Unit 01 Outcomes

LPT

Define the following terms basic to chemistry:

Chemistry = science that studies matter and its interactions

Matter = has mass & occupies space

Energy = ability to do work (move matter)

Mass = "intrinsic (just is) property" called inertia
= measure of quantity

Weight = a force (mass x gravity) measured in pounds

Mixture = 2 or substances in variable composition

Homogeneous = "same" … uniform composition

Heterogeneous = "different" … variable composition

LPT

Define the following relating to chemical components:

Substance
Single chemical entity
Only one kind of matter
Has one definite composition
Has definite properties
Homogeneous

Compound
Can be chemically sub-divided
Contains 2 or more kinds of atoms (molecule)

Molecule
Can be chemically sub-divided into atoms
Contains 2 or more atoms

LPT

Define the following relating to chemical components:

Atom
Smallest particle of an element
Combines with other atoms to form molecules

Element
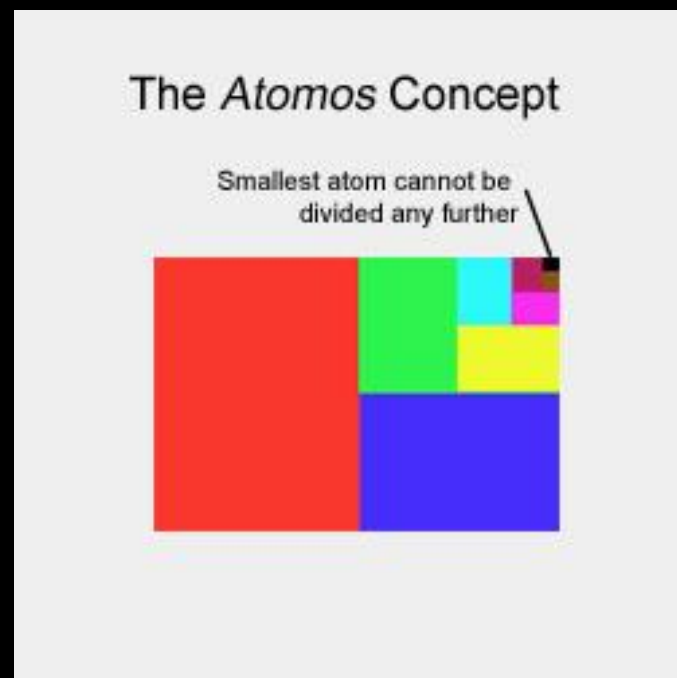Can't be sub-divided
Contains only 1 kind of atom

LPT

Define the following relating to changes and properties:

Physical Property
Observed without forming new substance
Described by senses
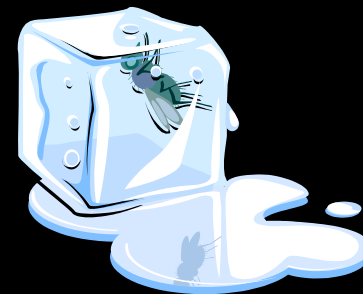Color, shape, odor, taste
Measurable
mp, bp, density

Physical Change
New form of same substance
No new substance (chemical entity) formed

LPT

Define the following relating to changes and properties:

Chemical Property

New substance(s) formed when observed

List of chemical changes

"may react to form…"

Chemical Change

Old substance(s) destroyed

New substance(s) formed

LPT

List the 3 states of matter and describe the characteristics of each

1. Solid

Form	Rigid
Compressibility	Very Low
Shape	Constant (definite)
Volume	Constant (definite)
Particle Movement	Vibration in fixed position
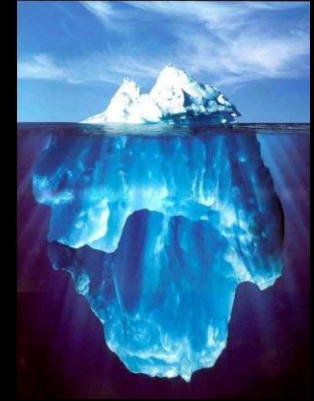
2. Liquid

Form	Fluid (Flows)
Compressibility	Extremely Low
Shape	Variable (Fills Container)
Volume	Constant (Definite)
Particle Movement	Some attraction, particles move freely beneath surface

LPT

List the 3 states of matter and describe the characteristics of each

3. Gas

|	
Form	**Fluid (Flows)**
Compressibility	**Very High**
Shape	**Variable (Fills Closed Container)**
Volume	**Variable (Fills Closed Container)**
Particle Movement	**Random, Independent**

LPT

Describe the difference between mass and weight.

Mass

Depends on the quantity

Does not change with location

Can never be zero

Measured in grams

Weight

Depends on force (gravity)

Changes with location

Can be zero

Measured in Pounds

LPT
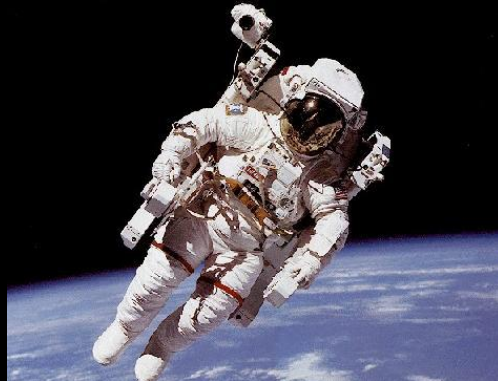
Classify units as being basic or derived

Basic
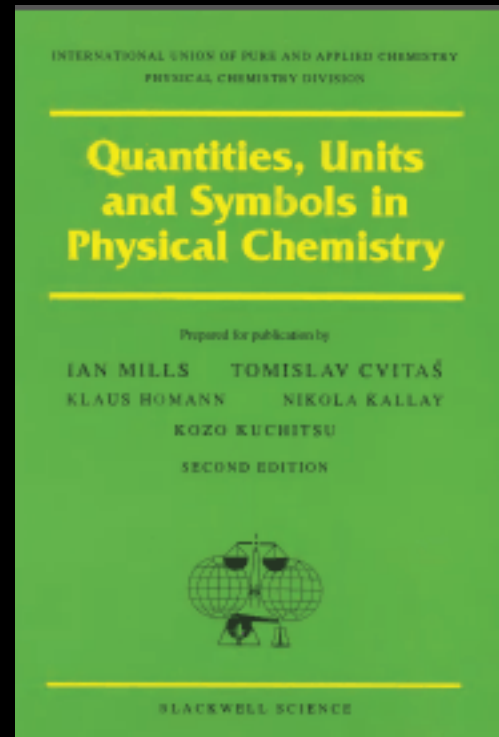
mass = gram (g)

length = meter (m)

time = second (s)

chemical quantity = mole (mol)

Derived (or combination)

area = length x width

volume = length x width x height

density = mass/volume

INTERNATIONAL UNION OF PURE AND APPLIED CHEMISTRY

PHYSICAL CHEMISTRY DIVISION

Quantities, Units and Symbols in Physical Chemistry

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SECOND EDITION

BLACKWELL SCIENCE

LPT

Identify given and wanted quantities in a problem that are related by a "per" expression (conversion factor).

Given = furnished or known information
= initial or starting quantity

Wanted = information sought
= the solution

"per" expression = conversion factor
= relationship between given and sought
= relationship between units or quantities

LPT

Set up and solve problems involving a "per" expression (conversion factor) by dimensional analysis.

1. What is being asked?

2. What do I know?

3. Can I get from 2 ➜ 1 ? ("per" expressions")

4. "Turn the crank" (Do the math)

   USE UNITS

   Units wrong, most likely have wrong answer

   Units can provide means to solution

LPT

Write the standard symbols for:

Grams = g

Liters = L (lower case l also acceptable)

Meters = m

Moles = mole or mol

Write the standard symbols for the metric prefixes:

Kilo- k

Centi- c

Milli- m

State and write with appropriate metric prefixes the relationship between any unit and its corresponding

kilo-unit = 1000 x unit

centi-unit = 1/100 x unit (0.01 x unit)

milli-unit = 1/1000 x unit (0.001 x unit)

LPT

Given a mass, length or volume expressed in metric units, kilo units, centi units, or milli units express that quantity in the three other units.

Kilo unit = 1000 x unit
= 100,000 x centi-unit
= 1,000,000 x milli-unit

Centi-unit = 10^{-5} x kilo-unit
= 1/100 x unit
= 10 x milli-unit

milli-unit = 10^{-6} x kilo-unit
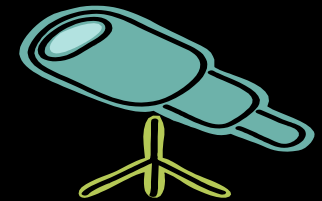= 10^{-1} x centi-unit
= 10^{-3} x unit

LPT

In a measured quantity distinguish the numeral and the unit label.

4.78 cm

Unit

Numeral

Recognize that to be added or subtracted, measured quantities must have identical units.

When adding or subtracting, check units for consistency

LPT

**These outcomes simply to "be able to do practice exam problems"**

Add & subtract measured quantities, correctly expressing units

Multiply & divide measured quantities

Recognize that dividing a unit by the same unit gives an answer of one (This is called CANCELLATION.)

Reduce the units obtained as a result of a calculation to their lowest terms

$$\text{Starting Unit} \quad \text{x} \quad \frac{\text{Final Unit}}{\text{Starting Unit}} \quad = \quad \text{Wanted Unit}$$

LPT
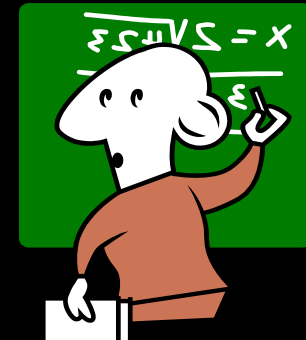
How many square centimeters in a square meter?

Each measurement, both length and width needs to be converted

$$1 \text{ m}^2 \text{ x } \frac{(100 \text{ cm})^2}{(1 \text{ m})^2} = 1 \times 10^4 \text{ cm}^2$$

A sprinter runs the 100 meter dash in 10.1 seconds. What is his speed in miles per hour?

12 in = 1 ft   5280 ft = 1 mile   2.54 cm = 1 in   60 sec = min   60 min = 1 hour

$$\frac{100 \text{ m}}{10.1 \text{ sec}} \text{ x } \frac{100 \text{ cm}}{1 \text{ m}} \text{ x } \frac{1 \text{ inch}}{2.54 \text{ cm}} \text{ x } \frac{1 \text{ ft}}{12 \text{ in}} \text{ x } \frac{1 \text{ mile}}{5280 \text{ ft}} \text{ x } \frac{60 \text{ sec}}{1 \text{ min}} \text{ x } \frac{60 \text{ min}}{1 \text{ hr}} = 22.1 \text{ mi / hr}$$

Convert 5.6 kg to mg

$$5.6 \text{ kg } \text{ x } \frac{1000 \text{ g}}{1 \text{ kg}} \text{ x } \frac{1000 \text{ mg}}{1 \text{ g}} = 5.6 \times 10^6 \text{ mg}$$

LPT