



# *Measurement in Chemistry*

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# SI Units

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*All systems of weights and measures, metric and non-metric, are linked through a network of international agreements supporting the **International System of Units**.*

*The International System is called the **SI**, using the first two initials of its French name Systeme International d'Unités.*

# SI Units

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## *Base SI Units:*

- *meter - distance*
- *kilogram - mass*
- *second - time*
- *kelvin - temperature*
- *mole - amount of substance*
- *ampere - electric current*
- *candela - intensity of light*



# SI Units

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All other SI Units are **derived** from the seven standard units.

*For example:*

- *Units of volume -derived from units of length.*

$$1 \text{ mL} = (1 \text{ cm})(1 \text{ cm})(1 \text{ cm}) = 1 \text{ cm}^3$$

$$1 \text{ L} = 1 \text{ dm}^3$$

- *Units of energy -derived from a combination of units.*

$$1 \text{ J} = 1 \frac{\text{kg} \cdot \text{m}^2}{\text{s}^2}$$

# SI Units

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*SI units have universally accepted symbols. Some common features of these symbols include:*

- 1. no periods after SI units*
- 2. Symbols for SI units never pluralized*
- 3. SI units are case-sensitive (IF I WRITE SOMETHING UPPER CASE, YOU NEED TO WRITE IT IN UPPER CASE!)*

# Significant Figures

*What are they?*

*All “certain” digits and ONE “uncertain” digit in a scientific measurement or calculation.*

*What do we mean by “certain” and “uncertain”?*

# Significant Figures

*Why do we use them?*

- 1. To account for the limits of ourselves.*
- 2. To account for the limits of our instruments.*

*Basically, we use sig. figs. to keep from lying about the precision of our instruments.*



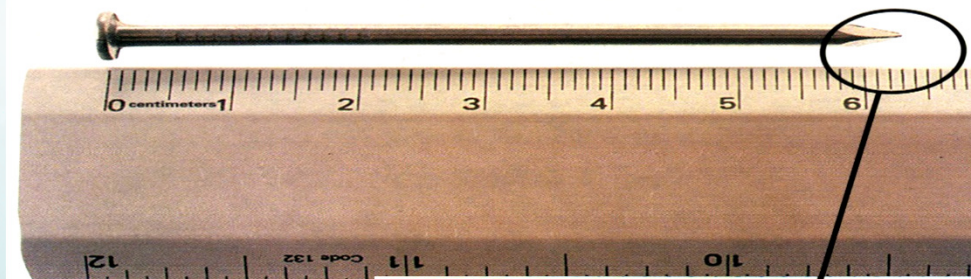
# Significant Figures

*How do I use sig. figs. when measuring?*

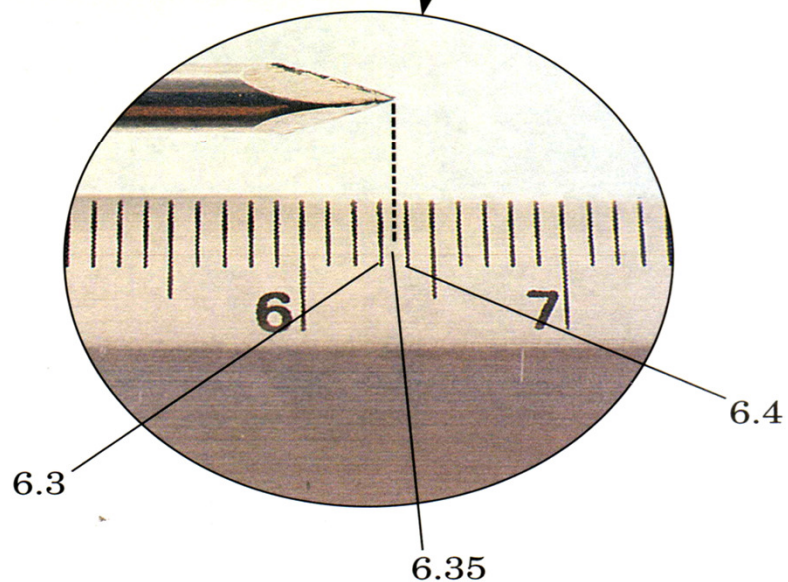
- 1. If the instrument is digital, record every digit (even zeroes).*
- 2. If the instrument is lined (rulers, graduated cylinders, etc.), estimate one digit beyond the markings.*



# Reporting Measurements

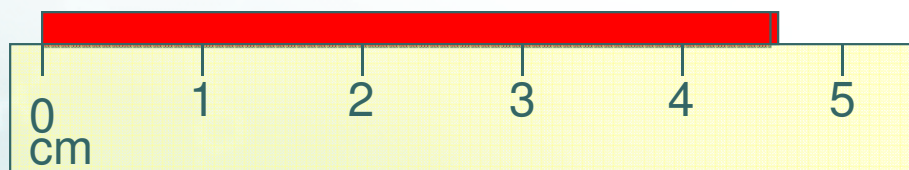


- Report what is known with certainty
- Add ONE digit of uncertainty (estimation)

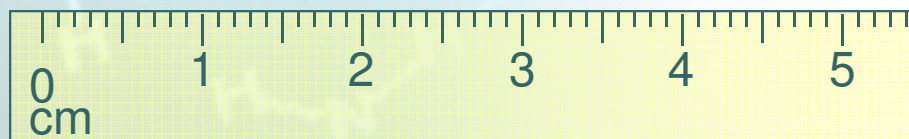


# Practice Measuring

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4.5 cm



4.54 cm



3.0 cm

# Significant Figures

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*How do I tell if a digit in a number is significant?*

- 1. All nonzero digits are significant.*
- 2. All “captured” zeroes are significant.*
- 3. “Leading” zeroes are never significant.*
- 4. “Trailing” zeroes are significant only if the number has a decimal in it.*



# Significant Figures

*What is the difference between  
a measurement of 20 mL and  
20. mL? 20.0 mL? 20.00 mL?*

# Significant Figures

*How many sig. figs. do these numbers contain?*

■ 3.582

■ 0.503

■ 4600

■ 520.

■ 0.060050

■ 1800.03

■ .1000

■ 3250

■ .0036

■ 60