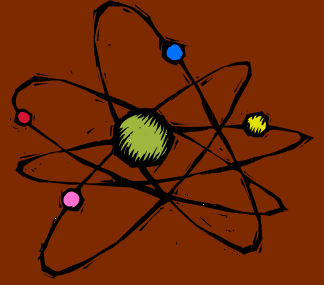
CHAPTER 18 NOTES

Properties of Atoms and the Periodic Table

CHEMICAL SYMBOLS

- Chemical symbol – short abbreviated way to write the name of an element
- Element – made up of only one kind of atom – cannot be broken down
- How to write symbols – 1 capital letter or a capital and small letter

PARTS OF AN ATOM



- Nucleus – positively charged center; contains most of the mass of the atom
- Electron – particles that move around the nucleus forming a cloud of negative charge
- Proton – particle that gives the nucleus its positive charge
- Neutron – particle with no charge; also in the nucleus

PARTS OF AN ATOM (continued)

- net charge on nucleus is positive
- Amount of positive charge is = to the amount of negative charge
- Quarks – smaller particles that make up protons and neutrons

COUNTING ATOMS

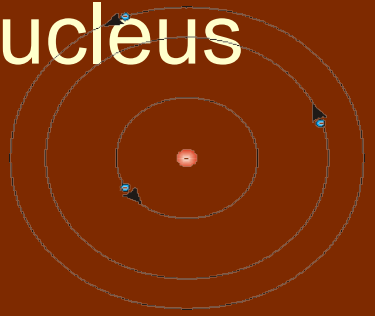
- All atoms of an element have same # of protons
- The # of protons in nucleus determines what the element is
- Atomic # - # of protons in an atom
- Atoms are neutral – the cloud of negative actually balances positive charge
- # of electrons = # of protons

MODELS OF ATOMS

- John Dalton – atoms were solid spheres
- J. J. Thomson – an atom contained small, negatively charged particles
- Rutherford – proposed that almost all the mass of an atom and all of its positive charges were concentrated in a central atomic nucleus surrounded by electrons

MODELS (continued)

- Niels Bohr – atoms had a dense center; electrons traveled in fixed orbits around the atom's nucleus



- Present day – electrons do not follow fixed orbits but tend to occur more frequently in certain areas around the nucleus

ELECTRON CLOUD

- Area around the nucleus of an atom where its electrons are most likely found
- Farther an electron is from the nucleus, the more energy
- Electrons with lower amount of energy are in the first level
- 1st – 2 electrons2nd – 8 electrons

3rd – 18 electrons4th – 32 electrons

ATOMIC MASS

- Protons tell what the element is
- Atomic # - # of protons in an atom
- Mass of an atom depends on # of protons & neutrons
- Mass # - the sum of the protons & the # of neutrons
- If you know the mass # & atomic # can find the # of neutrons
- # of neutrons = mass # - atomic #

ISOTOPES

- atoms of the same element with different #s of neutrons

example – hydrogen has 3 isotopes

0, 1, or 2

- 2 ways to show difference between isotopes:

1. name of element followed by mass #
2. write the symbol with the mass # and atomic #

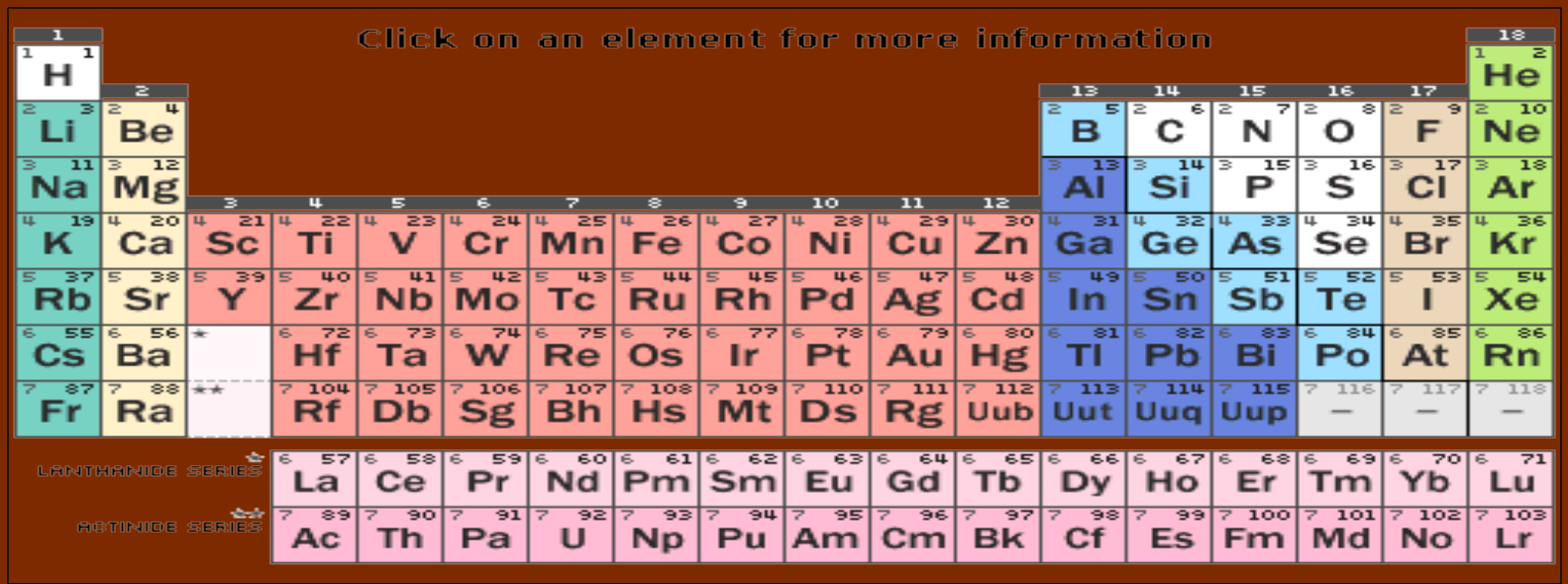
PERIODIC TABLE

- Mendeleev – classified elements by arranging the elements in order of increasing atomic mass
- Periodic table – table of elements arranged by increasing atomic number & by changes in physical and chemical properties

PERIODIC TABLE

- Elements are arranged in vertical rows called <u>groups or families</u>
- Groups labeled 1-18; each group contains elements with similar properties

example: Group 11 Cu, Ag, Au all metals, shiny, and conductors

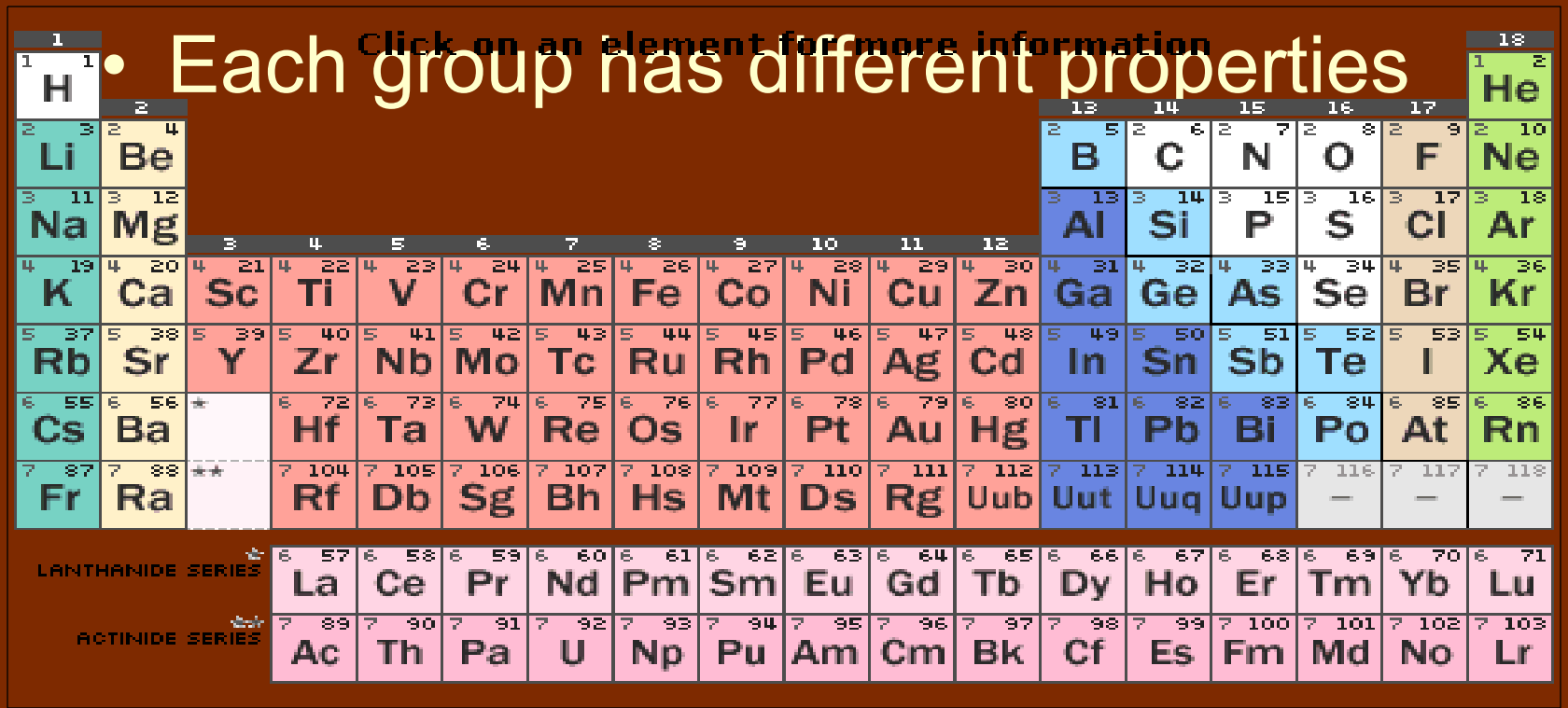


PERIODIC TABLE (cont)

- Halogen family – Group 17 – each element has 7 electrons on outer energy level (**valence electrons**); form compounds with elements in group 1
- Noble gas family – Group 18 – all but one element has 8 valence electrons; occur in nature; no compounds are found in nature
- Horizontal rows of periodic table are called periods

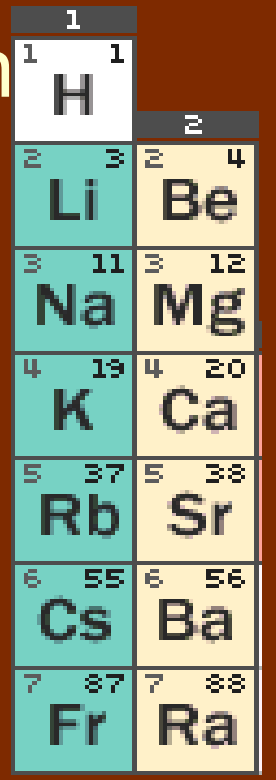
PERIODIC TABLE (cont)

- Period 2 begins with Li and ends with Ne
- Each element across is in a different group
- Each group has different properties

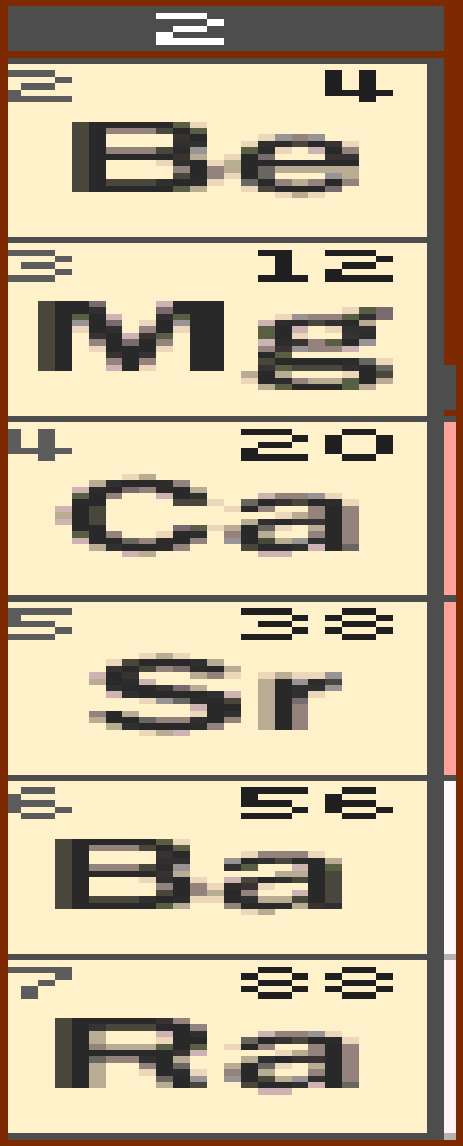


PERIODIC TABLE (still)

- Metals – located on the left side; most atoms have 3 or fewer valen electrons; they are shiny, conduct electricity & heat, tend to lose electrons when they react



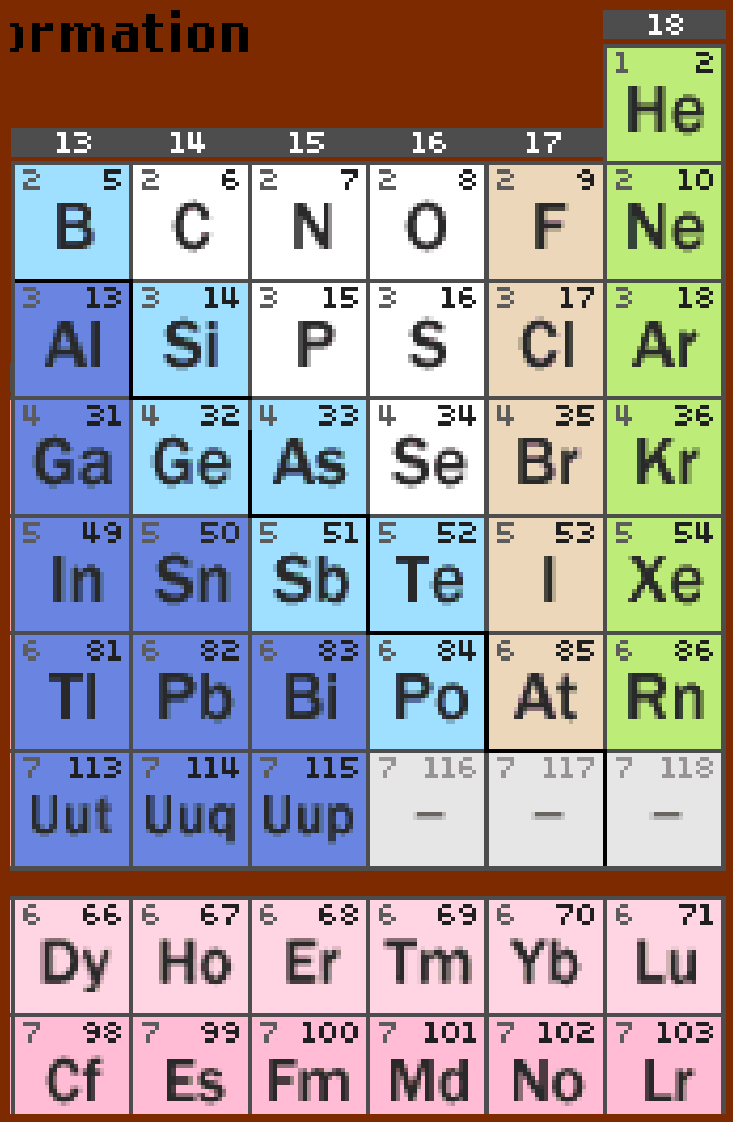
ALKALINE EARTH METALS



- Group 2
- Have 2 valence electrons

NONMETALS

- On the right side of table
- Usually 5 or more valence electrons except C, H, He.
- Poor conductors of heat & electricity
- Most are gases at room temp, some are brittle solids
- tend to gain electrons when reacting with



ALKALI METALS

- Group 1
- Usually shiny, reflect light, malleable, ductile, good conductors of heat & electricity, soft, relatively low melting point

METALLOIDS

- Elements along a stair line
- Have properties of metals and nonmetals
- Boron, Silicon, Germanium, Arsenic, Antimony, Tellurium, Polonium,