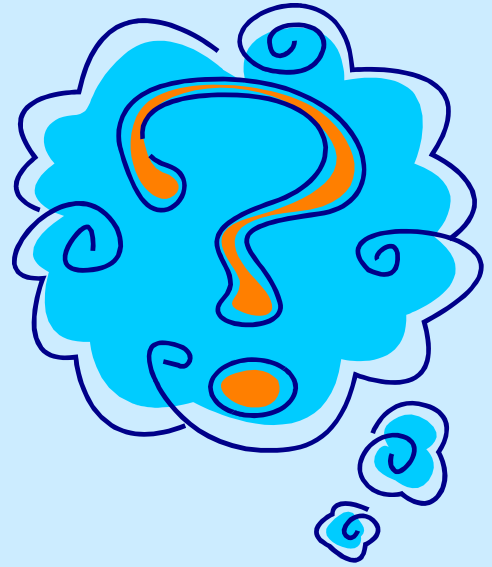
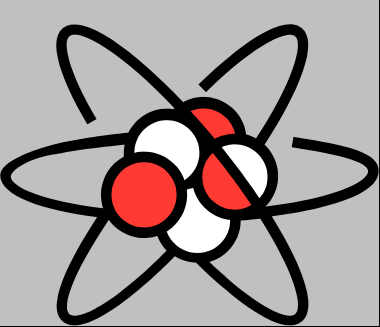


What

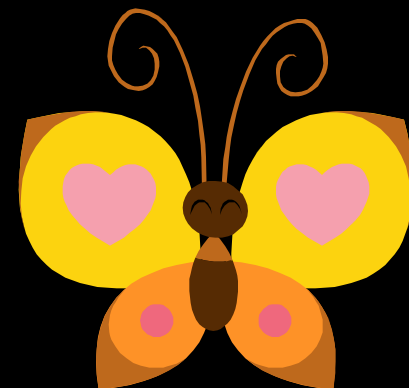
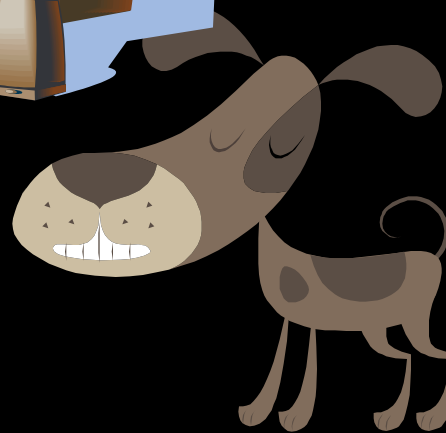
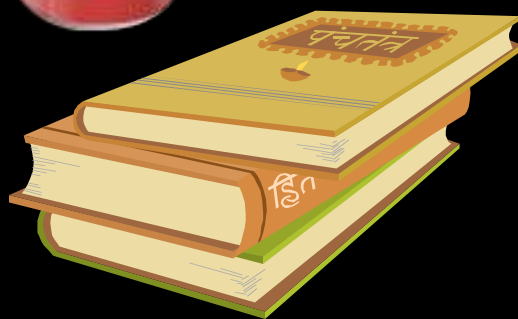
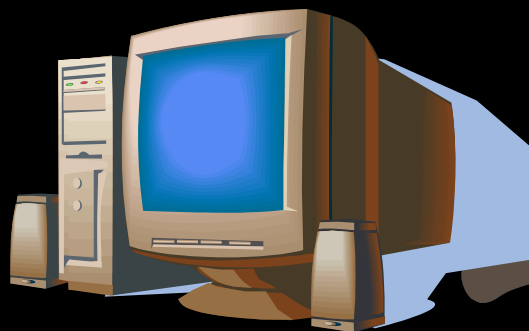
is




Matter?

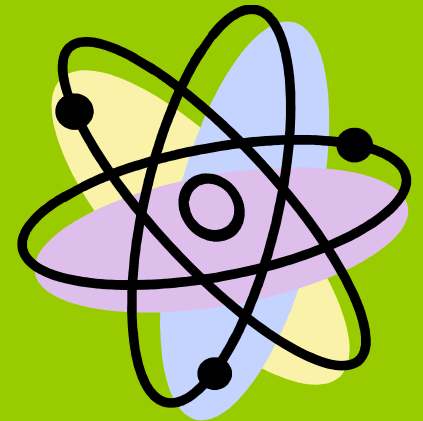


EVERYTHING!!!



Matter is anything that has mass and volume.

- **Mass**  **The amount of matter in a substance.**



- **Volume**  **The amount of space a substance occupies.**



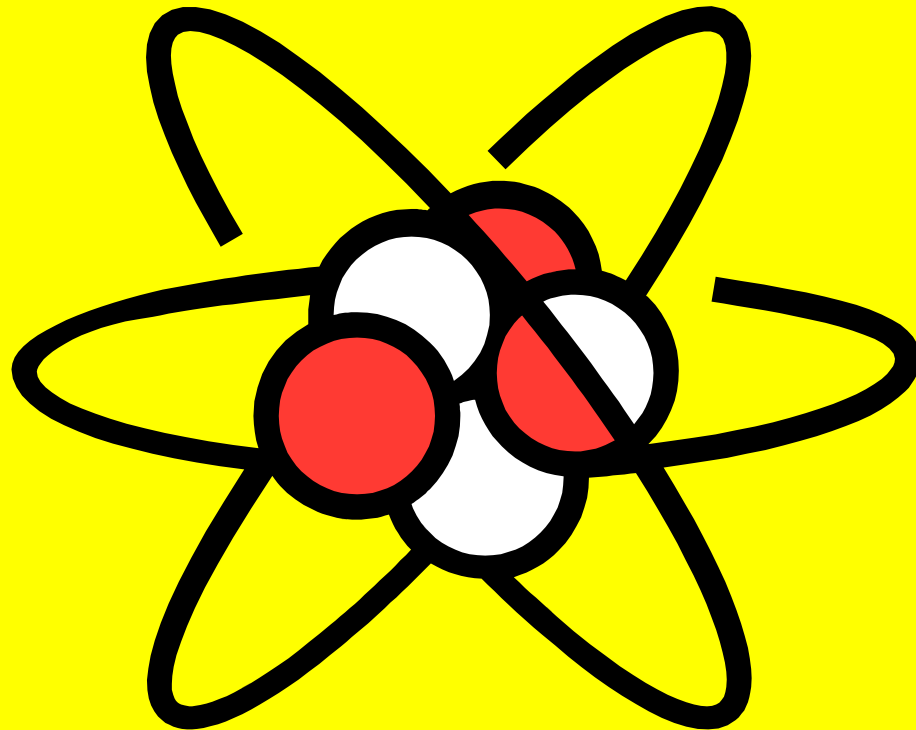
Atoms

- Atoms are the basic building blocks of all matter.
- The smallest particle of matter.
- Like the bricks in a house.



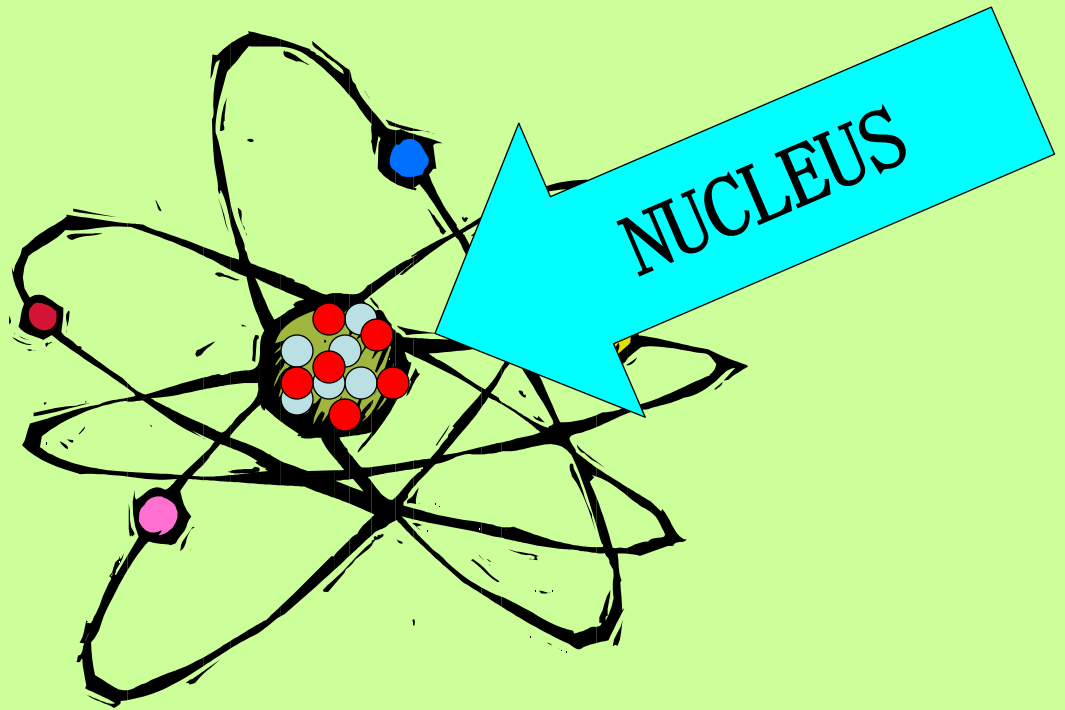
Parts of an Atom

- **An atom's parts make it different from other atoms.**



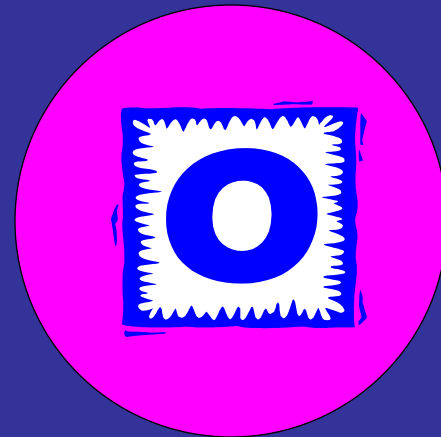
The Nucleus

- At the center of an atom
- Made up of two kinds of particles
 - Protons
 - Neutrons



PROTONS & NEUTRONS

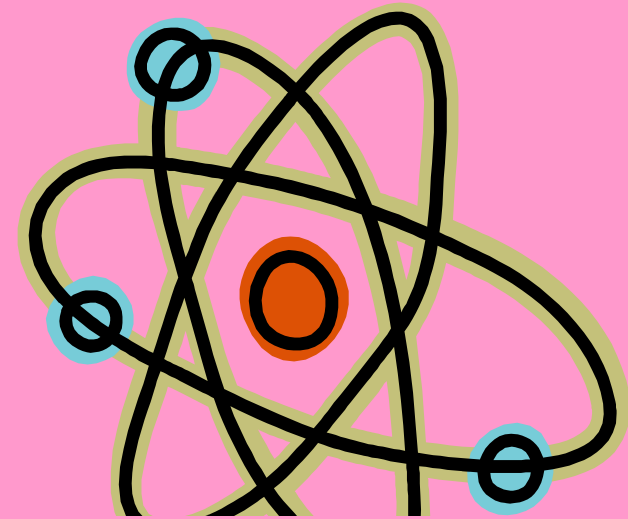
- EACH HAVE A MASS OF ABOUT 1 ATOMIC MASS UNIT (AMU)
- PROTONS
 - CARRY A POSITIVE (+) CHARGE
- NEUTRONS
 - HAVE NO CHARGE (NEUTRAL)



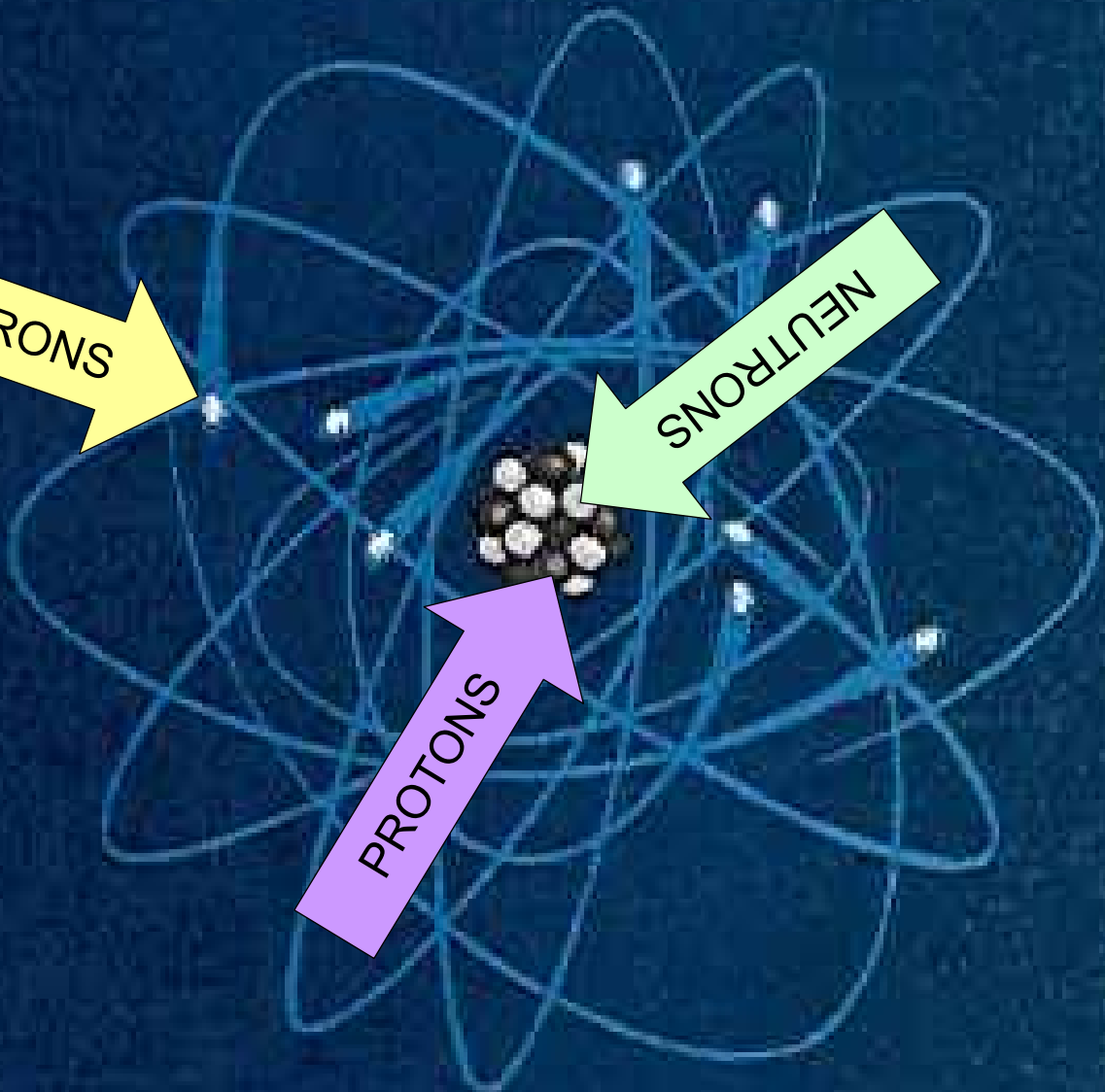
Electrons

Electrons

- Move around in an area outside the nucleus called the electron cloud
- Carry a negative (-) charge
- Have an insignificant mass compared to protons and neutrons



ELECTRONS



A diagram of an atom on a dark blue background. The central nucleus is a cluster of white spheres (protons) and black spheres (neutrons). Surrounding the nucleus are several blue elliptical orbits. Small white dots representing electrons are positioned at various points along these orbits. Three colored arrows point towards the nucleus: a yellow arrow from the top-left labeled 'ELECTRONS', a green arrow from the top-right labeled 'NEUTRONS', and a purple arrow from the bottom-left labeled 'PROTONS'.

NEUTRONS

PROTONS

Elements

- Each kind of atom is an element.
- An element is a pure substance that cannot be broken down into simpler substances.

Kr

Krypton

Atomic Number: 36

Atomic Mass: 83.80

C

Carbon

Atomic Number: 6

Atomic Mass: 12.01

U

Uranium

Atomic Number: 92

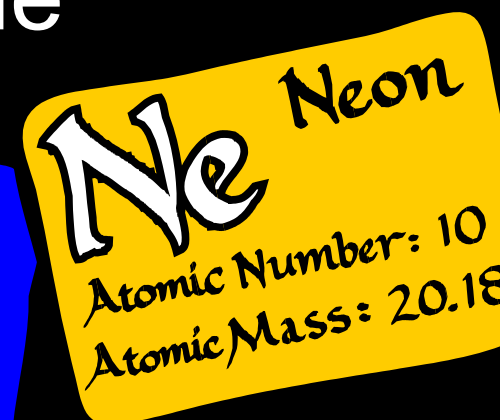
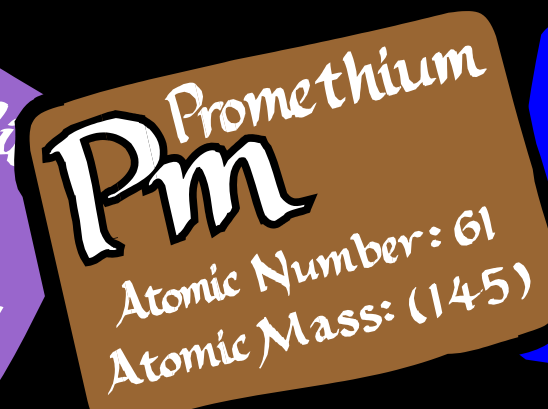
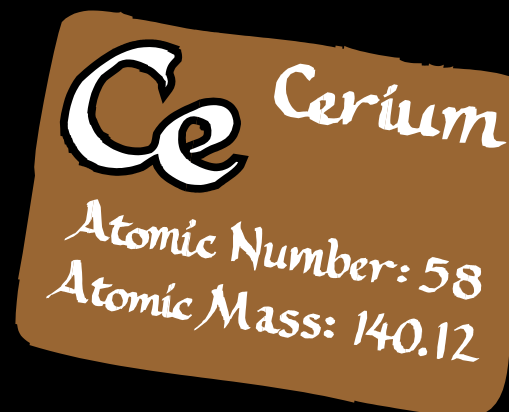
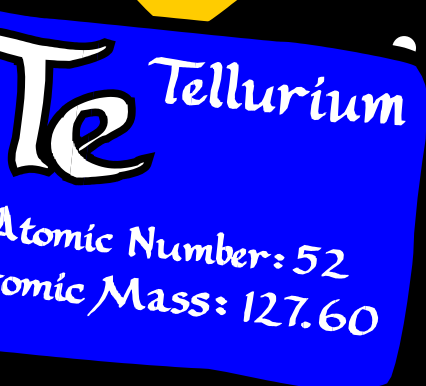
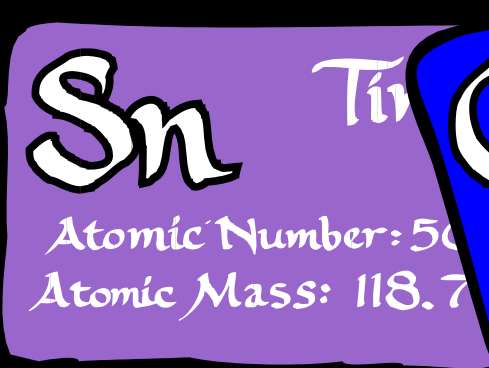
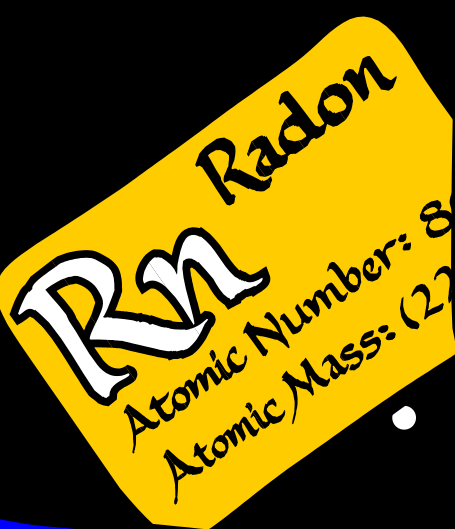
Atomic Mass: 238.03

Cd

Cadmium

Atomic Number: 48

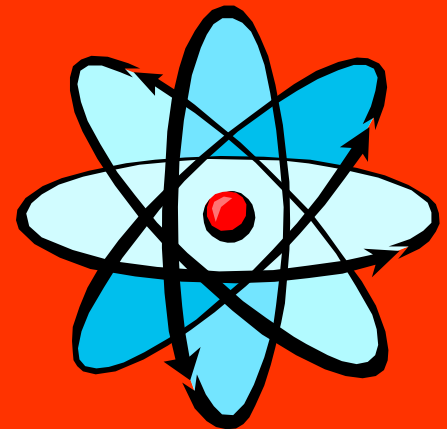
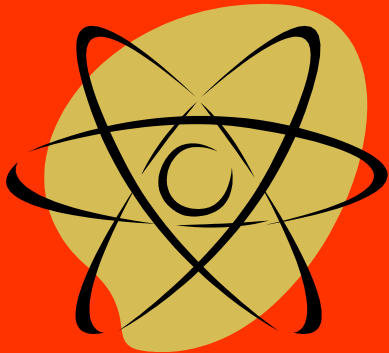
Atomic Mass: 112.41



- 117 confirmed elements
- 90 found in nature
 - Ex: carbon, oxygen, gold, silver, iron
- Other 27 are man-made

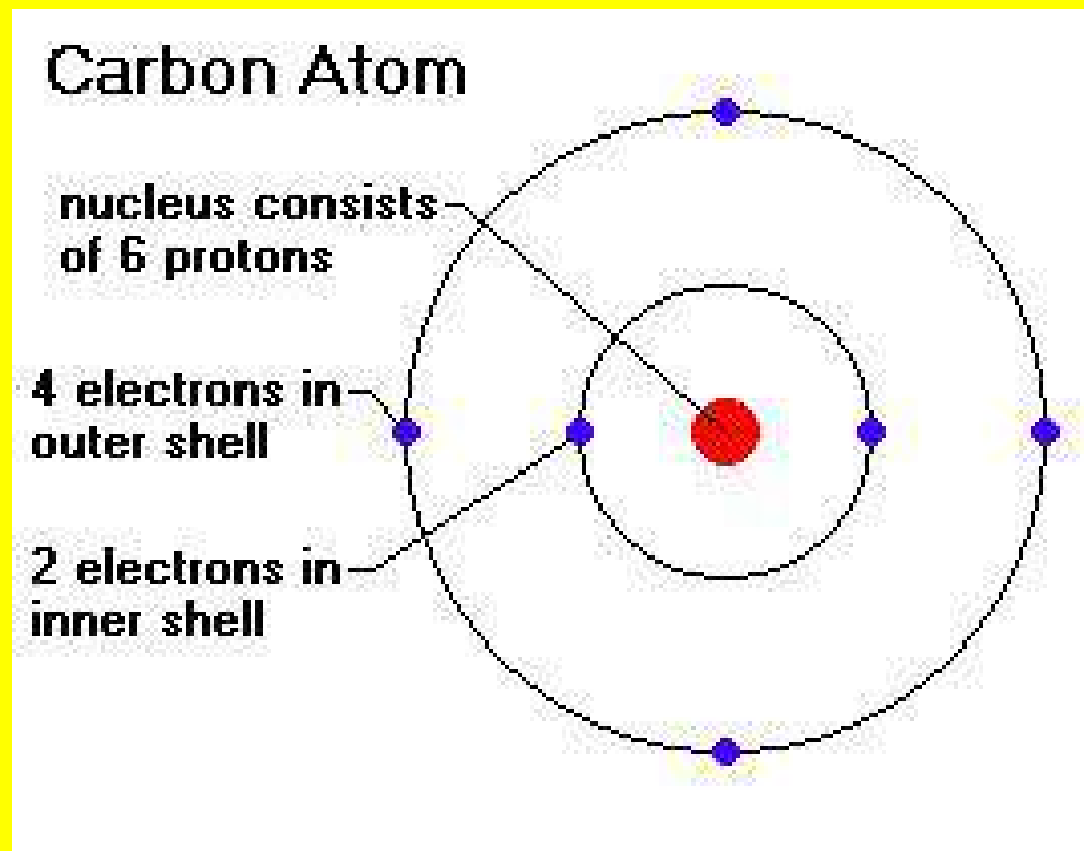
Remember: The properties of an element are determined by the structure of its atoms.

- The main feature used to distinguish the atoms of different kinds of elements is atomic number.
 - Atomic Number: the # of PROTONS in the nucleus of an atom.
 - It's unique for each element.



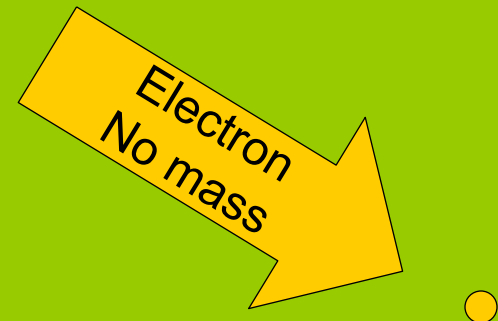
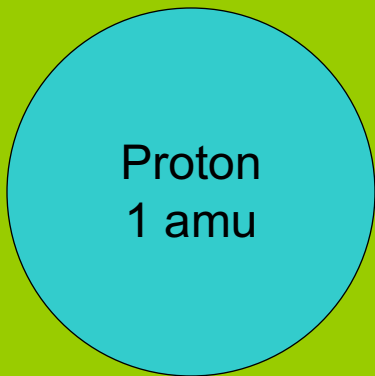
A more in depth look at an atom:

- DOES A CARBON ATOM HAVE A POSITIVE OR NEGATIVE CHARGE?
 - HINT: LOOK AT THE # OF SUBATOMIC PARTICLES.



Atomic Mass

- Protons + Neutrons = Atomic Mass
 - The mass of a proton is 1 amu
 - The mass of a neutron is 1 amu
 - Electrons contribute no mass to an atom.

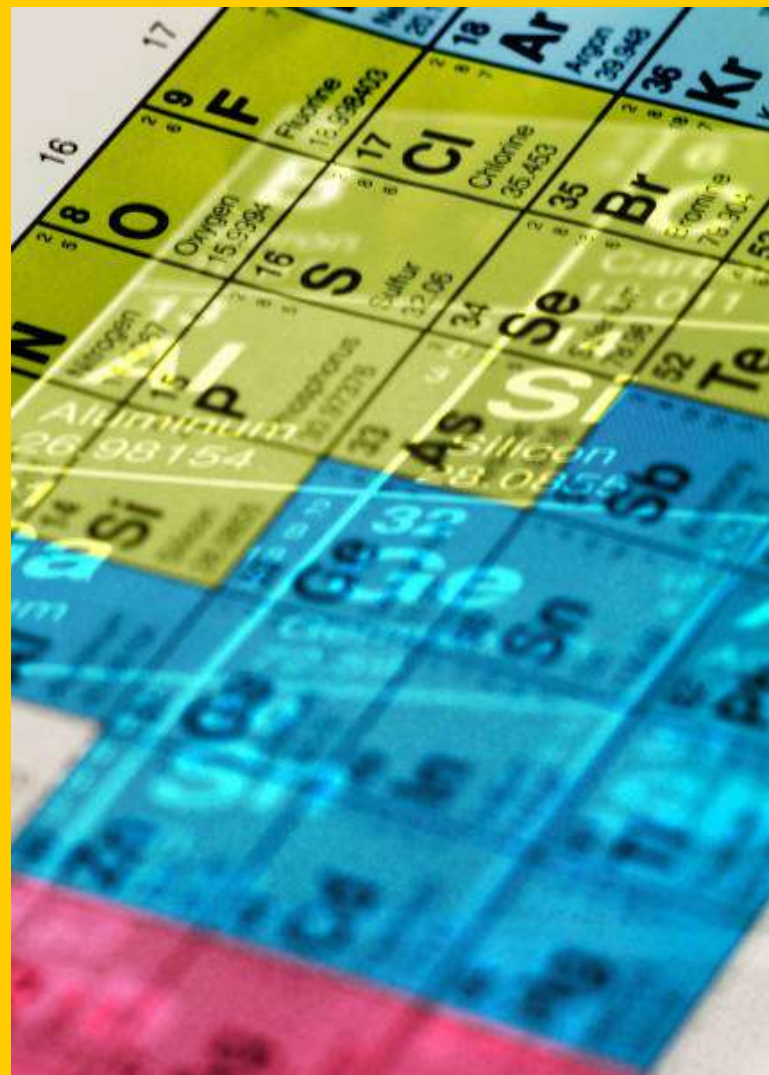


Try a few...

Element	Protons	Neutrons	Electrons	Atomic Mass
Carbon (C)	6	6	6	12 amu
Oxygen (O)	8	8	8	16 amu
Sodium (Na)	11	11	11	22 amu
Potassium (K)	19	20	19	39 amu
Iron (Fe)	26	29	26	55 amu

Chemical Symbols

- **A code, usually one or two letters, that is used to represent a particular element.**
 - **Ex. – C=Carbon, Ca=Calcium, Fe=Iron, etc.**





Types of Matter

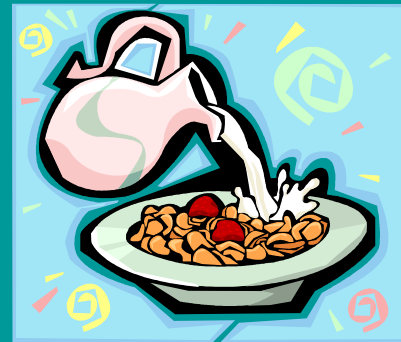
• All forms of matter can be classified into three groups based on how the atoms making up the matter are arranged.

- Elements
- Compounds
- Mixtures



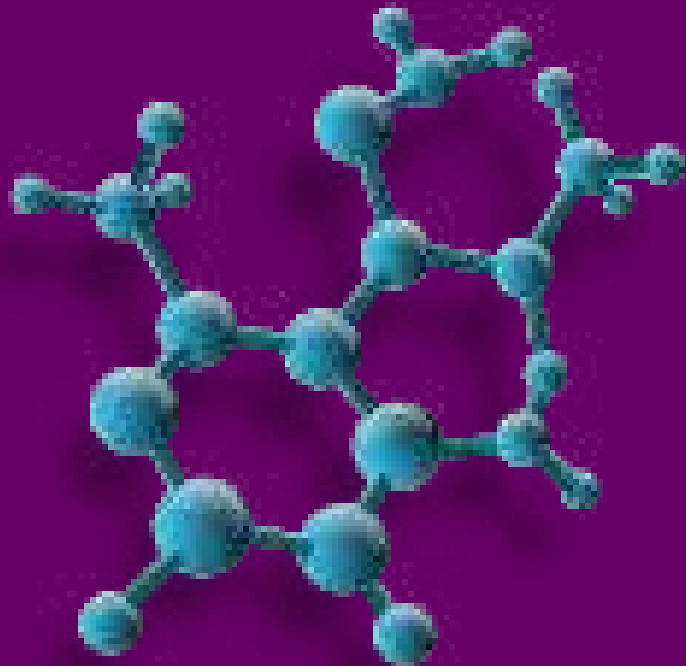
Mixtures

- When two or more substances combine without joining together chemically
 - The mixture's parts retain their identity
- Heterogeneous – mixed unevenly
- Homogeneous – mixed evenly
- Mixtures can be separated more easily than compounds
- Examples?

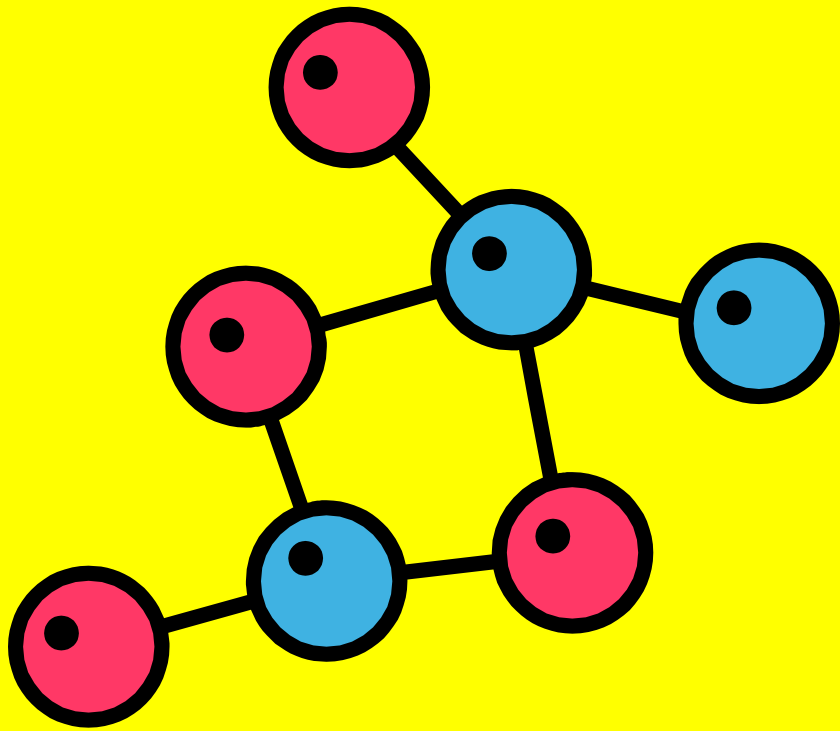


Pure Substances

- Elements and Compounds
 - Have a homogeneous composition
 - It's properties and chemical makeup are the same throughout the sample
 - Cannot be separated by physical means into the parts that make it up.



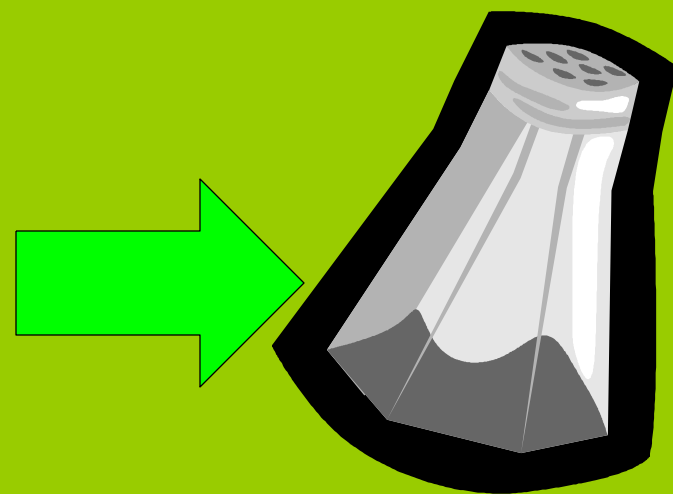
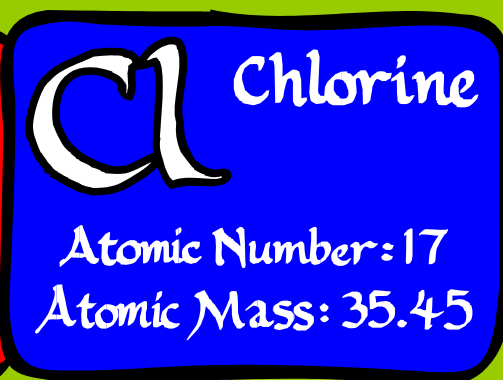
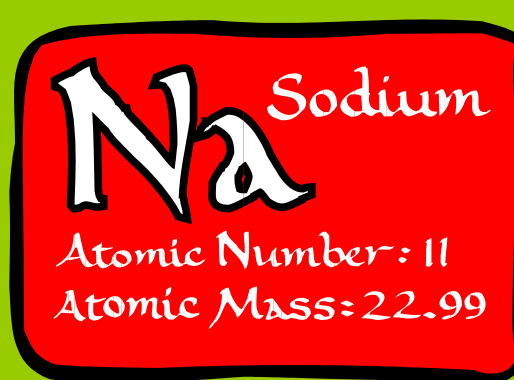
Compound



- Form when two or more elements join chemically.
 - Join by sharing electrons

Example of a Compound

- Table Salt
 - Made up of Sodium (Na) and Chlorine (Cl)
 - Na – soft metal that explodes when combined with water
 - Cl – poisonous gas
 - Combine to form the edible, white solid: SALT!



When elements
combine to form
compounds,
they DO
NOT keep
their individual
properties.



If they did,
we wouldn't
be able to
eat salt!

MATTER

```
graph TD;
    Matter[MATTER] -- exists as --> PureSubstances[Pure Substances];
    Matter -- exists as --> Mixtures[Mixtures];
    PureSubstances -- which include --> Elements[Elements];
    PureSubstances -- which include --> Compounds[Compounds];
    Mixtures -- which include --> HeterogeneousMixtures[Heterogeneous Mixtures];
    Mixtures -- which include --> HomogeneousMixtures[Homogeneous Mixtures];
    Elements --> OneAtom[Made of one type of atom];
    Compounds --> MoreThanOneAtom[Made of more than one type of atom];
    HeterogeneousMixtures --> MoreThanOneAtom;
    HomogeneousMixtures --> MoreThanOneAtom;
```

exists as

Pure
Substances

Mixtures

which include

which include

Elements

Compounds

Heterogeneous
Mixtures

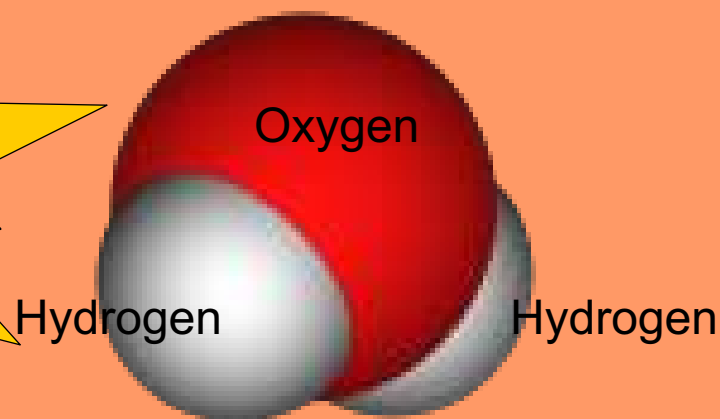
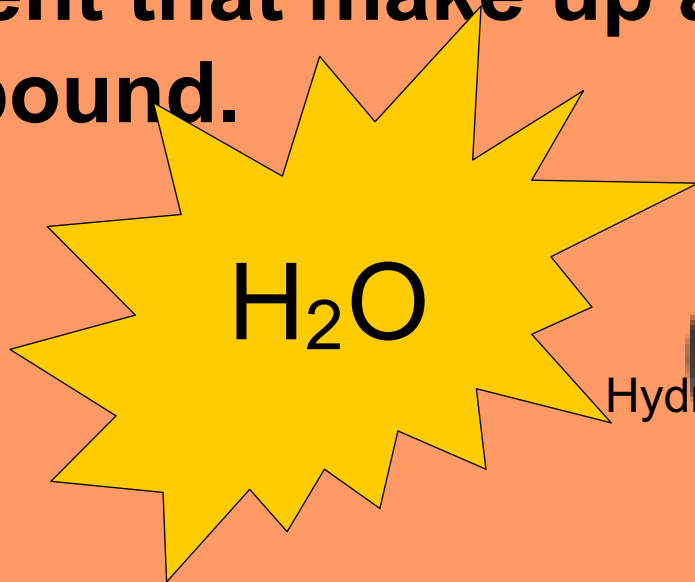
Homogeneous
Mixtures

Made of one
type of atom

Made of more than
one type of atom

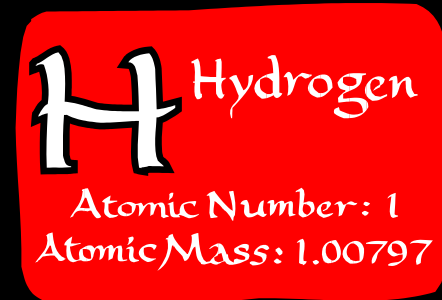
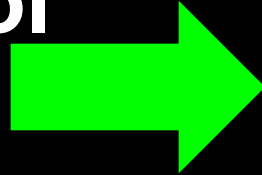
Molecules

- The smallest unit of a compound that has all the properties of the compound.
- Chemical Formula – uses chemical symbols and subscripts to identify the number and types of atoms of each element that make up a molecule of a compound.

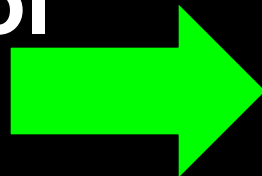


More with H₂O

- Chemical Symbol for Hydrogen



- Chemical Symbol for Oxygen

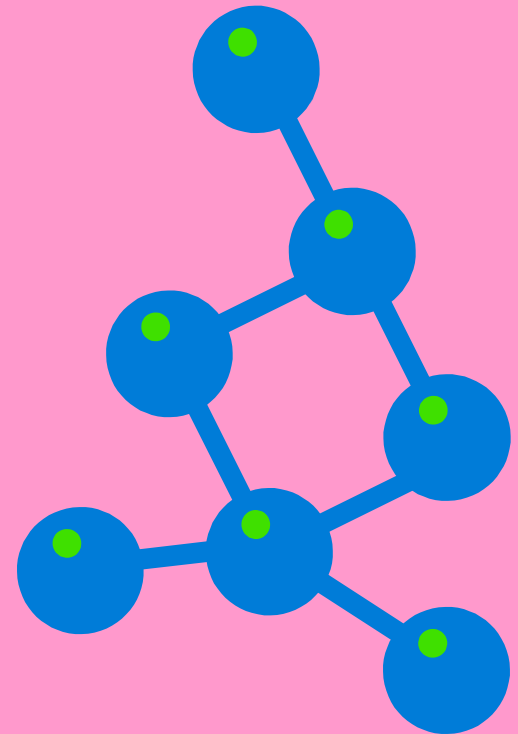
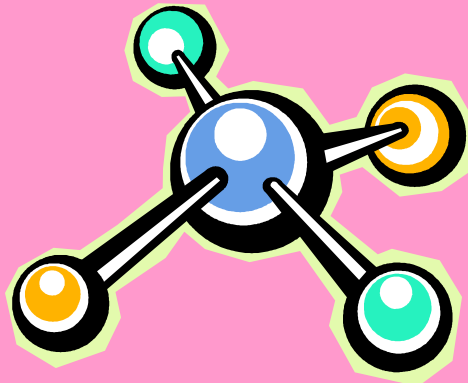
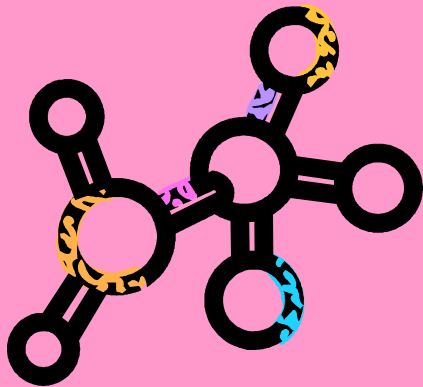


- What do you think the “2” means?

The # of atoms of that element in the substance

Subscript

- Written to the right and slightly below a chemical symbol to tell the number of atoms of that element in a substance.
- Water – H_2O
 - Two molecules of Hydrogen
 - One molecule of Oxygen



You Try!

Common Name	Formula	How Many?
Dry Ice	CO ₂	C- 1 O- 2
Table Salt	NaCl	Na- 1 Cl- 1
Fool's Gold	FeS ₂	Fe- 1 S- 2
Cane Sugar	C ₁₂ H ₂₂ O ₁₁	C- 12 H- 22 O- 11
Rust	(Fe ₂ O ₃)H ₂ O	Fe- 2 O- 4 H- 2
Asprin	CH ₃ CO ₂ C ₆ H ₄ COOH	C- 9 H- 8 O- 4