Metals with two electrons in the outer energy level

Let's start by telling you that there are many factors that are considered metal forward. Which metal is the transition metal? 21 (Scandi) to 29 (Copper) 39 (Yttrium) to 47 (Silver) 57 (Lantan) to 79 (Gold) 89 (Actinium) and all higher numbers. What makes them so special? All are related to their shells / orbits. We prefer to introduce students to the first eighteen factors, because they are easier to explain. Metal transitions are good examples of advanced shell ideas and trajectories. They have a lot of electrons and distribute them in different ways. You will often find that the transition metal is also shiny. Not all of them, but we're sure you've seen pictures of silver (Ag), gold (Au), and platinum (Pt). The transition metal can place more than eight electrons in the shell which is one from the outer shell. Think about argon (Ar). It has 18 electrons set in order 2-8-8. Scandium (Sc) is only 3 points away with 21 electrons, but it has a 2-8-9-2 configuration. Wow! This is where it started. This is the point in the circulatory table, where you can put more than 8 electrons in the shell. You need to remember that these electrons are added to the second to last shell. The transition metals can put up to 32 electrons in their second to last shell. Something like gold (Au), with some atoms of 79, has a hold of 2-8-18-32-18-1. Of course, there are still some rules. No shell can have more than 32 electrons. You will find it is usually 2, 8, 18 or 32 for the maximum number of electrons in an orbit. One More Thing Most elements can only use electrons from their outer orbit to link with other elements. Transition metals can use two outer outer shells/orbits to link with other elements. It is a chemical feature that allows them to connect with many elements in many different shapes. Why can they do it? As you learn more, you'll discover that most transitional factors actually have two unhappy shells. Whenever you have a shell that is not happy, the electrons want to link to other elements. Example: Molybdenum (Mo), with 42 electrons. The configuration is 2-8-18-13-1. The casings with 13 and 1 are not satisfied. These two orbits can use electrons to link to other atoms. With the advent of electron profiles, we began to deepen our understanding of the Circulatory Table. An understanding of electron configurations will prove to be invaluable when we look at connective and chemical reactions. The method representing the orbit to represent the electron configuration is shown below. The orbital representation was learned in an earlier chapter but like many skills you learn in chemistry, it will be used a lot in this chapter and in some chapters later in the course. In this lesson, we will focus on the connection between electrons and the main group elements of the Circulatory Table. We'll need to remember the sub-level fill groups in the Circulatory Table. Keep the image below in mind. We'll use it for the next two chapters. Target lesson[edit] Describes the patterns that exist in electron profiles for the main group elements. Identify columns in the Circulatory Table containing 1) alkaline metals, 2) alkaline soil metals, 3) halogens, and 4) noble gases, and describe the differences between each family's electron profiles. With the electron configuration the outer power level for an element, determine its last name on the circulatory table. We have to go. Elements Ending in s1 = Alkaline In the Circulatory Table, elements are arranged in order of increasing the number of atoms. In the previous material we learned that the number of atoms is the number of protons in the nucleus of an atom. For a neutral atom, the number of protons is equal to the number of electrons. Therefore, for neutral atoms, the circulatory table is also arranged in order of increasing the number of electrons. Take a look now at the first group or column in the circulatory table. It is one of the 1A markers in the time table image above. Groups or they are vertical rows of elements. The first group has seven elements representing the seven stages of the Circulatory Table. Keep in mind that a period in the circulatory table is a horizontal row. Group 1A is the only group with seven elements in it. Table 9.1: Electron Configuration for Group 1A Atomic Number Electron Atomic Atomic Number Electron Configuration Lithium (Li) 3 1 s 2 2 s 1 {\displaystyle 1s^{2}2s^{1}} Sodium (Na) 11 1 s 2 2 s 2 p 6 3 s 1 {\displaystyle 1s^{2} <3> <3>2s^{2}2p^{6}3s^{1}} Potassium (K) 19 1 s 2 2 s 2 p 6 3 s 2 3 p 6 4 s 1 {\displaystyle 1s^{2}2s^{2}2p^{6}3s^{ 2}3p^{6}4s^{1}} Rubidium (Rb) 37 1 s 2 s 2 s 2 2 p 6 3 s 2 3 p 6 4 s 2 3 d 10 4 p 6 5 s 1 {\displaystyle 1s^{2}2s^{2}2p^{6}3s^{2}3p^{6}4s^{2}3d^{10}4p^{6}5s^{1}} Cesium (Cs) 55 1 s 2 s 2 p 2 p 6 3 s 2 p3 s 2 p3 p 6 4 s 2 3 d 10 4 p 6 5 s 2 4 d 10 5 p 6 6 s 1 {\displaystyle 1s^{2}2s^{2}2p^{6}3s^{2}3p^{6}4s^{2}3d^{10}4p^p

{6}5s^{2}4d^{10} {2} <9>5p^{6}6s^{1}} Franxi (Fr) 87 1 s 2 s 2 p 6 3 s 2 3 p 6 4 s 2 3 d 10 4 p 6 5 s 2 4 d 10 5 p 6 6 s 2 4 f 14 d 5 d 10 6 p 6 7 s 1 {\displaystyle 1s^{2}2s^{2}2p^{6}3s^{2}3p^{6}4s^{2}3d^{10}4p^p {6} {2}5s^{2}4d^{10}5p^{6}6s^{2}4f ^{14}5d^{10}6p^{6}7s^{1}} Table 9.1: Electron Configuration for Group 1A Atomic Atomic Number Electron Configure Lithium (Li) 3 1 s 2 2 s 1 {\ displaystyle 1s^{2}2s^{1}} Sodium (Na) 11 1 s 2 2 s 2 p 6 3 s 1 {\displaystyle 1s^{2}2s^{2}2p^{6}3s^{1}} Potassium (K) 19 1 s 2 2 s 2 p 6 3 s 2 3 p 6 4 s 1 {\displaystyle 1s^{2}2s^{2} 2p^{6}3s^{2}3p^{6}4s^{1}} Rubidi (Rb) 37 1 s 2 2 s 2 p 6 3 s 2 3 p 6 4 s 2 3 d 10 4 p 6 5 s 1 {\displaystyle 1s^{2} 2s^{2}2p^{6}3s^{2}3p^{6}4s^{2}3d^{10}4p^{6}5s^{1}} Cesium (Cs) 55 1 s 2 2 s 2 2 p 6 s 2 3 p 6 4 s 2 3 d 10 {\displaystyle 1s^{2}2s^{2}2p^{6}3s^{2}3p^{6}4s^{2}3d^{10}} 4 p 6 5 s 2 4 d 10 5 p 6 6 s 1 {\displaystyle 4p^{6}5s^{2}4d^{10}5p^{6}6s^{1}} Franxi (Fr) 87 1 s 2 2 s 2 p 6 3 s 2 3 p 6 4 s 2 3 d 10 {\displaystyle 1s^{2}2s^{ 2} 2p^{6}3s^{2}3p^{6}4s^{2}3d^{10}} 4 p 6 5 s 2 4 d 10 5 p 6 6 s 2 4 f 14 5 d 10 6 p 6 7 s 1 {\displaystyle 4p^{6}5s^{2}4d^{10}5p^{6}6s^{2}4f^{14}5d^{10}6p^{6}7s^{1}} What do you notice about all the elements in Group 1? All of them have s1 as the outer power level electron configuration. The whole number in front of s tell you what time the elements are in. For example sodium, Na, has an electron configuration of 1s22s22p63s1, so it is in phase 3. This is the first element of this period. This group of elements is called alkaline metals. They took their name from ancient Arabic (al potassium) because scientists at the time discovered that the ash of the vegetation they were burning contained large amounts of sodium and potassium. In Arabic, al potassium means ash. We know today that all alkaline metals have electronic configurations ending in s1. You may want to note that while hydrogen is usually placed in group 1, it is not considered an alkaline metal. The reasons for this will be discussed later. Alkaline Earth elements have two electrons in their external energy level elements Ending in s2 = Earth Alkaline Looking at Group 2A in Table 9.2, we can use the same analysis that we used with group 1 to see if we can find a similar trend. It is the second vertical group in the Circulatory Table and it contains only six elements. Table 9.2: Electron configuration for group 2A Atomic Atomic Metals Beryllium Configuration (Be) 4 1 s 2 2 s 2 {\displaystyle 1s^{2}2s^{2}} Magnesium (Mg) 12 1 s 2 2 s 2 p 6 3s 2 {\displaystyle 1s ^{2}2s^{2}2p^{6}3s^{2}} Calcium (Ca) 20 1 s 2 s 2 p 6 3 s 2 3 p 6 4 s 2 {\displaystyle 1s^{2}2s^{2} 2p^{6}3s^{ 2}3p^{6}4s^{2}} Stronti (Sr) 38 1 s 2 s 2 p 6 3 s 2 3 p 6 4 s 2 3 d 10 4 p 6 5 s 2 {\displaystyle 1s^{2}2s^{2}2p^{6}3s^{2}3p^{6}4s^{2}3d^{10}4p^{6}5s^{2}} Bari (Ba) 56 1 s 2 s 2 s 2 2 p 6 3 s 2 3 p 6 4 s 2 3 d 10 4 p 6 5 s 2 4 d 10 5 p 6 6 s 2 {\displaystyle 1s^{2}2s^{2}2p^{6}3s^{2}3p^{6}4s^{2}3d^{10}4p^{6}5s^{2}4d^{10} {10} <2> <4> <9>5p^{6}6s^{2}} Radium (Out) 88 1 s 2 2 s 2 p 6 3 s 2 3 p 6 4 s 2 3 d 10 4 p 6 5 s 2 4 d 10 5 p 6 6 s 2 4 f 14 5 d 10 6 p 6 7 s 2 {\displaystyle 1s^{2}2s^{2}2p^{6}3s^{2}3p^{6}4s^{2}3d^{10}4p^{6}5s^{2}4d^{10} {2} <2> <2>5p^{6}6s^{2}4f^{14} {2}4f^{2}4f^{2}4s^{2}4f^{2}4s^{2}4 <1>5d^{10}6p^{6}7s^{2}} Table 9.2 : Electron configuration for atomic number configuration group 2A Beili (Be) 4 1 s 2 2 s 2 {\displaystyle 1s^{2}2s^{2}} Magnesium (Mg) 12 1 s 2 s 2 p 6 3 s 2 {\displaystyle 1s^{2} <6>2s^{2}2p^{6}3s^{2}} Calcium (Ca) 20 1 s 2 2 s 2 p 6 3 s 2 3 p 6 4 s 2 {\displaystyle 2 1s^{2}2s^{2}2p^{6} 3s^{2}3p^{6}4s^{2}} Strontium (Sr) 38 1 s 2 2 s 2 p 6 3 s 2 3 p 6 4 s 2 2 d 10 4 p 6 5 s 2 {\displaystyle 1s^{2}2s^{2}2p^{6}3s^{2}3p^{6}4s^{2}3d^{10}4p^{6}5s^{2}} Bari (Ba) 56 1 s 2 s 2 s 2 p 6 3 s 2 3 p 6 4 s 2 3 d 10 {\displaystyle 1s^{2}2s^{2}2p^{6}3s^{2}3p^{6}4s^{2}3d^{10}} 4 p 6 5 s 2 4 d 10 5 p 6 6 s 2 {\ displaystyle 4p^{6}5s^{2}4d^{10}5p^{6}6s^{2}} Radium (Ra) 88 1 s 2 s 2 p 6 3 s 2 3 p 6 4 s 2 3 d 10 {\displaystyle 1s^{2}2s^{2} 2p^{6}3s^{2}3p^{6}4s^{2}3d^{10}} 4 p 6 5 s 2 4 d 10 5 p 6 6 s 2 4 f 14 5 d 10 6 p 6 7 s 2 {\displaystyle 4p^{ 6}5s^{ 2}4d^{10}5p^{6}6s^{2}4f^{14}5d^{10}6p^{6}7s^{2}} What do you notice about all the elements in group 2A? All of them have the outer outer power level electron configuration of s2. The whole number in front of s tell you what time the elements are in. For example, magnesium, Mg, has an electron profile of 1s22s2p63s2, so it is in phase 3 and is the second element in that period. Keep in mind that the subordinates of s can contain two electrons, so in Group 2A, the s orbit has been filled. The elements in this group are named alkaline soil metals. They get their name because scientists first found that all the alkaline earths were found in the earth's crust. Alkaline soil metals, although not as reflexive as alkaline metals, still have a high reaction. All alkaline soil metals have an electron profile that ends in s2. Noble Gases There are 8 electrons in their external energy-level elements Ending in s2p6 = Noble Gases The first to isolated a noble gas was Henry Cavendish, who isolated argon in the late 1700s. Noble gases were actually considered inert gases until the 1960s when a compound formed between xenon and fluorine changed the way ing000s viewed inert gases. In English, inert means lifeless or ermed; in the chemical world, inert means do not react. Later, the noble gas name replaced the inert gas for the group name 8A. When we write electron profiles for these elements, we see the same general trend that has been observed with groups 1A and 2A; that is, the same electron configurations in the group. Table 9.3: Electron configuration for Atomic Atomic Atomic Configuration Group 8A Helium (He) 2 1 s 2 {\displaystyle 1s^{2}} Neon (Ne) 10 1 s 2 2 s 2 p 6 {\displaystyle 1s^{2}2s^{2}2p^{6}} Argon (Ar) 18 1 s 2 s 2 2 p 6 3 s 2 3 p 6 {\displaystyle 1s^{2}2s^{2}2p^{6}3s^{2}3p^{6}} Krypton (Kr) 36 1 s 2 2 s 2 p 6 3 s 2 3 p 6 4 s 2 3 d 10 4 p 6 {\displaystyle 1s^{2}2s^{2}2p^{6}3s^{2}3p^{6}4s^{2}3d^{10}4p^{10}4p^{6} {10} <2> <9>} Xenon (Car) 154 1 s 2 2 s 2 2 p 6 3 s 2 3 p 6 4 s 2 3 d 10 4 p 6 6 s 4 4 d 10 5 p 6 {\displaystyle 1s^{2}2s^{2}2p^{ 6}3s^{2}3p^{ 6}4s^{2}3d^{10}4p^{6}5s^{2}4d^{10}5p^{6}} Radon (Rn) 86 1 s 2 2 s 2 2 p 6 3 s 2 3 p 6 4 s 2 3 d 10 4 p 6 5 s 2 4 d 10 5 p 6 6 s 2 4 f 14 d 5 d 10 6 p 6 {\displaystyle Table 9.3: Electron configuration for atomic number electron configuration group 8A Helium element (He) 2 1 s 2 {\displaystyle 1s^{2}} Neon (Ne) 10 1 s 2 2 s 2 p 6 {\displaystyle 1s^{2}2s^{2}2p^{6} {2}2p^{2}2p^{2} <3> <4>} Argon (Ar) 28 1 s 2 s 2 p 6 3 s 2 3 p 6 {\displaystyle 1s^{2}2s^{2}2p^{6}3s^{2}3p^{6}} Krypton (Kr) 36 1 s 2 2 s 2 2 p 6 3 s 2 3 p 6 4 s 2 3 d 10 4 p 6 {\displaystyle 1s^{2}2s^{2}2p^{6}3s^{2}3p^{6}4s^{2}3d^{10}4p^{6}} Xenon (Car) 54 1 s 2 s 2 2 p 6 3 s 2 3 p 6 4 s 2 3 d 10 {\displaystyle 1s^{2}2s^{2}2p^{6}3s^{2}3p^{6}4s^{2}3d^{10}} 4 p 6 5 s 2 4 d 10 5 p 6 {\displaystyle 4p^{6}5s^{2}4d^{10}5p^{6}} Radon (Rn) 86 1 s 2 s 2 p 6 3 s 2 3 p 6 4 s 2 3 d 10 {\displaystyle 1s^{2}2s^{2}2p^{6}3s^{2}3p^{6}4s^{2}3d^{10}} 4 p 6 5 s 2 4 d 10 5 p 6 6 s 2 4 f 14 d 10 6 p 6 {\displaystyle 4p^{6} 5s^{2}4d^{10}5p^{6}6s^{2}4f^{14}5d^{10}6p^{6}} In addition to helium, He, all noble gases have the same external energy level electron configuration, ns2np6, where n is the number of cycles. So Argon, Ar, is in phase 3, is an aristocratic gas, and therefore will have an external energy level electron configuration of 3s23p6. Notice that both s and p sublevels are filled. Helium has an electron configuration that can match Group 2A. However, the chemical reaction of helium, because it has the first full energy level, is similar to noble gases. Halogens have 7 electrons in their external energy level factors Ending in s2p5 = Halogen Halogen The halogens are an interesting group. Halogens are members of Group 7A, also known as 17. This is the only group in the Circulatory Table that contains all material states at room temperature. Fluorine, F2, is a gas, as well as chlorine, Cl2. Bromine, Br2, is a liquid and iodine, I2, and astatine, At2, are all solids. What else is neat about Group 7A is that it contains four (4) of the seven (7) diatomic compounds. Remember diatomics are H2, N2, O2, F2, Cl2, Br2, and I2. Note that the following four factors are group 17. The word halogen comes from the Greek word for salt formed. French chemons discovered that the majority of halogen ions would form salt when combined with metals. We all know some of these already: LiF, NaCl, KBr, and NaI. Looking at group 7A in the picture, we can find the same model of electron profiles similar to those found with groups 1A, 2A and 8A. It is the 17th group in the Circulatory Table and it contains only five elements. Table 9.4: Electron configuration for group 7A Atomic element electron configuration fluorine (F) 9 1 s 2 s 2 2 p 5 {\displaystyle 1s^{2}2s^{2}2p^{5}} Chlorine (Cl) 17 1 s 2 2 s 2 2 p 6 3 s 2 3 p 5 {\displaystyle 1s^{2}2s^{2}2p^{6}3s^{2}3p^{5}} Bromine (Br) 35 1 s 2 2 s 2 p 6 3 s 2 3 p 6 4 s 2 3 d 10 4 p 5 {\displaystyle 1s^{2}2s^{2}2p^{6}3s^{2}3p^{6}4s^{6}3s^{2}3p^{6}4s^{2} {6}3s^{6}4s^ <2> <6>3d^{10}4p^{5}} Iodine (I) 53 1 s 2 2 s 2 2 p 6 3 s 2 3 p 6 4 s 3 d 10 4 p 6 5 s 2 4 d 10 5 p 5 {\displaystyle 1s^{2}2s^{2}2p^{6}3s^{2}3p^{6}4s^{2}3d^{10}4p^{6}5s^{2}4d^{10}5p^{5}} Astatine (At) 85 1 s 2 s 2 s 2 2 p 6 3 s 2 3 p 6 4 s 2 3 d 10 4 p 6 5 s 2 4 d 10 5 p 6 6 s 2 4 f 14 5 d 10 6 p 5 {\displaystyle 1s^{2}2s^{2}2p^{6}3s^{2}3p^{6}4s^{2}3d^{10}4p^{6}5s^{2}4d^{10}5p^{6}6s^{2}4f^{14}4f^<5>d^{10}6p^{5}} Table 9.4: Electron configuration for Group 7A (F) Atomic Number Electron Configuration 9 1 s 2 2 s 2 p 5 {\displaystyle 1s^{2}2s^{2}2p^{5}} Chlorine (Cl) 17 1 s 2 s 2 s 2 s 2 6 3 s 2 3 p 5 {\displaystyle 1s^{2}2s^{2}2p^{6}3s^{2}3p^{5}} Bromine (Br) 35 1 s 2 s 2 p 6 3 s 2 3 p 6 4 s 2 3 d 10 4 p 5 {\displaystyle 1s^{2}2s^{2}2p^{6}3s^{2}3p^{6}4s^{2}3d^{10}4p^{5}} Iodine (I) 53 1 s 2 2 s 2 p 6 3 s 2 3 p 6 4 s 2 3 d 10 {\displaystyle 1s^{2}2s^{2}2p^{6}3s^{2}3p^{6}4s^{2}3d^{10}} 4 p 6 5 s 2 4 d 10 5 p 5 {\displaystyle 4p^{6}5s^{2}4d {10}^5p^{5}} Astatine (At) 85 1 s 2 s 2 s 2 p 6 3 s 2 3 p 6 4 s 2 3 d 10 {\displaystyle 1s^{2}2s^{2}2p^{6}3s^{2}3p^{6}4s^{2}3d^ 10}} 4 p 6 5 s 2 4 d 10 5 p 6 6 s 2 4 f 14 d 10 6 p 5 {\displaystyle 4p^{6}5s^{2} {6} <1> <8>4d^{10}5p^{6}6s^{2}4f^{14}5d^{10}6p^{5}} What are the general trends for elements in Group 7A? They all have, like the outer-outer power level electron configuration, ns2np5, where n is the number of times. You should also note that these elements are a group away from aristocratic gases (those that usually do not react!) and that the outer electron configuration of halogen is a distant group. For example, chlorine (Cl) has an electron configuration [Ne] 3s23p5 so it is in phase 3, the seventh element in the main group elements. The main group elements, as you recall, are equivalent to the s + p blocks of the Circulatory Table (or the pink and orange groups in the diagram above). The oxygen family has 6 electrons in the external energy-level elements Ending in s2p4 = Oxygen family oxygen and other elements in Group 6A tend to be similar in their electron configuration. Oxygen is the only gas in the group; all others are in a solid state at room temperature. Oxygen was first named by Antoine Lavoisier in the late 1700s but indeed the planet has had oxygen around since the first plant on Earth. Looking at Group 6A in the image below, we find the same pattern in the electron profiles that we find with other groups. Oxygen and family members are in the 16th group in the Circulatory Table. In group 16, there are, again, only five factors. Table 9.5: Electron configuration for Group 6A Atomic Element Electron Configuration Oxygen (O) 8 1 s 2 s 2 p 4 {\displaystyle 1s^{2}2s^{2}2p^{4}} Sulfur (S) 16 1 s 2 2 s 2 2 p 6 3 s 2 3 p 4 {\displaystyle 1s^{2}2s^{2}2p^{6}3s^{2}3p^{4}} Selenium (Se) 34 1 s 2 2 s 2 p 6 3 s 2 3 p 6 4 s 2 3 d 10 4 p 4 {\displaystyle s 2 3 d 10 4 p 4 {\displaystyle s 2 3 d 10 4 p 4 {\displaystyle s Tellurium (Te) 52 1 s 2 2 s 2 p 6 3 s 2 3 p 6 4 s 2 3 d 10 4 p 6 5 s 2 4 d 10 5 p 4 {\displaystyle 1s^{2}2s^{2}2p^{6}3s ^{2}3p^{6}4s^{2}3d^{10}4p^{6}5s^{2}4d^{10}5p^{4}} Polonium (Po) 84 1 s 2 s 2 s 2 p 6 3 s 2 3 p 6 4 s 2 3 d 10 4 p 6 5 s 2 4 d 10 5 p 6 6 s 2 4 f 14 5 d 10 6 p 4 {\displaystyle 1s^{2}2s^{2}2p^{6}3s^{2}3p^{6}4s^{2}3d ^{10}4p^{6}5s^{2}4d^{10}5p^{6}6s^{2}4f^{14}5d^{10}6p^{4}} Table 9.5: Electron configuration for group 6A Elemental element electron configuring oxygen (O) 8 1 s 2 2 s 2 p 4 {\displaystyle 1s^{2}2s^{2}2p^{4}} Sulfur (S) 16 1 s 2 2 s 2 p 6 3 s 2 3 p 4 {\displaystyle 1s^{2}2s^{2}2p^{6}3s^{2}3p^{4}} Selen (Se) 34 1 s 2 s 2 s 2 p 6 3 s 2 3 p 6 4 s 2 3 d 10 4 p 4 {\displaystyle 1s^{2}2s^{2}2p^{6}3s^{2}3p^{ 6}4s^{2}3d^{ 10}4p^{4}} Tellurium (Te) 52 1 s 2 2 s 2 p 6 3 s 2 3 p 6 4 s 2 3 d 10 {\displaystyle 1s^{2}2s^{2}2p^{6}3s^{2} 3p^{6}4s^{2}3d^{10}} 4 p 6 5 s 2 4 d 10 5 p 4 {\displaystyle 4p^{6}5s^{2}4d^{10}5p^{4}} Polonium (Po) 84 1 s 2 2 s 2 p 6 3 s 2 3 p 6 4 s 2 3 d 10 {\displaystyle 1s^{2}2s^{2}2p^{6}3s^{2}3p^{6}4s^{2}3d^{10}} 4 p 6 5 s 2 4 d 10 5 p 6 6 s 2 4 f 14 5 d 10 6 p 4 {\displaystyle 4p^{6}5s^{2}4d^{10}5p^{6}6s^{2}f^{14}5d^{10}6p^{4}} , we see that all these elements have the external energy level electron configuration of ns2np4. We will see that this same electron configuration gives all the elements in the group the same properties to link. These elements are two groups away from aristocratic gases and the outer electron configuration is two distant groups that are filled. Sulfur, for example, has an electron configuration of 1s22s2p63s23p4 so it is in phase 3. Sulfur is the sixth element in the main group elements. We know it was the sixth element in the time period of the main group elements because there are 6 electrons at the outer power level. The nitrogen family has 5 electrons in the external energy-level elements Ending in s2p3 = the nitrogen family Like we saw with Group 6A, Group 5A has a similar oddity in its group. Nitrogen is the only gas in the group with all other members in a solid state at room temperature. Nitrogen was first discovered by Scottish chemistry Rutherford in the late 1700s. The air is mainly made of nitrogen. Nitrogen has different properties in a number of ways from its team members. As we will learn in later lessons, the electron configuration for nitrogen provides the ability to form three very strongly. Nitrogen and its family members belong to the 15th group in the circulatory table. In group 15, there were also only five factors. Table 9.6: Electron configuration for Group 5A Atomic Element Electron Configuration Nitrogen (N) 7 1 s 2 s 2 2 p 3 {\displaystyle 1s^{2} 2s^{2}2p^{3}} Phosphorus (P) 15 1 s 2 2 s 2 2 p 6 3 s 2 3 p 3 {\displaystyle Arsenic (As) 33 1 s 2 s 2 s 2 p 6 3 s 2 3 p 6 4 s 2 d 3 d 4 p 3 {\displaystyle 1s^{2}2s^{2}2p^{6}3s^{2}3p^{6}4s^{2}3d^{10}4p^{3}} Antimony (Sb) 51 1 s 2 2 s 2 2 p 6 3 s 2 3 p 6 4 s 2 3 d 10 4 p 6 5 s 2 4 d 10 5 p 3 {\ display style 1s^{2}2s^{2}2p^{6}3s^{2}3p^{6}4s^{2}3d^{10}4p^{6}5s^{2}4d^{10}5p^{3}} Bismuth (Bi) 83 1 s 2 2 s 2 s 2 p 26 3 s 2 3 p 6 4 s 2 3 d 10 4 p 6 5 s 2 4 d 10 5 p 6 6 s 2 4 f 14 5 d 10 6 p 3 {\displaystyle 1s^{2}2s^{2}2p^{6}3s^{ 2} 3p^{6}4s^{2}3d^{10}4p^{6}5s^{2}4d^{10}5p^{6}6s^{2}4f^{14}5d^{10}6p^{3}} Table 9.6: Electron Configuration for Group 5A Element nitrogen configuration (N) 7 1 s 2 2 s 2 p 3 {\displaystyle 1s^{2}2s^{2}2p^{3}} Phosphorus (P) 15 1 s 2 s 2 s 2 p 6 3 s 2 3 p 3 {\displaystyle 1s^{2}2s^{ 2}2p^{6}3s^{ 2}3p^{3}} Arsenic (As) 33 1 s 2 2 s 2 p 6 3 s 2 3 p 6 4 s 2 3 d 10 4 p 3 {\displaystyle 1s^{2}2s^{2}2p^{6} 3s^{2}3p^{6}4s^{2}3d^{10}4p^{3}} Antimony (Sb) 51 1 s 2 s 2 2 p 6 3 s 2 3 p 6 4 s 2 3 d 10 {\displaystyle 1s^{2}2s^{2} 2p^{6}3s^{2} 3p^{6}4s^{2}3d^{10}} 4 p 6 5 s 2 4 d 10 5 p 3 {\displaystyle 4p^{6}5s^{2}4d^{10}5p^{3}} Bismuth (Bi) 83 1 s 2 2 s 2 p 6 6 3 s 2 3 p 6 4 s 2 3 d 10 {\displaystyle 1s^{2}2s^{2}2p^{6}3s^{2}3p^{6}4s^{2}3d^{10}} 4 p 6 5 s 2 4 d 10 5 p 6 6 s 2 4 f 14 5 d 10 6 p 3 {\displaystyle 4p^{6}5s^{2}4d^{10}5p^{6}6s^{2}4f^{14}5d^{10}6p^{3}} What are the general trends for elements in group 5A? They all have, like the electron configuration at the outer power level, ns2np3, where n is the number of times. These elements are three groups away from noble gases and the outer electron configuration is three groups away from the finished external energy level. In other words, the sub-level p in the group of 15 elements is half full. Arsenic, for example, has an electron configuration of 1s22s2p63s23p64s23d104p3 so it is in phase 4, the fifth element in the main group elements. We know it was the fifth element in the time period of the main group elements because there are 5 electrons at the outer energy level. Lesson Summary[edit] Families in the circulatory table are vertical columns and are also called groups. Group 1A elements are alkaline metals and all have an electron at the outer power level because their electron configuration ends in s1. Group 2A elements are alkaline earth metals and all have two electrons at the outer power level because their electron configuration ends in s2. The 5A group elements all have five electrons at the outer power level because their electron configuration ends in s2p3. The 6A group elements all have six electrons at the outer power level because their electron configuration ends in s2p4. Group 7A elements are halogens and all have seven electrons at the outer power level because their electron configuration ends in s2p5. Group 8A elements are noble gases and all have eight at the outer power level because their electron configuration ends in s2p6. Elements in group 8A have the most stable electron configuration in the outer outer crust because the substructions are filled with electrons. Review the question [edit] If an component is believed to have the outer outer electronic configuration of ns2np3, which group is it in the circulatory table? (a) What is Group 3A (b) Group 4A (c) Group 5A (d) Group 7A General electronic configuration for Group 8A elements? (Note: when we want to point out an electron configuration without specifying the correct energy level, we use the letter n to represent any number of energy levels. (a) ns2np6 (b) ns2np5 (c) ns2np1 (d) ns2 What are group 2 elements named? (a) alkaline metal (b) alkaline earth metal (c) halogen (d) noble gas Use the diagram below, determine: (a) Alkaline metal by giving the letter of where the element will be located and write the outer outer electronic configuration. (b) Alkaline soil metals by giving letters that show the location of the element and writing the outer outer electronic configuration. (c) Noble air by giving letters that show the location of the element and writing the outer outer electronic configuration. (d) Halogen by giving the letter that shows the location of the element and writing the outer outer electronic configuration. (e) Elements with an electronic configuration of the outer end of s2p3 by giving letters that tell where the elements will be located. (f) Elements with an electronic configuration to the outer end of s2p1 by giving letters that tell where the elements will be located. In the circulatory table, name the elements with the outer outer electronic configuration found below. If possible, name the group. (a) 5s2 (b) 4s23d104p1 (c) 3s23p3 (d) 5s24d105p2 (e) 3s1 (f) 1s2 (g) 6s25d106p5 (h) 4s24p4 Vocabulary[edit] alkaline metal Group 1 in the circulatory table (Li, Na, K, Rb, Cs, Fr). Alkaline soil metal Group 2 in the circulatory table (Be, Mg, Ca, Sr, Ba, Ra). column group of the circulatory table. halogen Group 17 in the circulatory table (F, Cl, Br, I, At). The main group elements are equivalent to the s + p blocks of the circulatory table, also known as the representation elements. Noble Air Group 18 in the circulatory table (He, Ne, Ar, Kr, Xe, Rn). Horizontal row time of the circulatory table. This material is an in-version of the original CK-12 book that can be found here.