Chapter 2 Part 2

Warm Up

- You are trying to determine the density of a metal. You measure a mass of 9.34 g and a volume of 1.23 mL.
- What is the density?

- Other groups in your class reported their values to be 7.2 g/cm^3, 7.914 g/cm^3, and 7 g/cm^3.
- What is the class average measurement?
- Which measurement would you say is the most precise? Why?

Today's Agenda

- QOTD: What is the difference between accuracy and precision? How can we calculate error?

- Accuracy and precision
- Calculating error
- Significant figures

- Homework : Ch 2 #86-98 evens, 101, 106 & 121 due Friday

Accuracy and Precision

Accurate – right on the target!!

Good accuracy
Good precision

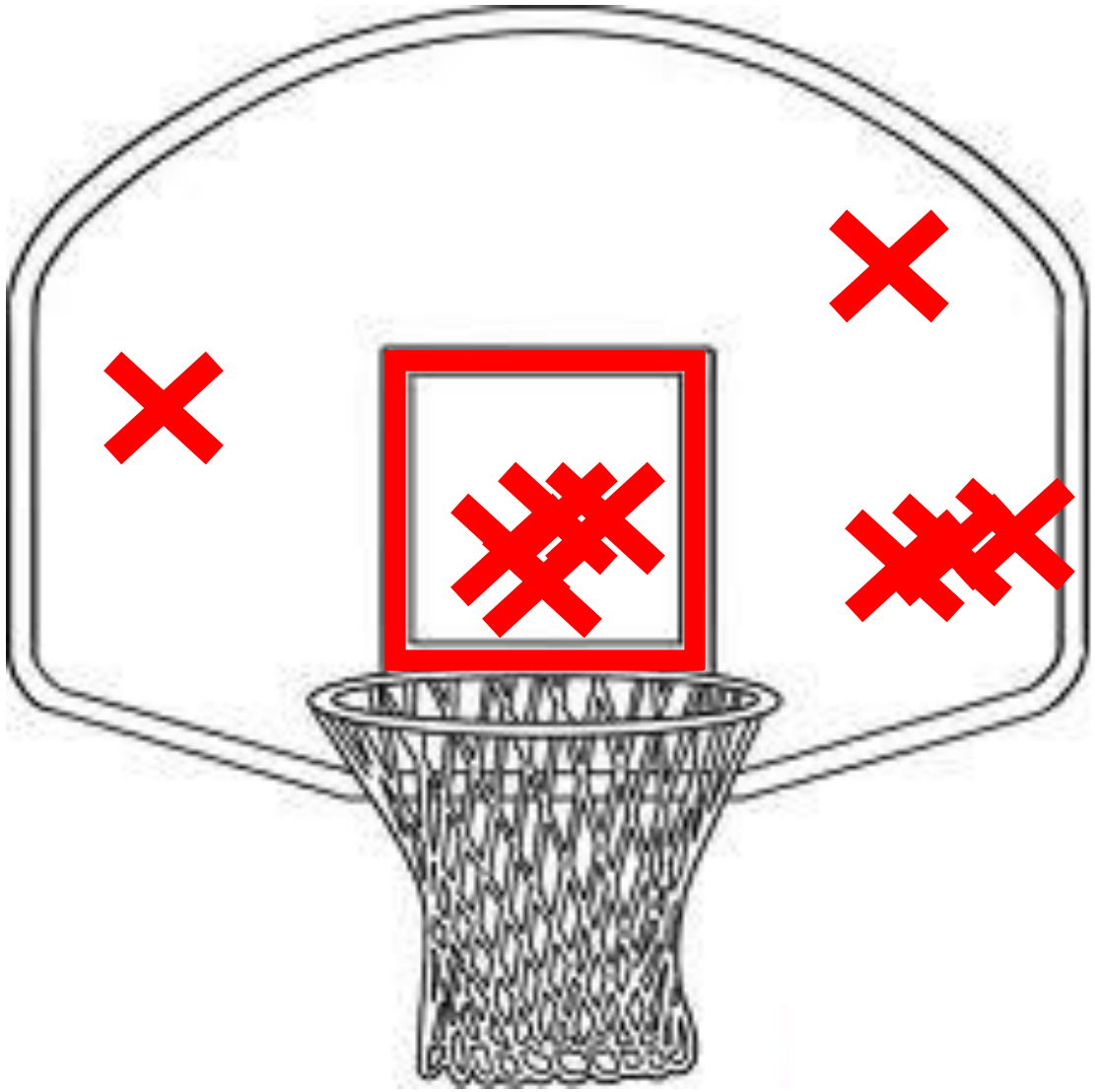
Poor accuracy
Good precision

Poor accuracy
Poor precision

Definitions!

- Accuracy – how CLOSE a measured value is to the accepted value.

- Precision – how close a series of measurements are to one another (reproducible). A measurement that has many significant digits.



1. You put your puppy on a scale to see how much he's grown: 10lbs, 4 lbs, 12lbs…whats wrong?
2. Your weathergirl's forecast for yesterday was sunny and 57.5 °F, the temperature was 73 °F…is she accurate? precise?
3.

Table 2.3 Student Density and Error Data (Unknown was sucrose; density = 1.59 g/cm³)

	Student A		Student B		Student C	
	Density	Error (g/cm³)	Density	Error (g/cm³)	Density	Error (g/cm³)
Trial 1	1.54 g/cm³	−0.05	1.40 g/cm³	−0.19	(a) 1.70 g/cm³	+0.11
Trial 2	1.60 g/cm³	+0.01	1.68 g/cm³	+0.09	1.69 g/cm³	+0.10
Trial 3	1.57 g/cm³	−0.02	1.45 g/cm³	−0.14	1.71 g/cm³	+0.12
Average	(b) 1.57 g/cm³		1.51 g/cm³		1.70 g/cm³	

Error and Percent Error

- Error :

  Error = experimental value – accepted value

- Percent error :

$$\text{Percent error} = \frac{|\text{error}|}{\text{accepted value}} \times 100$$

I measured the length of the room to be 4 m. The actual length is 5 m. What is my error, and what is my percent error?

Next, I measured the distance between BHS and Panera. I came up with a distance of 809 m. The actual distance is 810 m. What is my error and what is my percent error?

Significant Figures

- Precision is limited to our instrumentation. We cannot report numbers that don't have meaning.
- Which numbers are meaningful when making measurements??

Rules for “How many?”

1. Numbers other than zero are ALWAYS significant. (36)
2. “Sandwich” zeros are ALWAYS significant. (2001)
3. All zero’s after a # and decimal are ALWAYS significant. (2.60)
4. All other zeros (leading zero’s or zero’s after only a number) are NOT significant. (0.034 or 6300)

How Many Significant Digits

1. 90
2. 93.20
3. 0.00243
4. 20,534
5. 25,340
6. 0.010

Warm Up

- How many significant digits?

a) 0.090 b) 120

c) 12.03 d) 12300.0

- Clyde Clumsy was directed to weigh a 500 g mass on the balance. After diligently goofing off for ten minutes, he quickly weighed the object and reported 458 g. What is his error & % error?
- If Clyde were weighing a 5000 g mass and got 4958 g, how would his error & % error change? Why?

Today's Agenda

- QOTD: What should you expect from yourself when calculating % error in lab?
- Lab measurements/rounding
- Accuracy and precision worksheet/lab completion.
- Write a review sheet for Chapter 2 test.

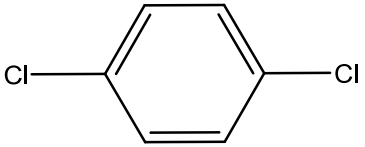
Turn in Conversion lab TODAY!

Book work AND accuracy/precision worksheet due tomorrow!

Round to 3 Sig Figs!

HINT: sometimes sci notation helps!

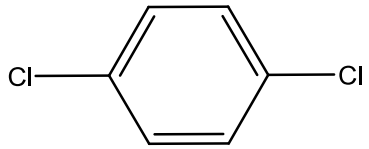
1. 3236
2. 0.9302
3. 1200
4. 0.02398

The melting point of  is 53.0 °C.

Melting Point Data Table

Student 1	Student 2
51.5 °C	52.3 °C
53.5 °C	53.2 °C
55.0 °C	54.0 °C
52.3 °C	52.5 °C
54.2 °C	53.5 °C

- What is the average mp for each student?
- What is the percent error on the averages?
- Which is more precise?
- Which is more accurate?
- How many significant figures should be in the mp data? In the error?

The melting point of  is 53.0 °C.

- Average – Student 1 = 53.3 °C, Student 2 = 53.1 °C
- % Error – Student 1 = 0.566%, Student 2 = 0.189%
- 2 is most precise and accurate
- 3 sig figs in mp, 3 sig figs in % error

Warm Up

- What did you learn yesterday about performing this experiment? (If I knew then what I know now…)
- How complete and useful was your procedure?
- Did you find any techniques that would be useful to share?

Today's Agenda

- LAB!

- Writing a lab report
  - Small % of grade based on error.
  - First BIG lab grade of the year.
  - Rough drafts will be accepted. Lab Report will be due Oct 3!
- Do lab!