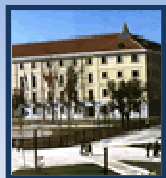


## Chemistry

# TOPIC 1

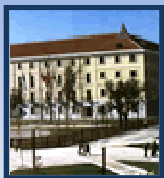
## Introduction to Chemistry



# General Chemistry

## Contents

1. Introduction to Chemistry
2. The Scientific Method
3. Physical and Chemical Properties
4. Classification of Matter
5. SI Units
6. Significant figures
7. Measurements in Chemistry

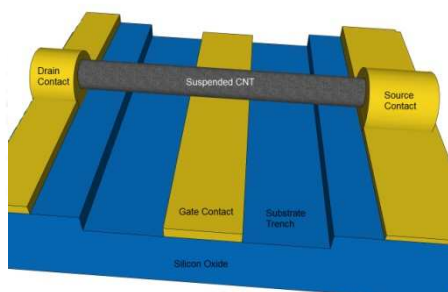


# General Chemistry

## 1. Introduction to Chemistry

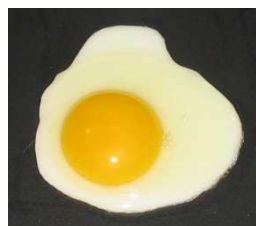
• *Chemistry* is the study of matter and the changes that matter undergoes.

- Health and Medicine
- Energy and the environment
- Materials Technology
- Food Technology

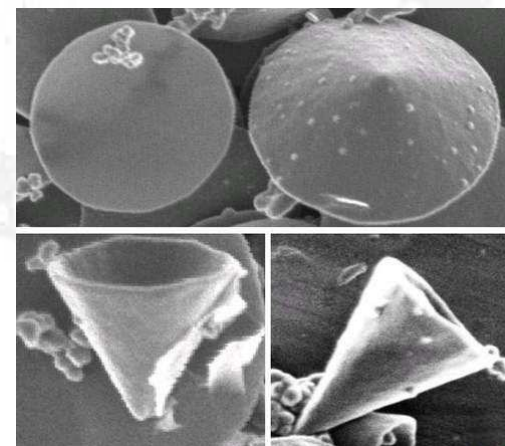


Electronic materials

<http://commons.wikimedia.org/wiki/File:Wiki6.jpg>

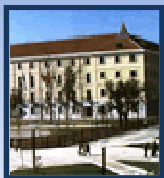


Teflon®



Carbon nanocones

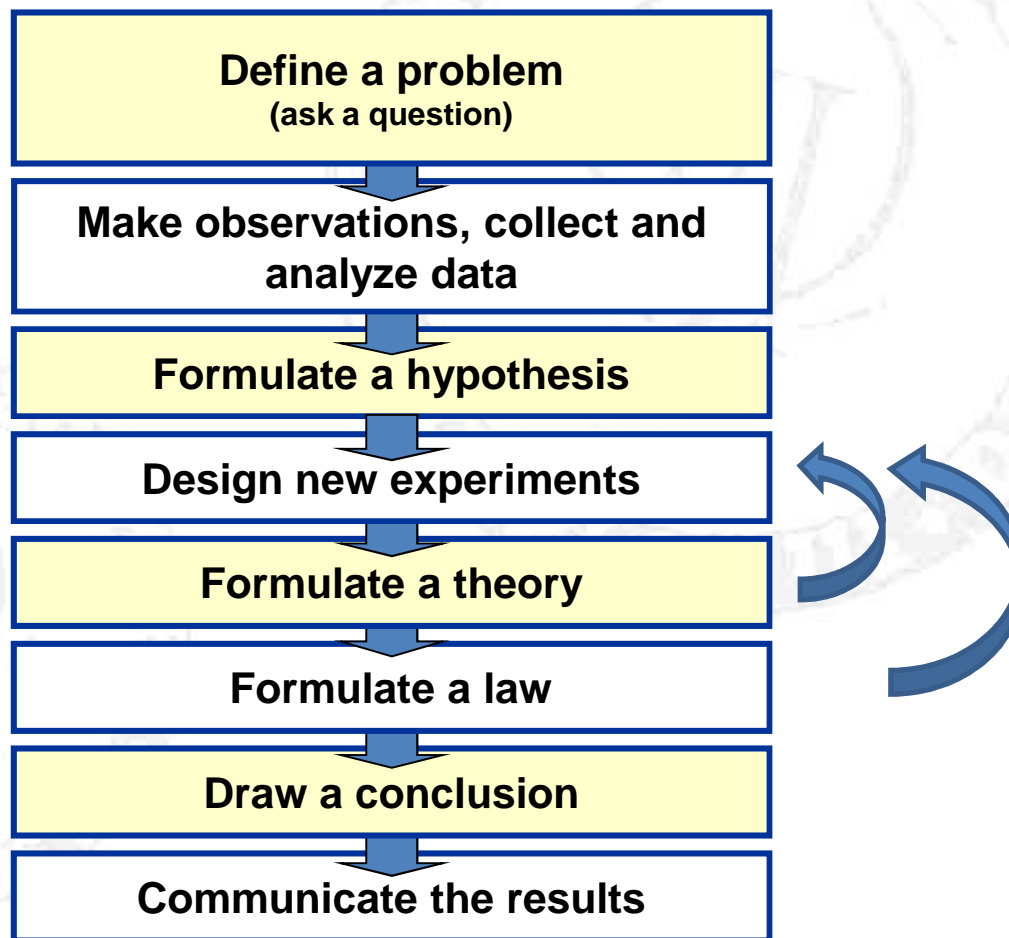
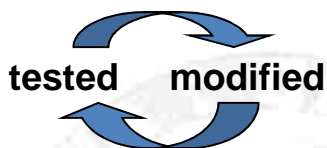
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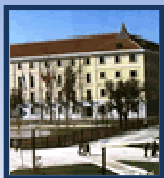


# General Chemistry

## 2. The Scientific Method

*The scientific method is a systematic approach to research.*



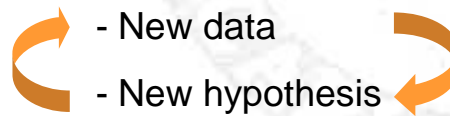


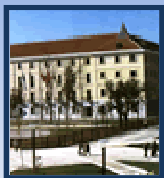
# General Chemistry

Las Vegas criminologists use scientific methods to solve grisly murders in this unusually graphic (and hugely popular) drama, which inspired a host of other cop-show 'procedurals.'



- **Problem:** Crime
- **Experimental Data:** Evidences / Proofs  
(Qualitative and Quantitative data)
- **Hypothesis:** tentative explanation
- New data
- New hypothesis
- Theory





## General Chemistry

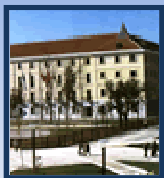
### 3. Chemical and Physical Properties

***Chemical Properties*** describe how a substance reacts with other substances

- Flammability
- Hydrolysis
- Combustion
- ...

***Physical Properties*** can be observed or measured without changing the composition of matter. Physical properties are used to observe and describe matter.

- Boiling or melting point of a pure substance
- Separation of a mixture of substances
- Mass
- Density
- Colour
- ...



## General Chemistry

### 3. Chemical and Physical Properties

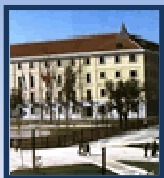
Physical properties of matter are classified as either intensive or extensive:

***Intensive Properties:*** do not depend on the amount of matter present.

- Color
- Odor
- Luster
- Malleability
- Ductility
- Conductivity
- Hardness
- Melting/Freezing, boiling or sublimation or vaporization points
- Density...

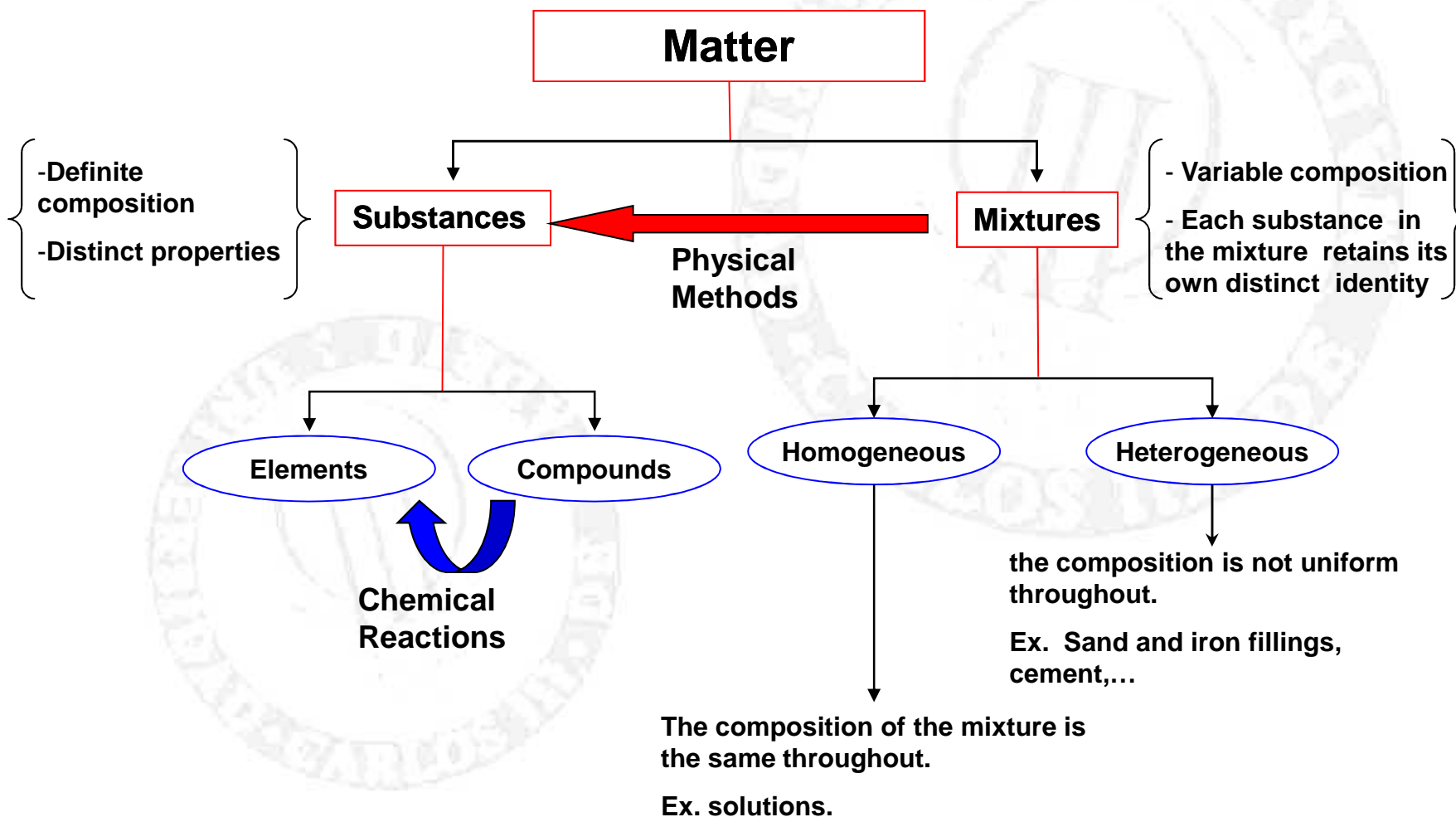
***Extensive Properties:*** depend on the amount of matter.

- Mass - A measurement of the amount of matter in a object (grams).
- Weight - A measurement of the gravitational force of attraction of the earth acting on an object.
- Volume
- Length ...

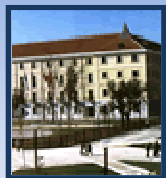


# General Chemistry

## 4. Classification of Matter





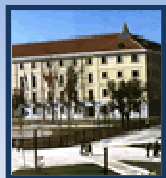


# General Chemistry

## 5. SI Units

Scientists use a unified system of measurement (*Le Systeme Internationale d'Unites*, or SI Units). There are seven fundamental “quantities” that can be measured:

Base Quantity	Name of Unit	Symbol
Length	meter	m
Mass	kilogram	kg
Time	second	s
Electrical current	ampere	A
Temperature	Kelvin	K
Luminous Intensity	Candela	cd
Amount of substance	Mole	mol

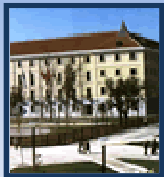


# General Chemistry

## 5. SI Units

### Derived Units

Physical Property	Name of Unit	Symbol
Area	Square metre	m <sup>2</sup>
Volume	Cubic Metre	m <sup>3</sup>
Density	Kilogram per cubic metre	kg/m <sup>3</sup> .
Force	Newton	N (kg.m/s <sup>2</sup> )
Pressure	Pascal	Pa (N.m <sup>-2</sup> )
Energía	Joule	J (kg m <sup>2</sup> s <sup>-2</sup> )



# General Chemistry

## 6. Significant Figures

Scientific Notation

$$\mathbf{N \times 10^n}$$

$\left\{ \begin{array}{l} N \text{ is a number between 1 and 10} \\ n \text{ is a positive or negative integer} \end{array} \right.$

**1. Non-zero digits are always significant.**

523.7 has \_\_\_\_ significant figures

**2. Any zeros between two significant digits or numbers are significant.**

73.01 has \_\_\_\_ significant figures

**3. A final zero or trailing zeros in the decimal portion ONLY are significant.**

5.200 has \_\_\_\_ significant figures

302 has \_\_\_\_ significant figures

4.00 x 100 has \_\_\_\_ significant figures

**4. Exact numbers can be thought of as having an infinite number of significant figures:**

8 people

12 eggs in a dozen

12 inches in a foot

60 minutes in an hour



# General Chemistry

## 6. Significant Figures

### 5. Addition and subtraction:

Round the result of the operation so that its decimal portion has the same number decimal places as the decimal portion of the least precise number used.

Use the number of decimal places in the number with the fewest decimal places.

### 6. Multiplication and division (standard rule):

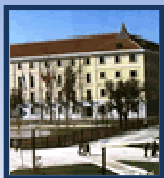
Round the result of the operation so that it has the same number of significant figures as the least precise number used in the calculation.

Examples:

$$3.1405 - 0.25 = \underline{\hspace{2cm}}$$

$$5.0 \times 3.550 \times 10^{-6} = \underline{\hspace{2cm}}$$

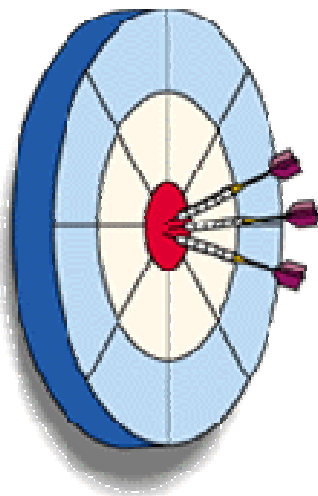
$$0.01305 \div 0.362 = \underline{\hspace{2cm}}$$



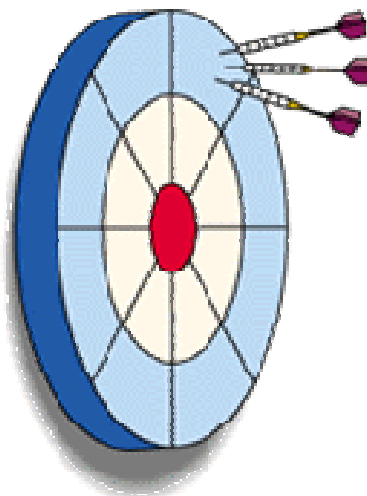
## General Chemistry

### 6. Significant Figures

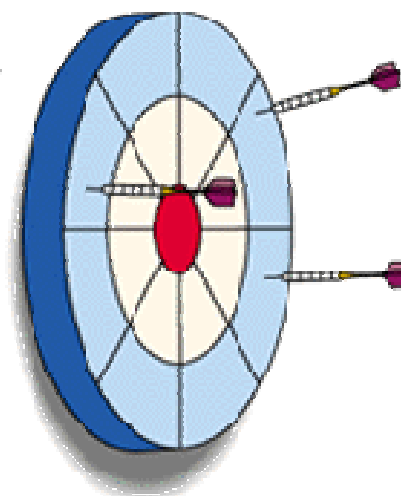
*Accuracy and precision*



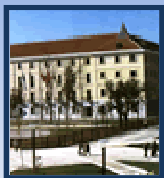
**Accurate and precise**



**Poor accuracy but precise**



**Neither accurate nor precise**



# General Chemistry

## 7. Measurement in Chemistry

- Atomic mass: The atomic mass is the mass of an atom, most often expressed in unified atomic mass units (uma)
- Molar Mass: is the mass of one mole of a substance (chemical element or chemical compound).

	Units	M.A. (uma)
<b>1 x Na =</b>	<b>1</b>	<b>x 23 uma</b>
<b>1 x H =</b>	<b>1</b>	<b>x 1 uma</b>
<b>1 x O =</b>	<b>1</b>	<b>x 16 uma</b>
<b>NaOH Mass formula = 40 uma</b>		

	Units	M.A. (uma)
<b>3 x H</b>	<b>3</b>	<b>x 1 uma = 3 uma</b>
<b>1 x P</b>	<b>1</b>	<b>x 31 uma = 31 uma</b>
<b>4 x O</b>	<b>4</b>	<b>x 16 uma = 64 uma</b>
<b>H<sub>3</sub>PO<sub>4</sub> Mass formula = 98 uma</b>		