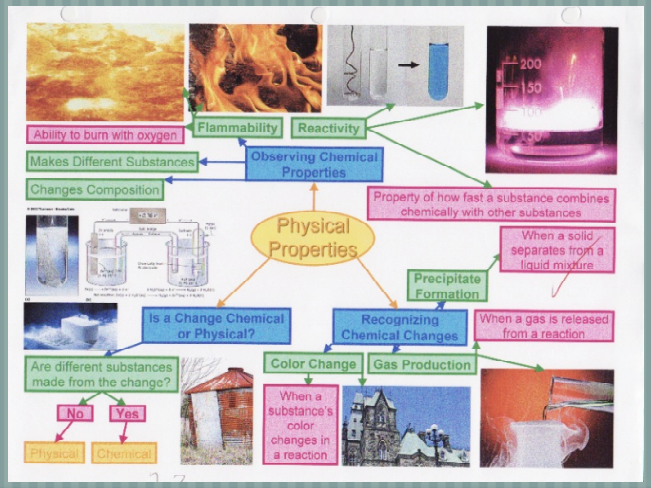
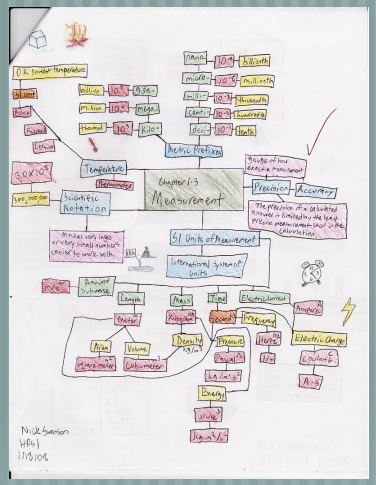
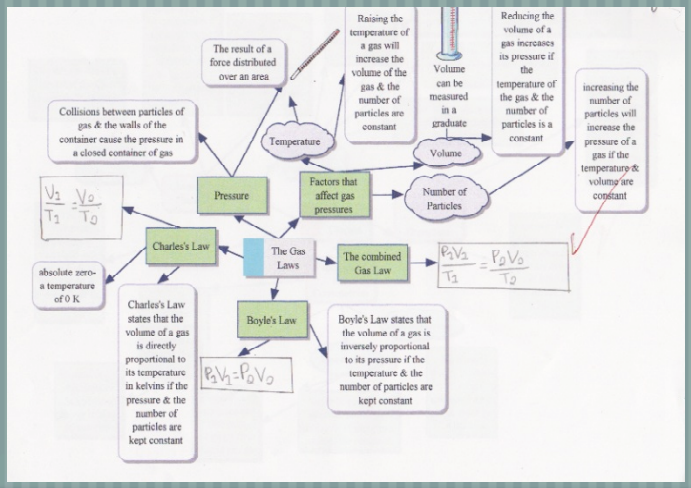



# Concept Mapping



The Physical Science Series

# Concept Map (Mind Map)

A concept map is a visual representation of a reading showing how the ideas are related.

1. Use unlined paper.
2. Keep words to a minimum.
3. Link ideas together with lines.
4. Begin in the center and work out in all directions.
5. Color & images help your grade.
6. One map per section, one map per page.
7. Be creative! There is no one correct map.

Here are some Grade A Concept Maps from the past. Notice that:

1) the section title is placed in the middle of the page and ideas radiate outward

2) ideas are linked together with lines

3) ideas are summarized - there is no more than one or two sentences.

4) the maps contain color and graphics to help convey the ideas and make them more visually appealing.

Andrew Cunningham
1/15/08
Per. 3

# What is Science?

## Science from Curiosity

Science is a system of knowledge and ways to fulfill our curiosity as humans

Humans have always been curious of the wonders around us.

In order to answer questions of curiosity, we need order, called science.

## Science and Technology

Technology is science put to practical use.

### Technology

An example of a technological advance is the cell phone.

### Advances

Advances in science lead to advances in technology and vice-versa.


## Science and Your Perspective

Scientific facts can always change over time, so no book has definite, unchangable facts.

## Branches of Science

### Physical Science

Chemistry is the study of all aspects of matter

Physics is the study of matter and energy with force and motion.

### Earth/space science

Geology is the study of Earth

Astronomy is space science.

### Life Science

Biology is the physics and chemistry of living things.

Many branches of science are correlated.

## The Big Ideas of Physical Science

### Space and Time

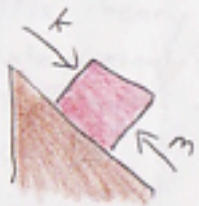
### Matter and Change

Matter (made of atoms) is everything in the universe.

### Forces and Motion

Forces cause changes in motion

Everything must obey to the laws of physics.

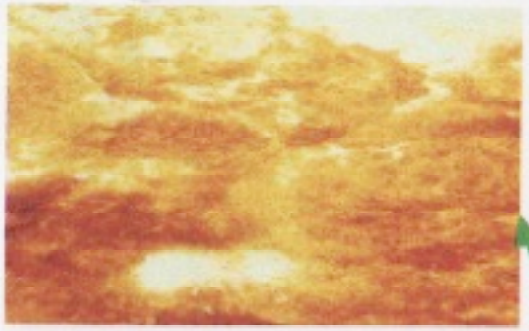


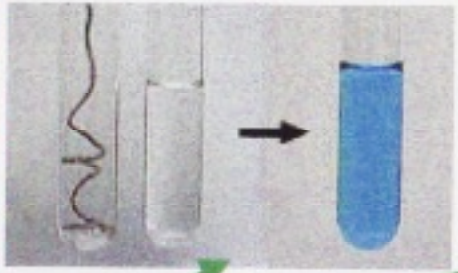
### Energy

Energy cannot be created or destroyed but only changed in form.

Moving objects have kinetic energy while still ones have potential energy

Energy exists in many forms.






Ability to burn with oxygen

Flammability

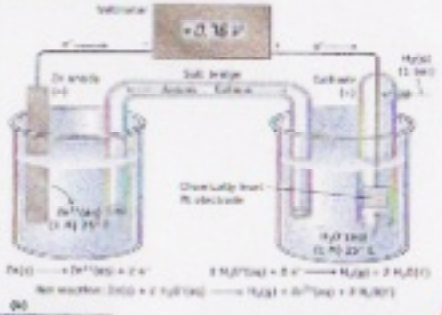
Reactivity

Makes Different Substances

Observing Chemical Properties

Changes Composition

Property of how fast a substance combines chemically with other substances



Physical Properties

When a solid separates from a liquid mixture

Precipitate Formation

Is a Change Chemical or Physical?

Recognizing Chemical Changes

When a gas is released from a reaction

Are different substances made from the change?

Color Change

Gas Production

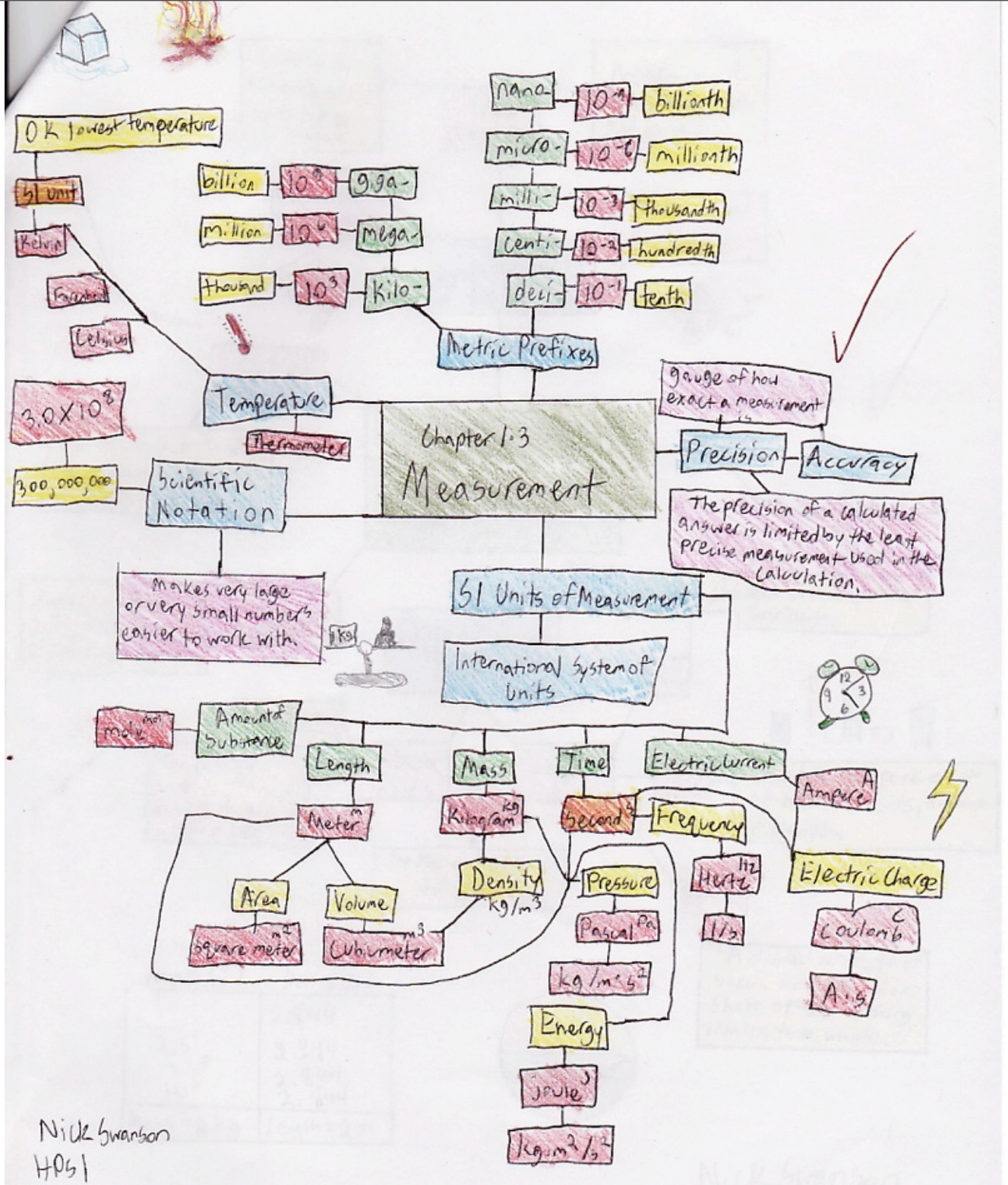
No

Yes

When a substance's color changes in a reaction

Physical

Chemical




Nick Swanson
HPS1
1/13/108

# Measurement

## Limits of Measurement

Accuracy

The closeness of a measurement to the actual value of what is being measured

Precision

It's a gauge of how exact a measurement is

Significant figures are all the digits known in a measurement

The precision of a calculated answer is limited by the least precise measurement used

## Using Scientific Notation

Scientific notation is a way of expressing a value as the product of a number 1-10 and a power of 10

Ex:
300,000,000 =
$3.0 \times 10^8$

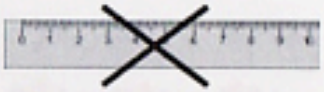
The exponent tells you how many places to the right the decimal point is from the 3

Scientific notation makes very large or very small numbers easier to work with

## SI Units of Measurement

For a measurement to make sense, it needs both a number and a unit

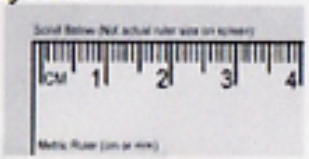
**2 m**



The English system isn't used in science

Scientists use numbers called SI, International System of Units

SI is a revised version of the metric system



### Base Units and Derived Units

SI is based on many metric units, base units

Mass is measured in kilograms (kg)

In SI base length is measured in meters (m)

### Metric Prefixes

A metric prefix means how many times the number should be multiplied/divided by 10

The metric unit for a given quantity is not always convenient

To write 0.009 seconds is very confusing

You can compact it into 9 milliseconds

**milli-**

A conversion factor is a ratio of equivalent measurements that is used to convert a quantity expressed in one unit to another

## Measuring Temperature

A thermometer is a tool that measures temperature

The two major temperature scales are Celsius (Metric) and Fahrenheit (English system)

**C°**

**F°**

The SI unit for temperature is Kelvins

**K**

# Measurement

Significant figures are the [illegible] that are known in a measurement, plus the last digit that is estimated. The fewer significant figures the more precise the measurement is.

The precision of a calculated answer is limited by the least precise measurement used in the calculation.

Is a gauge of how exact a measurement is.

Precision

Accuracy is the closeness of a measurement to it's actual value.

Accuracy

Limits of measurement

Water freezes at 32° and boils at 212° at sea level.

Fahrenheit

Water freezes at 0° an boils at 100° a degree Celsius is almost twice that of Fahrenheit.

Celsius

Thermometer is an instrument that measures temperature.

Measuring temperature

The SI unit of temperature is the Kelvin.

0 Kelvin is the lowest temperature that can be reached.

SI units of measurement

SI is the international system of units used by scientists.

Conversion factor is a ratio of equivalent measurements that is used to convert a quantity expressed in one unit to another

SI base units

| Quantity | Unit | Symbol |
|---|---|---|
| length | meter | m |
| mass | kilogram | kg |
| temperature | kelvin | K |
| time | second | s |
| Amount of substance | mole | mol |
| Electric current | ampere | A |
| Luminous intensity | candela | cd |

$10^0 = 1$

$10^1 = 10$

$10^3 = 1{,}000$

$10^6 = 1{,}000{,}000$

Using scientific notation

Scientific notation: a way of expressing a value as the product of a number between 1 and 10 and a power of 10.

When multiplying numbers written in scientific notation you multiply the numbers that appear before the multiplication signs and add the exponents.

10

This makes really big numbers or really small numbers easier to work with.

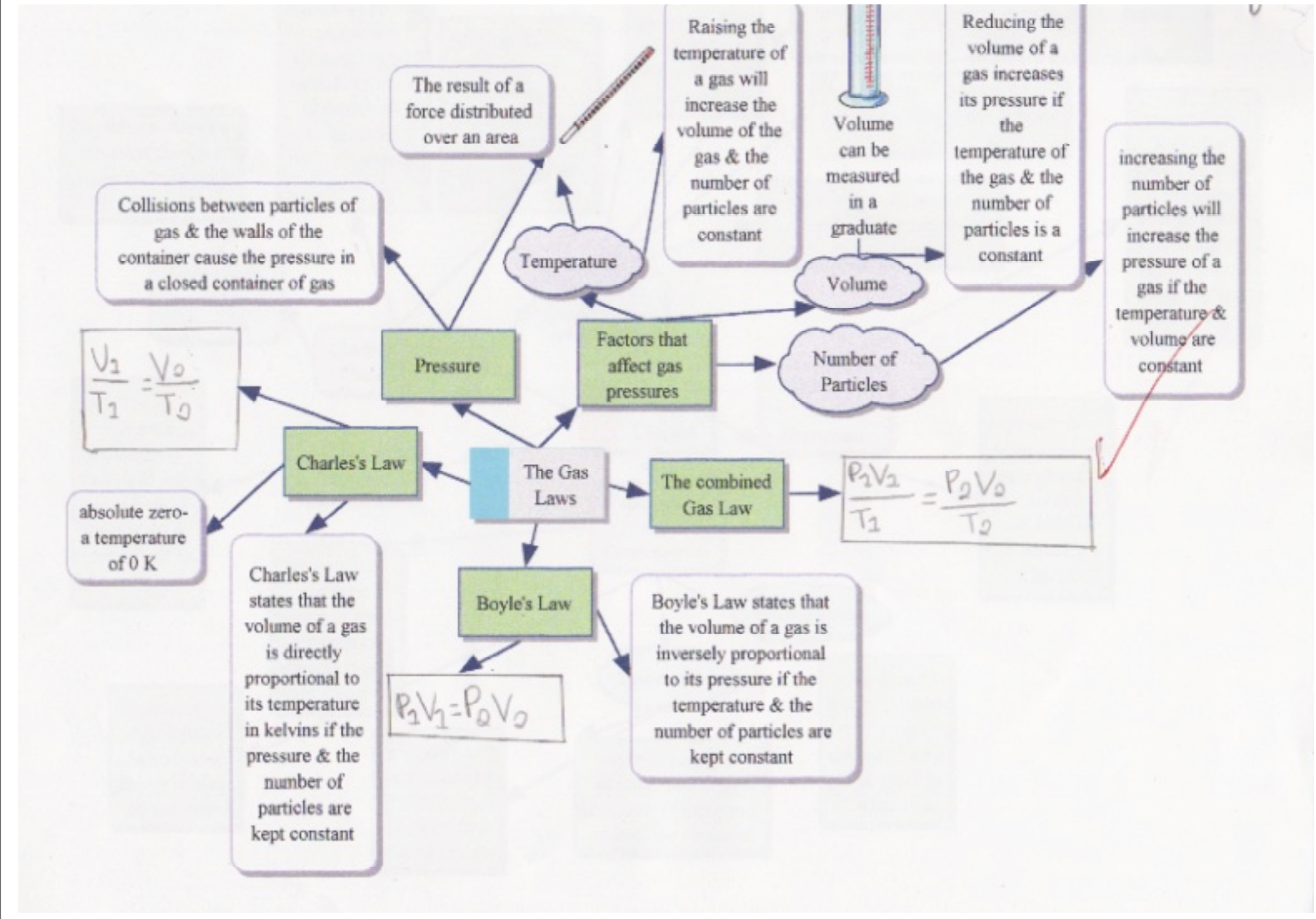
When dividing numbers written in scientific notation, you divide the numbers that appear before the exponential terms and subtract the exponents.

SI prefixes

| Prefix | Symbol | Meaning | Multiply units by |
|---|---|---|---|
| Giga- | G | billion | 1,000,000,000 |
| Mega- | M | million | 1,000,000 |
| Kilo- | k | thousand | 1,000 |
| Deci- | d | tenth | 0.1 |
| Centi- | c | hundredth | 0.01 |
| Milli- | m | thousandth | 0.001 |
| Micro- | μ | millionth | 0.000001 |
| Nano- | n | billionth | 0.000000001 |

Derived units

| Quantity | Unit | Symbol |
|---|---|---|
| area | Square meter | $m^2$ |
| volume | Cubic meter | $m^3$ |
| density | Kilograms per cubic meter | $Kg/m^3$ |
| pressure | Pascal ($kg/m \cdot s^2$) | Pa |
| energy | Joule ($kg \cdot m^2/s^2$) | J |
| frequency | Hertz (1/s) | Hz |
| Electric charge | Coulomb (A•s) | C |


The result of a force distributed over an area
Collisions between particles of gas & the walls of the container cause the pressure in a closed container of gas
Pressure
Raising the temperature of a gas will increase the volume of the gas & the number of particles are constant
Temperature
Volume can be measured in a graduate
Volume
Reducing the volume of a gas increases its pressure if the temperature of the gas & the number of particles is a constant
increasing the number of particles will increase the pressure of a gas if the temperature & volume are constant
Number of Particles
Factors that affect gas pressures
$\frac{V_1}{T_1} = \frac{V_2}{T_2}$
Charles's Law
absolute zero- a temperature of 0 K
Charles's Law states that the volume of a gas is directly proportional to its temperature in kelvins if the pressure & the number of particles are kept constant
The Gas Laws
The combined Gas Law
$\frac{P_1V_1}{T_1} = \frac{P_2V_2}{T_2}$
Boyle's Law
$P_1V_1 = P_2V_2$
Boyle's Law states that the volume of a gas is inversely proportional to its pressure if the temperature & the number of particles are kept constant

# Representative Groups

8A- Colorless and odorless and very unreactive


Noble Gases

3A- Used in many man-made things, and Al is the most abundant element in the earth's crust

Boron Family

4A- Conductivity increases as you go down, and carbon is in most of the compounds in your body

Carbon Family

2A- Difference in reactivity is shown by water- most are necessary for many life processes

Alkaline Earth Metals

Valence Electrons

Electrons in the outer energy level that determine and element's properties

Oxygen Family


6A- 3 non-metals, 2 metalloids

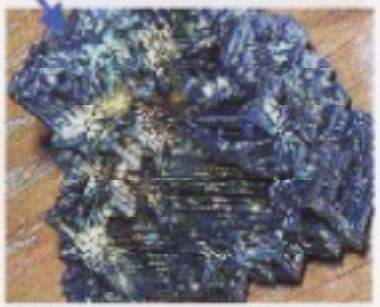
Halogens


7A- Physically different, chemically similar

Alkali Metals


1A- Extremely reactive metals- reactivity increases from top to bottom

Nitrogen Family



5A- Wide range of properties, and mostare necessary for life and are found in most fertilizers


Brenna Butler
8-1 Formation of Solutions
Dissolving
Solvent
Substance the solute dissolves in
Solid, liquid, or gas
Substances can dissolve by dissociation, dispersion & ionization
Solution= Homogeneous mixture
Solute
Substances particles dissolved in the Solution
2 or more Substances
2 types of components
Particles must attract 1 another
Particles must attract 1 another
Join 2gether
Requires energy
Aff. among particles must b broken
Heat of Solution
Dissolving makes solutions become warmer
Properties of Liquid Solutions
Conductivity, FP, & boiling point
Release E 2 it's surroundings
Ions in a solution conduct electric current
Exothermic
Endothermic
Energy is released
absorbed
Ionization may also conduct a EC
A Solute can raise the boiling point of a Solvent
Solute
Solvent
Ex.
Gas
Air
Gas
water in air
Liquid
Carbonated beverage
Liquid
Vinegar

The End.