Time: 60 min.

Chem. 102
Final Laboratory
Examination

Jan. 25th, 1999
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Name: _____

I.D. #: _____

Score:

I. _____ / 22

II. _____ / 22

III. _____ / 40

IV. _____ / 16

Grade _____ / 100

Good Luck

1 (22%) Fill in the Blanks:

- _____ have different colors in acidic and basic solutions. For example, _____ is blue in base, but it is _____ in acid.

- in qualitative analysis, the source of sulfide ion was _____.

- A _____ is a U-tube filled with gel solution of a saturated salt.

- Hydrogen peroxide can be reduced to form _____ _____ or oxidized to form _____.

- In Group III and IV ions analysis, a solid mixture of _____ and _____ is separated by addition of excess base.

- Hard water is the water that contains _____.

- _____ is a reagent used to identify the presence of ferric ion by the formation of _____.

- The identification of potassium ion is done by the _____ and the color will be _____.

- The electrode at which the oxidation occurs is the _____.

II A (10%) Circle the letter T for true statements and F for false ones:

T F - As the number of charged species increases, the conductivity of the solution decreases.

T F - Based on the equilibrium constant of a chemical system, one can predict the conductivity of the solution.

T F - Hydrogen peroxide reacts with bromine water to produce oxygen.

T F - The oxides of metals are acidic, while those of nonmetals are basic.

T F - Calcium carbonate is insoluble in water but it is soluble in acids.

B (12%) Write balanced equations for the following reactions:

- Identification of magnesium ion.

- Reaction of permanganate with hydrogen peroxide.

- Reaction of mercuric sulfide with aqua regia.

- Identification of cupric ion.

Concentrated nitric acid is a powerful oxidizing agent. How can you experimentally determine this ? write chemical equation.

How can you prepare oxygen gas in the laboratory ? Write the chemical equation and name all the species involved.

The absorbanse of an aqueous solution of $KMnO_4$ (1.0×10^{-3} M) at a certain wavelength, and in a 1.0 cm cell, is equal to 2.0. Using Beer's Law, calculate the molar absorption coefficient of $KMnO_4$.

IV (16%) Draw a flow sheet that describes how you can separate and identify the following ions when present in a mixture: (Hint start by separating Group I ions).

Ag^{+}, Pb^{2+}, Hg^{2+}, Cu^{2+}, Al^{3+}, Ca^{2+} and Na^{+}

In the space provided, list five cations given that the first and the second form amphoteric metal hydroxides the third and the fourth form amine complexes, and the fifth exhibits both properties. Then, give the formulas of their hydroxides or amine complexes.

Cation: _____ _____ _____ _____ _____

Metal Hydroxide: _____ _____ _____ _____ _____

Amine complex: _____ _____ _____ _____ _____

Explain what happened when a sulfide solution is heated with ferric nitrate solution.

Explain the test for ammonium ion.

III (40%) Answer the following independent questions:

In one of the experiments of Chem. 102 laboratory, carbon monoxide was generated. Explain how, and write the chemical reactions of its preparation, combustion, and reducing power.

Both hydrogen and oxygen are colorless, odorless and tasteless. Suppose you were given a sample of one of these gases, what could you do to determine which gas your sample represented ?

What is the difference between a galvanic cell and a voltaic cell ? Give one example of each.