Alief ISD Middle School Science STAAR Review

Reporting Category 1: Matter & Energy

8.5.A describe the structure of atoms, including the masses, electrical charges, and locations, of protons and neutrons in the nucleus and electrons in the electron cloud

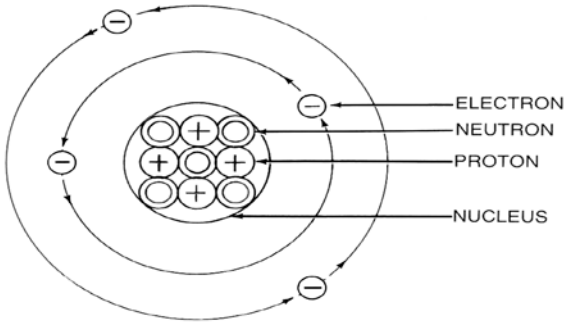
Atomic Particles

An atom is made up of **3 subatomic particles**.

Subatomic Particles	Approximate Atomic Mass (amu)	Electrical Charge	Location in Atom
Proton	1	Positive (+)	Nucleus
Neutron	1	No Charge (0)	Nucleus
Electron	0	Negative (-)	Electron Cloud

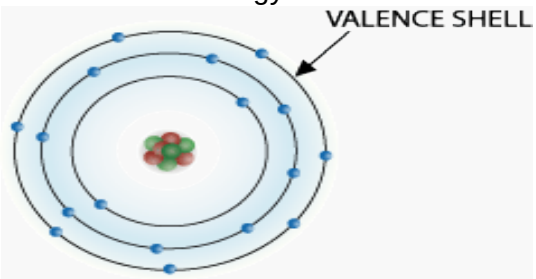
8.5.B identify that protons determine an element's identity and valence electrons determine its chemical properties, including reactivity

Atomic Structure



Protons= determine an element's identity; So this element's identity is **Boron**.

- The electrons in the last shell or energy level of an atom.

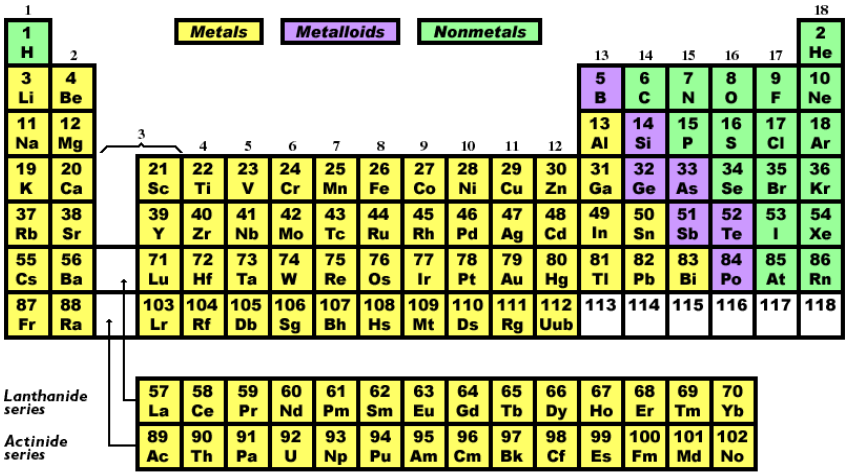


Valence electrons determine **reactivity** of an atom.

Valence Electrons= determine an element's chemical properties, including reactivity (how elements combine or break down into new products)

8.5.C interpret the arrangement of the Periodic Table, including groups and periods, to explain how properties are used to classify elements

Periodic Table



- Rows on the Periodic Table are called **Periods**
- Columns on the Periodic Table are called **Groups or Families**
- ***Elements in the same Group/Family have similar properties because they have the same number of valence electrons!***

8.5.D recognize that chemical formulas are used to identify substances and determine the number of atoms of each element in chemical formulas containing subscripts

Chemical Formulas

Chemical Formulas represent **compounds** as **chemical symbols** represent **elements.**

Example: Water is a compound (2 or more elements chemically bonded.) **Water's chemical formula** is **H_2O.**

Example: Helium is an element. Helium's chemical symbol is **He.**

Counting Atoms

- The subscript (little #) identifies how many atoms of that element are in each molecule
- If there is no subscript, there is just 1 atom of the element
- Subscripts get multiplied by the **coefficient** (big #)

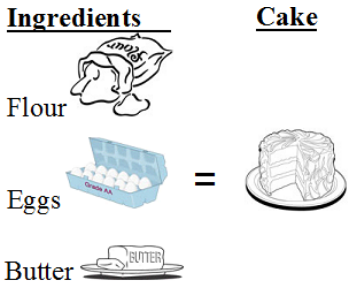
Example: 2Na_2CO_3

a) **number of sodium (Na) atoms** = **2** x 2 = 4
b) **number of carbon (C) atoms** = **2** x 1 = 2
number of oxygen (O) atoms = **2** x 3 = 6

8.5.E investigate how evidence of chemical reactions indicate that new substances with different properties are formed

Chemical Reaction

A **Chemical Reaction** occurs when elements rearrange to form new substances. Example:



It's made of the same ingredients, but has changed into another substance.

8.5.F recognize whether a chemical equation containing coefficients is balanced or not and how that relates to the law of conservation of mass

Chemical Equation

When a chemical reaction occurs, it can be described by an equation. This shows the chemicals that react (called the ***reactants***) on the left-hand side, and the chemicals that they produce (called the ***products***) on the right-hand side.

Example

REACTANTS → PRODUCT

$Fe + S \rightarrow FeS$

So in the above equation, the reactants are Fe and S. The product is FeS.

Law of Conservation of Mass

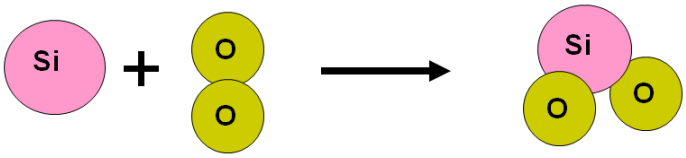
The Law: Matter cannot be **created** or **destroyed**.

What does this mean??

The **mass of the reactants** MUST EQUAL the **mass of the products**!
Whatever atoms you start with, you have to have after the reaction.
This is why equations must be balanced!

Balanced Equation

$Si + O_2 \longrightarrow SiO_2$



Reactants	Products
Si = 1 atom	Si = 1 atom
O = 2 atoms	O = 2 atoms

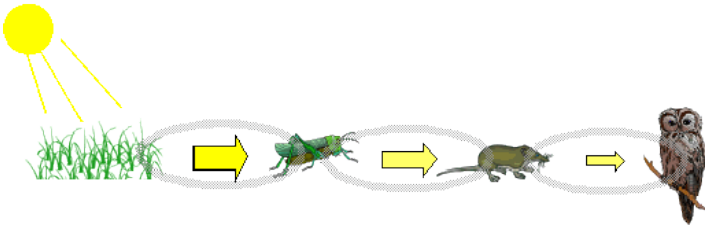
Balancing game: Are the following equations balanced or unbalanced?

1. $Si + O_2 \rightarrow SiO_2$
2. $2H_20 \rightarrow H_2 + O_2$
3. $2Al + 3Cl_2 \rightarrow 2AlCl_3$

7.5.C diagram the flow of energy through living systems, including food chains, food webs, and energy pyramids

Food Chain

Shows the flow of energy.
All energy comes from the SUN!

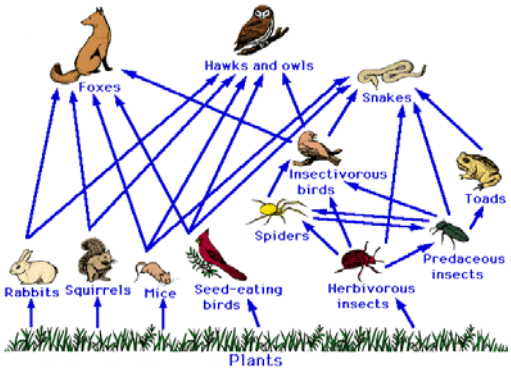


Note: The sun provides energy to plants to produce food in the process called Photosynthesis

The sun's energy is radiant energy!

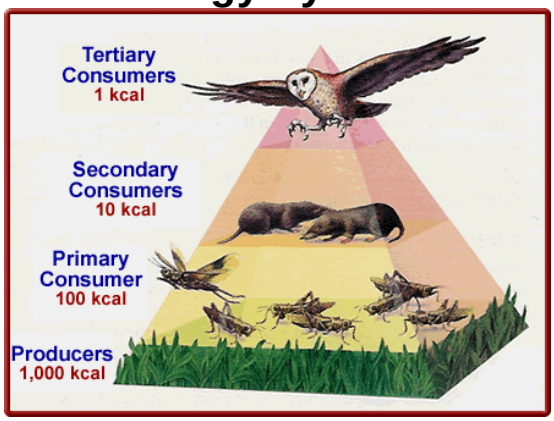
Food Web

Shows all the possible feeding relationships between organisms living in an ecosystem.



<u>Arrows show the flow of energy – points to the predator!</u>

Energy Pyramid



Most of the energy is stored in the **<u>producers</u>**!

<u>Question/ Checkpoint:</u>
In the energy pyramid above, show the flow of energy using arrows.

7.6.A identify that organic compounds contain carbon and other elements such as hydrogen, oxygen, phosphorus, nitrogen, or sulfur

Organic Compound

MUST contain **carbon** and at least two **hydrogen** atoms.
Can also contain O, P, S, F or N.

Sugar

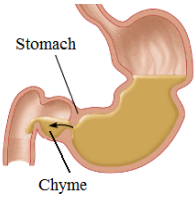
$C_{12}H_{22}O_{11}$

7.6.B distinguish between physical and chemical changes in matter in the digestive system

Physical Change

As food travels through the digestive system, it undergoes a series of **Physical** and **Chemical** changes that break it down to provide energy for cells. ***Physical Changes*** simply alter the appearance of something. For example, chewing breaks large food molecules into smaller ones.

Chemical Change



Chemical Changes occur when the chemical make-up of the food particle is changed to create a new substance. During the digestive process, enzymes change carbohydrates, proteins, fats and nucleic acids into substances that can be absorbed by cells called ***Chyme***.

6.5.C differentiate between elements and compounds on the most basic level

Elements

Elements	**Compounds**
An **Element** is a substance that contains only **one** kind of atom.	A **compound** is a substance that contains at least two different elements chemically bonded.
 	  
Examples: Copper (Cu); Sodium (Na)	**Examples: NaCl, H_2O, $CaCO_3$**

6.6.A compare metals, nonmetals, and metalloids using physical properties such as luster, conductivity, or malleability

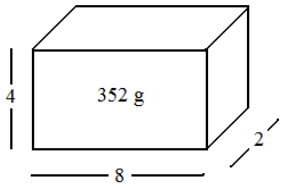
Physical Properties	Metals	Nonmetals	Metalloids
1. **Luster(shiny)**	Shiny/has luster	dull	Can be shiny or dull
2. **Conductivity(conducts electricity)**	YES	NO	Maybe
3. **Malleability (hammered into sheets) ex. Al foil**	YES	NO	Some

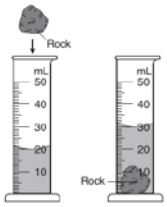
6.6.B calculate density to identify an unknown substance

Calculate Density

Formula chart!

$$\text{Density} = \frac{\text{Mass}}{\text{Volume}}$$





Length = 8 cm

Width = 2 cm

Height = 4 cm

Mass = 352 g

Rock Mass = 27g

Rock Volume = 10ml

$\frac{352\text{ g}}{64\text{cm}^3}$ = $\frac{352\text{ g}}{64\text{cm}^3}$ = **5.5g/cm^3**

Volume;
8cm x 2cm x 4cm = 64 cm^3

$\frac{27\text{g}}{10\text{ml}}$ = **2.7 g/ml**

Volume:
10 ml

Look at the table below to answer the following question:
What is the rock in the example made of? Explain.

Substance	Density (g/ml or g/cm^3)
Gold	**19.3**
Lead	**11.3**
Copper	**8.9**
Aluminum	**2.7**
Ethyl alcohol	**.92**