hand out photocopied tables

1.3 Periodic Table and Energy Level Diagrams pg. 25-37

During the 1800's, a Russian chemist, Dmetri Mendeleev, examined 62 elements. He developed a table of these elements based upon the fact that they had repeating properties. The table was called a periodic table. for this reason. He further predicted the existence and properties of unknown elements and left spaces on his periodic table for them.

Elements are arranged according to increasing atomic number (number of protons in the nucleus)

Examine our modern periodic table on p482. It displays the known elements in a format that follows various patterns and trends:

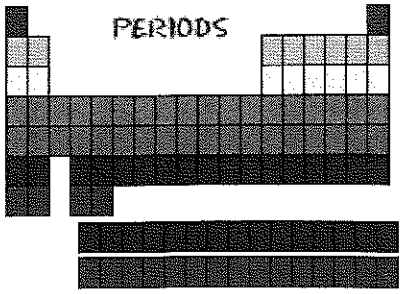
Patterns in the Periodic Table

- Left of the staircase line are metals: mostly solids, these elements are shiny, malleable, ductile + conduct electricity
- To the right are non-metals these elements are either solid or gas. They are dull brittle, and do not conduct electricity
- Surrounding this line are the metalloids these elements display ... both metal + non-metal properties

Demo: metals + nonmetals

Periods

- The period number tells you how many energy levels you have
- Properties change in 2 ways as you move from left to right across a period:
  - The elements change from metal to non-metal
  - The elements become less reactive



Groups

- Elements in the same group have very similar properties.
- Group number tells us how many electrons are in the valence shell.
- for groups 13 – 18, we use the last number to designate the number of valence electrons
- (eg. elements in group 16 have 6 valence electrons)
- electrons fill the first orbital before they can occupy the second, and fill the second before they can occupy the third
- when the valence level is full, it is referred to as a stable octet since there are 8 electrons occupying the orbital (unless it is the first level)

Group 1 – hydrogen and the alkali metals

- The most reactive metals and react violently in air or water. Reactivity increases as you move down the group

Group 2 –the alkali earth metals

- very reactive with oxygen, but less reactive than the alkali metals.

Group 17 –the halogens

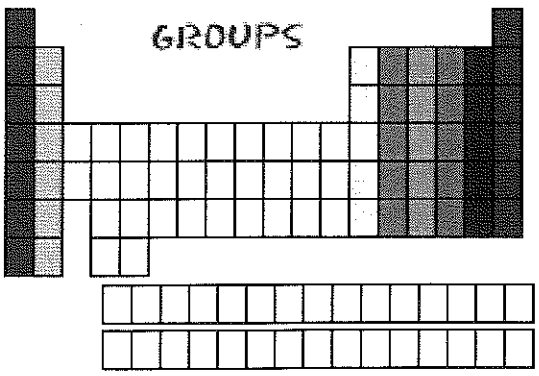
- The most reactive of the non-metals. They tend to combine with other elements to make compounds.

Group 18 – the noble gases

- The most stable and unreactive of the elements.

Inner-transitional elements

- top period = lanthanoids (fits in period 6)
- bottom period = actinoids (fits in period 7)



Electrons & Energy Level Diagrams

Patterns of electron arrangement in periods & groups

Recall that Neils Bohr inferred that electrons orbit the nucleus of the atom in fixed energy levels, and each level can only hold a certain maximum number of electrons. The first can hold 2 electrons, the second can hold 8, and the third can hold 8.

Electron energy level diagrams show us the number of electrons in each energy level, the number of protons, and the charge on the atom or ion.

Ex. The energy level diagram for Mg

2e-

8e-

2e-

12p+

Mg

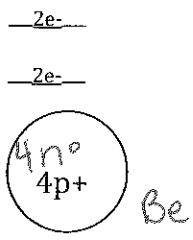
- period number shows the number of orbitals used in each element (eg. Period 2 elements have 2 orbitals)
- group number describes how many e- are found in the *valence* or outer/most energy level (eg. Lithium is in group 1 and has 1 valence electron)

- for groups 13 – 18, we use the last number to designate the number of valence electrons (eg. Elements in group 16 have 6 valence electrons)

- electrons fill the first orbital before they can occupy the second and fill the second before they can occupy the third

- when the valence level is full, it is referred to as a stable octet since there are 8 electrons occupying the orbital (unless it is the first level)

The diagram representing the element beryllium looks like this:



Metals will give away e⁻ and become positive ions called cations

Non-metals will take e⁻ and become negative ion called anions

- When non-metals become ions you add an **–ide** at the end of their name

Try the diagram for fluorine:

fluoride ion:

Try the diagram for magnesium:

magnesium ion:

Try the diagram for oxygen:

oxide ion:

Energy Level Diagrams Assignment