Continue

The element blocks are s, p, d, and f. They are determined by the valence electron orbital.Periodic table blocks are sets of elements grouped by their valence electron orbitals. The four block names are s-block, p-block, d-block, and f-block. Should a new element be discovered, it will be in g-block. Each block indicates which electron sublevel is in the process of being filled.Charles Janet introduced the concept of element blocks as an alternative to element groups (and also envisaged helix and left-step periodic tables).The block names come from the electron azimuthal quantum number values, which represent characteristics of spectroscopic lines: sharp (0), principal (1), diffuse (2), or fundamental (3). G-block gets its name because “g” is the next letter after “f”.The four periodic table blocks are the basis for the main group (s- and p-blocks), transition metal (d-block), and inner transition metal (f-block) elements.Element blocks determine the main group, transition metal, and inner transition metal elements.The s-block elements (except for helium) are on the left side of the periodic table.With the exception of helium (and possibly hydrogen), all of the s-block elements are metals. The s-block includes the alkali metals and alkaline earth metals.S-block elements tend to form soft solids with low melting points.With the exception of helium, all s-block elements are electropositive and reactive.The p-block elements are on the right side of the periodic table. They include the last six element groups of the table (except for helium). P-block elements include all of the nonmetals (except hydrogen and helium), all of the metalloids, and the post-transition metals.P-block elements can gain, lose, or share their valence electrons.Most p-block elements form covalent compounds. The halogens form ionic compounds with s-block elements.D-block elements are the transition metals (groups 3-12).D-block elements display properties between those of the highly reactive electropositive s-block elements and the more electronegative p-block elements. This is why they are called “transition” metals.These elements are all metals, usually with two or more oxidation states.D-block elements tend to have high melting points and boiling points.Many of these elements form colored complexes and salts.D-block elements tend to be good catalysts.The f-block elements or inner transition metals are the lanthanides and actinides. They are the two rows of elements found below the main body of the periodic table.F-block elements display variable oxidation states.Most f-block elements have high melting points.These elements form colored complexes and salts, but they tend to be paler than those formed by d-block elements.Many of the f-block elements (the actinides) are radioactive.The g-block elements will be elements beyond oganesson (element 118). As these elements have not yet been synthesized, their properties have yet to be determined.Blocks, groups, and periods are three broad ways of classifying elements based on their position on the periodic table and common properties.Blocks indicate which electron sublevel is being filled.Groups are the vertical columns on the periodic table. Moving down a group adds a new electron subshell. For s-block elements, the group number is the number of valence electrons. for p-block elements, the group number is 10 plus the number of valence electrons. For d-block elements, the group numbers is (n-1) the number of electrons in the subshell plus the number of electrons in the valence shell.Periods are the horizontal rows of the periodic table. The length of a period is determined by the number of electrons needed to fill the electron sublevel.Gschneidner Jr., Karl A. (2016). “282. Systematics”. In Jean-Claude G. Bünzli; Vitalij K. Pecharsky (eds.). Handbook on the Physics and Chemistry of Rare Earths. 50. p. 12–16. ISBN: 978-0-444-63851-9.Jensen, William B. (March 2015). “The positions of lanthanum (actinium) and lutetium (lawrencium) in the periodic table: an update”. Foundations of Chemistry. 17: 23–31. doi:10.1007/s10698-015-9216-1Stewart, Philip (April 2010). “Charles Janet: Unrecognized Genius of the Periodic System”. Foundations of Chemistry. 12: 5–15. doi:10.1007/s10698-008-9062-5Related Posts The S block elements have valence electrons in the s orbital.The s block elements are a group of chemical elements that have valence electrons in the s-subshell. In other words, atoms of these elements have a general valence electron configuration of ns1-2, where “n” is the principal quantum number and “s” is the orbital. A maximum of The elements are those in group 1 (the alkali metals), group 2 (the alkaline earth metals), and helium. French scientist and engineer Charles Janet introduced the concept of element blocks and also arranged the elements into different periodic table designs according to blocks.There are 14 s-block elements:Hydrogen (H)Helium (He)Lithium (Li)Beryllium (Be)Sodium (Na)Magnesium (Mg)Potassium (K)Calcium (Ca)Rubidium (Rb)Strontium (Sr)Cesium (Cs)Barium (Ba)Francium (Fr)Radium (Ra)Note that helium is in the same column as the p-block elements, but it does not have any valence electrons in the p subshell.The alkali metals have a single valence electron in their outer shell, while helium and the alkaline earth metals have two valence electrons in the outer shell. Here is a list of the s-block element electron configurations:Atomic NumberSymbolElectron Configuration1H1s12He1s23Li1s22s14Be[He]2s211Na1s22s22p63s112Mg[Ne]3s219K1s22s22p63s23p64s120Ca[Ar]4s237Rb1s22s22p63s23p63d104s24p65s138Sr[Kr]5s255Cs[Xe]6s156Ba[Xe]6s287Fr[Rn]7s188Ra[Rn]7s2All of the s-block elements, except helium, readily lose their valence electrons and form chemical bonds. The elements in group 1 form ions with a +1 charge, while those in group 2 form ions with a +2 charge. With the exceptions of hydrogen and helium, the s-block elements are highly reactive metals. The metallic elements are shiny, silver-colored (except cesium, which has a golden tint), and good electrical and thermal conductors. The s-block elements form soft, light solids that have low melting points. Except for hydrogen and helium, the elements vigorously react in air and in water. Keeping them in an inert atmosphere or under mineral oil protects them against oxidation.The diagonal relationship is when an element display behavior more like the element diagonal to it on the periodic table than to other elements in its own group. This occurs in some s-block elements. Lithium displays behavior similar to magnesium. Beryllium acts similarly to aluminum. The reason for this behavior is because lithium/magnesium and beryllium/aluminum are element pairs with similar ionic radius sizes and comparable charge/radius ratios.The s-block elements feature prominently in firework colors. So, the flame test is a good first step toward identifying them. Note that not all of these elements display a characteristic color and some colors are similar to each other.ElementFlame Test ColorLithiumCarmine redSodiumYellowPotassiumLilacRubidiumViolet redCesiumBlue violetBeryllium WhiteMagnesiumColorless to whiteCalciumBrick redStrontiumCrimson redBariumApple greenAside from the flame test, the reactivity series helps identify an element when comparing its reactivity against another. For example, lithium replaces other metals in a reaction. Barium replaces calcium or magnesium, but not lithium.Gschneidner Jr., Karl A. (2016). “282. Systematics”. In Jean-Claude G. Bünzli; Vitalij K. Pecharsky (eds.). Handbook on the Physics and Chemistry of Rare Earths. 50. ISBN: 978-0-444-63851-9.Langmuir, Irving (June 1919). “The Arrangement of Electrons in Atoms and Molecules”. Journal of the American Chemical Society. 41 (6): 868–934. doi:10.1021/ja02227a002Scerri, Eric (2020). “Recent attempts to change the periodic table”. Philosophical Transactions of the Royal Society A. 378 (2180). doi:10.1098/rsta.2019.0300Stewart, Philip (April 2010). “Charles Janet: unrecognized genius of the Periodic System”. Foundations of Chemistry. 12: 5–15. doi:10.1007/s10698-008-9062-5Related Posts S-block elements are those elements in which the last electron is present in the s-orbital. In the periodic table. They reside in the first 2 columns. S-block consists of 14 elements that include, Hydrogen (H), Lithium (Li), Helium (He), Sodium (Na), Beryllium (Be), Potassium (K), Magnesium (Mg), Rubidium (Rb), Calcium (Ca), Caesium (Cs), Strontium (Sr), Francium (Fr), Barium (Ba), and Radium (Ra).In this article, we will learn about s-block elements, their various properties, and others in detail.What are s-block Elements?You all are well-familiar with the concept of the modern periodic table. In the modern periodic table, we learn about 4 kinds of blocks i.e. s-block, p-block, d-block & f-block. Here, we will learn the definition of s-block elements. It is the most intriguing block of the periodic table.The element which enters in the outermost s-orbital are known as s-block elements. S-block elements consists 2 groups i.e. Group 1 & Group 2. Group 1 consists elements which are called as alkali metals while Group 2 consists metals which are called as alkaline earth metals.Group 1- Alkali MetalsGroup 2- Alkaline Earth MetalsWhat are Alkali Metals of Group 1?Have you ever wondered why sodium causes a fizzy explosion when it is dropped in water? We will uncover this further.Group 1 elements are called alkali metals because they make hydroxides, whenever reacts with water. You all know that water is strongly alkaline. Here you got your answer for the above question. Alkali metals are well-known for their extreme reactions & their easy bond with other elements. The elements of Group 1 have 1 valence electron in their outermost s-orbital.Learn more about, Alkali MetalsWhat are Alkaline Earth Metals of Group 2?During any occasion, you buy fireworks right? And when you light them up, they starts glowing & gives a beautiful view. It's the magic of none other than our magnesium.Group 2 introduces us the alkaline earth metals which exists in the earth's crust. The interesting thing here is that their oxides & hydroxides are alkaline in nature. The elements of Group 2 have 2 valence electrons in their outermost s-orbital.Learn more about, Alkaline Earth MetalsTable of S-block Elements & Their SymbolS-block comprises total 14 elements which are classifies into 2 groups: Group 1 & Group 2. The classification of these 14 elements are given below in tabular form:S-block elementsGroup 1 (Alkali Metals)Group 2 (Alkaline Earth Metals)Name of ElementsSymbolName of ElementsSymbolHydrogenHBeryllium BeLithium LiMagnesium MgSodium NaCalcium CaPotassium KStrontium SrRubidium RbBarium BaCesium CsRadium RaFranciumFrHelium HeElectronic Configuration of S-block elementsElectronic Configuration of s-block elements is added in the image below,S-block ElementsGroup 1 (Alkali Metals)Group 2 (Alkaline Earth Metals)Name of elementsElectronic ConfigurationName of elementsElectronic ConfigurationHydrogen 1s1 Beryllium[He]2s2Lithium[He]2s1Magnesium[Ne]3s2Sodium [Ne]3s1Calcium[Ar]4s2Potassium[Ar]4s1Strontium[Kr]5s2Rubidium[Kr]5s1Barium[Xe]6s2Cesium[Xe]6s1Radium[Rn]7s2Francium[Rn]7s1Helium1s2Difference between Group 1A and Group 2A ElementsLet's learn the basic differences between the elements of Group 1 & Group 2 on the basis of some characteristics:CharacteristicsGroup 1 (Alkali Metals)Group 2 (Alkaline Earth Metals)ReactivityThese are highly reactive elements.These are less reactive elements.Oxidation StateThese have oxidation state as +1These have oxidation state as +2Electrons in outermost shellThese have only 1 electron.These have 2 electrons.Melting & Boiling PointThese have low melting & boiling point.These have high melting & boiling point.Properties of s-block ElementsThe S-block elements possesses distinct properties. In this section, you'll learn about the properties of s-block elements. Their properties mainly categorized into 2 parts:Physical PropertiesChemical PropertiesPhysical Properties of s-block ElementsLet's dive deep into the properties of s-block elementsMelting Point: S-block elements consists different melting points. The Group 1 elements i.e. Alkali metals have low melting point. For example, Sodium can be melted around 98° celsius. When we talk about Group 2 elements i.e. Alkaline Earth Metals, they have high melting point. For example, Calcium needs 842° celsius temperature to melt which is 9 times more than sodium needs.Conductivity: Due to the presence of electrons that are loosely bound, these electrons can easily move through the metallic structure. This encourages the flow of electricity. That's why s-block elements have higher electrical conductivity.Nature of Bonds: In S-block, the Group 1 elements i.e. Alkali metals always form ionic bonds as these elements have low ionization enthalpies that decreases downwards to the group. In simple words, as we move down the group, the ionic characteristic increases.Density: The densities of s-block elements is relatively low due to their large size. Photoelectric effect: The s-block elements shows photoelectric effect. They emit electrons from their surface, when they come into the contact of light. Lithium is an exception here because of its higher ionization enthalpy.Chemical Properties of s-block ElementsNow, it's time to learn about the chemical properties of S-block elements:Reactivity: S-block elements are highly reactive in nature. Group 1 elements especially Na and K are well-known for their high reactivity with water that results in producing hydrogen gas & hydroxides. Group 2 metals are less reactive as compared to Group 1 elements but still they show a notable reactivity when exposed to air or water.Formation of Compounds: S-block elements have high tendency to make compounds. They donate their electrons to form ionic compounds. Group 1 elements donate 1 valence electron while Group 2 elements donate 2 valence electrons to form a compound.Reducing Agents: Due to the strong tendency of loosing electrons, s-block elements are known as strong reducing agents.Atomic Mass of s-block ElementsAtomic mass is the total mass of the protons & neutrons in an atom of the element. It is denoted by atomic mass per unit i.e. a.m.u or g/mol.Atomic mass of S-block elements refers to the average mass of the atoms of a particular element, taking into account the various isotopes and their relative abundances in nature.Atomic masses of the s-block elements changes as we go down the groups. The number of protons & neutrons increases and that's why the atomic mass also increases.s-block Elements & Their Atomic MassesThe table added below shows the s-block elements and their atomic massS-Block ElementsGroup 1 (Alkali Metals)Group 2 (Alkaline Earth Metals)Name of ElementAtomic MassName of ElementAtomic MassHydrogen1.008 amuBeryllium9.012 amuLithium22.99 amuMagnesium24.305 amuSodium22.98 amuCalcium40.08 amuPotassium39.10 amu Strontium87.62 amuRubidium85.47 amuBarium137.33 amuCesium132.91 amuRadium226 amuFrancium223 amuHelium4.0026 amuDiagonal Relationship of s-Block ElementsDiagonal relationship is the relationship which shows a similar behavior between certain elements. These elements are located diagonally across each other within the same group but different periods of a periodic table.For example. Lithium (Li) and Magnesium (Mg) have a diagonal relationship. Due to their similar ionic sizes and electronic configurations, they show similarities. Even after being in different periods, they have a very similar size of ions which forms a diagonal relationship between them.Some of the similarities observed in these diagonal relationships include:Similar Ionic radii- Certain elements have remarkably similar ionic sizes. For example, Lithium (Li) and Magnesium (Mg} & Beryllium (Be) and Aluminum (Al).Common chemical behavior- Diagonal elements show similarity in their chemical reactions. For example, Lithium (Li) and Magnesium (Mg} & Beryllium (Be) and Aluminum (Al).Complex formation- Due to their anonymous charge densities and electronic configurations, diagonal elements form similar kind of complexes. For example, Lithium (Li) and Magnesium (Mg}.Oxidation state- Diagonal elements tend to show similar oxidation state in some cases. For example, Beryllium (Be) and Aluminum (Al).Periodic Trends in s-Block ElementsS-block elements show several kind of periodic trends. As you move down to the group:Atomic size of the elements increases due to the addition of electron shells.Metallic character of the s-block elements follows a certain pattern from left to right. The elements on left like Alkali metals easily lose electrons and shows strong metallic properties. While the elements on right like halogens and noble gases have more non-metallic traits. This happens due to the decreasing atomic sizes.As you move down the group, the reactivity of s-block elements increases due to the increase in their atomic sizes.Due to the increasing atomic size & shielding effect, the s-block elements need less energy to remove electrons which results in the decline of ionization energy.Compounds of s-block ElementsHere are preparations & properties of some important compounds of S-block elements:Sodium Hydroxide (NaOH)Preparation: Sodium hydroxide is generally prepared through the electrolysis of aqueous sodium chloride or via the reaction of sodium carbonate with calcium hydroxide.Properties: It is a white solid with high solubility in water and form a strongly alkaline solution. It is a strong base which is used in various industries such paper production, detergents, and in the chemical industry.Calcium Carbonate (CaCO3)Preparation: Calcium carbonate is naturally occured and can be obtained from limestone, chalk, or marble. It's also prepared through precipitation reaction by mixing calcium chloride & sodium carbonate.Properties: It is a white, odorless powder with a variety of applications such as cement production, diet supplement, plastic manufacturing and as a filler in paints and coatings.Read More,Important Compounds of SodiumImportant Compounds of CalciumSample Questions on s-Block ElementsQ1: Determine the atomic mass of following elements: Solution:Atomic mass of the given elements is,Na= 6.94 a.m.u.Ra= 226 a.m.u.Q2: Which of the following is alkaline earth metal?SodiumPotassiumRadiumFranciumSolution:Option is (3) Radium is Correct. Radium is an alkaline earth metal.Q3: Write the electronic configuration of following s-block elements:Solution:Electronic configuration of following s-block elements is:Calcium= [Ar]4s2Francium= [Rn]7s1Helium= 1s2 The elements of Groups 1 and 2 of the periodic table are called s-block elements. They include alkali and alkaline earth metals. They are called s-block because their valence electrons lie in the s orbital [1-4]. s-Block Elements The Group 1 elements or alkali metals have one electron in their valence shell. Their electron configuration ends in ns1, where n is the period number. A list of Group 1 elements, their chemical symbols, and electron configurations are shown below [1-4]. The Group 2 elements or alkaline earth metals have two electrons in their outermost shell with an electron configuration ending in ns2. A list of Group 2 elements, with their chemical symbols and electron configurations, are shown below [1-4]. Note: Helium is considered an s-block element since its valence electrons lie in the 1s subshell. However, it is located in Group 18. Its electron configuration is 1s2. 1. All the s-block elements are light metals except hydrogen, which is a non-metal. They are soft, silvery, shiny, and good conductors of electricity and heat. 2. The alkali metals have low melting and boiling points due to weak metallic bonding. They have low density, increasing Group 1 from Li to Cs. The exception is K, which is lighter than Na. Li is the lightest known metal. Fr is a natural element that can be found rarely on Earth. 3. The alkaline earth metals are harder than alkali metals. Due to their smaller sizes, their melting and boiling points are higher than the corresponding alkali metals. 1. The outermost electrons are loosely held to the atom. As a result, these metals quickly lose their valence electrons and are highly electropositive. 2. Alkali metals lose one valence electron and form a +1 oxidation state. Alkaline earth metals lose two valence electrons and form a +2 oxidation state. 3. Alkali and alkaline earth metals react vigorously with water to produce hydrogen gas. They must be stored carefully to prevent unnecessary reactions or even explosions. 4. Alkali metals react with hydrogen to produce hydrides. These hydrides react with water to form the corresponding hydroxides and hydrogen gas. Example 2 Li + H2 → 2 LiH LiH + H2O → LiOH + H2 Alkali metals also form complex hydrides such as LiAlH4. 5. Alkali metals react with oxygen to produce oxides and superoxide. Examples: Li2O and Na2O2. 6. Fireworks are composed of s-block elements along with other substances. Their purple, red, and green colors are due to the ionic forms of potassium, strontium, and barium. A diagonal relationship exists between the elements of the second and third periods. For instance, lithium in Group 1, Period 2 shows similar properties to magnesium in Group 2, period 3. Similarly, beryllium in Group 2, Period 2 shows similar properties to aluminum in Group 13, Period 3. Two elements showing identical properties are called diagonal pairs or diagonal neighbors [1-4]. Many similarities exist between lithium and magnesium, and one of them is the atomic size. The following table shows the atomic and ionic radii of the two elements. PropertyLithiumMagnesiumAtomic radius152 pm160 pmIonic radius76 pm72 pm Many similarities also exist between beryllium and aluminum. The ionic radius of Be2+ is 31 pm, and that of Al3+ is 50 pm. Both elements have nearly the same charge/radius ratio. References Chem.libretexts.orgStudy.comThoughtco.comSciencenotes.org Share — copy and redistribute the material in any medium or format for any purpose, even commercially. Adapt — remix, transform, and build upon the material for any purpose, even commercially. The licensor cannot revoke these freedoms as long as you follow the license terms. Attribution — You must give appropriate credit , provide a link to the license, and indicate if changes were made . You may do so in any reasonable manner, but not in any way that suggests the licensor endorses you or your use. ShareAlike — If you remix, transform, or build upon the material, you must distribute your contributions under the same license as the original. No additional restrictions — You may not apply legal terms or technological measures that legally restrict others from doing anything the license permits. You do not have to comply with the license for elements of the material in the public domain or where your use is permitted by an applicable exception or limitation . No warranties are given. The license may not give you all of the permissions necessary for your intended use. For example, other rights such as publicity, privacy, or moral rights may limit how you use the material. The S block elements have valence electrons in the s orbital.The s block elements are a group of chemical elements that have valence electrons in the s-subshell. In other words, atoms of these elements have a general valence electron configuration of ns1-2, where “n” is the principal quantum number and “s” is the orbital. A maximum of The elements are those in group 1 (the alkali metals), group 2 (the alkaline earth metals), and helium. French scientist and engineer Charles Janet introduced the concept of element blocks and also arranged the elements into different periodic table designs according to blocks.There are 14 s-block elements:Hydrogen (H)Helium (He)Lithium (Li)Beryllium (Be)Sodium (Na)Magnesium (Mg)Potassium (K)Calcium (Ca)Rubidium (Rb)Strontium (Sr)Cesium (Cs)Barium (Ba)Francium (Fr)Radium (Ra)Note that helium is in the same column as the p-block elements, but it does not have any valence electrons in the p subshell.The alkali metals have a single valence electron in their outer shell, while helium and the alkaline earth metals have two valence electrons in the outer shell. Here is a list of the s-block element electron configurations:Atomic NumberSymbolElectron Configuration1H1s12He1s23Li1s22s14Be[He]2s211Na1s22s22p63s112Mg[Ne]3s219K1s22s22p63s23p64s120Ca[Ar]4s237Rb1s22s22p63s23p63d104s24p65s138Sr[Kr]5s255Cs[Xe]6s156Ba[Xe]6s287Fr[Rn]7s188Ra[Rn]7s2All of the s-block elements, except helium, readily lose their valence electrons and form chemical bonds. The elements in group 1 form ions with a +1 charge, while those in group 2 form ions with a +2 charge. With the exceptions of hydrogen and helium, the s-block elements are highly reactive metals. The metallic elements are shiny, silver-colored (except cesium, which has a golden tint), and good electrical and thermal conductors. The s-block elements form soft, light solids that have low melting points. Except for hydrogen and helium, the elements vigorously react in air and in water. Keeping them in an inert atmosphere or under mineral oil protects them against oxidation.The diagonal relationship is when an element display behavior more like the element diagonal to it on the periodic table than to other elements in its own group. This occurs in some s-block elements. Lithium displays behavior similar to magnesium. Beryllium acts similarly to aluminum. The reason for this behavior is because lithium/magnesium and beryllium/aluminum are element pairs with similar ionic radius sizes and comparable charge/radius ratios.The s-block elements feature prominently in firework colors. So, the flame test is a good first step toward identifying them. Note that not all of these elements display a characteristic color and some colors are similar to each other.ElementFlame Test ColorLithiumCarmine redSodiumYellowPotassiumLilacRubidiumViolet redCesiumBlue violetBeryllium WhiteMagnesiumColorless to whiteCalciumBrick redStrontiumCrimson redBariumApple greenAside from the flame test, the reactivity series helps identify an element when comparing its reactivity against another. For example, lithium replaces other metals in a reaction. Barium replaces calcium or magnesium, but not lithium.Gschneidner Jr., Karl A. (2016). “282. Systematics”. In Jean-Claude G. Bünzli; Vitalij K. Pecharsky (eds.). Handbook on the Physics and Chemistry of Rare Earths. 50. ISBN: 978-0-444-63851-9.Langmuir, Irving (June 1919). “The Arrangement of Electrons in Atoms and Molecules”. Journal of the American Chemical Society. 41 (6): 868–934. doi:10.1021/ja02227a002Scerri, Eric (2020). “Recent attempts to change the periodic table”. Philosophical Transactions of the Royal Society A. 378 (2180). doi:10.1098/rsta.2019.0300Stewart, Philip (April 2010). “Charles Janet: unrecognized genius of the Periodic System”. Foundations of Chemistry. 12: 5–15. doi:10.1007/s10698-008-9062-5Related Posts The "s-block" in the periodic table refers to the two groups of elements located in the leftmost part of the periodic table: Group 1 and Group 2. These elements are characterized by their outermost electrons occupying the s orbital of their respective electron shells.1.0What are s-block Elements?The s-block elements in the Periodic Table are those where the last electron enters the outermost s-orbital. Two groups, 1 and 2, belong to the s-block. Here is s-block element’s position in periodic table-Group 1 includes- Lithium, Sodium, Potassium, Rubidium, Caesium, and Francium, collectively known as the alkali metals. They are named so because they form strongly alkaline hydroxides when reacting with water. Group 2 comprises- Beryllium, Magnesium, Calcium, Strontium, Barium, and Radium. Except for beryllium, they are known as the alkaline earth metals, as their oxides and hydroxides are alkaline and are commonly found in the earth’s crust.Alkali metals and alkaline earth metals are both groups of elements found in the s-block of the periodic table, but they have distinct differences in their properties and reactivities.2.0Electronic Configuration of s-block Elements Group- 1 Electronic Configuration-Group-2 Electronic Configuration-3.0Properties of s blockHere we will discuss some unique and important properties of s-block elements. Physical Properties of s-block ElementsNote- In s-block elements Beryllium (Be) has the smallest size, while Caesium (Cs) has the largest size.Note- In s-block elements Be has smallest size, while Cs has largest size.Flame test- The flame test is a method used to identify the presence of certain metal ions in a compound by observing the color of the flame when the compound is heated. Different metals produce characteristic flame colors due to electronic transitions, allowing for qualitative analysis.Chemical Properties of s-block Elements4.0Important Compounds of s-block ElementsNaCl (Sodium Chloride):Properties: It is a white crystalline solid with a high melting point. It is highly soluble in water and forms a salty solution.Uses: Commonly known as table salt, it is used as a seasoning and preservative in food. It is also used in the production of chemicals, in the food processing industry, and in water softening.NaOH (Sodium Hydroxide):Properties: It is a white solid at room temperature, highly soluble in water, and forms a strongly alkaline solution.Uses: Sodium hydroxide is widely used in the manufacture of pulp and paper, textiles, soaps, detergents, and various types of cleaners. It is also used in the production of biodiesel, as a pH regulator in water treatment, and in many chemical processes.NaHCO3 (Sodium Bicarbonate):Properties: It is a white crystalline solid with a slightly alkaline taste. It is moderately soluble in water.Uses: Sodium bicarbonate, commonly known as baking soda, is used as a leavening agent in baking. It is also used as an antacid to relieve heartburn and indigestion. Additionally, it finds applications in cleaning and deodorizing.Na2CO3 (Sodium Carbonate):Properties: It is a white, odorless solid, soluble in water. It is alkaline in nature.Uses: Sodium carbonate, also known as soda ash or washing soda, is used in glassmaking, detergent production, and in the manufacturing of various chemicals. It is also used in water treatment processes and as a pH regulator in swimming pools.CaO (Calcium Oxide):Properties: It is a white, caustic solid with a high melting point. It reacts vigorously with water to form calcium hydroxide.Uses: Calcium oxide, also known as quicklime, is used in various industrial processes such as steelmaking, water treatment, and the production of cement, paper, and chemicals. It is also used in agriculture to neutralize acidic soils.Ca(OH)2 (Calcium Hydroxide):Properties: It is a white powder with low solubility in water. It forms a strong alkaline solution.Uses: Calcium hydroxide, commonly known as slaked lime, is used in construction (mortar and plaster), wastewater treatment, and as a pH regulator in agriculture. It is also used in food processing (pickling) and as an ingredient in toothpaste and antacids.CaSO4 (Calcium Sulfate):Uses: Calcium sulfate is commonly found in two forms:Gypsum (CaSO4·2H2O): Used in the construction industry for making plaster of Paris, plasterboard, and cement.Anhydrous Calcium Sulfate (CaSO4): Used in agriculture as a soil conditioner and in brewing as a water conditioner.Plaster of Paris:Properties: It is a white powder that hardens when mixed with water.Uses: Plaster of Paris, made by heating gypsum to remove water molecules, is used in construction for making casts, molds, and sculptures. It is also used in medicine for casting broken limbs and in dentistry for making dental impressions. Additionally, it finds applications in art and crafts for creating sculptures and decorative items. The S block elements have valence electrons in the s orbital.The s block elements are a group of chemical elements that have valence electrons in the s-subshell. In other words, atoms of these elements have a general valence electron configuration of ns1-2, where “n” is the principal quantum number and “s” is the orbital. A maximum of The elements are those in group 1 (the alkali metals), group 2 (the alkaline earth metals), and helium. French scientist and engineer Charles Janet introduced the concept of element blocks and also arranged the elements into different periodic table designs according to blocks.There are 14 s-block elements:Hydrogen (H)Helium (He)Lithium (Li)Beryllium (Be)Sodium (Na)Magnesium (Mg)Potassium (K)Calcium (Ca)Rubidium (Rb)Strontium (Sr)Cesium (Cs)Barium (Ba)Francium (Fr)Radium (Ra)Note that helium is in the same column as the p-block elements, but it does not have any valence electrons in the p subshell.The alkali metals have a single valence electron in their outer shell, while helium and the alkaline earth metals have two valence electrons in the outer shell. Here is a list of the s-block element electron configurations:Atomic NumberSymbolElectron Configuration1H1s12He1s23Li1s22s14Be[He]2s211Na1s22s22p63s112Mg[Ne]3s219K1s22s22p63s23p64s120Ca[Ar]4s237Rb1s22s22p63s23p63d104s24p65s138Sr[Kr]5s255Cs[Xe]6s156Ba[Xe]6s287Fr[Rn]7s188Ra[Rn]7s2All of the s-block elements, except helium, readily lose their valence electrons and form chemical bonds. The elements in group 1 form ions with a +1 charge, while those in group 2 form ions with a +2 charge. With the exceptions of hydrogen and helium, the s-block elements are highly reactive metals. The metallic elements are shiny, silver-colored (except cesium, which has a golden tint), and good electrical and thermal conductors. The s-block elements form soft, light solids that have low melting points. Except for hydrogen and helium, the elements vigorously react in air and in water. Keeping them in an inert atmosphere or under mineral oil protects them against oxidation.The diagonal relationship is when an element display behavior more like the element diagonal to it on the periodic table than to other elements in its own group. This occurs in some s-block elements. Lithium displays behavior similar to magnesium. Beryllium acts similarly to aluminum. The reason for this behavior is because lithium/magnesium and beryllium/aluminum are element pairs with similar ionic radius sizes and comparable charge/radius ratios.The s-block elements feature prominently in firework colors. So, the flame test is a good first step toward identifying them. Note that not all of these elements display a characteristic color and some colors are similar to each other.ElementFlame Test ColorLithiumCarmine redSodiumYellowPotassiumLilacRubidiumViolet redCesiumBlue violetBeryllium WhiteMagnesiumColorless to whiteCalciumBrick redStrontiumCrimson redBariumApple greenAside from the flame test, the reactivity series helps identify an element when comparing its reactivity against another. For example, lithium replaces other metals in a reaction. Barium replaces calcium or magnesium, but not lithium.Gschneidner Jr., Karl A. (2016). “282. Systematics”. In Jean-Claude G. Bünzli; Vitalij K. Pecharsky (eds.). Handbook on the Physics and Chemistry of Rare Earths. 50. ISBN: 978-0-444-63851-9.Langmuir, Irving (June 1919). “The Arrangement of Electrons in Atoms and Molecules”. Journal of the American Chemical Society. 41 (6): 868–934. doi:10.1021/ja02227a002Scerri, Eric (2020). “Recent attempts to change the periodic table”. Philosophical Transactions of the Royal Society A. 378 (2180). doi:10.1098/rsta.2019.0300Stewart, Philip (April 2010). “Charles Janet: unrecognized genius of the Periodic System”. Foundations of Chemistry. 12: 5–15. doi:10.1007/s10698-008-9062-5Related Posts • General Electronic Configuration of s-Block Elements For alkali metals [noble gas] ns1 For alkaline earth metals [noble gas] ns2 • Group 1 Elements: Alkali metals Electronic Configuration, ns1, where n represents the valence shell. These elements are called alkali metals because they readily dissolve in water to form soluble hydroxides, which are strongly alkaline in nature. • Atomic and Ionic Radii Atomic and ionic radii of alkali metals increase on moving down the group i.e., they increase in size going from Li to Cs. Alkali metals form monovalent cations by losing one valence electron. Thus cationic radius is less as compared to the parent atom. • Ionization Enthalpy The ionization enthalpies of the alkali metals are generally low and decrease down the group from Li to Cs. Reason: Since alkali metals possess large atomic sizes as a result of which the valence s-electron (ns1) can be easily removed. These values decrease down the group because of decrease in the magnitude of the force of attraction with the nucleus on account of increased atomic radii and screening effect. • Hydration Enthalpy Smaller the size of the ion, more is its tendency to get hydrated hence more is the hydration enthalpy. Hydration enthalpies of alkali metal ions decrease with increase in ionic sizes. Li+ > Na+ > K+ > Rb+ > Cs+ • Physical Properties (i) All the alkali metals are silvery white, soft and light metals. (ii) They have generally low density which increases down the group. (iii) They impart colour to an oxidising flame. This is because the heat from the flame excites the outermost orbital electron to a higher energy level. When the excited electron comes back to the ground state, there is emission of radiation in the visible region. • Chemical Properties of Alkali Metals (i) Reaction with air: When exposed to air surface of the alkali metals get tarnished due the formation of oxides and hydroxides. Alkali metals combine with oxygen upon heating to form different oxides depending upon their nature. (ii) Reaction with water: Alkali metals react with water to form hydroxide and dihydrogen (iii) Reaction with hydrogen: The alkali metals combine with hydrogen at about 673 K (lithium at 1073 K) to form hydrides. 2M + H2 ————-> 2M+ The ionic character of hydrides increases from Li to Cs. (iv) Reaction with halogens: Alkali metals combine with halogens directly to form metal halides. 2M + X2————–> 2MX They have high melting and boiling points. Order of reactivity of M: (v) Reducing nature: The alkali metals are strong reducing agents. In aqueous solution it has been observed that the reducing character of alkali metals follows the sequence Na < K < Rb < Cs < Li, Li is the strongest while sodium is least powerful reducing agent. This can be explained in terms of electrode potentials (E°). Since the electrode potential of Li is the lowest. Thus Li is the strongest reducing agent. (vi) Solubility in liquid ammonia: The alkali metals dissolve in liquid ammonia to give deep blue solution. The solution is conducting in nature. M+ (x + y) NH3 ———-> [M (NH3) X]+ + [e (NH3) y]– When light falls on the ammoniated electrons, they absorb energy corresponding to red colour and the light which emits from it has blue colour. In concentrated solution colour changes from blue to bronze. The blue solutions are paramagnetic while the concentrated solutions are diamagnetic. • Uses of Alkali Metals Uses of Lithium (i) Lithium is used as deoxidiser in the purification of copper and nickel. (ii) Lithium is used to make both primary and secondary batteries. (iii) Lithium hydride is used as source of hydrogen for meteorological purposes. (iv) Lithium aluminium hydride (LiAlH4) is a good reducing agent. (v) Lithium carbonate is used in making glass. Uses of Sodium (i) Used as sodium amalgum in laboratory (synthesis of organic compounds). (ii) Sodium is used in sodium vapour lamp. (iii) In molten state, it is used in nuclear reactors. (iv) An alloy of sodium-potassium is used in high temperature thermometres. Uses of Potassium (i) Salts of potassium are used in fertilizers. (ii) Used as reducing agent. Uses of Cesium (i) In rocket propellent (ii) In photographic cells. • Group 2 Elements: Alkaline Earth Metals Alkaline Earth Metals: They were named alkaline earth metals since they were alkaline in nature like alkali metals oxides and they were found in the earth’s crust. Example, Be (Beryllium), Ca, Mg, Sr etc. • Electronic Configuration Their general electronic configuration is represented as [noble gas] ns2. • Atomic and Ionic Radii Atomic and ionic radii of alkaline earth metals one comparatively smaller than alkali metals. Within the group atomic and ionic radii increases with the increase in atomic number. Reason: Because these elements have only two valence electrons and the magnitude of the force of attraction with the nucleus is quite small. • Ionization Enthalpies These metals also have low ionization enthalpies due to fairly large size of atoms. As the atomic sizes increase down the group ionization enthalpies are expected to decrease in the same manner. Due to their small size in comparison to alkali metals first ionization enthalpies of alkaline earth metals is higher than that of alkali metals. • Hydration Enthalpies The hydration enthalpies of alkaline earth metal ions are larger than those of the alkali metals. Thus alkaline earth metals have more tendency to become hydrate. The hydration enthalpies decreases down the group since the cationic size increases. Be2+ > Mg2+ > Ca2+ > Sr2+ > Ba2+ Metallic character: They have strong metallic bonds as compared to the alkali metals in the same period. This is due to the smaller kernel size of alkaline earth metal and two valence electrons present in the outermost shell. • Physical Properties (i) They are harder than alkali metals. (ii) M.P and B.P are higher than the corresponding alkali metals due to their small size. (iii) The electropositive character increases down the group. (iv) Except Be and Mg, all these metals impart characteristic colour to the flame. (v) The alkaline earth metals possess high thermal and electrical conductivity. • Chemical Properties 1. Reaction with oxygen. Beryllium and magnesium are kinetically inert to oxygen because of the formation of a thin film of oxide on their surface. Reactivity towards oxygen increases as going down the group. 2. Reaction with water. Since these metals are less electropositive than alkali metals, they are less reactive towards water. Magnesium reacts with boiling water or steam. Rest of the members reacts even with cold water. Mg + 2H20 ——> Mg(OH)2 + H2 Ca + 2H20 ————> Ca(OH)2 + H2 3. Reaction with halogens. They combine with the halogens at appropriate temperature to form corresponding halides MX2. M + X2 ——-> MX2 (X = F, Cl, Br, I) Thermal decomposition of (NH4)2 BeF4is used for the preparation of BeF2. 4. Reaction with hydrogen. These metals except Be combine with hydrogen directly upon heating to form metal hydrides. • General Characteristics of Compounds of Alkaline Earth Metals Oxides and Hydroxides (i) The alkaline earth metals bum in oxygen to form MO (monoxide). (ii) These oxides are very stable to heat. (iii) BeO is amphoteric in nature while oxides of other elements are ionic. (iv) Exept BeO, they are basic in nature and react with water to form sparingly soluble hydroxides. MO + H2O ————> M(OH)2 (v) Hydroxides of alkaline earth metals are less stable and less basic than alkali metal hydroxides. (vi) Beryllium hydroxide is amphoteric in nature. Halides The alkaline earth metals combine directly with halogens at appropriate temperatures forming halides, MX2. They can also be prepared by the action of halogen acids (HX) on metals, metal oxides, metal hydroxides. M + 2HX ——> MX2 + H2 MO + 2HX ——> MX2 + H20 M (OH)2 + 2HX —–> MX2 + 2H20 (i) Except beryll