Chem 108: Lab

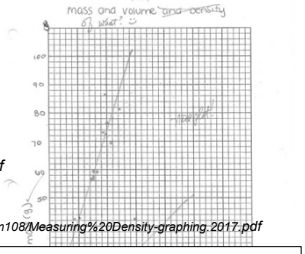
Week 4

Sign in: Roster @ front of lab

Due Today

- Completed density calculations, graphs & Report Forms pp.20-25 (One form for each lab partner are both to be turned in; stapled together. Neatest one on top.) DUE Today
- (GQ) On-line *Density & Buoyancy Guiding Questions* (individually done) DUE Today

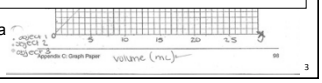
- Plot of data (A) & (B) using blank graph paper
  - Either (A) & (B) on the same graph paper or separate pages.
  - Attach graph(s) to the combined Report Form pages
  - *Complete the bottom table of handout and attach to the Report Forms to turn in.*



http://chemconnections.org/general/chem108/Measuring%20Density-graphing.2017.pdf

$$Percent\ Error = \frac{Experimental\ value\ - True\ value}{True\ value} \times 100$$

- Anyone plot the data using a spreadsheet?



3

Using a Spreadsheet (Excel)

Density

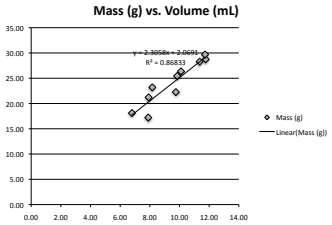
Volume (cm3)	Mass (g)	Volume (cm3)	Mass (g)
7.89	17.22	6.63	53.90
6.80	18.11	6.45	54.53
7.92	21.21	6.42	57.15
9.75	22.25	6.61	57.34
8.17	23.19	7.97	69.15
9.84	25.44	8.40	69.43
10.1	26.36	7.98	72.24
11.4	28.29	9.65	84.84
11.8	28.73	9.65	86.14
11.7	29.69	9.84	87.67
AVG		AVG	
STD		STD	
Density			

Using a Spreadsheet (Excel)

Density

Volume (cm3)	Mass (g)	Volume (cm3)	Mass (g)
7.89	17.22	6.63	53.90
6.80	18.11	6.45	54.53
7.92	21.21	6.42	57.15
9.75	22.25	6.61	57.34
8.17	23.19	7.97	69.15
9.84	25.44	8.40	69.43
10.1	26.36	7.98	72.24
11.4	28.29	9.65	84.84
11.8	28.73	9.65	86.14
11.7	29.69	9.84	87.67
AVG	9.53	24.05	AVG
STD	1.77	4.38	STD
Density		2.52	

Using a Spreadsheet (Excel)
Youtube



Equation of a line: y = mx + b

y = y axis m = slope x = x axis b = y-intercept

We're plotting: Mass = y axis Volume = x axis

- How are mass and volume related?

$$\frac{mass}{Volume} = density$$

We can rearrange this as: $mass = density(Volume)$

If we compare to equation of a line:

$$mass = density(Volume) + 0$$
$$y = m\ x + b$$

Now, what does the slope of our trendline represent? Should a (0,0) point be included or excluded in determining location of trendline?

Using a Spreadsheet (Excel)

Youtube

$$Percent\ Error = \frac{Experimental\ value\ -True\ value}{True\ value} \times 100$$

A

Metal identified	Al = 2.64 g/cm3
Density (g/cm3) averaged	2.52 g/cm^3 +/-0.19
Error (%) averaged	(2.52-2.64)/2.64 * 100= 4.5%
Density (g/cm3) graphed	2.31 g/cm^3 +/-0.12
Error (%) graphed	(2.31-2.64)/2.64 * 100= 12.5%

Linear Regression straight lines improve precision.
They do not necessarily improve accuracy.

MOOCs: "Free" Courses

https://www.edx.org/course/analyzing-visualizing-data-excel-microsoft-dat206x-4

Learning to Use a Spreadsheet (Excel)

EdX

Coursera

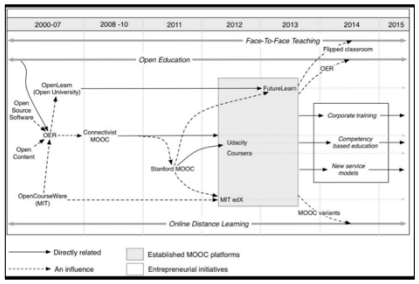
Udacity

MOOCs: "Free" Courses

EdX

Coursera

Udacity



QUESTION

Rank the correct relative precision of the results from the two methods for Metal A's density's calculation. It's accepted density is 2.64 g/cm^3

.

Density		*Density*
Data Averaging		Linear Regression Straight Line
2.52 g/cm3 +/-0.19		2.31 g/cm3 +/-0.12

A) Precision: Straight Line > Averaging
B) Precision: Averaging > Straight Line

QUESTION

Rank the correct relative accuracy of the results from the two methods for Metal A's density's calculation. It's accepted density is 2.64 g/cm^3

.

Density		*Density*
Data Averaging		Linear Regression Straight Line
2.52 g/cm3 +/-0.19		2.31 g/cm3 +/-0.12

A) Accuracy: Straight Line > Averaging
B) Accuracy: Averaging > Straight Line

CHEM 108

Experiment 3:
Classification of Matter
and
Chemical Change

Classification of Matter and Chemical Change

- Goals:
  - Part A: To classify a pure substance as a homogeneous or heterogeneous mixture and quantify the mixture's components
  - Part B: To classify a material as a pure substance or mixture based on observation
  - Part C: Using Paper Chromatography to classify inks as pure substances or homogeneous mixtures
  - Part D: Determining if chemical changes occur.
- Work with a partner
  - Be sure to write partner's name ON BOTH REPORT FORMS

Classification of Matter

Part A: Procedural Scheme

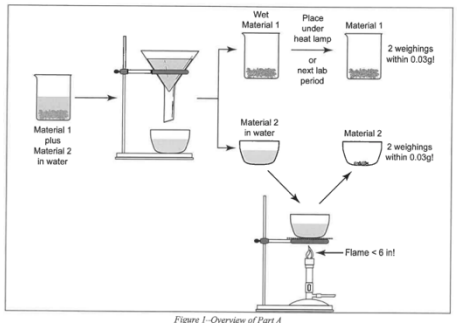


Figure 1–Overview of Part A

Classification of Matter and Chemical Change

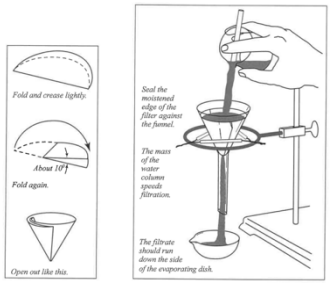
Measuring solids (Part A):

1) Weigh empty container (beaker) & record mass
2) Remove beaker from balance and pour solid into the beaker
3) Place the beaker with the solid back on the balance & record mass

DO NOT pour any materials/ chemical into containers while on balance pan; clean area and balance of any loose /spilled materials/ chemicals before leaving, close all bottles

Classification of Matter

Filtration



Part A

- Use a minimal amount of H_2O when transferring solids from beaker into filter; too much causes evaporation time to be VERY long
- PROCEDURE to note & follow:
- Boil filtrate *gently* until no drops are observed on watch glass
  - If boiled too rapidly, crystals collect on watch glass
  - SAFETY TIP: Hot evaporating dish will shatter if placed on cold lab bench – Allow to cool on grating before placing on bench
- DO NOT dry Material 1 and filter paper under heat lamp. Store in your lab drawer covered by paper towel . . . by the next lab session, they will be *very* dry
- WASTE: (after next session)
  - Filter paper and Material 1 in trash
  - Material 2 in sink with H_2O running

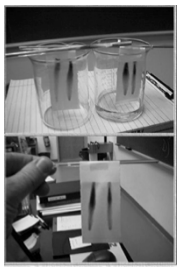
Part B: $CuSO_4 \cdot 5H_2O$

- Copper(II) sulfate pentahydrate
  - *May be labeled cupric sulfate pentahydrate*
- Heat the hydrate *gently* in a test tube
- Waste:
  - Add in minimum amount of H_2O and stir to dissolve all solid
- Pour solution into red "Aqueous Metal Waste" container in hood
- Be sure to record "color" and/or "clarity" BEFORE discarding any solutions or chemicals

e.g.) *solution: blue and cloudy, solution: colorless and clear, soliid: white*

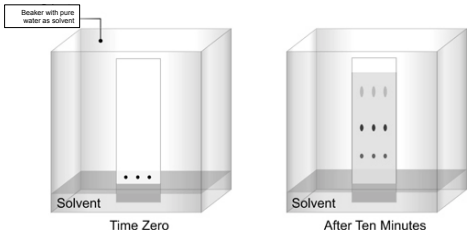
Classification of Matter

Part C – Paper Chromatography)



Part C – Paper Chromatography

- Use water-soluble pens that are provided, DO NOT use your own pen
  - DO NOT use permanent pens/markers



- Waste: paper in trash; water in sink

- PROCEDURE: ***Before starting*** Part D, dispense 3-4mL of 6M NaOH and 3-4mL of 6M HCl into separate test tubes: *6M means 6 Molar = 6 mol/L; Molarity is an important unit of concentration*
  Take to YOUR LAB BENCH for Parts D.1 and D.3
- Avoid spilling NaOH or HCl
  - If spilled, neutralize with solid $NaHCO_3$ (sodium bicarbonate) from bucket, then wipe with paper towel
    - An acid + base react to produce a salt and water
- Waste for D.1:
  - Pour all solutions into $NaHCO_3$ in hood sink with H_2O running

Part D.2:

- Waste for D.2:
  - Into red "Aqueous Metal Waste" container in hood

Part D.3:

- *20 drops HCl ≈ 1mL, add "dropwise"*
- Waste for D.3:
  - Into $NaHCO_3$ in hood sink with H_2O running

Part D.4:

- Waste for D.4:
  - Into red "Aqueous Metal Waste" container in hood

Exp. 3 – Classification of Matter and Chemical Change

- Report Forms: *One form for each lab partner are both to be turned in; stapled together. Neatest one on top.*
  - Check sig figs are correct and units included
  - Show example of each type of calculation
  - Answer questions legibly in complete sentences.

Individually complete on-line post-lab questions and submit:
http://www.chemconnections.org/general/chem108/Physical%20Properties.html
DUE Next Lab Period