH value of 5.0 is:

- a. 3.98×10^{-6}
- b. 1.0×10^{-5}
- c. 4.0×10^{-3}
- d. 1.0×10^{-9}

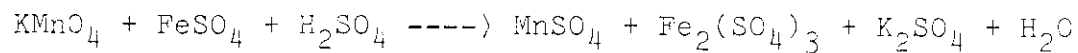
* For a reversible reaction:

- a. the rate of the forward reaction increases as the reaction proceeds.
- b. the rate of the reverse reaction increases as the reaction proceeds.
- c. as equilibrium is attained, the rate of the forward reaction is higher than that of the reverse reaction at high temperature in endothermic reactions.
- d. the rate of the forward reaction is equal to the rate of the reverse reaction as the reaction starts.

* For a system that contains equimolar amount of NH_3 and NH_4Cl

- a. the pH of the solution will increase drastically by slight addition of NaOH.
- b. the pH of the solution will increase drastically by slight addition of HCl.
- c. the pH of the solution will remain constant upon slight addition of HCl or NaOH.
- d. we cannot talk about the pH of the above system, since it does not contain any H^+ ions.

* Consider the following equation:



a. Balance the equation by the oxidation number method.

b. Calculate the number of moles of KMnO_4 required to oxidize 3.20 g of iron (II) sulfate.

c. How many mls of 0.100M KMnO_4 solution would be required to oxidize 3.20 g of iron(II)sulfate.

d. What is the equivalent weight of the reducing agent.

II) Solve each of the following problems. Show your calculations, be neat.

* Calculate the pH of a solution made up by mixing 20.0ml of 0.10M HCl and 80.0ml of 0.020N NaOH.

* 1.50g of 80.0% by mass KOH is titrated with 10.0ml of HCl solution to a phenolphthalein end point. a) Calculate the molarity of HCl solution.
b) the percent by mass (d of solution = 1.037 g/ml) of the HCl solution.

* A gaseous compound is made up of 83% carbon and 17% hydrogen by mass. When 1.2g of this gas are placed in a 500ml container at 25°C, the pressure of the gas is found to be 1.0 atm.

a. What is the empirical formula of the gas?

b. What is the molecular formula of the gas?

ANSWER SHEET

Family Name _____

First Name _____

ID No _____

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