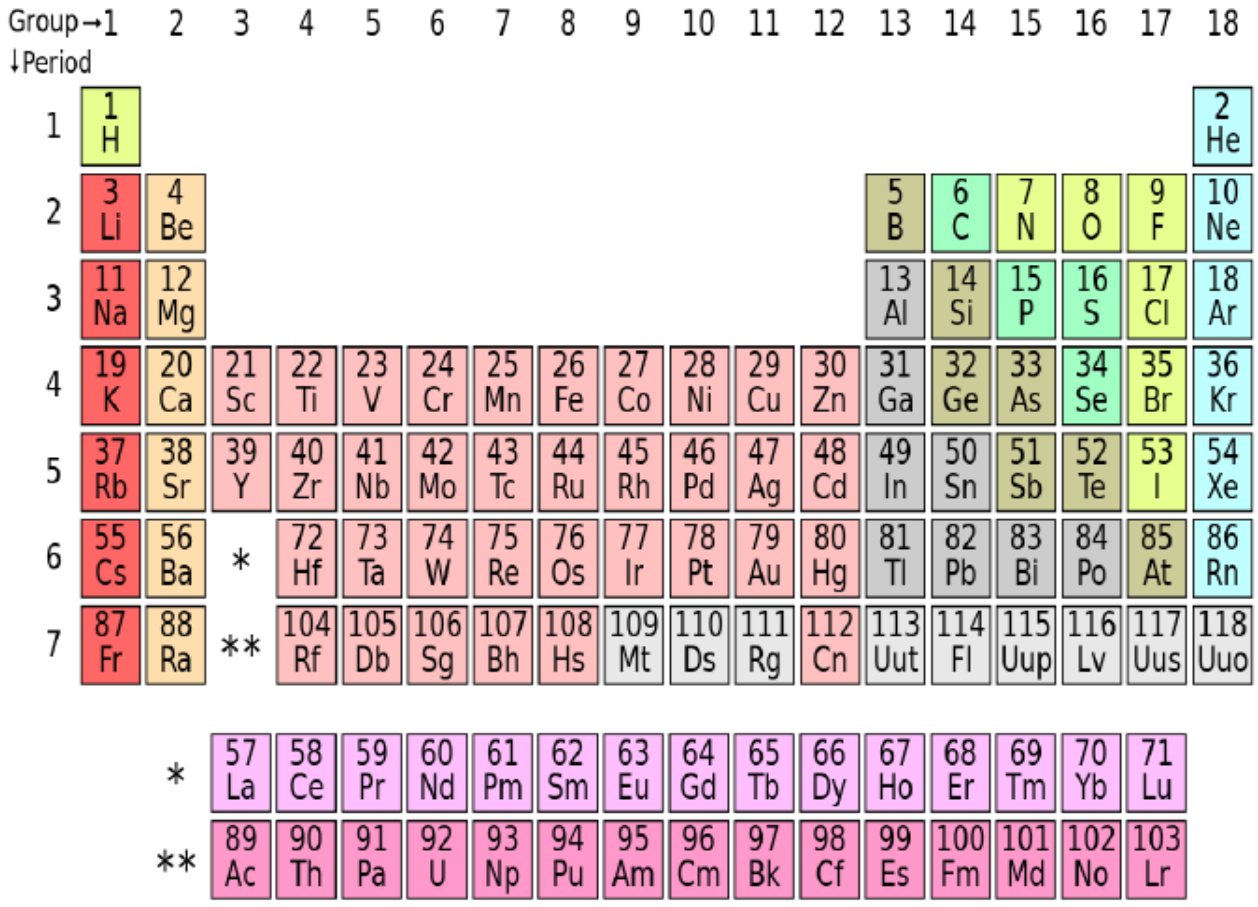
CHEMICAL ELEMENTS AND THE PERIODIC TABLE

READING

1.1.1. The Periodic Table

*After reading the text, match the highlighted terms **(1-9)** in the text to the given **definitions (a-i).***



The Periodic Table of Elements categorizes like elements together. Dmitri Mendeleev, a Russian scientist, was the first to create a widely accepted arrangement of the elements in 1869. Mendeleev believed that when the elements are arranged in order of increasing atomic mass, certain sets of properties recur periodically. Although most modern periodic tables are arranged in eighteen groups (columns) of elements, Mendeleev's original periodic table had the elements organized into eight groups and twelve periods (rows).

On the periodic table, elements that have similar properties are in the same groups (vertical). From left to right, the atomic number (z) of the elements increases from one period to the next (horizontal). The groups are numbered at the top of each column and the periods on

the left next to each row. The main group elements are groups 1,2 and 13 through 18. These groups contain the most naturally abundant elements, and are the most important for life. The elements shaded in light pink in the table above are known as transition metals. The two rows of elements starting at z=58, are sometimes called inner transition metals and have that have been extracted and placed at the bottom of the table, because they would make the table too wide if kept continuous. The 14 elements following lanthanum (z=57) are called lanthanides, and the 14 following actinium (z=89) are called actinides.

Elements in the periodic table can be placed into two broad categories, metals and nonmetals. Most metals are good conductors of heat and electricity, are malleable and ductile, and are moderate to high melting points. In general, nonmetals are nonconductors of heat and electricity, are nonmalleable solids, and many are gases at room temperature. Just as shown in the table above, metals and nonmetals on the periodic table are often separated by a stairstep diagonal line, and several elements near this line are often called metalloids (Si, Ge, As, Sb, Te, and At). Metalloids are elements that look like metals and in some ways behave like metals but also have some nonmetallic properties. The group to the farthest right of the table, shaded orange, is known as the noble gases. Noble gases are treated as a special group of nonmetals.

1. mass	**a**. one of a group of metallic elements in which the members have the filling of the outermost shell to 8 electrons interrupted to bring the penultimate shell from 8 to 18 or 32 electrons
2. properties	**b.** gases in group 0 of the periodic table; they are monatomic and, with limited exceptions, chemically inert
3.atomic number	**c.** elements whose properties are intermediate between those of metals and non-metals
4.abundant	**d.** the amount of material in sg
5.transition metals	**e.** existing or available in large quantities so that there is more than enough
6.malleable	**f.** sg that can be pressed or pulled into shape without needing to be heated
7.ductile	**g.** sg that is easy to press or pull into a new shape
8.metalloids	**h.** the number of protons in the nucleus of an atom
9.noble gases	**i.** a quality or power that belongs naturally to sg

VOCABULARY DEVELOPMENT

1.1.2. The Importance of the Periodic Table

*Provide the translation for the highlighted words **(1-9)** in the text below.*

The modern periodic table has changed since Mendeleev's original table, yet both the first tables and the modern table are important for the same reason: The periodic table organizes elements according to similar properties so you can tell the **characteristics** of an element just by looking at its position on the table.

Before all the naturally occurring elements were discovered, the periodic table was used to **predict** the chemical and physical properties of elements in the gaps on the table. Today, the table can be used to predict properties of elements yet to be discovered, **although** these new elements are all highly radioactive and break down into more familiar elements almost instantly.

The table is useful for modern students and scientists because it helps predict the types of chemical reactions that are likely for an element. Rather than memorize facts and **figures** for each element, a quick **glance** at the table reveals a lot about the reactivity of an element, whether it is likely to conduct electricity, whether it is hard or soft, and many other characteristics.

Elements in the same column as each other (groups) share **similar** properties. For example, the elements in the first column (the alkali metals) are all metals that usually carry a 1+ charge in reactions, react **vigorously** with water, and combine readily with nonmetals.

Another useful feature of the periodic table is that most table **provide** all the information you need to balance chemical reactions at a glance. The table tells an element’s atomic number and usually its atomic weight. The usual charge on an element is **indicated** by an element's group.

READING

1.1.4. Grouping of the Elements

Add a heading to each paragraph.

Metalloids, Transition Metals, Alkali Metals, Halogens, Lanthanides and Actinides, Alkali Earth Metals, Noble Gases

……

The …… are comprised of group 1A of the periodic table and consist of Lithium, Sodium, Rubidium, Caesium, and Francium. These metals are highly reactive and form ionic compounds (when a nonmetal and a metal come together) as well as many other compounds. …… all have a charge of +1 and have the largest atom sizes than any of the other elements on each of their respective periods.

……

…… are located in group 2A and consist of Bereyllium, Magnesium, Calcium, Strontium, Barium, and Radium. Unlike the Alkali metals, the earth metals have a smaller atom size and are not as reactive. These metals may also form ionic and other compounds and have a charge of +2.

……

The …… range from groups IIIB to XIIB on the periodic table. These metals form positively charged ions, are very hard, and have very high melting and boiling points. …… are also good conductors of electricity and are malleable.

……

…… (shown in row ** in chart above on page 2) and …… (shown in row * in chart above on page 2), form the block of two rows that are placed at the bottom of the periodic table for space issues. These are also considered to be transition metals. …… form the top

row of this block and are very soft metals with high boiling and melting points. ..... form the bottom row and are radioactive. They also form compounds with most nonmetals.

.....

As mentioned in the introduction, ... are located along the staircase separating the metals from the nonmetals on the periodic table. Boron, silicon, germanium, arsenic, antimony, and tellurium all have metal and nonmetal properties. For example, Silicon has a metallic luster but is brittle and is an inefficient conductor of electricity like a nonmetal. As the ..... have a combination of both metallic and nonmetal characteristics, they are intermediate conductors of electricity or "semiconductors".

.....

..... are comprised of the five nonmetal elements Flourine, Chlorine, Bromine, Iodine, and Astatine. They are located on group 17 of the periodic table and have a charge of -1. The term 15

"....." means "salt-former" and compounds that contain one of the ..... are salts. The physical properties of ..... vary significantly as they can exist as solids, liquids, and gases at room temperature. However in general, ... are very reactive, especially with the alkali metals and earth metals of groups 1 and 2 with which they form ionic compounds.

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The ..... consist of group 18 (sometimes reffered to as group 0) of the periodic table of elements. The ..... have very low boiling and melting points and are all gases at room temperature. They are also very nonreactive as they already have a full valence shell with 8 electrons. Therefore, the ..... have little tendency to lose or gain electrons.