Cycle 5 Chemistry I Lesson 1

A Tour of the Periodic Table

AGENDA

Hand in Shoptimes

Vocab: "Main-group elements", "Alkali Metal", "Alkaline-Earth Metal", "Halogen", "Noble Gas", "Transition Metal", "Lanthanide", "Actinide"

Reading: p.124-130

Classwork:

P. 131 #1-4, 7, (HONORS #10, #11, #13)

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The Main-Group Elements

- **S-block elements:** Groups 1 and 2
- **P-block elements:** Groups 13-18
- **Main-group elements**: The Main-group elements are in the *s*- and *p*-blocks of the periodic table.

- The electron configurations of the main group elements are regular: the elements in each group have the same number of valence electrons.

- The main-group elements are sometimes called the *representative elements* because they have a wide range of properties.

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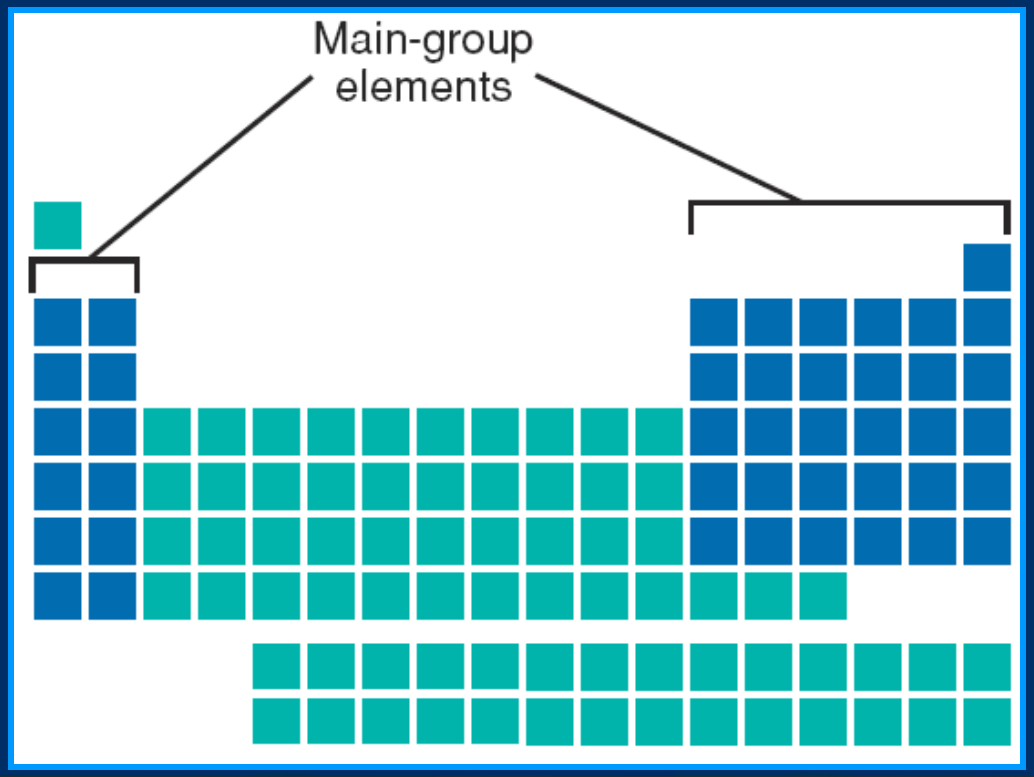
The Main-Group Elements, *continued*

- Main-group are highlighted in the groups on the left and right sides of the periodic table.



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The Main-Group Elements, *continued*

Four groups within the main-group elements have special names. These groups are:

- *alkali metals* (Group 1)
- *alkaline-earth metals* (Group 2)
- *halogens* (Group 17)
- *noble gases* (Group 18)

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The Main-Group Elements, *continued*

The Alkali Metals Make Up Group 1

- Elements in Group 1 are called **alkali metals.**
  - lithium, sodium, potassium, rubidium, cesium, and francium
- Alkali metals are so named because they are metals that react with water to make alkaline solutions.
- Because the alkali metals have a single valence electron, they are very reactive.
  - In losing its one valence electron, potassium achieves a stable electron configuration.
- Alkali metals are never found in Nature as pure elements but are found as compounds.

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The Main-Group Elements, *continued*

The Alkaline-Earth Metals Make Up Group 2

- Group 2 elements are called **alkaline-earth metals.**
- The alkaline-earth metals have two valence electrons and must lose both their valence electrons to get to a stable electron configuration.
  - It takes more energy to lose two electrons than it takes to lose just the one electron that the alkali metals must give up to become stable.
- The alkaline-earth metals are slightly less reactive than the alkali metals.
  - They are always found as compounds in Nature.

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The Main-Group Elements, *continued*

The Halogens, Group 17, Are Highly Reactive

- Elements in Group 17 of the periodic table are called the **halogens.**
- The halogens are the most reactive group of nonmetal elements.
  - When halogens react, they often gain the one electron needed to have eight valence electrons, a filled outer energy level.
- Because the alkali metals have one valence electron, they are ideally suited to react with the halogens.
- The halogens react with most metals to produce salts.

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The Main-Group Elements, *continued*

The Noble Gases, Group 18, Are Unreactive

- Group 18 elements are called the **noble gases.**
- The noble gas atoms have a full set of electrons in their outermost energy level.
- The low reactivity of noble gases leads to some special uses.
- The noble gases were once called inert gases because they were thought to be completely unreactive.
  - In 1962, chemists were able to get xenon to react, making the compound $XePtF_6$.
  - In 1979, chemists were able to form the first xenon-carbon bonds.

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The Main-Group Elements, *continued*

Hydrogen Is in a Class by Itself

- Hydrogen is the most common element in the universe.
  - It is estimated that about three out of every four atoms in the universe are hydrogen.
- Because it consists of just one proton and one electron, hydrogen behaves unlike any other element.
- Hydrogen is in a class by itself in the periodic table.
- With its one electron, hydrogen can react with many other elements, including oxygen.

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Most Elements Are Metals, *continued*

Transition Metals Occupy the Center of the Periodic Table

- The **transition metals** constitute Groups 3 through 12.
- Valence behavior of transition metals is complicated. The outer two shells of electrons can participate in chemical bonding.
- The transition metals are less reactive than the alkali metals and the alkaline-earth metals are.
  - Some transition metals are so unreactive that they seldom form compounds with other elements.

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The "Rare-Earth Metals" – Lanthanides & Actinides

- There are two "series" of Rare-Earth metals: to keep the P. T. from becoming too wide, they are broken out at the bottom. They are all considered to be part of Group III, along with Sc and Y.
- A **lanthanide** is a member of the rare-earth series of elements, whose atomic numbers range from 58 (cerium) to 71 (lutetium).
- An **actinide** is any of the elements of the actinide series, which have atomic numbers from 89 (actinium, Ac) through 103 (lawrencium, Lr).

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Most Elements Are Metals

The regions highlighted in blue indicate the elements that are metals.

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Most Elements Are Metals, *continued*

Metals Share Many Properties

- All metals are excellent conductors of electricity.
  - Electrical conductivity is the one property that distinguishes metals from the nonmetal elements.
- Some metals, such as manganese, are brittle.
- Other metals, such as gold and copper, are ductile and malleable.
  - *Ductile* means that the metal can be squeezed out into a wire.
  - *Malleable* means that the metal can be hammered or rolled into sheets.

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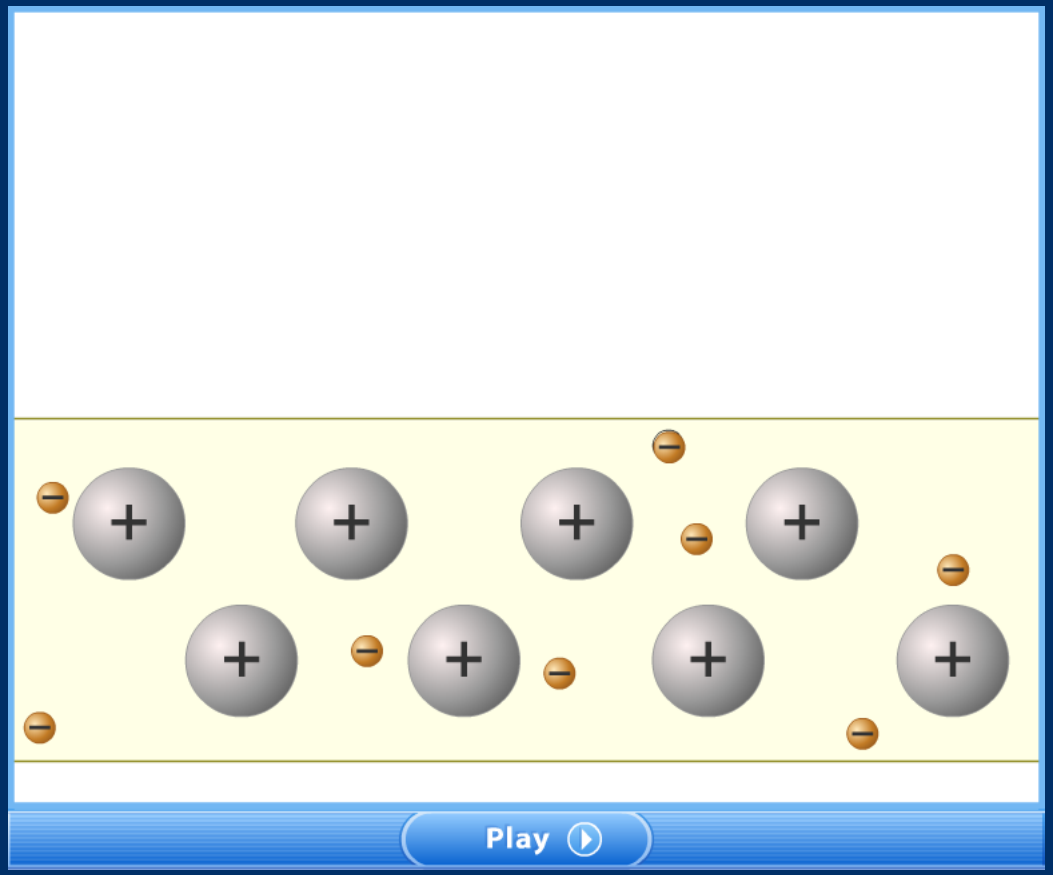
Properties of Metals: Malleability and Ductility



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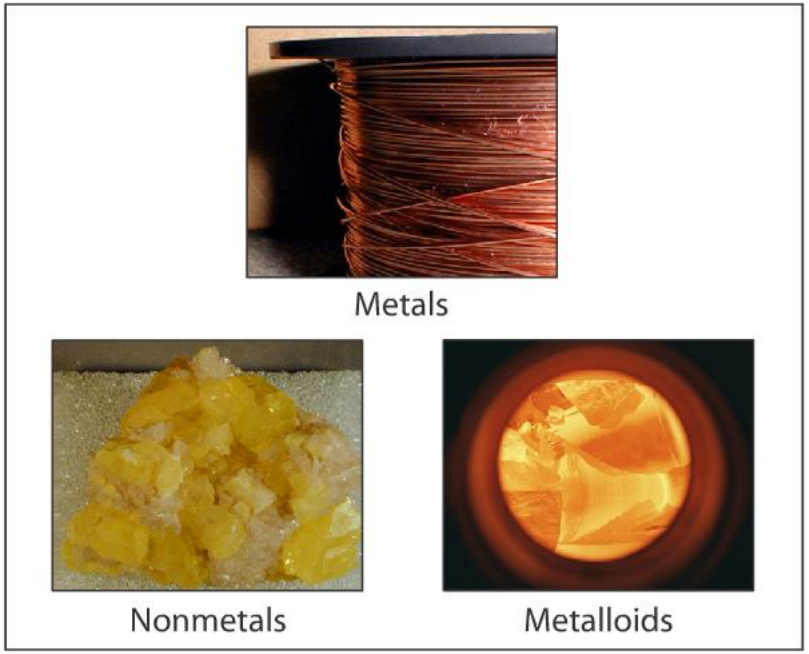
Comparing Metals, Metalloids, and Nonmetals



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