The ACA is a not-for-profit, membership Association which disseminates information on corrosion and its prevention or control by providing training, 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. In chemistry, an activity series lets you predict the degree to which a particular element reacts with water and acids. Although this type of ordering is primarily used with metals, you can also organize non-metals into an activity series. Different elements exhibit a wide range of reactive potential, from explosive to inert. An activity series lists elements ranked with the most reactive at the top and the least reactive on the bottom. Most of the elements in the periodic table are metal substances distinguished by their luster, electrical conductivity and other physical properties. With the exception of mercury, they are solids with relatively high melting points. A defining characteristic of metals is the loose hold the atoms have on their outermost electrons. It is these electrons that participate in chemical reactions and determine the rank in an activity series. As you progress from the top to the bottom of a column of metals in the periodic table, activity tends to increase. Non-metals are elements such as carbon, sulfur and oxygen. Physically, they tend to be non-lustrous and poor conductors of electricity. These substances have a strong hold on their outer electrons, and may even "rob" nearby metal atoms of some of their electrons. Unlike metals, which tend to be more chemically reactive as their atomic numbers increase, the heaviest non-metals are less reactive than the lighter ones. An activity series indicates how strongly an element reacts to aqueous solutions at room temperature. Among the metals, you'll find the strongest reactions among the alkali group that makes up the first column of the periodic table. An activity series that includes the alkali metals will rank them in reverse order, with those lowest in the column at the top of the list, because cesium and rubidium react more violently than lithium and sodium. The halogens, which constitute the 17th column, are highly reactive non-metals. An activity series using halogens ranks them in the order they appear in the periodic table, with fluorine the most reactive. Water and acids dissolve metals to varying degrees, dispersing metal ions into an aqueous solution. Once the metal is dissolved, however, you recover it in solid form by dissolving another with a higher activity. For example, if you dissolve iron with acid, then add aluminum to the solution, the aluminum dissolves and the iron turns back into a solid. Aluminum has a higher activity than iron, so it takes iron's place in the solution. If you then try to dissolve nickel with the same solution, the nickel remains a solid. Aluminum has a higher activity than nickel, so nickel will not force aluminum out of the solution. Papiewski, John. "What Can Be Predicted By Using An Activity Series?" sciencing.com, . 24 April 2017. APA Papiewski, John. (2017, April 24). What Can Be Predicted By Using An Activity Series?. sciencing.com. Retrieved from Chicago Papiewski, John. What Can Be Predicted By Using An Activity Series? last modified March 24, 2022. Analytical progression of a series of metals arranged by their reactivity in descending orderNot to be confused with Electrochemical series.In chemistry, a reactivity series (or reactivity series of elements) is an empirical, calculated, and structurally analytical progression[1] of a series of metals, arranged by their "reactivity" from highest to lowest.[2][3][4] It is used to summarize information about the reactions of metals with acids and water, single displacement reactions and the extraction of metals from their ores. [5]MetalIonReactivityExtractionCaesiumCsCs+reacts with cold waterElectrolysis (a.k.a. electrolytic refining)RubidiumRbRb+PotassiumKK+SodiumNaNa+LithiumLiLi+BariumBaBa2+StrontiumSrSr2+CalciumCaCa2+MagnesiumMgMg2+reacts very slowly with cold water, but rapidlyin boiling water, and very vigorously with acidsBerylliumBeBe2+reacts with acids and steamAluminiumAlAl3+ManganeseMnMn2+reacts with acids; very poor reaction with steamsmelting with cokeZincZnZn2+ChromiumCrCr3+aluminothermic reactionIronFeFe2+smelting with cokeCadmiumCdCd2+CobaltCoCo2+NickelNiNi2+TinSnSn2+LeadPbPb2+AntimonySbSb3+may react with some strong oxidizing acidsheat or physical extractionBismuthBiBi3+CopperCuCu2+reacts slowly with airTungstenWW3+[citation needed]may react with some strong oxidizing acidsMercuryHgHg2+SilverAgAg+GoldAuAu3+[6][7]PlatinumPtPt4+Going from the bottom to the top of the table the metals:increase in reactivity;lose electrons (oxidize) more readily to form positive ions;corrode or tarnish more readily;require more energy (and different methods) to be isolated from their compounds;become stronger reducing agents (electron donors).There is no unique and fully consistent way to define the reactivity series, but it is common to use the three types of reaction listed below, many of which can be performed in a high-school laboratory (at least as demonstrations).[6]The most reactive metals, such as sodium, will react with cold water to produce hydrogen and the metal hydroxide:2 Na (s) + 2 H2O (l) 2 NaOH (aq) + H2 (g)Metals in the middle of the reactivity series, such as iron, will react with acids such as sulfuric acid (but not water at normal temperatures) to give hydrogen and a metal salt, such as iron(II) sulfate:Fe (s) + H2SO4 (l) FeSO4 (aq) + H2 (g)There is some ambiguity at the borderlines between the groups. Magnesium, aluminium and zinc can react with water, but the reaction is usually very slow unless the metal samples are specially prepared to remove the surface passivation layer of oxide which protects the rest of the metal. Copper and silver will react with nitric acid; but because nitric acid is an oxidizing acid, the oxidizing agent is not the H+ ion as in normal acids, but the NO3 ion.The reactivity series is sometimes quoted in the strict reverse order of standard electrode potentials, when it is also known as the "electrochemical series".[8]The following list includes the metallic elements of the first six periods. It is mostly based on tables provided by NIST.[9][10] However, not all sources give the same values: there are some differences between the precise values given by NIST and the CRC Handbook of Chemistry and Physics. In the first six periods this does not make a difference to the relative order, but in the seventh period it does, so the seventh-period elements have been excluded. (In any case, the typical oxidation states for the most accessible seventh-period elements thorium and uranium are too high to allow a direct comparison.)[11]Hydrogen has been included as a benchmark, although it is not a metal. Borderline germanium, antimony, and astatine have been included. Some other elements in the middle of the 4d and 5d rows have been omitted (ZrTc, HfOs) when their simple cations are too highly charged or of rather doubtful existence. Greyed-out rows indicate values based on estimation rather than experiment.ZSymElementReactionE (V)3LilithiumLi+ + e Li3.0455CscaesiumCs+ + e Cs3.0337RbrubidiumRb+ + e Rb2.9419KpotassiumK+ + e K2.9456BabariumBa2+ + 2 e Ba2.9138SrstrontiumSr2+ + 2 e Sr2.9020CacalciumCa2+ + 2 e Ca2.8711NasodiumNa+ + e Na2.7157LalanthanumLa3+ + 3 e La2.3839YyttriumY3+ + 3 e Y2.3812MgmagnesiumMg2+ + 2 e Mg2.3659PrpraseodymiumPr3+ + 3 e Pr2.3558CeceriumCe3+ + 3 e Ce2.3468ErerbiumEr3+ + 3 e Er2.3367HoholmiumHo3+ + 3 e Ho2.3360NdneodymiumNd3+ + 3 e Nd2.3269TmthuliumTm3+ + 3 e Tm2.3262SmsamariumSm3+ + 3 e Sm2.3061PmpromethiumPm3+ + 3 e Pm2.3066DydysprosiumDy3+ + 3 e Dy2.2971LulutetiumLu3+ + 3 e Lu2.2865TbterbiumTb3+ + 3 e Tb2.2864GdgadoliniumGd3+ + 3 e Gd2.2870YbytterbiumYb3+ + 3 e Yb2.1921ScscandiumSc3+ + 3 e Sc2.0963EueuropiumEu3+ + 3 e Eu1.994BeberylliumBe2+ + 2 e Be1.9713AlaluminiumAl3+ + 3 e Al1.6822TititaniumTi3+ + 3 e Ti1.3725MnmanganeseMn2+ + 2 e Mn1.1823VvanadiumV2+ + 2 e V1.1224CrchromiumCr2+ + 2 e Cr0.8930ZnzincZn2+ + 2 e Zn0.7631GagalliumGa3+ + 3 e Ga0.5526FeironFe2+ + 2 e Fe0.4448CdcadmiumCd2+ + 2 e Cd0.4049IninidiumIn3+ + 3 e In0.3481TlthalliumTl+ + e Tl0.3427CocobaltCo2+ + 2 e Co0.2828NinickelNi2+ + 2 e Ni0.2450SntinSn2+ + 2 e Sn0.1482PbleadPb2+ + 2 e Pb0.131Hhydrogen2 H+ + 2 e H20.0032GegermaniumGe2+ + 2 e Ge+0.151SbantimonySb3+ + 3 e Sb+0.1583BibismuthBi3+ + 3 e Bi+0.3129CucopperCu2+ + 2 e Cu+0.3484PopoloniumPo2+ + 2 e Po+0.644RurutheniumRu3+ + 3 e Ru+0.6045RhrhodiumRh3+ + 3 e Rh+0.7647AgsilverAg+ + e Ag+0.8080HgmercuryHg2+ + 2 e Hg+0.8546PdpalladiumPd2+ + 2 e Pd+0.9277IriridiumIr3+ + 3 e Ir+1.085AtastatineAt+ + e At+1.078PtplatinumPt2+ + 2 e Pt+1.1879AugoldAu3+ + 3 e Au+1.50The positions of lithium and sodium are changed on such a series.Standard electrode potentials offer a quantitative measure of the power of a reducing agent, rather than the qualitative considerations of other reactive series. However, they are only valid for standard conditions: in particular, they only apply to reactions in aqueous solution. Even with this proviso, the electrode potentials of lithium and sodium and hence their positions in the electrochemical series appear anomalous. The order of reactivity, as shown by the vigour of the reaction with water or the speed at which the metal surface tarnishes in air, appears to beCs > K > Na > Li > alkaline earth metals,i.e., alkali metals > alkaline earth metals,the same as the reverse order of the (gas-phase) ionization energies. This is borne out by the extraction of metallic lithium by the electrolysis of a eutectic mixture of lithium chloride and potassium chloride: lithium metal is formed at the cathode, not potassium.[1]The image shows a periodic table extract with the electronegativity values of metals.[12]Wulfsberg[13] distinguishes: very electropositive metals with electronegativity values below 1.4 electropositive metals with values between 1.4 and 1.9; and electronegative metals with values between 1.9 and 2.54.From the image, the group 12 metals and the lanthanides and actinides are very electropositive to electropositive; the transition metals in groups 3 to 12 are very electropositive to electronegative; and the post-transition metals are electropositive to electronegative. The noble metals, inside the dashed border (as a subset of the transition metals) are very electronegative.Reactivity (chemistry), which discusses the inconsistent way that the term 'reactivity' is used in chemistry.^ a b Greenwood, Norman N.; Earnshaw, Alan (1984). Chemistry of the Elements. Oxford: Pergamon Press. pp.8287. ISBN978-0-08-022057-4.^ France, Colin (2008), The Reactivity Series of Metals^ Briggs, J. G. R. (2005), Science in Focus, Chemistry for GCE 'O' Level, Pearson Education, p.172^ Lim Eng Wah (2005), Longman Pocket Study Guide 'O' Level Science-Chemistry, Pearson Education, p.190^ "Metal extraction and the reactivity series - The reactivity series of metals - GCSE Chemistry (Single Science) Revision - WJEC". BBC Bitesize. Retrieved 2023-03-24.^ a b Activity series at the Wayback Machine (archived 2019-05-07)^ Wulsberg, Gary (2000). Inorganic Chemistry. p.294. ISBN9781891389016.^ Periodic table poster at the Wayback Machine (archived 2022-02-24) by A. V. Kulsha and T. A. Kolevich gives: Li > Cs > Rb > K > Ba > Sr > Ca > Na > La > Y > Mg > Ce > Sc > Be > Al > Ti > Mn > V > Cr > Zn > Ga > Fe > Cd > In > Tl > Co > Ni > Sn > Pb > (H) > Sb > Bi > Cu > Po > Ru > Rh > Ag > Hg > Pd > Ir > Pt > Au^ Standard Electrode Potentials and Temperature Coefficients in Water at 298.15 K, Steven G. Bratsch (NIST)^ For antimony: Antimony - Physico-chemical properties - DACTARI^ Lide, David R., ed. (2006). CRC Handbook of Chemistry and Physics (87thed.). Boca Raton, Florida: CRC Press. ISBN0-8493-0487-3.^ Aylward, G; Findlay, T (2008). SI Chemical Data (6ed.). Milton, Queensland: John Wiley & Sons. p.126. ISBN978-0-470-81638-7.^ Wulfsberg, G (2018). Foundations of Inorganic Chemistry. Mill Valley: University Science Books. p.319. ISBN978-1-891389-95-5.Science Line ChemistryRetrieved from " activity series helps predict metal reactions with water, acids, and in displacement reactions.Metals at the top of the activity series are more reactive than those at the bottom.The reactivity series can aid in predicting reactions in aqueous solutions at room temperature. The activity series of metals is an empirical tool used to predict products in displacement reactions and reactivity of metals with water and acids in replacement reactions and ore extraction. It can be used to predict the products in similar reactions involving a different metal. The activity series is a chart of metals listed in order of declining relative reactivity. The top metals are more reactive than the metals on the bottom. For example, both magnesium and zinc can react with hydrogen ions to displace H2 from a solution by the reactions: Mg(s) + 2 H+(aq) H2(g) + Mg2+(aq) Zn(s) + 2 H+(aq) H2(g) + Zn2+(aq) Both metals react with the hydrogen ions, but magnesium metal can also displace zinc ions in solution by the reaction: Mg(s) + Zn2+ Zn(s) + Mg2+ This shows magnesium is more reactive than zinc and both metals are more reactive than hydrogen. This third displacement reaction can be used for any metal that appears lower than itself on the table. The further apart the two metals appear, the more vigorous the reaction. Adding a metal like copper to zinc ions will not displace the zinc since copper appears lower than zinc on the table. The first five elements are highly reactive metals that will react with cold water, hot water, and steam to form hydrogen gas and hydroxides. The next four metals (magnesium through chromium) are active metals that will react with hot water or steam to form their oxides and hydrogen gas. All the oxides of these two groups of metals will resist reduction by H2 gas. The six metals from iron to lead will replace hydrogen from hydrochloric, sulfuric and nitric acids. Their oxides can be reduced by heating with hydrogen gas, carbon, and carbon monoxide. All the metals from lithium to copper will combine readily with oxygen to form their oxides. The last five metals are found free in nature with little oxides. Their oxides form through alternate pathways and will readily decompose with heat. The series chart below works remarkably well for reactions that occur at or near room temperatures and in aqueous solutions. MetalSymbolReactivityLithiumLidisplaces H2 gas from water, steam and acids and forms hydroxidesPotassiumKStrontiumSrCalciumCaSodiumNaMagnesiumMgdisplaces H2 gas from steam and acids and forms hydroxidesAluminumAlZincZnChromiumCrIronFedisplaces H2 gas from acids only and forms hydroxidesCadmiumCdCobaltCoNickelNiTinSnLeadPbHydrogen gasH2included for comparisonAntimonySbcombines with O2 to form oxides and cannot displace H2ArsenicAsBismuthBiCopperCuMercuryHgfound free in nature, oxides decompose with heatingSilverAgPalladiumPdPlatinumPtGoldAu Greenwood, Norman N.; Earnshaw, Alan (1984). Chemistry of the Elements. Oxford: Pergamon Press. pp. 8287. ISBN 0-08-022057-6.Analytical progression of a series of metals arranged by their reactivity in descending orderNot to be confused with Electrochemical series.In chemistry, a reactivity series (or reactivity series of elements) is an empirical, calculated, and structurally analytical progression[1] of a series of metals, arranged by their "reactivity" from highest to lowest.[2][3][4] It is used to summarize information about the reactions of metals with acids and water, single displacement reactions and the extraction of metals from their ores.[5]MetalIonReactivityExtractionCaesiumCsCs+reacts with cold waterElectrolysis (a.k.a. electrolytic refining)RubidiumRbRb+PotassiumKK+SodiumNaNa+LithiumLiLi+BariumBaBa2+StrontiumSrSr2+CalciumCaCa2+MagnesiumMgMg2+reacts very slowly with cold water, but rapidlyin boiling water, and very vigorously with acidsBerylliumBeBe2+reacts with acids and steamAluminiumAlAl3+ManganeseMnMn2+reacts with acids; very poor reaction with steamsmelting with cokeZincZnZn2+ChromiumCrCr3+aluminothermic reactionIronFeFe2+smelting with cokeCadmiumCdCd2+CobaltCoCo2+NickelNiNi2+TinSnSn2+LeadPbPb2+AntimonySbSb3+may react with some strong oxidizing acidsheat or physical extractionBismuthBiBi3+CopperCuCu2+reacts slowly with airTungstenWW3+[citation needed]may react with some strong oxidizing acidsMercuryHgHg2+SilverAgAg+GoldAuAu3+[6][7]PlatinumPtPt4+Going from the bottom to the top of the table the metals:increase in reactivity;lose electrons (oxidize) more readily to form positive ions;corrode or tarnish more readily;require more energy (and different methods) to be isolated from their compounds;become stronger reducing agents (electron donors).There is no unique and fully consistent way to define the reactivity series, but it is common to use the three types of reaction listed below, many of which can be performed in a high-school laboratory (at least as demonstrations).[6]The most reactive metals, such as sodium, will react with cold water to produce hydrogen and the metal hydroxide:2 Na (s) + 2 H2O (l) 2 NaOH (aq) + H2 (g)Metals in the middle of the reactivity series, such as iron, will react with acids such as sulfuric acid (but not water at normal temperatures) to give hydrogen and a metal salt, such as iron(II) sulfate:Fe (s) + H2SO4 (l) FeSO4 (aq) + H2 (g)There is some ambiguity at the borderlines between the groups. 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However, they are only valid for standard conditions: in particular, they only apply to reactions in aqueous solution. Even with this proviso, the electrode potentials of lithium and sodium and hence their positions in the electrochemical series appear anomalous. The order of reactivity, as shown by the vigour of the reaction with water or the speed at which the metal surface tarnishes in air, appears to beCs > K > Na > Li > alkaline earth metals,i.e., alkali metals > alkaline earth metals,the same as the reverse order of the (gas-phase) ionization energies. 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The noble metals, inside the dashed border (as a subset of the transition metals) are very electronegative.Reactivity (chemistry), which discusses the inconsistent way that the term 'reactivity' is used in chemistry.^ a b Greenwood, Norman N.; Earnshaw, Alan (1984). Chemistry of the Elements. Oxford: Pergamon Press. pp.8287. ISBN978-0-08-022057-4.^ France, Colin (2008), The Reactivity Series of Metals^ Briggs, J. G. R. (2005), Science in Focus, Chemistry for GCE 'O' Level, Pearson Education, p.172^ Lim Eng Wah (2005), Longman Pocket Study Guide 'O' Level Science-Chemistry, Pearson Education, p.190^ "Metal extraction and the reactivity series - The reactivity series of metals - GCSE Chemistry (Single Science) Revision - WJEC". BBC Bitesize. Retrieved 2023-03-24.^ a b Activity series at the Wayback Machine (archived 2019-05-07)^ Wulsberg, Gary (2000). Inorganic Chemistry. p.294. ISBN9781891389016.^ Periodic table poster at the Wayback Machine (archived 2022-02-24) by A. V. Kulsha and T. A. Kolevich gives: Li > Cs > Rb > K > Ba > Sr > Ca > Na > La > Y > Mg > Ce > Sc > Be > Al > Ti > Mn > V > Cr > Zn > Ga > Fe > Cd > In > Tl > Co > Ni > Sn > Pb > (H) > Sb > Bi > Cu > Po > Ru > Rh > Ag > Hg > Pd > Ir > Pt > Au^ Standard Electrode Potentials and Temperature Coefficients in Water at 298.15 K, Steven G. Bratsch (NIST)^ For antimony: Antimony - Physico-chemical properties - DACTARI^ Lide, David R., ed. (2006). CRC Handbook of Chemistry and Physics (87thed.). Boca Raton, Florida: CRC Press. ISBN0-8493-0487-3.^ Aylward, G; Findlay, T (2008). SI Chemical Data (6ed.). Milton, Queensland: John Wiley & Sons. p.126. ISBN978-0-470-81638-7.^ Wulfsberg, G (2018). Foundations of Inorganic Chemistry. Mill Valley: University Science Books. p.319. ISBN978-1-891389-95-5.Science Line ChemistryRetrieved from " Metals are more easily oxidized than nonmetals. This means metals lose electrons more easily than nonmetals. Metals are strong reducing agents, but their reducing power decreases going across a period of the periodic table. Below is a table of a partial activity series for metals in aqueous solution. The table lists the oxidation reactions. Lithium is at the top of the list and is the most easily oxidized metal which means it is the strongest reducing agent in the activity series below. Gold is at the end of the list and is not as easily oxidized and is therefore the weakest reducing agent on this activity series. Both the ease of oxidation and the reducing strength of the metals decrease going down the column. For example, zinc is a weaker reducing agent than sodium, but it is a stronger reducing agent than copper. A metal can reduce any ion below it in the series. Chromium can reduce Cu2+ ion, but it cannot reduce Mn2+. Silver tarnishes according to the following reaction with H2S gas.2 Ag (s) + H2S (gas) Ag2S (s) + H2 (g) Commercial silver polishes will remove the tarnish from silver, but some of the silver is lost because these polishes are abrasive. Tarnish can be removed chemically with aluminum. The aluminum is a stronger reducing agent than silver and will reduce the Ag+ ion to solid Ag.3 Ag2S (s) + 2 Al(s) 6 Ag (s) + Al2S3 (s) Notice the position of hydrogen in the activity series. The metals above hydrogen will react with aqueous hydrogen ion to form hydrogen gas. In fact, the first five metals in the series, both Group 1A and 2A metals, will react with pure water to form hydrogen gas. 2 K (s) + 2 H2O (l) c 2 K+ (aq) + 2 OH (aq) + H2 (g)The remaining metals (above hydrogen) will not react with water but do react with aqueous hydrogen ions. The metals below hydrogen in the series do not react with aqueous hydrogen ions or water. They are much more stable meaning they are less reactive. As we go from left to right on the periodic table, reactivity decreases. Worksheet: The Activity SeriesExercisesExercise 1. Consider the partial activity series below to answer the questions.K(s) K+ (aq) + eMn(s) Mn2+ (aq) + 2 eFe(s) Fe2+ (aq) + 2 eAg(s) Ag+ (aq) + eHg(l) Hg2+ (aq) + 2 ea) Which metal is the weakest reducing agent?b) Will solid iron reduce manganese ion?c) Will the following reaction occur? Fe(s) + Hg 2+ (aq) Fe2+ (aq) + Hg (l)Check Answers/Solutions to Exercise 1Exercise 2. Use the partial activity series below to write a reaction with manganese and silver. K(s) K+ (aq) + eMn(s) Mn2+ (aq) + 2 eFe(s) Fe2+ (aq) + 2 eAg(s) Ag+ (aq) + eHg(l) Hg2+ (aq) + 2 eCheck Answers/Solutions to Exercise 2Exercise 3. Use the following activity series to write a balanced equation for the reactions below. If no reaction occurs, just write NR.a) Fe (s) + Cu(NO3)2 (aq) b) Sn (s) + HBr (aq) c) Al (s) + CoSO4 (aq) d) Zn (s) + MgSO4 (aq) The activity series is a type of ordering system for elements, which ranks how reactive a certain element is in relation to other elements. The activity series determines the level of reactivity based on how well a certain element can displace hydrogen gas from acidic solutions and water.The activity series is a very useful tool when selecting materials for a particular application. It is important to know which metals are reactive and which are more stable. Referencing the activity series can help ensure that the correct material is selected and that no unwanted reactions occur.Potassium and lithium are near the top of activity series, which means that they are more likely to react than elements near the bottom of the series. They are also more prone to corrosion. Gold and platinum are near the bottom of the list; their ability to resist reaction is part of the reason they are so valuable. The periodic table of elements is key to understanding and mastering chemistry concepts. These periodic table activities are fun and engaging, and you can use many of them with both younger and older students. Pick a few to try in your own classroom!Just a heads up, WeAreTeachers may collect a share of sales from the links on this page. Thank you for your support!1. Start with an anchor chartThe periodic table is an ingenious construction, but it takes a little explaining. These anchor charts explain the layout and details and are excellent references to use throughout all your periodic table activities.Learn more: Scholastic2. Explore an illustrated periodic table chartTeachers love this chart, and for good reason. It brings the table to life, helping chemistry students understand the role each element plays in the world around us. You can print copies of it for free, or buy posters and card sets. Theres even an interaction version!Learn more: elements.wlonk.com3. Color and learn about the elementsYou can use this clever coloring book for all kinds of periodic table activities. Try a few free printable pages from author Teresa Bondoras site here. If you like them, buy The Periodic Table of Elements Coloring Book on Amazon .[contextly_auto_sidebar]4. Sing a periodic table songThough kids dont necessarily need to memorize the periodic table, songs like this one can help if they want to try! We love this new up-to-date take, but the old Tom Lehrer classic from 1959 is lots of fun too.5. Build a model using egg cartonsLove a good recycled craft project? This is the activity youre looking for! Save up egg cartons and use them to build a periodic table model.Learn more: Weird Unsocialized Homeschoolers6. Create an elements card deckThese free printable cards are terrific for reviewing the elements, especially if youre working on memorizing some or all of them.Learn more: Homeschool Creations7. Make pipe cleaner element modelsGain a deeper understanding of the construction of each element by making models with pom poms, beads, and pipe cleaners.Learn more: Teach Beside Me8. Find the elements to win the gameFamiliarize yourself with where each element is located on the table, along with their abbreviations, with this simple (and free) point-and-click computer game.Learn more: Mr. Nussbaum Learning + Fun9. Go on an elements scavenger huntSend students on a search for real-life examples of the various elements. Theyll be surprised at how easy it is to find so many of them.Learn more: Pinay Homeschooler10. Make a periodic table of giant tilesThis classic research project comes together in a giant periodic table display. You can use poster board, or add a 3-D element by creating the tiles on pizza boxes instead.Learn more: missmiklius11. Play periodic table BattleshipHeres another fun game to help familiarize kids with where various elements are found on the table. Learn how to play at the link.Learn more: Teach Beside Me12. Turn elements into superheroes (or villains)This is such a fun twist on the usual element research project. Students learn more about the characteristics of their element, then decide whether its a superheroor a villain!Learn more: Morpho Science/Teachers Pay Teachers13. Download the Atomidoodle appThis cool little app, available on both the Apple AppStore and Google Play, challenges students to draw paths through mazes. They use fusion (addition) and fission (division) to create new atoms, all while learning hundreds of facts about the elements.Learn more: Atomidoodle14. Sort periodic people into a tableThis clever activity gives students the chance to see how Mendeleev sorted the elements to create his brilliant periodic table. Get it for free at the link.Learn more: Sunrise Science15. Put the periodic table on your ceiling Make use of every last bit of your classroom space by turning ceiling tiles into an enormous periodic table! Adhesive vinyl works well for this ambitious project.16. Solve The Mystery of the Periodic TableMiddle school readers will enjoy this tale of the development of the periodic table, learning about the various scientists involved along the way. Buy The Mystery of the Periodic Table on Amazon here.17. Get to know the Element charactersEach element has its own set of characteristics that could almost be called its personality. Thats the idea behind these incredibly fun cards, which imagine the elements as living characters. You could use a set of these for all kinds of periodic table activities.Learn more: ElementsExperiments in Character Design18. Defeat a periodic table escape roomEscape rooms are all the rage, and theyre a lot of fun in the classroom too. Create your own set of chemistry-based challenges, or buy this ready-to-go periodic table escape room on Teachers Pay Teachers.Learn more: Kesler Science19. Make periodic table pixel artIn this free interactive program, students answer questions about the elements to unlock squares on the periodic table, creating a pixel picture. Bonus: Have kids create their own pixel pics using the table!Learn more: Teaching Above the Test20. Put together colorful tilesThese colorful pieces interlock to create an interactive puzzle you can use for lots of different periodic table activities. Buy the set at Amazon.21. Compete at periodic table BingoBingo is always fun, but this version helps you learn the various abbreviations of the elements too. Make your own cards, or buy a pre-made set at the link.Learn more: STEAM Powered FamilyWant more hands-on science? Try the Best Science Kits for Kids, As Chosen by Teachers .Plus, 20 of the Best Science Bulletin Boards and Classroom Decor Ideas. Periodic table activities are a powerful way to make chemistry lessons more interactive and enjoyable for students. These hands-on strategies help learners explore atomic structure, element groups, and periodic trends through fun, engaging experiences.Instead of relying solely on memorization, students can develop a deeper understanding by participating in games, experiments, and creative challenges. These activities work well in both middle and high school classrooms, making complex science content easier to teach and exciting to learn.15 Engaging Periodic Table Activities for Your ClassroomHere are some engaging activities to spark curiosity and make chemistry lessons more interactive:1. Periodic Table BattleshipAs one of the most effective activities using the periodic table in fun and strategic ways, it helps reinforce periodic trends and element organization without students even realizing how much theyre reviewing.By adapting the classic game of Battleship, students become more familiar with the layout of the periodic table and improve their recall of element names, symbols, and positions.Periodic table battleshipMaterials Needed:Laminated periodic tablesDry erase markersTwo file folders or dividers per pairBattleship-style coordinate sheetsHow to Do:Pair students and give each one a periodic table and divider.Each student hides five elements on their board by circling them.Students take turns calling out element names or coordinates.If the opponent marked that element, its a hit.First student to sink all five of their opponents elements wins.2. Element Superhero PostersThis creative project allows students to personify elements as superheroes, connecting atomic properties to imaginative superpowers. Through research and visualization, students gain a deeper understanding of each elements characteristics, such as reactivity, state of matter, and real-world applications.The artistic freedom and storytelling component make this ideal for engaging diverse learning styles.Element superhero postersMaterials Needed:Poster board or large paperColored pencils, markersPeriodic table handoutsInternet access for researchHow to Do:Assign each student an element or let them choose.Have students research its atomic number, symbol, uses, and properties.Students create a superhero with a name, costume, powers, and origin story based on their element.Display posters around the classroom.3. Periodic Table Escape RoomThis fast-paced group activity simulates a chemistry lab escape mission, requiring students to solve puzzles based on periodic table knowledge.The time-sensitive format fosters teamwork and critical thinking while reinforcing foundational concepts like atomic structure, groups, and periods. Its an excellent end-of-unit review or an exciting way to introduce key concepts.Periodic table escape roomMaterials Needed:Printable puzzlesLockable boxes (optional)Periodic tablesClue cardsHow to Do:Prepare a series of puzzles (e.g., match element with symbol, atomic mass riddles).Group students and set up a challenge path.Students must solve each chemistry-based clue using the periodic table.When they complete all tasks, they escape.4. Build-a-Table Puzzle ChallengeThis hands-on activity helps students build their own periodic table from scratch using element cards. As they match cards to the correct spots based on properties like atomic number and group classification, students develop a concrete understanding of the tables logical structure.Its especially effective for visual and kinesthetic learners who benefit from manipulating physical pieces.Build-a-table puzzle challengeMaterials Needed:Blank table grid printoutsElement cards with name, symbol, number, and atomic massVelcro or magnetsHow to Do:Distribute scrambled element cards.Ask students to place them correctly on the blank table grid.Students explain their reasoningperiods, groups, metals vs. nonmetals, etc.Review together as a class.5. Periodic Table BingoIts one of the classic periodic table activities that combines learning with gameplay, and its easy to adjust for different grade levels.A chemistry-themed version of Bingo makes learning element symbols and names fun and competitive. This activity supports memorization in an informal way while still reinforcing important content.Periodic table bingoMaterials Needed:Printable bingo cards with element symbolsElement name calling cardsChips or tokensHow to Do:Hand out bingo cards.Call out element names; students mark the symbol if it appears on their card.First to complete a row, column, or diagonal wins.Review the correct answers together.6. Element CommercialsStudents take on the role of advertisers, pitching their assigned element to the class in a creative commercial. This activity helps them connect academic content to real-world applications as they explore how elements are used in products, industry, or daily life.Public speaking and creativity are emphasized, and students often retain facts better when they present them in their own words.Element commercialsMaterials Needed:Internet access for researchNote cardsProps (optional)How to Do:Assign or allow students to pick an element.Research element uses and characteristics.Write a 1-minute commercial selling the elements benefits.Perform in front of the class.7. Periodic Table Scavenger HuntThis high-energy game gets students moving around the classroom to find clues about elements hidden throughout the room or embedded in a digital platform. Each clue encourages deeper thinking about properties, uses, or trends of specific elements.Its an engaging way to practice retrieval and explore lesser-known facts in a memorable context.Periodic table scavenger huntMaterials Needed:Clue cardsPeriodic table posters or handoutsPrizes for winnersHow to Do:Hide clues around the classroom or use a digital platform.Each clue leads to an element. Example: Im the gas used in balloons.Students find helium and move to the next clue.First team to complete all tasks wins.8. Periodic Table of CandyA delicious twist on classification, this activity uses different candy types to represent metals, nonmetals, metalloids, and other element groups.Students build a model of the periodic table using their sweet elements, which helps them visually and tactilely distinguish between categories.Its perfect for a thematic lesson around Halloween or the end of a unit.Periodic table of candyMaterials Needed:Assorted candies (e.g., Skittles, M&Ms, gummy bears)Blank periodic tableGlue or double-sided tapeHow to Do:Assign candy types to categories (e.g., metals, nonmetals).Students place each candy on the correct spot on a large blank periodic table.Discuss trends and groupings.Allow students to eat a few as a reward.9. Periodic Table FoldablesCreating foldables encourages students to explore the periodic table in a tactile, organized way. Students build personalized, interactive graphic organizers that help them visualize and remember concepts such as group trends, electron configurations, or element families.These foldables also double as great study tools for future assessments.Periodic table foldablesMaterials Needed:Colored paperScissorsMarkersGlueHow to Do:Have students fold paper into flaps with labels like Symbol, Atomic Mass, Uses, etc.Fill in the flaps with data about a specific group or period.Decorate and share findings with classmates.10. Periodic Table Music VideosThis is one of those creative, classroom-friendly activities inspired by the periodic table that combines music and science in a way that students really enjoy. Students write and perform original songs or raps that incorporate chemical terms, periodic trends, and element facts.The process of writing lyrics encourages students to creatively process and re-express their knowledge, leading to increased retention. Plus, performing adds a fun, collaborative element to classroom learning.Periodic table music videosMaterials Needed:Background musicLyrics templates (optional)Microphones or speakersHow to Do:Students work in small groups to write lyrics that include facts about elements, periods, and groups.Practice and record their performance.Watch and evaluate videos for creativity and accuracy.11. Human Periodic TableIn this large-group kinesthetic activity, each student represents a different element and physically places themselves in the correct location in a life-sized periodic table formation.This visual and bodily experience solidifies understanding of the tables layout, groups, and periods. Its also ideal for fostering classroom community through teamwork.Human periodic tableMaterials Needed:Index cards with element names and infoTape or string to mark positionsHow to Do:Assign students to elements.Each wears a name card showing symbol, number, and mass.Students arrange themselves in the classroom according to the periodic table structure.Review group trends using the human model.12. Periodic Table Coloring ActivityColoring the periodic table may sound simple, but its a powerful visual tool for identifying patterns and trends. Students use color-coding to represent changes in atomic radius, electronegativity, or reactivity, helping them see relationships at a glance.It also encourages data interpretation and makes abstract concepts more concrete.Periodic table coloring activityMaterials Needed:Blank periodic tablesColored pencils or markersTrend data chartsHow to Do:Choose a trend to focus on (e.g., atomic size).Assign a color scale to represent values (small to large).Students color each element according to its property.Compare maps in small groups.13. Periodic Table Puns and Jokes WallAdding a humorous twist to learning, this ongoing bulletin board project challenges students to create and share chemistry-themed jokes or puns based on elements.Humor aids in memory retention, and the light-hearted environment fosters creativity and a more relaxed attitude toward learning challenging content.Periodic table puns and jokes wallMaterials Needed:Paper and markersBulletin board spaceHow to Do:Ask students to create puns or jokes related to their favorite elements.Example: I told a chemistry joke, but there was no reaction.Decorate a classroom wall with their creations.Let students vote on the funniest one.14. Periodic Table JeopardyA fast-paced review game modeled after the classic quiz show, this activity turns test prep into a team-based competition. With categories like Element Symbols, Trends, and Atomic Numbers, students must recall facts quickly and strategically. Its ideal for reinforcing knowledge right before a quiz or test.Periodic table jeopardyMaterials Needed:Jeopardy-style game board (PowerPoint or printed)Buzzer or bellsScoreboardHow to Do:Create questions in categories like Groups, Uses, Symbols, etc.Divide class into teams.Teams choose questions and answer for points.Most points at the end wins.15. Element Fact Trading CardsOne of the most hands-on periodic table activities, this task lets students blend creativity with content knowledge by designing and collecting element-themed trading cards.Similar to baseball cards, each one highlights key facts like atomic number, symbol, element family, and interesting real-world uses. As they collect and trade, students naturally become more familiar with a wide variety of elements in a fun, low-pressure way.Element fact trading cardsMaterials Needed:Index cardsMarkers or pensPeriodic tablesHow to Do:Each student chooses or is assigned an element.On one side of the card, draw the element symbol and an image.On the other side, list facts: atomic number, group, uses.Trade with classmates and build a full deck of element facts.Sum upPeriodic table activities offer more than just a break from textbooksthey provide students with opportunities to interact with core chemistry content in ways that are dynamic, collaborative, and fun.By incorporating these creative ideas into your lessons, youll help students deepen their understanding of the periodic table while fostering a love for science. No matter your teaching style, these activities are flexible, effective, and sure to make chemistry more memorable for every learner. Chapter 1 Chapter 2 Chapter 3 Chapter 4 Chapter 5 Chapter 6 Chapter 7 Chapter 8 Chapter 9 Chapter 10 Chapter 11 Chapter 12 Chapter 13 Chapter 14 Template:HideTOCLearning Objectives Use the activity series to predict if a reaction will occur. We see below two metals that can be exposed to water. The picture on the left is of sodium, which has a violent reaction when it comes in contact with water. The picture on the right is of silver, a metal so unreactive with water that it can be made into drinking vessels. Both metals have a single \(s\) electron in their outer shell, so you would predict a similar reactivity from each. However, we have a tool that allows us to make better predictions about how certain elements will react with others. Figure \(\PageIndex{1}\): On the left, sodium reacts with water. On the right, silver in the form of cups does not react with water. Single-replacement reactions only occur when the element that is doing the replacing is more reactive than the element that is being replaced. Therefore, it is useful to have a list of elements in order of their relative reactivity. The activity series is a list of elements in decreasing order of their reactivity. Since metals replace other metals, while nonmetals replace other nonmetals, they each have a separate activity series. The table \(\PageIndex{1}\) below is an activity series of most common metals, and the table \(\PageIndex{2}\) is an activity series of the halogens. Table \(\PageIndex{1}\): Activity Series of Metal Elements Elements, from most to least reactive Reaction Occurring \(\ce{Li}\) \(\ce{K}\) \(\ce{Ba}\) \(\ce{Sr}\) \(\ce{Ca}\) \(\ce{Na}\) React with cold water, replacing hydrogen. \(\ce{Mg}\) \(\ce{Al}\) \(\ce{Zn}\) \(\ce{Cr}\) \(\ce{Fe}\) \(\ce{Cd}\) React with steam, but not cold water, replacing hydrogen. \(\ce{Co}\) \(\ce{Ni}\) \(\ce{Sn}\) \(\ce{Pb}\) Do not react with water. React with acids, replacing hydrogen. \(\ce{H_2}\) \(\ce{Cu}\) \(\ce{Hg}\) \(\ce{Ag}\) \(\ce{Pt}\) \(\ce{Au}\) Unreactive with water or acids. Table \(\PageIndex{2}\): Activity Series of Nonmetal elements Elements, from most to least reactive \(\ce{F_2}\) \(\ce{Cl_2}\) \(\ce{Br_2}\) \(\ce{I_2}\) For a single-replacement reaction, a given element is capable of replacing an element that is below it in the activity series. This can be used to predict if a reaction will occur. Suppose that small pieces of the metal nickel were placed into two separate aqueous solutions: one of iron (III) nitrate and one of lead (II) nitrate. Looking at the activity series, we see that nickel is below iron, but above lead. Therefore, the nickel metal will be capable of replacing the lead in a reaction, but will not be capable of replacing iron. \[\ce{Ni} \left(s \right) + \ce{Pb(NO_3)_2} \left(aq \right) \rightarrow \ce{Ni(NO_3)_2} \left(aq \right) + \ce{Pb} \left(s \right) onumber \] \[\ce{Ni} \left(s \right) + \ce{Fe(NO_3)_3} \left(aq \right) \rightarrow \text{NR (no reaction)} onumber \] In the descriptions that accompany the activity series of metals, a given metal is also capable of undergoing the reactions described below that section. For example, lithium will react with cold water, replacing hydrogen. It will also react with steam and with acids, since that requires a lower degree of reactivity. Use the activity series to predict if the following reactions will occur. If not, write \(\text{NR}\). If the reaction does occur, write the products of the reaction and balance the equation. \(\ce{Al} \left(s \right) + \ce{Zn(NO_3)_2} \left(aq \right) \rightarrow\) \(\ce{Ag} \left(s \right) + \ce{HCl} \left(aq \right) \rightarrow\) Solutions to Example 7.11.1 Steps Example \(\PageIndex{1A}\) \(\ce{Al} \left(s \right) + \ce{Zn(NO_3)_2} \left(aq \right) \rightarrow\) Example \(\PageIndex{1B}\) \(\ce{Ag} \left(s \right) + \ce{HCl} \left(aq \right) \rightarrow\) Plan the problem. Compare the placements of aluminum and zinc on the activity series (Table \(\PageIndex{1}\)) Compare the placements of silver and hydrogen (Table \(\PageIndex{1}\)) Solve. Since aluminum is above zinc, it is capable of replacing it and a reaction will occur. The products of the reaction will be aqueous aluminum nitrate and solid zinc. Take care to write the correct formulas for the products before balancing the equation. Aluminum adopts a \(+3\) charge in an ionic compound, so the formula for aluminum nitrate is \(\ce{Al(NO_3)_3}\). The balanced equation is: \(2 \ce{Al} \left(s \right) + 3 \ce{Zn(NO_3)_2} \left(aq \right) \rightarrow 2 \ce{Al(NO_3)_3} \left(aq \right) + 3 \ce{Zn} \left(s \right)\) Since silver is below hydrogen, it is not capable of replacing hydrogen in a reaction with an acid. \(\ce{Ag} \left(s \right) + \ce{HCl} \left(aq \right) \rightarrow \text{NR}\) Use the activity series to predict the products, if any, of each equation. \(\ce{FeCl2 + Zn }\) \(\ce{HNO3 + Au }\) Answer a The products are ZnCl2 + Fe. Answer b No reaction. Metals and halogens are ranked according to their ability to displace other metals or halogens below them in the activity series.

Periodic table series. Periodic table activity. Elements in the activity series. Activity series periodic table trend. What is the activity series for metals. Reactivity series of metals periodic table. Periodiek systeem. In which part of the periodic table are the elements at the top of the activity series. Periodictable.com. What is an activity series in chemistry.