UNIT 3 MODULE 1 SIGNIFICANT FIGURES & SCIENTIFIC NOTATION

Module Concepts

- Recording measurements with the proper number of significant figures (digits)
- Counting Significant Figures in previously recorded measurements
- Scientific Notation

Significant Digits (or Figures)

- Just like Pokémon, not all instruments are created equal.
- Examine these two pieces of glassware. Suppose you wanted to measure a liquid volume of Muk's slime.
- The two pieces of glassware both measure liquid volume...but do they measure the same?







Significant Digits (or Figures)

- When we make measurements, the number of digits recorded in the measurement should be limited to indicate the physical markings on the instrument.
- We should only state values in a measurement that are reasonably measured or estimated by the markings on the instrument, no more, no less.

Significant Digits (Figures) – Cont'd

- When making a measurement, ALWAYS report the number one digit past the last marking on the instrument.
- The "certain" digits are those representing actual markings on the instrument.
- The last digit in a recorded measurement is estimated one digit beyond the physical markings of the instrument; it is therefore referred to as an "estimated" digit.

Significant Digits (Figures) – Cont'd

- This estimated digit is subjective. In other words, its value could be different depending on the person reading the instrument.
- Recording measurements in this manner indicates the level of precision allowed by the measuring device being used.

Recording Measurements with Proper Significant Digits (Figures)

- Measure from the bottom of the meniscus when measuring liquid volumes
- Include all certain digits (those with markings)
- Estimate and include one digit beyond the physical markings on the instrument
- Volume of liquid measured with this instrument = 38.2 cm³
- This measurement therefore has 3 significant figures.





- This instrument shows markings every 10mL – these "certain" digits will appear in the tens position.
- Estimate one digit beyond the physical markings – these "estimated" or "uncertain" digits will appear in the ones position.
- So how should this volume be recorded?
- Volume = 64 mL
- This volume therefore has 2 significant figures.

http://wps.prenhall.com/wps/media/objects/476/488316/Instructor_Resources/Chapter_02/FG02_07-28o.JPG



Here, there are markings for the ones position and the tenths position. Estimate one numerical position beyond that - to the hundredths place How should the measurement be recorded? 5.55 mL This measurement therefore has 3 significant figures.

Recording Measurements with Proper Significant Digits (Figures)



Include all certain digits (those with markings)

Estimate and include one digit beyond the physical markings on the instrument

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Length of nail using Ruler A = 4.38 cm (3 sig figs)
Length of nail using Ruler B = 4.3 cm (2 sig figs)
Ruler A is considered a more "precise" instrument
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Counting Significant Figures in Previously Recorded Measurements

When determining the number of significant digits in a measurement, follow the **Atlantic-Pacific rule**.

The Atlantic-Pacific Rule for Counting Significant Figures



A = Atlantic = Absent

In this case, the decimal is absent. To determine the number of significant digits, start on the Atlantic side of the number with the first non-zero digit, then count until the end.

The Atlantic-Pacific Rule for Counting Significant Figures

P = Pacific = Present

In this case, the decimal is present. To determine the number of significant digits, start on the Pacific side of the number with the first non-zero digit, then count until the end.



Significant Figures - Explained

Watch this video!And this one!

Sig Fig Practice



How many significant figures are in each of the following measurements?

• 24mL	2 sig figs
• 350.0 g	4 sig figs
• 0.0320m ³	3 sig figs
• 6.4 moles	2 sig figs
• 560 kg	2 sig figs

- Practice problems: Determine the number of significant digits in each of the following values.
 - 0.2430 gallons
 - 3400 days
 - 5,601,592 light years
 - 0.000 000 000 320 grams
 - 4.3090 cubits
 - 73.0 bushels
 - 42 measures
 - 420 cups

Scientific Notation

- Science deals with numbers that are very large and very small.
- A short-hand way to write these numbers is done using scientific notation.

Scientific Notation

There are two parts to a number written in scientific notation:

6.02	X	10 ²³ particles/mol
\uparrow		\uparrow
number		exponent is number
between 1 and 10		of places needed to
These numbers		move the decimal -
are significant		Not significant!

NOTE: If the decimal is moved to the right, the sign on the exponent is negative. If the decimal is moved to the left, the sign on the exponent is positive.

Scientific Notation- Explained

Watch this video!And this one!

Scientific Notation



Convert the following into scientific notation

• 2400 mL	$2.4 \text{ x} 10^3$
• 350.0 g	3.500 x 10 ²
• 0.0320m ³	§ .20 x 10 ⁻²
• 634,000 mol	6.34×10^{5}
• 5610 kg	5161 x 10 ³
	g