SCIENTIFIC MODELS

When there is a question you can't answer, or an observation you can't explain, one way of finding an answer is to develop a _____.

For example:

The Particle Theory of Matter

Matter is anything that has _____ and takes up _____ (has volume). A Greek philosopher, Democritus, suggested that all matter is made up of tiny particles. He called these particles _____.

This idea is the basis for what we call _____.

There are five postulates (statements) of the Particle Theory.

1.

2.

3.

4.

5.

SNC 1DI:Classification of Matter

MATTER:

For example: water, air, salt

PURE SUBSTANCE:
A substance that contains only ____ type of matter and has _____ properties.
For example:

MIXTURES:
Contain ____ or more types of matter where each keep their _____ properties.
For example:

ELEMENTS:
Made up of only ___ kind of _____. (particle).

Cannot be broken down by _____ means (rearranged).

For example:

COMPOUND:
Made up of ____ or more _____ atoms.

Can be broken down by chemical means to form _____ substances.

For example:

SOLUTION:
(Homogeneous Mixture)
Some parts that make up the mixture are _____.
Can only see one part or one _____.

For example:

MECHANICAL MIXTURE:
(Heterogeneous Mixture)

____ or more parts are _____.
Can see two or more parts or _____.
For example:

The Density of Matter

All matter has mass and volume. ***The amount of mass in a given volume is described as the density of a substance.*** In other words density describes how much stuff is present in a certain amount of space.

The preferred unit for density is: , but you may also see:

Every substance has a specific density. (Appendix D, p.564)
For example:

water	1000 kg/m^3	or 1.0 g/ml	or 1.0 g/cm^3
gold	19 300 kg/m^3	or 19.3 g/ml	or 19.3 g/cm^3
lead	11 300 kg/m^3	or 11.3 g/ml	or 11.3 g/cm^3

Sample Problems:

1. A "gold" chain has a mass of 29.8 g and a volume of 2.64 ml. Determine whether the chain is gold.
2. Iron has a density of 7.90 g/cm^3. If a piece of iron occupies a space of 25 cm^3, what is the mass of this piece of iron?
3. Nickel has a density of 8.9 g/ml. What is the volume of 500 g of nickel?
4. A piece of metal with a mass of 50 g is dropped into a graduated cylinder with 120 mL of water. The water rises to 160 mL. What is the density of the metal?
5. A rectangular solid measures 2.0 cm X 2.0 cm X 2.0 cm. It has a density of 2.5 g/cm^3. What is the mass of the solid?

More Density Examples!

Example One:
An irregularly shaped stone was lowered into a graduated cylinder holding a volume of water equal to 2.0 mL. The height of the water rose to 7.0 mL.
If the mass of the stone was 25 g, what was its density?

Example Two:
A sample of iron has the dimensions of 2.0 cm X 3 cm X 2 cm. If the mass of this rectangular shaped object is 94 g, what is the density of the iron?

Physical and Chemical Properties

A _____ of a substance is a _____ of that substance or something _____ about that substance.

Physical Property:

A physical property is something that can be _____ or _____ without forming a _____ substance.

For example:

Sometimes physical properties are not enough to identify a substance we need more information.

Chemical Property:

A chemical property describes how a substance _____ with another substance and forms _____ _____.

For example:

Physical and Chemical Changes

Physical Change

A physical change is a change in _____ or _____. No new substance is created.

For example:

Chemical Change

A chemical change creates a _____ substance with new _____.

For example:

Five Clues That a Chemical Change has Occurred

1.

2.

3.

4.

5.

SNC 1DI: GAS TESTS

Gas	How to test for gas.	What is observed if the gas is present.
oxygen		
carbon dioxide		
hydrogen		

Properties of Hydrogen, Oxygen and Carbon dioxide

Gas	Description	Density Compared to Air?	Does it Burn?	Does it support Combustion?
Oxygen (O_2)				
Carbon dioxide (CO_2)				
Hydrogen (H_2)				

The Electrolysis of Water

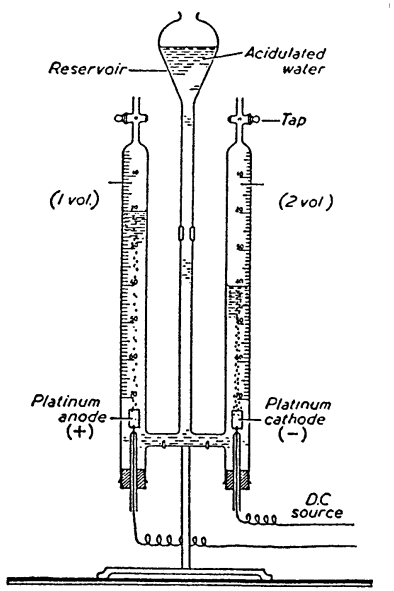
Purpose: To observe what happens when an electric current flows through water. The procedure of passing an electric current through a substance is called **electrolysis.**

Materials: Hoffman apparatus 2 test tubes
water wood splints

Procedure: demonstrated by teacher

Observations:

1. Make a labeled diagram of the apparatus used in this experiment.



2. Make a hypothesis: What will happen when an electric current is passed through water?

3. Describe what happens as electricity flows through water.

4. Compare the volumes of the two gases formed.

5. Describe the results of each gas test.

Discussion:

1. Name the gases produced during the electrolysis of water?

2. The formula for water is H_2O. Comment on the relationship between the formula for water and the volumes of the gases produced.

Dalton's Atomic Theory

Earlier we used the Particle theory of Matter to explain observations of matter. However, this theory cannot explain everything we have just learned regarding chemical changes.

For example it cannot explain the electrolysis of water.

John Dalton introduced a new theory to explain chemical changes.

Dalton's Atomic Theory

1.
2.

3.

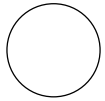
4.

Compounds are described by chemical formulas.

For Example:

A look at the atom over the years

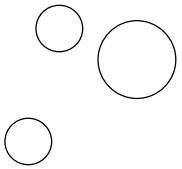
The Particle Theory



-good for explaining:

-but can't explain:

Dalton's Model of the Atom

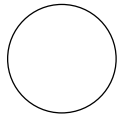


-explains:

-states that _____ make up matter
-elements have _____ kind of atom and _____ are a combination of different atoms

-can't explain:

Thompson's Model of the Atom



-explains:

-accounts for the presence of _____ _____ (protons and electrons)

Rutherford's Model of the Atom

-Rutherford using _____ describes an atom with a _____

-explains all observations so far **BUT** _____ _____

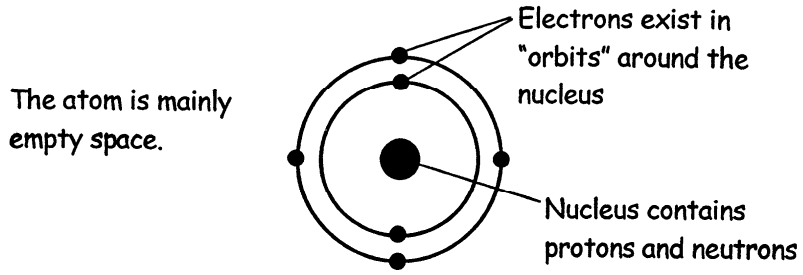
-this model is described as mostly empty space with a small dense positive center called a _____

Bohr-Rutherford Model of the Atom

-Niels Bohr describes _____ _____ (orbitals) to explain why the electrons do not attract to the nucleus

-Bohr-Rutherford model is a combination of Rutherford nuclear model and Bohr's energy levels

Bohr-Rutherford Model of the Atom



Subatomic Particles

Protons: Are _____ charged particles with a relative mass of __ (____) . Located ___ _____ _____.

Neutrons: Are _____ particles with a relative mass of __ (____). Located ___ ____ _____.

Electrons: Are _____ charged particles with a relative mass of 1/2000 (_____ _____), located in "orbits" _____ the nucleus.

Standard Atomic Notation

Atomic Number: The number of _____ in an atom. *Elements are grouped according to atomic number on the periodic table.*

Mass Number: The sum of the _____ and _____ in an atom.

Problem 1: Consider $^{6}_{12}C$

Problem 2: Consider $^{9}_{19}F$

Problem 3: Consider $^{11}_{23}Na$