



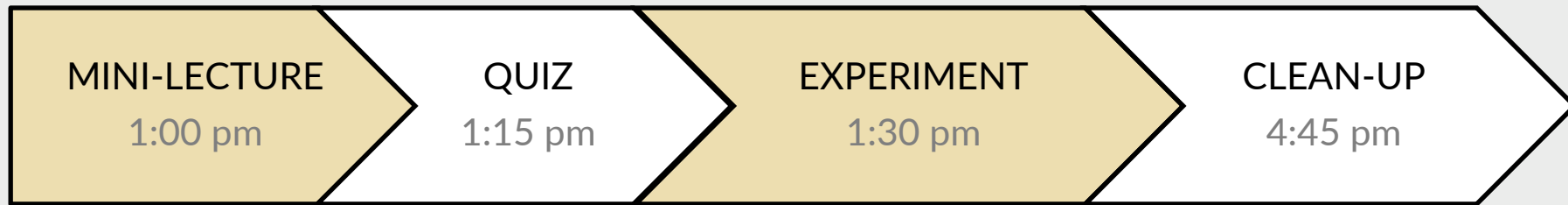
EXPERIMENT 1

ELEMENTS AND THE PERIODIC TABLE
THE BR OSCILLATING REACTION
MEASUREMENTS

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CHEMISTRY 134L // SPRING 2019

www.mioy.org/chem134

Course Information, Canvas, and Syllabus



<u>GRADING</u>	10 Quizzes	25 points/each	(1 dropped)	225 points
	9 Lab Reports	50 points/each	(1 dropped)	400 points
	Lab Conduct	25 points		25 points
				<hr/> 650 points

OFFICE
OFFICE HOURS
E-MAIL

SCL 155
Thursday, 3:30pm & by appointment
mioy.huynh@yale.edu

Laboratory Safety

1. Learn locations of safety equipment and exits
2. Always wear safety glasses in the lab
3. Wear: full-length pants, full-sleeve shirt, closed-toe shoes, and a lab coat (*no ripped/torn clothing; pants and socks should cover entirety of legs*)
4. Wear and remove gloves when appropriate
5. Discard chemical waste in labeled waster containers
6. Discard broken glass in broken glass containers
7. Do not bring into lab: food, drinks, phone, or laptop
8. Wash your hands before you leave the lab

Quantitative Measurements

BASIC QUANTITIES mass, length, time, temperature, mole, and current

volume, density, molar mass, concentrations, etc. **DERIVED QUANTITIES**

ACCURACY



Closeness to the true value
(agreement between determined
and actual value)

PRECISION



Repeatability of a measurement
(consistency among a set of
measurements)

How do we deal with accuracy & precision?

SIGNIFICANT FIGURES // all certain digits + one uncertain digit

Trapped zeroes
significant

0.0700600 g

Leading zeroes
not significant

Trailing zeroes
significant

The diagram shows the measurement 0.0700600 g. Three yellow brackets are used to highlight specific parts of the number: one under the leading zeros '0.0', one under the trapped zeros '700', and one under the trailing zeros '600'. Labels with underlines indicate the significance of each part: 'Leading zeroes not significant', 'Trapped zeroes significant', and 'Trailing zeroes significant'.

How do we deal with arithmetic operations?

ADDITION & SUBTRACTION // draw a vertical line at less precise number

$$\begin{array}{r} 34.78 \\ +55.9 \\ \hline \end{array}$$

tenth

$$\begin{array}{r} 84 \\ -63.04 \\ \hline \end{array}$$

ones

$$\begin{array}{r} 0.071 \\ + 1.4 \\ \hline \end{array}$$

tenth

$$\begin{array}{r} 101.2 \\ - 98 \\ \hline \end{array}$$

ones

$$\begin{array}{r} 27 \\ +273.15 \\ \hline \end{array}$$

ones

MULTIPLICATION & DIVISION // smallest number of significant figures

$$\begin{array}{r} 1.23 \\ \times 740 \\ \hline \end{array}$$

3 sf

$$\begin{array}{r} 0.450 \\ \div 0.063 \\ \hline \end{array}$$

2 sf

$$\begin{array}{r} 7.2 \times 10^{-3} \text{ g} \\ \div 3 \text{ mL} \\ \hline \end{array}$$

1 sf

$$\begin{array}{r} 6.022 \times 10^{23} \\ \times 0.100 \\ \hline \end{array}$$

3 sf

Sample Calculation

A metal rod of length 29.83 cm and diameter 1.25 inches has a mass of 451 g.
Can the rod be made of Mg?

$$\text{Radius} = 1.25 \text{ in} \times \frac{2.54 \text{ cm}}{1 \text{ in}} \times \frac{1}{2} = 1.58_8 \text{ cm}$$

$$\text{Volume} = 29.83 \text{ cm} \times [\pi \times (1.58_8 \text{ cm})^2] = 2.36_3 \times 10^2 \text{ cm}^3$$

$$\text{Density} = \frac{451 \text{ g}}{2.36_3 \times 10^2 \text{ cm}^3} = 1.91 \text{ g} \cdot \text{cm}^{-3} \{3 \text{ sig. figs.}\}$$

$$\text{Literature Value} = 1.74 \text{ g} \cdot \text{cm}^{-3}$$

Q: How do we minimize "round-off error" in multi-step calculations?

A: In intermediate calculations, write down an extra subscripted digit.

Ex. 1 – The Basics

A → Elements & the Periodic Table

What are chemical elements?

- Each element is a substance consisting of only one kind of atom
- Elements are the building blocks of all matter
- An element cannot be broken down chemically into simpler elements



B → The Briggs-Rauscher (BR) Oscillating Reaction



C → Basic Measurements

Notes

1. Lab safety & requirements; lab coat + safety glasses
2. Manual + lab notebook + calculator + pen
3. Pre-lab material in lab notebook:
 - Identification information
 - Purpose(s) in present or future tense
4. In-lab material in lab notebook:
 - Brief procedure in past tense
 - Then your observations and/or measurements
 - Always report measurements to correct sig. figs.
5. Lab report: none due for Ex. 1
6. Quizzes: use a pen + wait