

## **Appendix III: What to Turn in for Each Lab and Resubmission Policies**

### Lab Report Guidelines

All lab reports are due in lecture. Graded reports will be handed back in the laboratory section. If you miss a lab section meeting, it is your responsibility to get your graded work back. The items below indicate what is required for each lab. If a report is turned in without one or more of these components, the report will be returned for resubmission. Incomplete reports, i.e., reports with data from the laboratory but without calculations, will be marked as late and returned for resubmission.

### Resubmissions

All lab reports with the exception of the formal lab report can be resubmitted for re-grading with no penalty. Resubmissions are due 2 weeks after the original due date of the report or on the last day of the semester (see syllabus), whichever comes first. If you hand in your lab report late you do not get more time to hand in a resubmission. Only one resubmission is allowed.

### *Materials Required for Lab Report Resubmissions:*

\_\_\_\_ Original graded report with all required components

\_\_\_\_ New report form with recalculated values

\_\_\_\_ A written explanation indicating the change made in the resubmission

### **Glassware Calibration**

\_\_\_\_ Completed Report Form including sample calculations for average, standard deviation, and confidence interval.

\_\_\_\_ Summary Data Page with Buret and Pipet Data (photocopy from notebook okay)

\_\_\_\_ Buret Plot

### **Water Hardness Determination**

\_\_\_\_ Completed Report Form with sample calculations for concentration of EDTA,  $\text{Ca}^{2+}$ , water hardness, and confidence interval.

\_\_\_\_ Summary Data Page Showing Titration Data (photocopy from notebook okay)

### **Statistical Calculations**

\_\_\_\_ Completed Report Form – Answers to questions 1a), 1c), and 3d) – put in boxes.

\_\_\_\_ Completed Calibration Data Excel Spreadsheet (see template)

\_\_\_\_ Completed Comparison Data Excel Spreadsheet (see template)

### **Atomic Absorption Spectroscopy**

\_\_\_\_ Completed Report Form.

\_\_\_\_ Summary Data Page Showing Dilution of Standards and Unknowns (photocopy from notebook okay)

\_\_\_\_ Calibration plots for Mg, Ca (>1/2 page each)

\_\_\_\_ Excel print out for Mg, Ca (1 each)

### **Ion Chromatography**

\_\_\_\_ Completed Report Form with sample calculations for calibration standards, and concentration of anion in unknown and tap water.

\_\_\_\_ Summary Data Page Detailing Preparation of Standards (photocopy from notebook okay)

\_\_\_\_ Printout of calibration curve with  $y = mx + b$  and  $R^2$  value

### **Spectrophotometric Determination of Co(II) and Cr(III) in Water**

\_\_\_\_ Excel print out as shown at end of experimental description

### **Determination of Na<sub>2</sub>CO<sub>3</sub> in Soda Ash**

\_\_\_\_ Completed Report Form with sample calculations for concentration of HCl, mass of Na<sub>2</sub>CO<sub>3</sub> in unknown, and confidence interval.

\_\_\_\_ Summary Data Page Showing Titration Data (photocopy from notebook okay)

### **Formal Lab Report**

\_\_\_\_ See provided rubric

### **Gas Chromatography**

\_\_\_\_ Completed Report Form with sample calculations for calibration standards, and concentration of alcohol in solution C and solution A.

**Data Summary Page**  
***CALIBRATION OF 25 mL PIPET***

Name	Locker Number
Section number	

MEASUREMENT	Trial 1	Trial 2	Trial 3
Wt. of Erlenmeyer + Water			
Wt. of Erlenmeyer			
Apparent weight of water			
True pipet volume			
Date of measurements			

Ambient (water) temperature \_\_\_\_\_°C

Volume of 1 g of water at ambient temperature \_\_\_\_\_mL

Average pipet volume delivered \_\_\_\_\_mL

Standard deviation of volume ± \_\_\_\_\_mL

Relative standard deviation  
of volume ± \_\_\_\_\_ppt

# Pipet Calibration Report

Name \_\_\_\_\_

Lab Section \_\_\_\_\_

Submit the average volume delivered for the twenty-five mL volumetric pipet using the last three or four consecutive pipet volume values. Also include the standard deviation, the relative standard deviation (in parts per thousand), and the 95% confidence interval for these values.

## Trial

**1**

**2**

**3**

**4**

\_\_\_\_\_

Average volume (mL) \_\_\_\_\_

Standard Deviation (mL) \_\_\_\_\_

Relative Standard Deviation (ppt) \_\_\_\_\_

95% Confidence Interval \_\_\_\_\_  $\pm$  \_\_\_\_\_

## SAMPLE CALCULATION

Continue on reverse side if necessary.

**SUMMARY DATA PAGE - CALIBRATION OF 50 mL BURET**

Name	Locker Number
Section number	

**TRIAL ONE**

Ambient Water Temperature (°C) \_\_\_\_\_

Volume of 1 g of water at ambient temperature \_\_\_\_\_ mL

Date of work					
Range on the Buret	0-10	0-20	0-30	0-40	0-50
Final Buret Reading					
Initial Buret Reading					
Apparent Volume Delivered					
Weight of Flask+Stopper+Water					
Weight of Flask+Stopper					
Apparent Weight of Water					
True Volume of Water Delivered					
Correction Factor (mL)					

**TRIAL TWO**

Date of work					
Range on the Buret	0-10	0-20	0-30	0-40	0-50
Final Buret Reading					
Initial Buret Reading					
Apparent Volume Delivered					
Weight of Flask+Stopper+Water					
Weight of Flask+Stopper					
Apparent Weight of Water					
True Volume of Water Delivered					
Correction Factor (mL)					
Average Correction Factor					

Note: A slightly different table may be desired if the two step correction method is used.

# SUMMARY DATA PAGE

## WATER HARDNESS DETERMINATION

Preparation of Standard  $\text{Ca}^{2+}$  Solution

Date of Work

Weight of bottle with $\text{CaCO}_3$	g	
Weight of bottle less $\text{CaCO}_3$	g	
Weight $\text{CaCO}_3$	g	
Moles $\text{CaCO}_3$	moles	
Molarity of $\text{Ca}^{2+}$ in Standard	M	

Standardization of EDTA solution

Date of Work				
DETERMINATION	I	II	III	IV
Final Buret Reading				
Initial Buret Reading				
Apparent Volume of EDTA				
True Volume of EDTA				
EDTA Molarity				
Average Molarity	M			Relative Range %

Titration of an Aqueous Sample of  $\text{Ca}^{2+}$  and  $\text{Mg}^{2+}$

Date of Work				
DETERMINATION	I	II	III	IV
Date of Work				
Final Buret Reading				
Initial Buret Reading				
Apparent Volume of EDTA				
True Volume of EDTA				
$\text{CaCO}_3$ Molarity				
Water Hardness (ppm $\text{CaCO}_3$ )				
Average Water Hardness	ppm $\text{CaCO}_3$			
Relative Standard Deviation	ppt			

# REPORT FORM

## WATER HARDNESS DETERMINATION

Name	Lab Section
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### Preparation of Standard $\text{Ca}^{2+}$ Solution

Wt. of bottle with  $\text{CaCO}_3$  \_\_\_\_\_g  
Wt. of bottle less  $\text{CaCO}_3$  \_\_\_\_\_g  
Wt.  $\text{CaCO}_3$  \_\_\_\_\_g  
Molarity of  $\text{Ca}^{2+}$  standard \_\_\_\_\_M

### Standardization of EDTA solution

#### EDTA Molarity

I	II	III	IV	Average (M)
_____ M	_____ M	_____ M	_____ M	_____

Standard Deviation of EDTA Molarity \_\_\_\_\_M

### Water Hardness Expressed in ppm $\text{CaCO}_3$

I	II	III	IV	Average (ppm)
_____ ppm	_____ ppm	_____ ppm	_____ ppm	_____

Standard Deviation of Water Hardness \_\_\_\_\_ppm

95% CONFIDENCE INTERVAL \_\_\_\_\_  $\pm$  \_\_\_\_\_ppm

### SAMPLE CALCULATION

Continue on reverse side if necessary.

# REPORT FORM

## STATISTICAL CALCULATIONS

Name	Lab Section
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### Answers to Specific Questions

Exercise 1a)

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Exercise 1c) (remember a yes or no answer alone is insufficient)

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Exercise 3d)

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**Statistical Calculations – Excel Template I – Calibration Data (NOTE: Make your own spreadsheet and print, this is just an example)**

Lead Concentration (µg/L or ppb)	Absorbance (Instrument Response, in Absorbance Units)	Sx	95%CI for X	% Accuracy				
0.50	0.00092							
1.0	0.00177							
5.0	0.00837				Slope			Y-Intercept
10	0.01588				Standard Deviation in Slope			Standard Deviation in Y-Intercept
25	0.03725				R2			Standard Deviation in Y
50	0.07614							
					Average Y			
					SUM(Xi-meanX)^2			
	0.00264				t-Value (95%)			
	0.01240							
	0.00135							
	0.00146							
	0.01402							

**Statistical Calculations – Excel Template II – Comparison Data (NOTE: Make your own spreadsheet and print, this is just an example)**

Sample ID	Sacramento State Lead Concentration (ppb)	EPA Certified Laboratory Lead Concentration (ppb)			Harris Text Method of Type 3 t-Test di
Alpine 1st Floor March Replicate 1	4.08	4.10			
Alpine 1st Floor March Replicate 2	4.42	3.80			
Alpine 1st Floor Mid June Replicate 1	8.86	5.40			
Alpine 1st Floor Mid June Replicate 2	2.21	1.50			
Alpine 1st Early June Replicate 1	6.93	7.70			
Alpine 1st Early June Replicate 2	1.30	2.00			
Mariposa 3rd Floor March	1.82	1.90			
Mariposa 5th Floor March	1.36	1.20			
Mariposa 5th Floor June	0.51	0.15			
Sequoia 4th Floor June	1.19	0.67			
Alpine 1st Floor 2ppb Spike	3.96	3.50			
Alpine 1st Floor 10 ppb Spike	13	11			
Average				Average	
Standard Deviation				Standard Deviation	
t value (95%CI, 11 Degrees of Freedom, 2 tailed)				t calculated	
95% CI				t critical	
t-Test: Paired Two Sample for Means					
	<i>Sacramento State Lead Concentration (ppb)</i>	<i>EPA Certified Laboratory Lead Concentration (ppb)</i>			
Mean					
Variance					
Observations					
Pearson Correlation					
Hypothesized Mean Difference					
df					
t Stat					
P(T<=t) one-tail					
t Critical one-tail					
P(T<=t) two-tail					
t Critical two-tail					

## Atomic Absorption - Working Standards and Unknowns Table

Mg			Ca		
mL semi-Stock	mL diluted	ppm Mg	mL Stock	mL diluted	ppm Ca
1.			1.		
2.			2.		
3.			3.		
4.			4.		
5.			5.		
Mg Water Hardness			Ca Water Hardness		
mL Original	mL diluted	Estimated [Mg]	mL Original	mL Diluted	Estimated [Ca]
Mg Tap Water			Ca Tap Water		
mL Original	mL diluted	Estimated [Mg]	mL Original	mL Diluted	Estimated [Ca]

# REPORT FORM

## ATOMIC ABSORPTION SPECTROSCOPY

NAME	DATE
LAB SECTION	LAB PARTNER NAME

### Stock Solution Concentrations

Mg Semi-Stock Solution \_\_\_\_\_ppm      Ca<sup>2+</sup> Stock Solution \_\_\_\_\_ppm

### Tap Water Sample Location

latitude \_\_\_\_\_ N longitude \_\_\_\_\_ W (digital degrees to thousandths place)

### ATOMIC ABSORPTION RESULTS

Standards - Mg				Standards - Ca		
Concentration (ppm)	Absorbance			Concentration (ppm)	Absorbance	
1.				1.		
2.				2.		
3.				3.		
4.				4.		
5.				5.		
Unknowns - Mg				Unknowns - Ca		
	Abs	Conc (ppm)	95% unc (ppm)	Abs	Conc (ppm)	95% unc (ppm)
Diluted Water Hardness						
Original Water Hardness						
Diluted Tap Water						
Original Tap Water						

# REPORT FORM

## Ion Chromatography

Name	Locker Number
Section Number	

### QUALITATIVE ANALYSIS (Std. + 1<sup>st</sup> run of unknown)

COMPOUND	RETENTION TIME, min	Peak Area
Chloride		
Nitrate		
Sulfate		
Unknown		
Estimated [Unknown] from 1 pt. Calibration		

### QUANTITATIVE ANALYSIS

Solution	Concentration (ppm)	Integrated Peak Area
Unknown		
Std 1		
Std 2		
Instructor Std		

IDENTITY OF UNKNOWN \_\_\_\_\_

CONCENTRATION OF UNKNOWN IN ORIGINAL SOLUTION \_\_\_\_\_ ppm

### TAP WATER

Compound	Retention Time (min.)	Peak Area	Estimated Conc. (ppm)
Cl <sup>-</sup>			
NO <sub>3</sub> <sup>-</sup>			
SO <sub>4</sub> <sup>2-</sup>			

SAMPLE CALCULATIONS

use back

**REPORT FORM**  
**Determination of  $\text{Na}_2\text{CO}_3$  in Soda Ash**

Name	Locker number
Section number	

**SODA ASH ANALYSIS**

STANDARDIZATION TRIALS

	I	II	III
Molarity of HCl	_____ M	_____ M	_____ M
Average Molarity of HCl	_____ M		
95% confidence interval for HCl Molarity +	_____ M		

UNKNOWN TRIALS

	I	II	III
% $\text{Na}_2\text{CO}_3$	_____ %	_____ %	_____ %
Average % $\text{Na}_2\text{CO}_3$	_____ %		
95% Confidence interval for % $\text{Na}_2\text{CO}_3$	+ _____ %		

SAMPLE CALCULATIONS

# REPORT FORM GAS CHROMATOGRAPHY

Name	Locker Number
Section Number	

Identity of Unknown Alcohol \_\_\_\_\_  
 Internal Standard Alcohol Used \_\_\_\_\_

## DATA for SOLUTION B

SUBSTANCE	GRAMS	WEIGHT%	PEAK AREAS			Average
Methanol		-----	I	II	III	F
Unknown Alcohol						
Standard Alcohol						
Response Factor, F						

## DATA for SOLUTION C

SUBSTANCE	GRAMS	WEIGHT%	PEAK AREAS		
			I	II	III
SOLUTION A		-----	-----	-----	-----
Unknown Alcohol	-----	-----			
Standard Alcohol					
Weight % of Unknown Alcohol in SOLUTION C					
Weight % of Unknown Alcohol in SOLUTION A					

Average weight % of Unknown Alcohol in **SOLUTION A** \_\_\_\_\_

<p>SAMPLE CALCULATIONS</p> <p>Put on reverse side of this page.</p>
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