Introduction to Significant Figures &

Scientific Notation

Significant Figures

- Scientist use _____ to determine how _____ a measurement is.
- Significant digits in a measurement include all of the _____ plus one _____ .

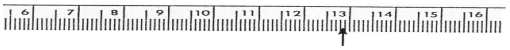
For example…

- Look at the ruler below

- What would be the measurement in the correct number of sig figs?
- _____

Let's try this one

- Look at the ruler below



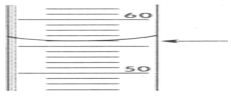
- What would be the measurement in the correct number of sig figs?
- _____

The same rules apply with all instruments

- The same rules apply
- Read to the last digit that you know
- Estimate the final digit

Let's try graduated cylinders

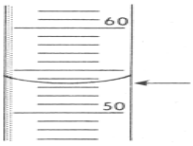
- Look at the graduated cylinder below



- What would be the measurement in the correct number of sig figs?
- _____

One more graduated cylinder

- Look at the cylinder below…



- What would be the measurement in the correct number of sig figs?
- _____

Rules for Significant figures Rule #1

- All non zero digits are **ALWAYS** significant
- How many significant digits are in the following numbers?

274 _____

25.632 _____

8.987 _____

Rule #2

- All zeros between significant digits are **ALWAYS** significant
- How many significant digits are in the following numbers?

504 _____

60002 _____

9.077 _____

Rule #3

- All **FINAL** zeros to the right of the decimal **ARE** significant
- How many significant digits are in the following numbers?

32.0 _____

19.000 _____

105.0020 _____

Rule #4

- All zeros that act as place holders are **NOT** significant
- Another way to say this is: zeros are only significant if they are between significant digits OR are the very final thing at the end of a decimal

For example

How many significant digits are in the following numbers?

1) 0.0002 1) _____
2) 6.02×10^{23} 2) _____
3) 100.000 3) _____
4) 150000 4) _____
5) 800 5) _____

Rule #5

- All counting numbers and constants have an infinite number of significant digits
- For example:

  1 hour = 60 minutes

  12 inches = 1 foot

  24 hours = 1 day

  There are 30 students in the class

How many significant digits are in the following numbers?

1) 0.0073 1) _____
2) 100.020 2) _____
3) 2500 3) _____
4) 7.90×10^{-3} 4) _____
5) 670.0 5) _____
6) 0.00001 6) _____
7) 18.84 7) _____

Rules Rounding Significant Digits Rule #1

- If the digit to the immediate right of the last significant digit is less that 5, do not round up the last significant digit.
- For example, let's say you have the number 43.82 and you want 3 significant digits

Rounding Rule #2

- If the digit to the immediate right of the last significant digit is greater that a 5, you round up the last significant figure
- Let's say you have the number 234.87 and you want 4 significant digits

Rounding Rule #3

- If the number to the immediate right of the last significant is a 5, and that 5 is followed by a non zero digit, round up
- 78.657 (you want 3 significant digits)

Rounding Rule #4

- If the number to the immediate right of the last significant is a 5, and that 5 is followed by a zero, you look at the last significant digit and make it even.
- 2.5350 (want 3 significant digits)

Say you have this number

- 2.5250 (want 3 significant digits)

Let's try these examples…

200.99	(want 3 SF)	_____
18.22	(want 2 SF)	_____
135.50	(want 3 SF)	_____
0.00299	(want 1 SF)	_____
98.59	(want 2 SF)	_____

Scientific Notation

- Scientific notation is used to express very _____ or very _____ numbers
- I consists of a number between _____ followed by _____ to an _____
- The _____ can be determined by the number of _____ you have to move to get only 1 number in front of the decimal

Large Numbers

- If the number you start with is greater than 1, the exponent will be _____
- Write the number 39923 in scientific notation

Small Numbers

- If the number you start with is less than 1, the exponent will be _____
- Write the number 0.0052 in scientific notation

Scientific Notation Examples

Place the following numbers in scientific notation:

1) 99.343 1) _____

2) 4000.1 2) _____

3) 0.000375 3) _____

4) 0.0234 4) _____

5) 94577.1 5) _____

Going from Scientific Notation to Ordinary Notation

- You start with the number and move the decimal the same number of spaces as the _____ .
- If the exponent is _____ , the number will be greater than 1
- If the exponent is _____ , the number will be less than 1

Going to Ordinary Notation Examples

Place the following numbers in ordinary notation:

1) 3×10^{6} 1) _____
2) 6.26×10^{9} 2) _____
3) 5×10^{-4} 3) _____
4) 8.45×10^{-7} 4) _____
5) 2.25×10^{3} 5) _____

Significant Digits

Calculations

Rules for Addition and Subtraction

- When you _____ or _____ measurements, your answer must have the same number of _____ as the one with the fewest
- For example:

20.4 + 1.322 + 83

Addition & Subtraction Problems

1) 1.23056 + 67.809 = 1) _____

2) 23.67 – 500 = 2) _____

3) 40.08 + 32.064 = 3) _____

4) 22.9898 + 35.453 = 4) _____

5) 95.00 – 75.00 = 5) _____

Rules for Multiplication & Division

- When you _____ and _____ numbers you look at the **TOTAL** number of _____ **NOT** just decimal places
- For example:

67.50 x 2.54

Multiplication & Division Problems

1) 890.15 x 12.3 = 1) _____

2) 88.132 / 22.500 = 2) _____

3) (48.12)(2.95) = 3) _____

4) 58.30 / 16.48 = 4) _____

5) 307.15 / 10.08 = 5) _____

More Significant Digit Problems

1) 18.36 g / 14.20 cm^3 1) _____

2) 105.40 °C –23.20 °C 2) _____

3) 324.5 mi / 5.5 hr 3) _____

4) 21.8 °C + 204.2 °C 4) _____

5) 460 m / 5 sec 5) _____