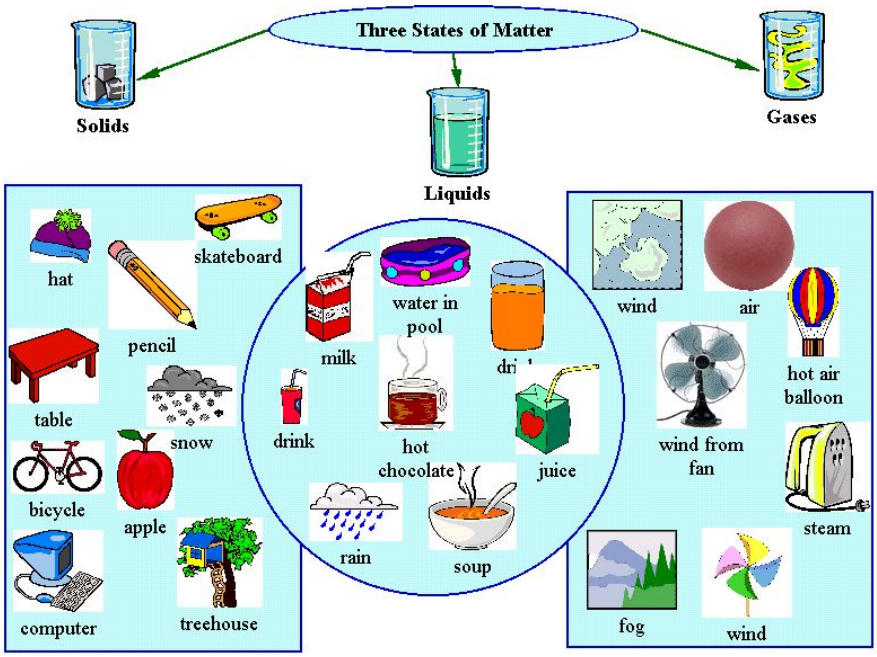
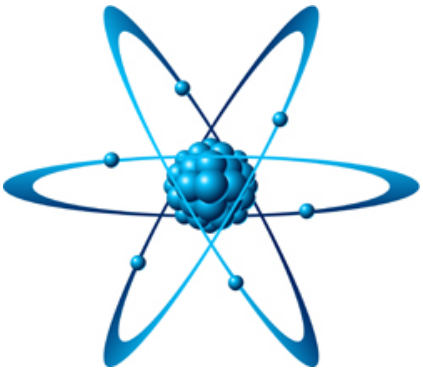
Unit 1

Composition of Matter



Controlling the behavior of electrons is what electronics is all about.



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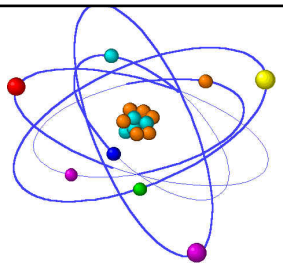
Let's Start With Chemistry...



Matter - is anything that has weight and takes up space
- can be solid, liquid or gas
- composed of one or more elements
- Ex) wood, water, Helium

Elements - builds all matter
- over 100 known elements (periodic table)
- 92 occure in nature (Ex. gold)
- rest are man-made
- Ex) wood, water, Helium

THE NATURAL ELEMENTS

Atomic Number	Name	Symbol	Atomic Number	Name	Symbol	Atomic Number	Name	Symbol
1	Hydrogen	H	32	Germanium	Ge	63	Europium	Eu
2	Helium	He	33	Arsenic	As	64	Gadolinium	Gd
3	Lithium	Li	34	Selenium	Se	65	Terbium	Tb
4	Beryllium	Be	35	Bromine	Br	66	Dysprosium	Dy
5	Baron	B	36	Krypton	Kr	67	Holmium	Ho
6	Carbon	C	37	Rubidium	Rb	68	Erbium	Er
7	Nitrogen	N	38	Strontium	Sr	69	Thulium	Tm
8	Oxygen	O	39	Yttrium	Y	70	Ytterbium	Yb
9	Fluorine	F	40	Zirconium	Zr	71	Lutetium	Lu
10	Neon	Ne	41	Niobium	Nb	71	Hafnium	Hf
11	Sodium	Na	42	Molybdenum	Mo	73	Tantalum	Ta
12	Magnesium	Mg	43	Technetium	Tc	74	Tungsten	W
13	Aluminum	Al	44	Ruthenium	Ru	75	Rhenium	Re
14	Silicon	Si	45	Rhodium	Rh	76	Osmium	Os
15	Phosphorus	P	46	Palladium	Pd	77	Iridum	Ir
16	Sulfur	S	47	Silver	Ag	78	Platinum	Pt
17	Chlorine	Cl	48	Cadmium	Cd	79	Gold	Au
18	Argon	A	49	Indium	In	80	Mercury	Hg
19	Potassium	K	50	Tin	Sn	81	Thallium	Tl
20	Calcium	Ca	51	Antimony	Sb	82	Lead	Pb
21	Scandium	Sc	52	Tellurium	Te	83	Bismuth	Bi
22	Titanium	Ti	53	Iodine	I	84	Polonium	Po
23	Vanadium	V	54	Xenon	Xe	85	Astatine	At
24	Chromium	Cr	55	Cesium	Cs	86	Radon	Rn
25	Manganese	Mn	56	Barium	Ba	87	Francium	Fr
26	Iron	Fe	57	Lanthanum	La	88	Radium	Ra
27	Cobalt	Co	58	Cerium	Ce	89	Actinium	Ac
28	Nickel	Ni	59	Praseodymium	Pr	90	Thorium	Th
29	Copper	Cu	60	Neodymium	Nd	91	Protactinium	Pa
30	Zinc	Zn	61	Promethium	Pm	92	Uranium	U
31	Gallium	Ga	62	Samarium	Sm			

Man-Made

THE ARTIFICIAL ELEMENTS

Atomic Number	Name	Symbol	Atomic Number	Name	Symbol	Atomic Number	Name	Symbol
93	Neptunium	Np	97	Berkelium	Bk	101	Mendelevium	Mv
94	Plutonium	Pu	98	Californium	Cf	102	Nobelium	No
95	Americium	Am	99	Einsteinium	Es	103	Lawrencium	Lr
96	Curium	Cm	100	Fermium	Fm	104	Rutherfordium	Rf

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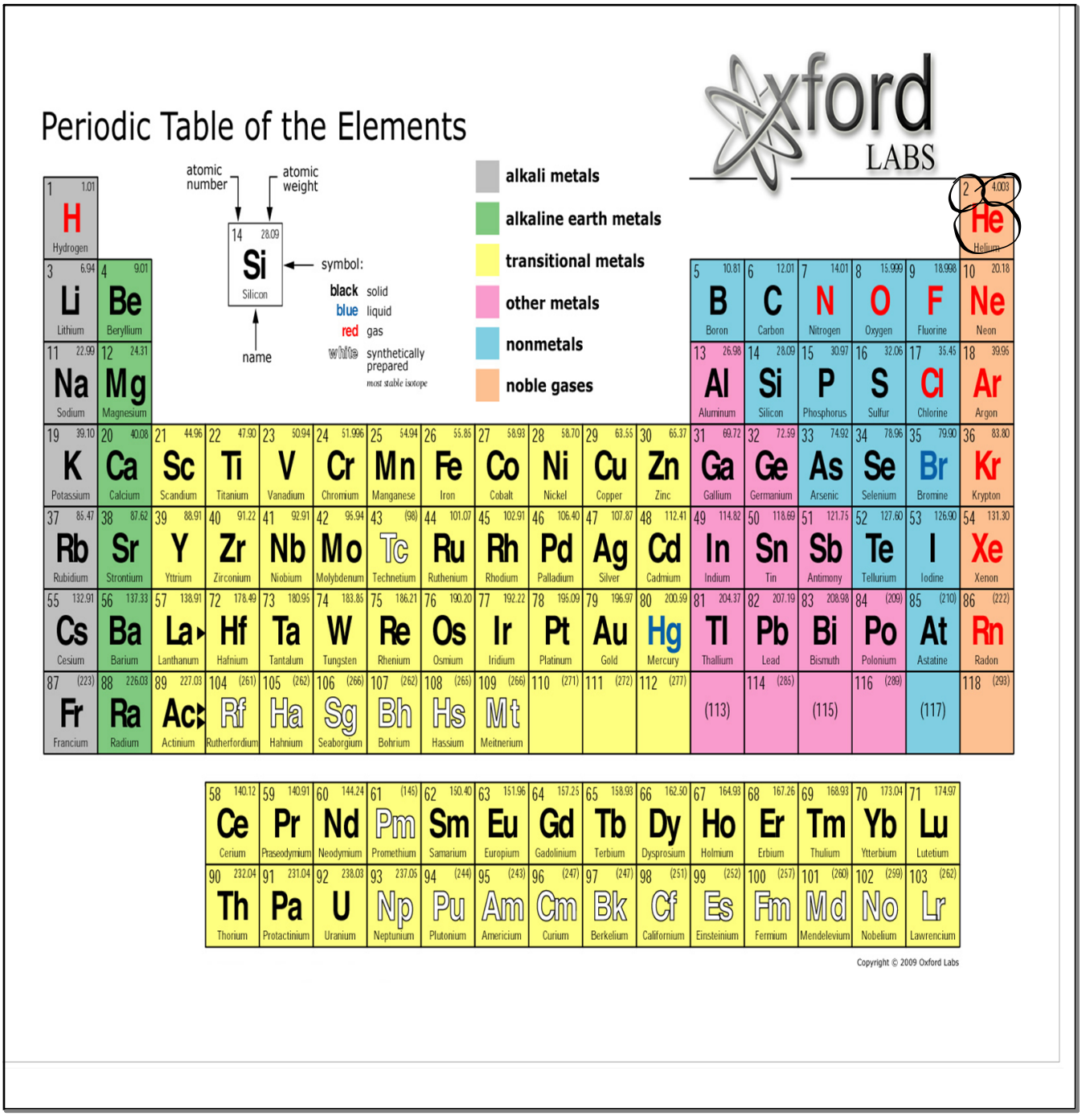

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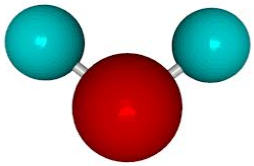
Compounds - made up of 2 or more elements

- can form millions of compounds



- Ex. Water is a compound - H_2O
*contains hydrogen and oxygen

Salt is a compound - NaCl
*contains sodium and clorine

Sugar is a compound made up of carbon, oxygen and hydrogen

- smallest particle of a compound is a molecule (think of dividing so many times that small)

Molecules are so small that they are invisible to the naked eye

BUT

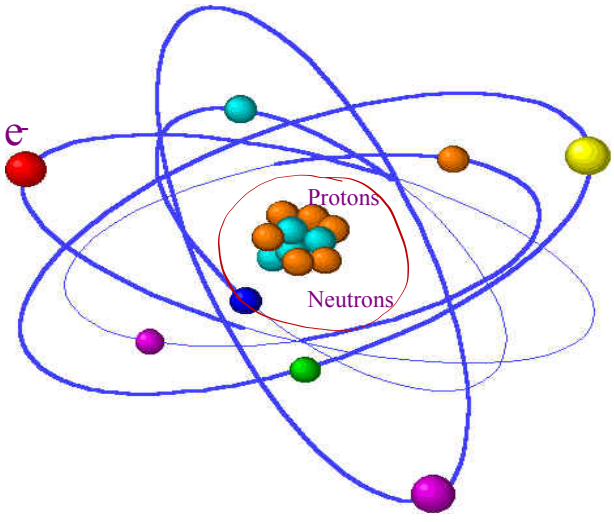
Atom - is the smallest particle of an element

-The **atom** is a basic unit of matter that consists of central nucleus surrounded by a cloud of negatively charged electrons. The nucleus contains a mix of positively charged protons and neutral neutrons.

-since there is only 92 natuarl elements that means there is onlu 92 atoms found in nature

Basic Building Blocks of an atom:

1. Protons: heavy positive charged particle
   Found in the nucleus (which is ~~the center of the~~ center of the atom)
   Denoted by p^+
2. Neutrons: are no charge (neutral)
   same mass as protons
   found in the nucleus
3. Electrons: negatively charged particles
   Light
   They circle the nucleus, in different energy levels, called orbits
   Denoted by e^-



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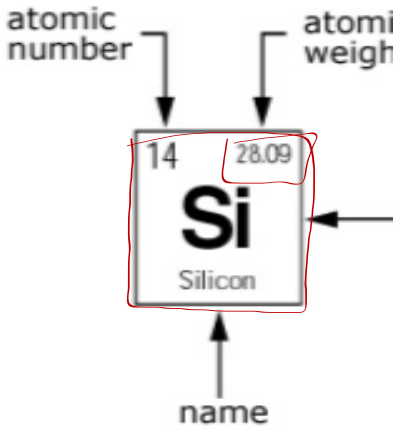


# of protons in an atom is equal to the atomic number

Atomic # = # of Protons = # of Electrons

Remember

protons = # electron , (in a neutral atom)

of neutrons = Atomic weight - Atomic #

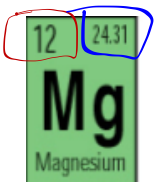
Example) Look at Si

Protons =

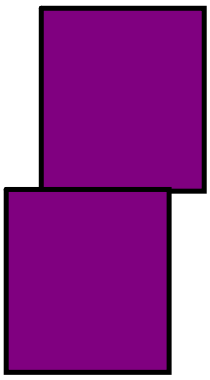
electrons =

Neutrons

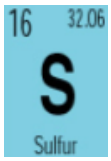
More Examples



1) For Magnesium find the following:
Atomic # = 12
Atomic weight = 24
# of protons = 12
# of electrons = 12
# of neutrons = weight − atomic #
24 − 12 = 12



2) For Sulfur find the following:
Atomic # = 16
Atomic weight = 32
# of protons = 16
# of elctrons = 16
# of neutrons = 32 − 16 = 16



1) Carbon
2) Oxygen
3) K
4) Na
5) Al
6) As
7) Cl
8) Ar

1) Carbon
-> 6
weight -> 12
protons - 6
electrons -> 6
neutrons -> 6.

Oxygen
-> 8
weight -> 16
P -> 8
E -> 8
N -> 8

K -> # -> 19
weight - 39
P^+ -> 19
E^- - 19
N -> 20

Na -> # = 11
weight = 23
P^+ = 11
e^- = 11
N = 12.

Al -> # = 13
weight = 27
P^+ = 13
e^- = 13
N = 14.

As -> # = 33
weight -> 75.
P^+ = 33
e^- = 33
N = 42.

Cl -> # = 17
weight = 35
P^+ = 17
e^- = 17
N = 18

Ar -> # = 18
weight - 40
P^+ = 18
e^- - 18
N = 22.

Warm Up

Atomic #
Atomic weight
P^+
e^-
N

1) Fe
2) Si
3) Sn
4) Cq
5) Ni
6) Bq

Feb 5-2:36 PM

The Bohr Diagram

- Nucleus in the center that contains protons and neutons

- Electrons orbit the nucleus (like planets orbit sun)

- Electrons don't fly away since they are moving fast and are attracted to the nucleus. This is because negative electrons are attracted to positive protons in the nucleus (opposites attract here). This is called **Electrostatic force**

Heaviest Lightest

Neutrons, Protons, Electrons

Jan 23-12:28 AM

http://www.youtube.com/watch?v=k1M6Xz4lOSE

Jan 23-1:03 AM

- We use **Bohr Diagrams** to represent the arrangement of electrons in different orbits.

- 1st orbit can hold a maximum of 2 e- (e- is electron)
- 2nd orbit can hold a maximum of 8 e-
- 3rd orbit can hold a maximum of 8 e-
- 4th orbit can hold a maximum of 18 e-
- 5th orbit can hold a maximum of 18 e-

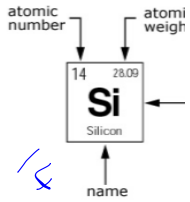
We are only going to look at Bohr Diagrams for elements up to Atomic # 20

http://www.youtube.com/watch?v=PnTFQwVSVxk&featur

Draw Borh Diagram for Silicon

Step 1) Find silicon in the periodic table

Step 2) locate the Atomic # and Atomic weight



Step 3) Calculate numerber of protons, electrons, and neutrons

Hint easiest way

neutrons

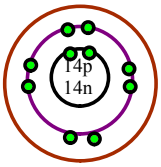
weight
atomic #
Symbol
neutrons

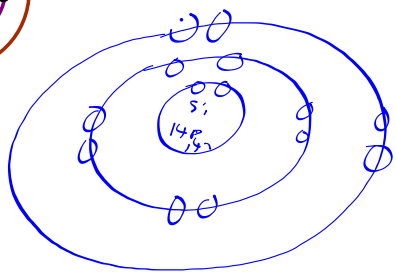
p+
n
e-

Step4) Draw circle for center nucleus. Inside put # of P and #of N

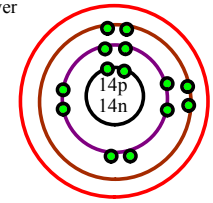
Step5) Draw a ring around center and start by placing electron in BUT it ca only hold 2

Step6) Draw another ring around center and put more electrons in BUT it can only hold 8 (Repeat until all electrons are used)





Your final answer



only have to draw this....

Jan 23-12:40 AM

Bohr Diagrams

1. Hydrogen

2. Calcium

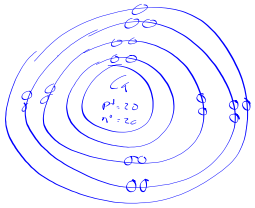
3. Magnesium

1. H

atomic # = 1
weight = 1
p^+ = 1
e^- = 1
n^o = 0

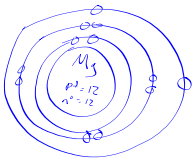
2. Ca

# = 20
w = 40
p^+ = 20
e^- = 20
n^o = 20



3. Mg

# = 12
w = 24
p^+ = 12
e^- = 12
n^o = 12

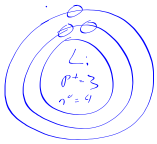


1. Na 11
2. K = 19
3. H = 1
10. Ar = 18
11. Mg = 12
Ca = 20.

4. C = 6
5. S: = 14
6. O = 8
7. Cl = 17
8. Br = 35
9. I = 53

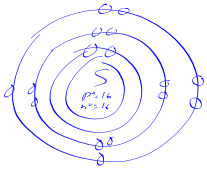
1. Li

# = 3
w = 7
p^+ = 3
e^- = 3
n^o = 4



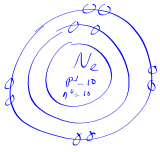
Solar

# = 16
w = 32
p^+ = 16
e^- = 16
n^o = 16



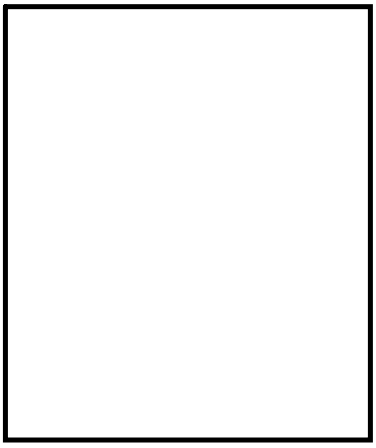
3. Neon

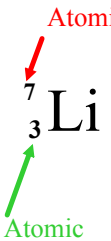
# = 10
w = 20
p^+ = 10
e^- = 10
n^o = 10



Feb 6-2:40 PM

Draw the Bohr diagram for lithium





Worksheet

http://fc2.sd23.bc.ca/~mmarlatt/FOV1-000E4F70/S0D396F10.18/Bohr%20Model%20Practice%20Worksheet.pdf

Quiz

Thursday

Matter Notes So far

Jan 28-12:47 AM

Remember from a few slides back

The Bohr Diagram

- Nucleus in the center that contains protons and neutons

- Electrons orbit the nucleus (like planets orbit sun)

- Electrons don't fly away since they are moving fast and are attracted to the nucleus. This is because negative electrons are attracted to positive protons in the nucleus (opposites attract here). This is called **Electrostatic force**

Heaviest

Lightest

Neutrons, Protons, Electrons

Jan 23-12:28 AM

Electrostatics

(static electricity)

Electrostatics - the study of electrical charge at rest (static electricity)

Electrical charge is properties related to electrons and protons (how they behave)

Electrical charge on an electron is negative

Electrical charge on a proton is positive

No electrical charge on a neutron

Electrons orbit the nucleus (like planets orbit sun)

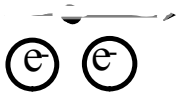
Law of Electrical Charges

Coulomb's Law - describes the actions of electrical charge

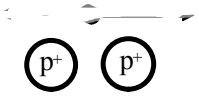
- Like charges repel

- Unlike charges attract

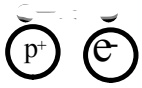
Two electrons _____



TwoProtons _____



Proton & Electron _____



Jan 28-9:06 PM

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IONS

Atoms can lose or gain electrons which form IONS

How?

Heat, Light, Electrostatic Field, chemical reactions...

- Ions are a charged atom in which the number of electrons does not equal the number of protons. (They either lose or gain electrons to become stable)

- Ionic charge is the numerical charge with a plus or minus

Positive ions means you lost electrons (metals)
Negative ions means you gain electrons (non metals)

Action of Electrostatic Charge

Example) Lightning
Clothes have static when removed from dryer
Touch metal after scuffing feet on rug

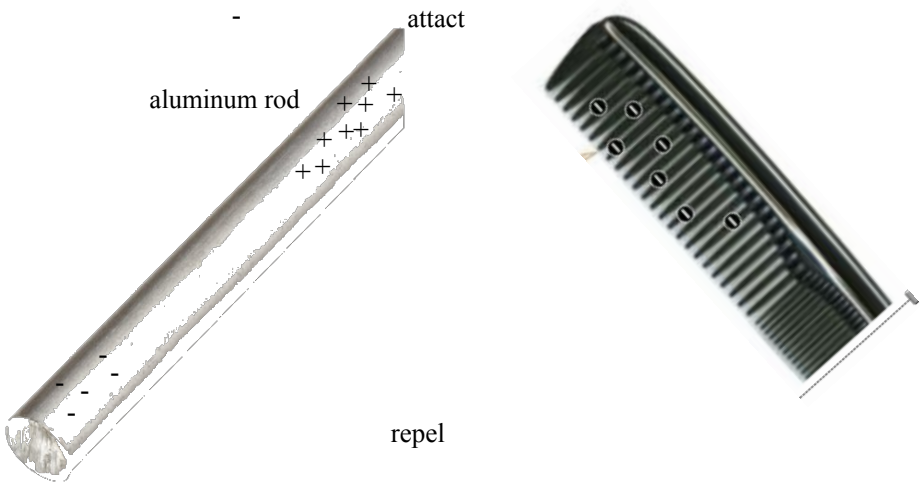
Two bodies receive opposite electrical charge
- one body gives up electrons to the other
- The body that gives up electrons become +, while the body that receives the electrons becomes -

Example of CHARGING BY FRICTION

Combing hair with a comb
-hair gives up e to the comb
-comb becomes negative
-hair becomes positive

.When a charged item touches an uncharged item, many of the excess e leave the object and go to the new object. This is charging by contact (or friction)

Charging by Induction - charge without touching



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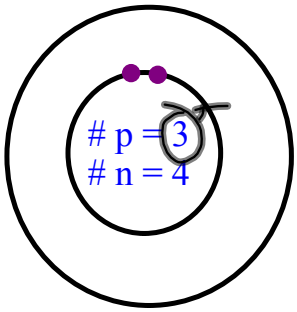
Lithuim ion $^{7}_{2}Li^{+}$

- It has 2e- in first shell and 1e- in second orbit
- If it loses that outer e- then it the same electron configuration as helium (a noble gas)
- BUT now lithium does not have the same # of e as p+

protons ALWAYS equals Atomic



Atomic mass

$^{7}_{2}Li^{+}$

Electrons

Quiz

Currrent 1-17 page out of DC Book

Jan 29-12:27 PM

Current

- Denoted by "I"
- rate of flow of electrons (how fast)

  Current flow

  * electrons flow from negative charged object to positive
- measured in ampers

So in order for electrons to move they must be "freed from an atom".

This involves the valence electrons

How easy they move depends on the number of electron in the outer shell (Fewer moves easy.....more is difficult to move)

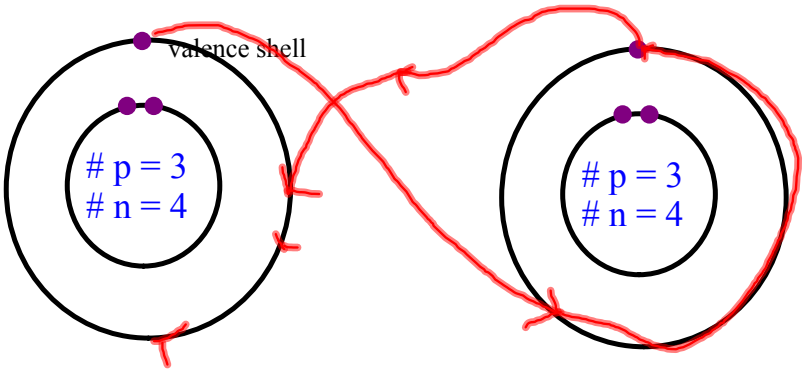
Jan 23-1:59 AM

Electricity

Outter shell of the atom is called thevalence shell (outer-most shell)

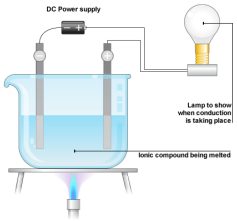
Electrons in outer shell are called valenced electrons

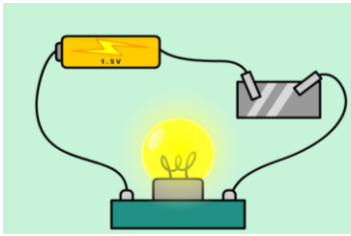
Further away the valaence electrons the less attraction to nucleus so it may float to other atoms. Therefore electricity is the flow of the FREE electrons



http://www.youtube.com/watch?v=vL2KklctxQ0

Conductors, Semiconductors & Insulators





Jan 27-11:57 PM

A conductors of electricity means allows free electrons to move easily

Has few electrons in outer shell (1 or 2)

The less electrons in outer shell the better the conductor

Metals are good conductors

good conductors to poor conductors
silver, copper, gold, aluminum.....iron, tin lead

Insulators means Has MANY electrons in outer shell (free electrons don't move well)
* Plastics, glass, rubber are good insulators

Semiconductors - Have characteristics of both insulators and conductors

- have 4 e - in valance shell

- low temperature good insulators

- high temperature good conductors

- Ex) Silicon

Jan 23-1:28 AM

Test Review
Unit 1 Matter

Definitions:

matter

atom

compound

ion (positive, negative)

Coulumb's Law

Conductor / Insulator / Semi-Conductors (How many electrons?)

proton, neutron, electron (where are the according to the nucleus, charge on them, and which is the lightest)

What happens when you lose or gain electrons?

Why don't electrons fly away?

How do you calculate the number of neutrons?

Electron theory

Pg 25

2 - 8

Feb 14-9:59 PM

http://app.discoveryeducation.ca/search?Ntt=battery+current+flow

Magic School Bus - Get Charged

23 minutes

Jan 29-11:06 AM

Batteries


Dry Cell

Wet Cell

- Batteries have 2 terminals in which an electrical circuit can be connected to.

- Batteries involve chemical reactions that forces negative "Free electron" to one end of the battery. (and a deficiency of electrons in the other end)

Positive Terminal

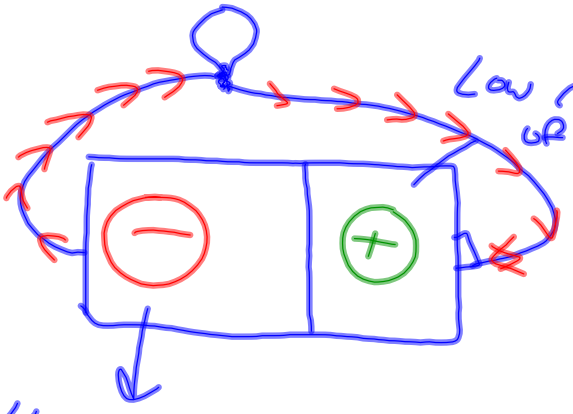
has few e-

Negative Terminal

has many e-

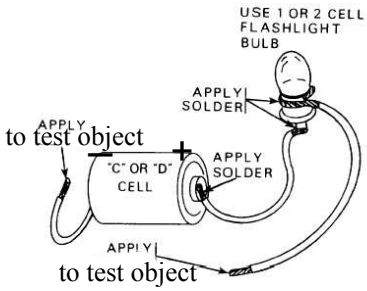
- When batteries are connected to a conductor, electron will always flow from the negative terminal to the positive terminal.

electrons move from high concentration to low concentration



Jan 29-11:01 AM

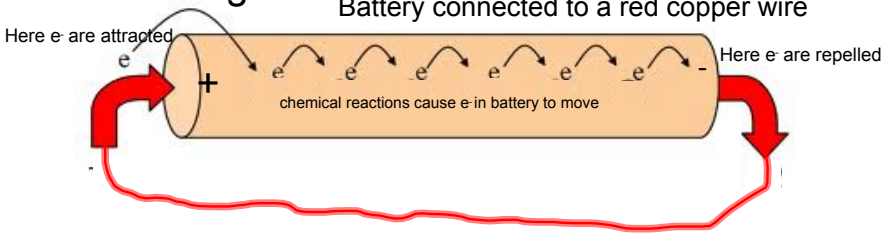
To test Continuity



if light up bright then good conductor

if dull then bad conductor

Figure 2 Battery connected to a red copper wire



Remember copper conducts electricity

You should never connect the battery like above since it can cause a "short circuit" causing the battery to explode. (should connect to conductor piece or resistors)

Current 1-25 in DC Book

also notes to help make up more questions

Jan 29-11:36 AM