INTRODUCTION

The lab practical is an exam to test your lab knowledge and skills gained during the semester. It will be a series of stations set up around the room that you will rotate through as directed by your instructor. Although any topic covered in lab during the semester may be covered on the practical, the main topics that you should review from each experiment are covered on the following pages of this document. Some additional information about how the practical will be done is covered in the list below.

1. Your instructor will assign you a specific start time within your normal lab period. (The practical only takes about an hour.)
2. When instructed, you will enter the room, set aside your backpack, etc., put on your lab coat, and goggles, and put your pencil and calculator in your pocket.
3. You will then be assigned to go to your starting station and wait for further instructions. (From this point on, all normal exam rules apply (no talking, no cell phones, etc.).
4. At this point, your instructor will explain the rules, which will include at least the following.
    a. When you receive your response sheet, note the version. (either A, B, or C)
    b. At each station, be sure to stick to the instructions corresponding to your version.
    c. The session will be broken down into 4-minute segments timed by your instructor. At the end of 4-minute, you must stop any activity (doing experiment or writing) and flip the instruction sheet upside-down. You will have a minute to clean-up as needed before rotating forward to the next station.
    d. At each station, be sure to record your response in the box corresponding to the number of the station. (For example, if you are at station 4, record your response in the box for station 4.)

EXPERIMENTS

~~Exp 0a – Lab Exploration~~

- ~~Know the names of common lab equipment, found on the "Equipment List" page of the lab manual.~~
- ~~Be able to use volumetric pipets and volumetric flasks~~
- ~~Be able to record measurement using burets, graduated cylinders, and balances.~~

Exp 1a – Making Measurements

- Know how to make measurements using different measuring devices. (Including rulers, graduated cylinders, and balances.)
- Be able to calculate volume using the dimensions of a regularly shaped object (rectangular prism or cylinder).
- Be able to calculate volume of an object using the "displacement method".
- Know how to calculate density. (d= m/v)
- Understand what density is and what can be implied if substances have the same or if substances have different densities.

~~Exp 3a – Electrons in Atoms~~

- ~~Make wavelength of light measurements with a spectroscope.~~
- ~~Calculate emission wavelengths from the hydrogen atom using the Rydberg equation.~~
- ~~Understand the Bohr model of the atom and how emission or absorption of light relates to electron energy levels.~~
- ~~Know the basic regions of the electromagnetic spectrum and be able to order/arrange different types of electromagnetic radiation in terms of energy, frequency, or wavelength.~~

Exp 4a – Law of Constant Composition

- Know the names of all the equipment used in this experiment and how they are used. (such as Bunsen Burner, bench stand)
- Be able to calculate the mass of copper reacted, mass of sulfur used, mass of compound made, *or* mass of sulfur reacted provided with experimental data.
- Calculate a mass ratio from experimental data

Exp 5a – Empirical Formula

- Understand empirical and molecular formulas of chemical compounds.
- Be able to calculate the empirical formula of a compound from experimental mass data
- Know names of all of the equipment used in this experiment and how they are used. (Bunsen burner, bench stand, crucible, iron ring, clay triangle, and crucible tongs.)
- Be able to calculate mass percentages of elements in a compound from experimental mass data or from a chemical formula.

Exp 6a – Molecular Modeling

- Be able to draw Lewis Structures of molecular compounds, provided chemical formula or molecular model.
- Be able to determine the molecular geometry, provided with a Lewis Structure or molecular model.

Exp 7a - Calorimetry

- Know how and when it is appropriate to use the equation, $q = m \cdot c \cdot \Delta T$
- Know how and when it is appropriate to use the equation, $q_{system} + q_{surroundings} = 0$
- Understand the purpose of, and the basic parts of a "coffee cup calorimeter".
- Know how to read a thermometer.
- Know how to make the appropriate measurements and calculate the change in temperature of a chemical reaction.
- Be able to calculate the heat absorbed or released by a chemical reaction from experimental data.
- Be able to calculate the heat absorbed or released by the surroundings from experimental data.
- Know how to interpret observations and data to determine whether a chemical reaction is exothermic or endothermic.
- Given experimental data, be able to calculate the enthalpy of fusion for ice (ΔH_{fus}) (Part 2 of the experiment).

~~Exp 8a – Stoichiometric Gas Production~~

- ~~Know how to correctly read the temperature from a thermometer.~~
- ~~Know how to look up vapor pressure of water in a reference manual. (and know what it is.)~~
- ~~Be able to use Dalton's Law of Partial Pressures to calculate the pressure of a gas collected above water. ($P_{atmosphere} = P_{gas} + P_{water\ vapor}$)~~
- ~~Know how to use the Ideal Gas Law (PV=nRT).~~
- ~~Know the parts of the gas collection apparatus and what they are used for.~~
- ~~Be able to read the volume of gas collected in an Eudiometer (gas collection tube).~~
- ~~Be able to perform the gas stoichiometry calculations necessary in this experiment (i.e. moles of hydrogen based on mass of magnesium)~~

Exp 9a – Solutions and Dilutions

- Be able to use volumetric pipets and volumetric flasks and know what types of measurements would be appropriate to make with each device.
- Be able to calculate the molarity of a solution made from solid solute (e.g. NaCl) dissolved in water. (M = mol/L)
- Be able calculate the molarity of a solution diluted from a more concentrated solution. ($C_1V_1=C_2V_2$) or ($M_1V_1=M_2V_2$)
- Know how to make the necessary measurements to calculate density of a solution.
- Be able to calculate the density of a solution from experimental data.

Exp 10a – Types of Reactions

- Know the different types of reactions (especially from "Scheme 2").
- Be able to determine the type of a chemical reaction from experimental observations
- Predict chemical formulas of products from the formulas of the reactants.
- Be able to complete the chemical equation for a reaction between known reactants including balancing the equation and assigning states of matter for reactants and products.

Exp 11a – Synthesis of Alum

- Be familiar with all equipment used in this experiment (beaker, watch glass, etc.)
    - Specifically- be able to recognize and describe the purpose of each part of the vacuum filtration apparatus
- Be able to use a balance
- Know how to calculate the molar mass of a hydrate.
- Be able to calculate theoretical yield for the reaction carried out in this experiment.
- Be able to calculate percent yield if given an actual yield.
- Know how to determine if a percent yield is reasonable or not.

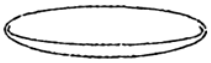
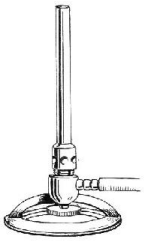
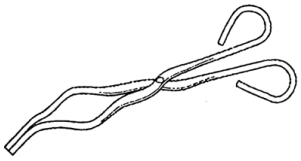
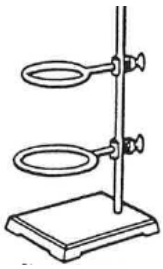
Exp 12a – pH of Household Items

- Understand the concept of pH.
- Understand how red cabbage juice changes with pH. (Know the basic color changes.)
- Given one of pH, pOH, $[H_3O^+]$, or $[OH^-]$, be able to calculate the other three.
- Given a mass of strong acid or base added to a known solution volume, be able to calculate the resulting pH of the solution.

Exp 12b – Determination of Acetic Acid Concentration in Vinegar

- Be familiar with all equipment used in a titration apparatus (Erlenmeyer flasks, buret, etc.)
- Understand the meaning of the terms, titration, titrant, standardization, and determination as they are used in the context of a titration experiment.
- Know how to use and read the volume on a buret.
- Know how to determine the volume of titrant (NaOH) used in a titration from experimental data.
- Be able to perform the solution stoichiometry calculations for the determination of percent by mass acetic acid in vinegar.

Chem 3A Equipment Study Guide

 Thermometer	 Test Tube	 Beaker	 Watch Glass
 Graduated Cylinder	 Erlenmeyer Flask	 Volumetric Flask	 Transfer Pipet
 Volumetric Pipet	 Pipet Bulb	 Buret	 Buret Clamp
 Bunsen Burner	 Funnel	 Wash Bottle	 Crucible Tongs
 Crucible w/ Lid	 Ring Stand w/ Rings	 Utility Clamp	 Clamp Holder