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Lithium has a boxed warning from the Food and Drug Administration (FDA) about lithium toxicity. This refers to a high level of lithium in your blood, which can lead to serious side effects. The boxed warning appears on the drug’s label and alerts you to possible serious risks.For details, you can see the “What is lithium toxicity?” section below.If you have bipolar disorder, your medical professional may prescribe a drug called lithium.Lithium is used for the following purposes in adults and some children:acute (short-term) treatment of manic and mixed episodes related to bipolar I disordermaintenance (long-term) treatment of bipolar I disorderLithium comes in several forms, all of which you take by mouth:extended-release (ER) tablets, which are long-actingimmediate-release (IR) tablets, which are short-actingcapsulesliquid solutionWe cover only the capsule, liquid solution, and IR tablet forms of lithium in this article. These forms of lithium aren’t available as brand-name drugs.If you’d like to learn about lithium ER tablets, your medical professional or pharmacist can tell you more.Most medications, including lithium, may cause side effects that can be serious or mild. To give you an idea of what might occur with lithium, we’ve listed some of the medication’s more common side effects below. It’s important to note that we haven’t included all the potential side effects.For more complete information about possible side effects of lithium, you can talk with your medical professional or pharmacist. They may also be able to recommend tips on how to help prevent and ease side effects.Note: Certain factors may affect a medication’s side effects. These factors can include other health conditions you may have, other drugs you may be taking, and your age.Some of the mild side effects that lithium may cause are listed below. For information about other mild side effects of the drug, we suggest that you talk with your medical professional or pharmacist. It may also be helpful to refer to the medication guide for lithium.Mild side effects of lithium that have been reported in studies include:Mild side effects of many drugs tend to lessen in a couple of days or a few weeks. But if you find that the side effects bother you, we encourage you to talk with your medical professional or pharmacist. * For details about this side effect, you can see “Side effects: A closer look” below. Lithium may cause serious side effects, but this isn’t common. If you do develop serious side effects while taking lithium, be sure to call your medical professional immediately. If you feel as if you’re having a medical emergency, call 911 or your local emergency number right away.Serious side effects of lithium that have been reported in studies include the following: * For details about this side effect, you can see “Side effects: A closer look” below. † See the “What is lithium toxicity?” section below for more information. It’s possible that lithium may cause long-term side effects. But the length of time lithium’s side effects last tends to vary from person to person.For example, some side effects like hypothyroidism (low thyroid hormone levels) and kidney problems may cause effects that last for months or years. Lithium toxicity (high levels of lithium in your blood) may also cause certain long-term problems.To help monitor for these side effects, your medical professional may give you thyroid or kidney function tests periodically during treatment. They’ll also check your lithium levels frequently with a blood test.For more details about what to expect with lithium treatment, you can talk with your medical professional.This section provides a close-up look at key side effects of lithium.Changes in weight are a common symptom of depressive episodes related to bipolar disorder. And lithium is used to treat bipolar I disorder. So you may gain or lose weight while you’re taking lithium because your symptoms are improving. Weight changes may not be a side effect of the drug itself.If you’re concerned about weight changes while taking lithium, we encourage you to talk with your medical professional. They can suggest ways to help you maintain a weight that’s healthy for you.Tremors (shaking you can’t control) may occur with lithium. This was a common side effect in studies of the drug.You may have different types of tremors with lithium. Some may be mild, such as shaky hands. But others can be a symptom of more serious conditions.For example, tremors that affect your arms, legs, or whole body may be more severe. This type of tremor can be a symptom of serious conditions such as:If you have tremors while taking lithium, it’s recommended that you tell your medical professional right away. They can help figure out if the side effect is a symptom of a more serious condition.A rash may occur with lithium. This side effect was more common in children than in adults during studies of the drug.You may have other symptoms along with rash. These include:itchy skindry skinskin redness or darkened skin colorswellingIf you have a rash while taking lithium, we suggest you tell your medical professional right away. A rash can be a sign of a serious allergic reaction. Your doctor can recommend ways to treat this side effect.Many drugs, including lithium, can cause an allergic reaction. Even though allergic reaction wasn’t reported in studies of lithium, it can still happen.Symptoms that can occur with a mild allergic reaction may include:itchinessskin rashflushing (temporary warmth, redness, or deepening of skin color)A more severe allergic reaction may also occur, but this is rare. Symptoms of a severe allergic reaction may include swelling of your mouth, tongue, or throat, which may cause trouble breathing. You may also experience swelling under your skin, often in your lips, eyelids, hands, or feet.If you have symptoms of an allergic reaction to lithium, be sure to call your medical professional immediately. If you feel as if you’re having a medical emergency, call 911 or your local emergency number right away.Lithium has a boxed warning about lithium toxicity. A boxed warning is a serious warning from the Food and Drug Administration (FDA). This warning appears on the drug’s label and alerts you to possible serious risks.Lithium toxicity refers to a high level of lithium in your blood, which may cause serious side effects.Your risk for lithium toxicity may be higher if you:To lessen your risk for lithium toxicity, your medical professional will check your lithium levels frequently with a blood test.Lithium toxicity can cause the following mild or moderate symptoms:If you have any symptoms of lithium toxicity, it’s important to tell your medical professional right away. They’ll likely lower your lithium dosage. Or they may switch you to a different treatment for your condition.Bipolar disorder causes extreme mood shifts that may last for several days. Generally, these moods alternate between manic episodes and depressive episodes. Manic episodes are periods of very high energy and excitement. Depressive episodes are periods in which you have depression symptoms.You may also have mixed episodes with bipolar disorder. Mixed episodes (also called mixed features) may describe either:periods of mania that occur with symptoms of depression, orperiods of depression that occur with symptoms of maniaLithium is specifically used for acute (short-term) treatment of manic and mixed episodes related to bipolar I disorder. Lithium can also be used as a maintenance (long-term) treatment for bipolar I disorder. Lithium is used for these purposes in adults and children ages 7 years and older.Lithium is a mood stabilizer. This means it can help stabilize the mood changes that bipolar disorder causes. The effects of lithium can vary from person to person. The way the drug works in your body isn’t exactly known.If you have questions about how lithium might make you feel, you can talk with your medical professional or pharmacist.Below we share answers to some commonly asked questions about lithium.Lithium isn’t approved to treat depression. But it may be prescribed off-label to treat certain types of depression. Off-label means using a drug for a condition it hasn’t been approved to treat.If you’d like to learn more about using lithium for depression and what this dosage would be, you can talk with your medical professional or pharmacist.Lithium is a mood stabilizer. This means it can help stabilize the mood changes that bipolar disorder causes. But the way lithium works* to treat this condition isn’t known for sure.The half-life of lithium is 18 to 36 hours. (A drug’s half-life is the amount of time it takes for half of a dose to leave your system.) So it takes about 18 to 36 hours for your body to get rid of half of a dose of lithium.* The way a drug works in your body is called its “mechanism of action.”Although lithium isn’t approved to treat schizophrenia or anxiety, it may be prescribed off-label to treat these conditions. Off-label means using a drug for a condition it hasn’t been approved to treat.When used for these purposes, lithium is usually taken along with other drugs that treat schizophrenia or anxiety. If you’d like to learn more about lithium treatment for these conditions, you can talk with your medical professional.Yes, lamotrigine (Lamictal) is a possible alternative to lithium. Both lithium and Lamictal are mood stabilizers. Both drugs can be used as maintenance (long-term) treatments for bipolar disorder.However, Lamictal may cause serious skin reactions such as Stevens-Johnson syndrome. For this reason, your medical professional may recommend that you try lithium before Lamictal.To learn more about how lithium and Lamictal are alike and different, we suggest talking with your medical professional or pharmacist.No, lithium isn’t a controlled substance.Controlled substances are medications that have a high potential for addiction or misuse. (Addiction refers to the continued use of a drug even if it’s causing you harm. Misuse refers to taking a drug differently than the way it was prescribed.) But lithium isn’t known to be addictive or to have a high potential for being misused.Your medical professional can provide more information if you have more questions about lithium and controlled substances.Before taking lithium, we encourage you to talk with your medical professional. You can tell them about any medical conditions you have. You can also tell them about your overall health and other medications you’re taking.We provide more details about these considerations below.Taking certain drugs, foods, vaccines, and other substances with a medication may affect how that medication works. These effects are known as interactions.Before you take lithium, it’s important to tell your medical professional about any other drugs you take. This includes prescription and over-the-counter medication. It’s also important to mention any herbs, supplements, and vitamins you take. They or your pharmacist can tell you about possible interactions these substances may have with lithium.Lithium can interact with several types of drugs. These drugs include:drugs that increase the level of a chemical in your body called serotonin, such as:certain antipsychotic drugs, such as quetiapine (Seroquel) or risperidone (Risperdal)nonsteroidal anti-inflammatory drugs (NSAIDs), such as:certain blood pressure or heart failure drugs, including:angiotensin II receptor blockers (ARBs), such as valsartan (Diovan)calcium channel blockers, such as diltiazem (Cardizem CD, Cartia XT)certain seizure drugs, such as:carbamazepine (Carbatrol, Tegretol)the asthma drug theophyllinethe antibiotic metronidazole (Flagyl)the dietary supplement potassium iodidethe altitude sickness drug acetazolamidecaffeinediuretic drugssodium bicarbonateIt’s important to note that we haven’t listed all types of drugs that may interact with lithium. Your medical professional or pharmacist can provide more details as well as information about other possible interactions.Lithium has a boxed warning from the Food and Drug Administration (FDA) about lithium toxicity. This is a high level of lithium in your blood. The boxed warning appears on the drug’s label and alerts you to possible serious risks.For details, you can see the “What is lithium toxicity?” section above.If you have certain medical conditions or other factors that affect your health, lithium may not be the right choice for you. Before you take lithium, it’s important to discuss your health history with your medical professional. The list below includes some factors to consider.Heart problems. If you have heart problems, be sure to tell your medical professional before starting lithium. Lithium may reveal a condition called Brugada syndrome (a type of abnormal heart rhythm) in people who have heart problems. Your medical professional may check for symptoms of this condition during treatment.Kidney problems. It’s very important to tell your medical professional if you have any kidney problems before starting lithium. Kidney problems increase your risk for lithium toxicity. If you have kidney problems, your medical professional may lower your lithium dosage or prescribe a different drug for you.Thyroid problems. Lithium may cause thyroid problems. These can include hypothyroidism (low thyroid hormone levels) and hyperthyroidism (high thyroid hormone levels). Your risk for this side effect may be higher if you have thyroid problems before starting lithium. We suggest you tell your medical professional if you have a thyroid problem before you start lithium. They’ll likely watch your thyroid function closely while you take the drug.Allergic reaction. If you’ve had an allergic reaction to lithium or any of its ingredients, you should not take lithium. Your medical professional can recommend other treatments that might be better choices for you.Use of antipsychotic drugs. It’s important to tell your medical professional if you’re taking any antipsychotic drugs before starting lithium. These drugs can increase your risk for nerve problems while taking lithium, such as neuroleptic malignant syndrome. If you take these drugs, your medical professional can advise whether lithium is right for treating your condition.It’s recommended that you avoid drinking alcohol while taking lithium.Drinking alcohol with lithium can raise your risk for lithium toxicity, which can cause serious side effects. If you drink alcohol, it’s important to talk with your medical professional about whether it’s safe to drink while you’re taking lithium.It may not be safe to take lithium while pregnant or breastfeeding. Your medical professional can advise you about taking lithium during these times.Your medical professional can advise you on how much lithium to take and how often. It’s important to follow the instructions they provide. Commonly used dosages are mentioned below, but always take the dosage your medical professional recommends.Lithium comes in several forms that you take by mouth:extended-release (ER) tablets, which are long-actingimmediate-release (IR) tablets, which are short-actingIR capsulesIR liquid solutionWe cover only the IR tablet, capsule, and liquid solution forms of lithium in this article. The table below shows the available strengths of each of these forms of lithium.If you’d like to learn about lithium ER tablets, your medical professional or pharmacist can tell you more.Typically, your medical professional will start by prescribing a low dosage of lithium. Then they’ll slowly increase your dosage over time until the symptoms of your condition have been reduced.Lithium can be used in adults and children ages 7 years and older. Below are the recommended starting dosages of lithium for bipolar I disorder.If your child weighs less than 20 kg, their medical professional will recommend whether lithium is right for them, and what their dosage would be.Your medical professional may adjust your lithium dosage depending on factors such as:your ageyour weightother medications you takeother health conditions you havethe level of lithium in your bloodIf you have questions about the dosage that’s right for you, we recommend that you talk with your medical professional.* One kg equals about 2.2 lb.To lessen your risk for side effects from lithium, your medical professional may regularly check your lithium levels with blood tests.Your doctor will start by prescribing a low dose of lithium. Then they’ll check your lithium blood levels 3 days later. Your medical professional may increase your dosage every few days until your lithium blood level is 0.8 mEq/mL to 1.2 mEq/mL. This is considered a normal range for lithium levels.Your medical professional may continue to check your lithium blood levels frequently until your condition is stable.Lithium is a generic prescription drug. The costs of prescription medications may depend on several factors, such as your insurance coverage and the pharmacy you use.If you’re wondering how to pay for lithium, we suggest that you talk with your medical professional or pharmacist. You may also want to visit Medicine Assistance Tool or NeedyMeds to see if support options are available.It’s possible. Withdrawal symptoms weren’t reported in studies of lithium. However, some people have reported withdrawal symptoms after suddenly stopping lithium.Possible withdrawal symptoms with lithium can include:anxietyirritabilitytrouble sleepingIt’s also possible that after stopping lithium, your bipolar disorder symptoms may start to come back.It’s important that you do not stop taking lithium unless your medical professional says it’s safe to do so. They may lower your dosage slowly over time when it’s safe for you to stop lithium treatment. This can lessen your risk of side effects after stopping the drug.It’s important that you don’t take more lithium than your medical professional recommends. Taking more than the recommended dosage can lead to severe side effects, including lithium toxicity. This is a high level of lithium in the blood, which can cause serious side effects.In fact, lithium has a boxed warning from the Food and Drug Administration (FDA) about lithium toxicity. The boxed warning appears on the drug’s label and alerts you to possible serious risks. For details about lithium toxicity, including its symptoms, you can see the “What is lithium toxicity?” section above.Symptoms caused by an overdose can include:seizuresirreversible brain damagecomaIf you believe you’ve taken too much lithium, call your medical professional right away. You can also call 800-222-1222 to reach the American Association of Poison Control Centers, or use its online resource. But if your symptoms are severe, immediately call 911 (or your local emergency number) or go to the closest emergency room.Your medical professional can give you instructions on how to take lithium. They can also explain how much to take and how often. It’s important to follow the instructions they provide.Lithium comes in several forms that you take by mouth:extended-release (ER) tablets, which are long-actingimmediate-release (IR) tablets, which are short-actingcapsulesliquid solutionWe cover only the IR tablet, capsule, and liquid solution forms of lithium in this article. If you’d like to learn about lithium ER tablets, your medical professional or pharmacist can tell you more.You’ll likely take lithium two to three times a day.It’s important to avoid becoming dehydrated or overheated while taking lithium. You can stay hydrated and keep your body temperature low by drinking plenty of liquids. This is especially important while in hot weather or while exercising.It’s also important to eat a consistent amount of salt while taking lithium. Changing your salt intake could affect your lithium blood levels. Lower lithium blood levels could make the drug less effective. But higher lithium blood levels could raise your risk for lithium toxicity.*Your medical professional can help determine the right amount of liquid and salt for you while taking lithium.It’s recommended that you take lithium doses around the same times each day. This helps keep a steady level of lithium in your system, which may help prevent withdrawal symptoms. (To learn more about withdrawal, you can see the “Can lithium cause withdrawal if you stop taking it?” section above.)Taking lithium with food may help reduce some side effects of the drug.Your medical professional may prescribe lithium by itself to treat your condition. But depending on the severity of your symptoms, they may prescribe lithium along with other drugs.For example, your medical professional may prescribe lithium along with certain antipsychotics. Examples include:Before starting lithium, it’s important to tell your medical professional about any other drugs you take. This is because certain drugs, including antipsychotics in some cases, may increase your risk for side effects from lithium. Or they may affect how lithium works.Below we share answers to some questions you may have about lithium treatment.How long does lithium take to work? You may not notice lithium starting to reduce your symptoms until you’ve taken the drug for about a week. It typically takes several weeks for your symptoms to be reduced completely. We recommend talking with your medical professional about when you can expect to notice lithium working.What should I do if I miss a dose of lithium? It’s recommended that you take a missed dose of lithium as soon as you remember. But if it’s almost time for your next dose, you can skip your missed dose and take your next dose at its regular time. It’s important that you do not take two doses of lithium to make up for a missed dose. An extra dose can raise your risk for side effects from the drug. If you aren’t sure whether to take a missed dose or skip it, we suggest you talk with your medical professional or pharmacist.Is lithium meant for long-term use? Your medical professional may prescribe lithium for short-term or long-term use. If the drug is working for you and isn’t causing bothersome effects, you may take lithium long term.Can you chew, split, or crush lithium? The manufacturer of lithium hasn’t stated if the drug can be chewed, split, or crushed. You should not chew split or crush lithium tablets or capsules without first talking with your medical professional or pharmacist. They can help you if you’re not able to swallow the tablets or capsules whole.Should you take lithium with food? You can take lithium with food or without it. But taking lithium with food can help reduce certain side effects of the drug, such as nausea.What should you ask your medical professional?It’s common to have questions about your treatment plan for lithium. Your medical professional is there to work with you and help address any concerns you have.To help guide your discussion, here are some suggestions:You can write down questions you have before your visit. For example, “How will taking lithium affect my mood, body, and lifestyle?”You can think about asking a loved one or friend to come with you to your appointment. Having in-person support may help you feel more at ease.You can ask your medical professional to explain something that you find unclear.Working with your healthcare team may help you stay on track with your treatment. If you find that you’re not getting answers to your questions or receiving the care you deserve, consider seeking a second opinion.If you still have questions about lithium after reading this article, talking with your medical professional may be helpful. Together you can decide if lithium might be a good choice for you.You can also discuss other treatments, forms of support, and resources that may benefit you. We’ve listed some suggestions below.While you take lithium, additional treatments or remedies may help you better manage your condition. These can include:Whether you’re looking for a therapist, support group, or information about how to afford therapy, these resources may help:To receive weekly information about mental health, you may want to sign up for the Psych Central newsletter. You’ll find stories directly from other people about their mental health journey as well as the latest information about treatments.Disclaimer: Psych Central has made every effort to make certain that all information is factually correct, comprehensive, and up to date. However, this article should not be used as a substitute for the knowledge and expertise of a licensed healthcare professional. You should always consult your doctor or another healthcare professional before taking any medication. The drug information contained herein is subject to change and is not intended to cover all possible uses, directions, precautions, warnings, drug interactions, allergic reactions, or adverse effects. The absence of warnings or other information for a given drug does not indicate that the drug or drug combination is safe, effective, or appropriate for all patients or all specific uses. Lithium comes as a tablet, capsule, extended-release (long-acting) tablet, and solution (liquid) to take by mouth. The tablets, capsules, and solution are usually taken three to four times a day. The extended-release tablets are usually taken two to three times a day. Take lithium at around the same times every day. Follow the directions on your prescription label carefully, and ask your doctor or pharmacist to explain any part you do not understand. Take lithium exactly as directed. Do not take more or less of it or take it more often than prescribed by your doctor.Swallow the extended-release tablet whole; do not split, chew, or crush it.Your doctor may increase or decrease the dose of your medication during your treatment. Follow these directions carefully.Lithium may help to control your condition but will not cure it. It may take 1 to 3 weeks or longer for you to feel the full benefit of lithium. Continue to take lithium even if you feel well. Do not stop taking lithium without talking to your doctor.

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This article is about the chemical element. For the use of lithium as a medication, see Lithium (medication). For other uses, see Lithium (disambiguation). "3Li" redirects here. For the isotope of lithium with three nucleons, see 3Li. Chemical element with atomic number 3 (Li)Lithium, 3LiFreshly cut sample of lithium, with minimal oxidesLithiumPronunciation/ˈlɪθiəm/ (LITH-ee-əm)Appearancesilvery-whiteStandard atomic weight Ar°(Li)[6.938, 6.997][1]6.94±0.06 (abridged)[2] Lithium in the periodic table Hydrogen Helium Lithium Beryllium Boron Carbon Nitrogen Oxygen Fluorine Neon Sodium Magnesium Aluminium Silicon Phosphorus Sulfur Chlorine Argon Potassium Calcium Scandium Titanium Vanadium Chromium Manganese Iron Cobalt Nickel Copper Zinc Gallium Germanium Arsenic Selenium Bromine Krypton Rubidium Strontium Yttrium Zirconium Niobium Molybdenum Technetium Ruthenium Rhodium Palladium Silver Cadmium Indium Tin Antimony Tellurium Iodine Xenon Caesium Barium Lanthanum Cerium Praseodymium Neodymium Promethium Samarium Europium Gadolinium Terbium Dysprosium Holmium Erbium Thulium Ytterbium Lutetium Hafnium Tantalum Tungsten Rhenium Osmium Iridium Platinum Gold Mercury (element) Thallium Lead Bismuth Polonium Astatine Radon Francium Radium Actinium Thorium Protactinium Uranium Neptunium Plutonium Americium Curium Berkelium Californium Einsteinium Fermium Mendelevium Nobelium Lawrencium Rutherfordium Dubnium Seaborgium Bohrium Hassium Meitnerium Darmstadtium Roentgenium Copernicium Nihonium Flerovium Moscovium Livermorium Tennessine Oganesson H↑Li↓Na helium ← lithium → beryllium Atomic number (Z)3Groupgroup 1: hydrogen and alkali metalsPeriodperiod 2Block s-blockElectron configuration[He] 2s1Electrons per shell2, 1Physical propertiesPhase at STPsolidMelting point453.65 K (180.50 °C, 356.90 °F) Boiling point1617 K (1344 °C, 2451 °F) Density (at 20° C)0.5334 g/cm3[3]when liquid (at m.p.)0.512 g/cm3 Critical point3220 K, 67 MPa (extrapolated)Heat of fusion3.00 kJ/mol Heat of vaporization136 kJ/mol Molar heat capacity24.860 J/(mol·K) Vapor pressure P (Pa) 1 10 100 1 k 10 k 100 k at T (K) 797 885 995 1144 1337 1610 Atomic propertiesOxidation statescommon: +1 −1[4]ElectronegativityPauling scale: 0.98 Ionization energies1st: 520.2 kJ/mol 2nd: 7298.1 kJ/mol 3rd: 11815.0 kJ/mol Atomic radiusempirical: 152 pm Covalent radius128±7 pm Van der Waals radius182 pm Spectral lines of lithiumOther propertiesNatural occurrenceprimordialCrystal structure body-centered cubic (bcc) (cI2)Lattice constanta = 350.93 pm (at 20 °C)[3]Thermal expansion46.56×10−6/K (at 20 °C)[3]Thermal conductivity84.8 W/(m·K) Electrical resistivity92.8 nΩ·m (at 20 °C) Magnetic orderingparamagnetic Molar magnetic susceptibility+14.2×10−6 cm3/mol (298 K)[5]Young's modulus4.9 GPa Shear modulus4.2 GPa Bulk modulus11 GPa Speed of sound thin rod6000 m/s (at 20 °C) Mohs hardness0.6 Brinell hardness5 MPa CAS Number7439-93-2 HistoryNamingfrom the Greek word λιθος, stoneDiscoveryJohan August Arfwedson (1817)First isolationWilliam Thomas Brande (1821)Isotopes of lithiumve Main isotopes[6] Decay abundance half-life (t1/2) mode product 6Li [1.9%, 7.8%] stable 7Li [92.2%, 98.1%] stable Significant variation occurs in commercial samples because of the wide distribution of samples depleted in 6Li. Category: Lithiumviewtalkedit | references Lithium (from Ancient Greek: λίθος, líthos, 'stone') is a chemical element; it has symbol Li and atomic number 3. It is a soft, silvery-white alkali metal. Under standard conditions, it is the least dense metal and the least dense solid element. Like all alkali metals, lithium is highly reactive and flammable, and must be stored in vacuum, inert atmosphere, or inert liquid such as purified kerosene[7] or mineral oil. It exhibits a metallic luster. It corrodes quickly in air to a dull silvery gray, then black tarnish. It does not occur freely in nature, but occurs mainly as pegmatitic minerals, which were once the main source of lithium. Due to its solubility as an ion, it is present in ocean water and is commonly obtained from brines. Lithium metal is isolated electrolytically from a mixture of lithium chloride and potassium chloride. The nucleus of the lithium atom verges on instability, since the two stable lithium isotopes found in nature have among the lowest binding energies per nucleon of all stable nuclides. Because of its relative nuclear instability, lithium is less common in the Solar System than 25 of the first 32 chemical elements even though its nuclei are very light: it is an exception to the trend that heavier nuclei are less common.[8] For related reasons, lithium has important uses in nuclear physics. The transmutation of lithium atoms to helium in 1932 was the first fully human-made nuclear reaction, and lithium deuteride serves as a fusion fuel in staged thermonuclear weapons.[9] Lithium and its compounds have several industrial applications, including heat-resistant glass and ceramics, lithium grease lubricants, flux additives for iron, steel and aluminium production, lithium metal batteries, and lithium-ion batteries. Batteries alone consume more than three-quarters of lithium production.[10] Lithium is present in biological systems in trace amounts. It has no established metabolic function in humans. Lithium-based drugs are useful as a mood stabilizer and antidepressant in the treatment of mental illness such as bipolar disorder. Lithium ingots with a thin layer of black nitride tarnish The alkali metals are also called the lithium family, after its leading element. Like the other alkali metals (which are sodium (Na), potassium (K), rubidium (Rb), caesium (Cs), and francium (Fr)), lithium has a single valence electron that, in the presence of solvents, is easily released to form Li+.[11] Because of this, lithium is a good conductor of heat and electricity as well as a highly reactive element, though it is the least reactive of the alkali metals. Lithium's lower reactivity is due to the proximity of its valence electron to its nucleus (the remaining two electrons are in the 1s orbital, much lower in energy, and do not participate in chemical bonds).[11] Molten lithium is significantly more reactive than its solid form.[12][13] Lithium metal is soft enough to be cut with a knife. It is silvery-white. In air it oxidizes to lithium oxide.[11] Its melting point of 180.50 °C (453.65 K; 356.90 °F)[14] and its boiling point of 1,342 °C (1,615 K; 2,448 °F)[14] are each the highest of all the alkali metals while its density of 0.534 g/cm3 is the lowest. Lithium has a very low density (0.534 g/cm3), comparable with pine wood.[15] It is the least dense of all elements that are solids at room temperature; the next lightest solid element (potassium, at 0.862 g/cm3) is more than 60% denser. Apart from helium and hydrogen, as a solid it is less dense than any other element as a liquid, being only two-thirds as dense as liquid nitrogen (0.808 g/cm3).[16] Lithium can float on the lightest hydrocarbon oils and is one of only three metals that can float on water, the other two being sodium and potassium. Lithium floating in oil Lithium's coefficient of thermal expansion is twice that of aluminium and almost four times that of iron.[17] Lithium is superconductive below 400 μK at standard pressure[18] and at higher temperatures (more than 9 K) at very high pressures (>20 GPa).[19] At temperatures below 70 K, lithium, like sodium, undergoes diffusionless phase change transformations. At 4.2 K it has a rhombohedral crystal system (with a nine-layer repeat spacing); at higher temperatures it transforms to face-centered cubic and then body-centered cubic. At liquid-helium temperatures (4 K) the rhombohedral structure is prevalent.[20] Multiple allotropic forms have been identified for lithium at high pressures.[21] Lithium has a mass specific heat capacity of 3.58 kilojoules per kilogram-kelvin, the highest of all solids.[22][23] Because of this, lithium metal is often used in coolants for heat transfer applications.[22] Main article: Isotopes of lithium Naturally occurring lithium is composed of two stable isotopes, 6Li and 7Li, the latter being the more abundant (95.15% natural abundance).[24][25] Both natural isotopes have anomalously low nuclear binding energy per nucleon (compared to the neighboring elements on the periodic table, helium and beryllium); lithium is the only low numbered element that can produce net energy through nuclear fission. The two lithium nuclei have lower binding energies per nucleon than any other stable nuclides other than hydrogen-1, deuterium and helium-3.[26] As a result of this, though very light in atomic weight, lithium is less common in the Solar System than 25 of the first 32 chemical elements.[8] Seven radioisotopes have been characterized, the most stable being 8Li with a half-life of 838 ms and 9Li with a half-life of 178 ms. All of the remaining radioactive isotopes have half-lives that are shorter than 8.6 ms. The shortest-lived isotope of lithium is 4Li, which decays through proton emission and has a half-life of 7.6 × 10−23 s.[27] The 6Li isotope is one of only five stable nuclides to have both an odd number of protons and an odd number of neutrons, the other four stable odd-odd nuclides being hydrogen-2, boron-10, nitrogen-14, and tantalum-180m.[28] 7Li is one of the primordial elements (or, more properly, primordial nuclides) produced in Big Bang nucleosynthesis. A small amount of both 6Li and 7Li are produced in stars during stellar nucleosynthesis, but it is further "burned" as fast as produced.[29] 7Li can also be generated in carbon stars.[30] Additional small amounts of both 6Li and 7Li may be generated from solar wind, cosmic rays hitting heavier atoms, and from early solar system 7Be radioactive decay.[31] Lithium isotopes fractionate substantially during a wide variety of natural processes,[32] including mineral formation (chemical precipitation), metabolism, and ion exchange. Lithium ions substitute for magnesium and iron in octahedral sites in clay minerals, where 6Li is preferred to 7Li, resulting in enrichment of the light isotope in processes of hyperfiltration and rock alteration. The exotic 11Li is known to exhibit a neutron halo, with 2 neutrons orbiting around its nucleus of 3 protons and 6 neutrons. The process known as laser isotope separation can be used to separate lithium isotopes, in particular 7Li from 6Li.[33] Nuclear weapons manufacture and other nuclear physics applications are a major source of artificial lithium fractionation, with the light isotope 6Li being retained by industry and military stockpiles to such an extent that it has caused slight but measurable change in the 6Li to 7Li ratios in natural sources, such as rivers. This has led to unusual uncertainty in the standardized atomic weight of lithium, since this quantity depends on the natural abundance ratios of these naturally-occurring stable lithium isotopes, as they are available in commercial lithium mineral sources.[34] Both stable isotopes of lithium can be laser cooled and were used to produce the first quantum degenerate Bose–Fermi mixture.[35] Lithium is about as common as chlorine in the Earth's upper continental crust, on a per-atom basis. Main articles: Nucleosynthesis, Stellar nucleosynthesis, and Lithium burning Although it was synthesized in the Big Bang, lithium (together with beryllium and boron) is markedly less abundant in the universe than other elements. This is a result of the comparatively low stellar temperatures necessary to destroy lithium, along with a lack of common processes to produce it.[36] According to modern cosmological theory, lithium—in both stable isotopes (lithium-6 and lithium-7)—was one of the three elements synthesized in the Big Bang.[37] Though the amount of lithium generated in Big Bang nucleosynthesis is dependent upon the number of photons per baryon, for accepted values the lithium abundance can be calculated, and there is a "cosmological lithium discrepancy" in the universe: older stars seem to have less lithium than they should, and some younger stars have much more.[38] The lack of lithium in older stars is apparently caused by the "mixing" of lithium into the interior of stars, where it is destroyed,[39] while lithium is produced in younger stars. Although it transmutes into two atoms of helium due to collision with a proton at temperatures above 2.4 million degrees Celsius (most stars easily attain this temperature in their interiors), lithium is more abundant than computations would predict in later-generation stars.[40] Nova Centauri 2013 is the first in which evidence of lithium has been found.[41] Lithium is also found in brown dwarf substellar objects and certain anomalous orange stars. Because lithium is present in cooler, less-massive brown dwarfs, but is destroyed in hotter red dwarf stars, its

Since 2018 the Democratic Republic of Congo is known to have the largest lithium spodumene hard-rock deposit in the world.[122] The deposit located in Manono, DRC, may hold up to 1.5 billion tons of lithium spodumene hard-rock. The two largest pegmatites (known as the Carriere de l'Este Pegmatite and the Roche Dure Pegmatite) are each of similar size or larger than the famous Greenbushes Pegmatite in Western Australia. Thus, the Democratic Republic of Congo is expected to be a significant supplier of lithium to the world with its high grade and low impurities. On 16 July 2018 2.5 million tonnes of high-grade lithium resources and 124 million pounds of uranium resources were found in the Falchani hard rock deposit in the region Puno, Peru.[123] In 2020, Australia granted Major Project Status (MPS) to the Finniss Lithium Project for a strategically important lithium deposit: an estimated 3.45 million tonnes (Mt) of mineral resource at 1.4 percent lithium oxide.[124][125] Operational mining began in 2022.[126] Extracting lithium from brine deep in Wyoming's Rock Springs Uplift has been proposed as revenue source to make atmospheric carbon sequestration economically viable.[127] Additional deposits in the same formation were estimated to be as much as 18 million tons if economic means of recovery can be employed.[128] Similarly in Nevada, the McDermitt Caldera hosts lithium-bearing volcanic muds that consist of the largest known deposits of lithium within the United States.[129] The Pampean Pegmatite Province in Argentina is known to have a total of at least 200,000 tons of spodumene with lithium oxide (Li_2O) grades varying between 5 and 8 wt %.[130] In Russia the largest lithium deposit Kolmozerskoye is located in Murmansk region. In 2023, Polar Lithium, a joint venture between Nornickel and Rosatom, has been granted the right to develop the deposit. The project aims to produce 45,000 tonnes of lithium carbonate and hydroxide per year and plans to reach full design capacity by 2030.[131] Another potential source of lithium as of 2012[update] was identified as the leachates of geothermal wells, which are carried to the surface.[132] Recovery of this type of lithium has been demonstrated in the field; the lithium is separated by simple filtration.[133][134] Reserves are more limited than those of brine reservoirs and hard rock.[135] Lithium prices In 1998, the price of lithium metal was about 95 USD/kg (or US$43/lb).[136] After the 2008 financial crisis, major suppliers, such as Sociedad Química y Minera (SQM), dropped lithium carbonate pricing by 20%.[137] Prices rose in 2012. A 2012 Business Week article outlined an oligopoly in the lithium space: "SQM, controlled by billionaire Julio Ponce, is the second-largest, followed by Rockwood, which is backed by Henry Kravis's KKR & Co., and Philadelphia-based FMC", with Talison mentioned as the biggest producer.[138] Global consumption may jump to 300,000 metric tons a year by 2020[failed verification] from about 150,000 tons in 2012, to match the demand for lithium batteries that has been growing at about 25% a year, outpacing the 4% to 5% overall gain in lithium production.[138][needs update] The price information service ISE – Institute of Rare Earths Elements and Strategic Metals – gives for various lithium substances in the average of March to August 2022 the following kilo prices stable in the course: Lithium carbonate, purity 99.5% min, from various producers between 63 and 72 EUR/kg. Lithium hydroxide monohydrate LiOH 56.5% min, China, at 66 to 72 EUR/kg; delivered South Korea – 73 EUR/kg. Lithium metal 99.9% min, delivered China – 42 EUR/kg.[139] Analyses of the extraction of lithium from seawater, published in 1975 Lithium and its compounds were historically isolated and extracted from hard rock. However, by the 1990s mineral springs, brine pools, and brine deposits had become the dominant source.[140] Most of these were in Chile, Argentina and Bolivia and the lithium is extracted from the brine by evaporative processes.[57] Large lithium-clay deposits under development in the McDermitt caldera (Nevada, United States) require concentrated sulfuric acid to leach lithium from the clay ore.[141] By early 2021, much of the lithium mined globally came from either "spodumene, the mineral contained in hard rocks found in places such as Australia and North Carolina"[142] or from salty brine pumped directly out of the ground, as it is in locations in Chile and Argentina.[142][119] In Chile's Salar de Atacama, the lithium concentration in the brine is raised by solar evaporation in a system of ponds.[119] The enrichment by evaporation process may require up to one-and-a-half years, when the brine reaches a lithium content of 6%.[119] The final processing in this example is done in Salar del Carmen and La Negra near the coastal city of Antofagasta where pure lithium carbonate, lithium hydroxide, and lithium chloride are produced from the brine.[119] Direct Lithium Extraction (DLE) technologies are being developed as alternatives to the evaporitic technology long used to extract lithium salts from brines. The traditional evaporitic technology is a long duration process requiring large amounts of land and intensive water use, and can only be applied to the large continental brines. In contrast, DLE technologies are proposed to tackle the environmental and techno–economic shortcomings by avoiding brine evaporation.[143][144] Some recent lithium mining projects are attempting to bring DLE into commercial production by these non-evaporative DLE approaches.[121] One method direct lithium extraction, as well as other valuable minerals, is to process geothermal brine water through an electrolytic cell, located within a membrane.[145][146] The use of electrodialysis and electrochemical intercalation was proposed in 2020 to extract lithium compounds from seawater (which contains lithium at 0.2 parts per million).[147][148][149][150] Ion-selective cells within a membrane in principle could collect lithium either by use of electric field or a concentration difference.[150] In 2024, a redox/electrodialysis system was claimed to offer enormous cost savings, shorter timelines, and less environmental damage than traditional evaporation-based systems.[151] Further information: Environmental impacts of lithium-ion batteries Environmental protests in Belgrade, Serbia, 11 December 2021 The manufacturing processes of lithium, including the solvent and mining waste, presents significant environmental and health hazards.[152][153][154] Lithium extraction can be fatal to aquatic life due to water pollution.[155] It is known to cause surface water contamination, drinking water contamination, respiratory problems, ecosystem degradation and landscape damage.[152] It also leads to unsustainable water consumption in arid regions (1.9 million liters per ton of lithium), such as in northwestern Argentina.[156][152] Massive byproduct generation of lithium extraction also presents unsolved problems, such as large amounts of magnesium and lime waste.[157] Although lithium occurs naturally, it is a non-renewable resource yet is seen as crucial in the transition away from fossil fuels, and the extraction process has been criticised for long-term degradation of water resources.[158][159] In the United States, open-pit mining and mountaintop removal mining compete with brine extraction mining.[160] Environmental concerns include wildlife habitat degradation, potable water pollution including arsenic and antimony contamination, unsustainable water table reduction, and massive mining waste, including radioactive uranium byproduct and sulfuric acid discharge. During 2021, a series of mass protests broke out in Serbia against the construction of a lithium mine in Western Serbia by the Rio Tinto corporation.[161] In 2024, an EU backed lithium mining project created large scale protests in Serbia.[162] Some animal species associated to salt lakes in the Lithium Triangle (on the borders of Argentina, Bolivia and Chile) are particularly threatened by the damages of lithium production to the local ecosystem, including the Andean flamingo[163] and Orestias parinacotensis, a small fish locally known as "karachi".[164] Reporting on lithium extraction companies and indigenous peoples in Argentina found that the state may did not always protect indigenous peoples' right to free prior and informed consent, and that extraction companies generally controlled community access to information and set the terms for discussion of the projects and benefit sharing.[156][165] In Argentina's Puna region, in 2023, two mining companies (Minera Exar and Sales de Jujuy) extracted over 3.7 billion liters of fresh water, over 31 times the annual water consumption of the local community of Susques department.[156] In Zimbabwe, the global increase in lithium prices in the early 2020s triggered a 'lithium fever' that led to displacement of locals and conflicts between small-scale artisanal miners and large-scale mining companies. Some local farmers agreed to relocate and were satisfied with their compensation.[166] Artisanal miners occupied parts of the Sandawana mines and a privately owned lithium claim area in Goromonzi, a rural area close to the capital Harare. The artisanal miners were later evicted after the area was cordoned off and shut down by Zimbabwe's Environmental Management Agency.[167] Development of the Thacker Pass lithium mine in Nevada, United States, has met with protests and lawsuits from several indigenous tribes who have said they were not provided free prior and informed consent and that the project threatens cultural and sacred sites.[168] They have also expressed concerns that development of the project will create risks to indigenous women, because resource extraction is linked to missing and murdered indigenous women.[169] Protestors have been occupying the site of the proposed mine since January 2021.[170][160] Pie chart of how much lithium was used and in what way globally in 2020.[171] In 2021, most lithium is used to make lithium-ion batteries for electric cars and mobile devices. Lithium oxide is widely used as a flux for processing silica, reducing the melting point and viscosity of the material and leading to glazes with improved physical properties including low coefficients of thermal expansion. Worldwide, this is one of the largest use for lithium compounds.[172][173] Glazes containing lithium oxides are used for ovenware. Lithium carbonate (Li_2CO_3) is generally used in this application because it converts to the oxide upon heating.[174] Late in the 20th century, lithium became an important component of battery electrolytes and electrodes, because of its high electrode potential. Because of its low atomic mass, it has a high charge- and power-to-weight ratio. A typical lithium-ion battery can generate approximately 3 volts per cell, compared with 2.1 volts for lead-acid and 1.5 volts for zinc-carbon. Lithium-ion batteries, which are rechargeable and have a high energy density, differ from lithium metal batteries, which are disposable (primary) batteries with lithium or its compounds as the anode.[175][176] Other rechargeable batteries that use lithium include the lithium-ion polymer battery, lithium iron phosphate battery, and the nanowire battery.[177] Over the years opinions have been differing about potential growth. A 2008 study concluded that "realistically achievable lithium carbonate production would be sufficient for only a small fraction of future PHEV and EV global market requirements", that "demand from the portable electronics sector will absorb much of the planned production increases in the next decade", and that "mass production of lithium carbonate is not environmentally sound, it will cause irreparable ecological damage to ecosystems that should be protected and that LiIon propulsion is incompatible with the notion of the 'Green Car'".[59] Main article: Lithium grease The third most common use of lithium is in greases. Lithium hydroxide is a strong base, and when heated with a fat, it produces a soap, such as lithium stearate from stearic acid. Lithium soap has the ability to thicken oils, and it is used to manufacture all-purpose, high-temperature lubricating greases.[22][178][179] Lithium (e.g. as lithium carbonate) is used as an additive to continuous casting mould flux slags where it increases fluidity,[180][181] a use which accounts for 5% of global lithium use (2011).[58] Lithium compounds are also used as additives (fluxes) to foundry sand for iron casting to reduce veining.[182] Lithium (as lithium fluoride) is used as an additive to aluminium smelters (Hall–Héroult process), reducing melting temperature and increasing electrical resistance,[183] a use which accounts for 3% of production (2011).[58] When used as a flux for welding or soldering, metallic lithium promotes the fusing of metals during the process[184] and eliminates the formation of oxides by absorbing impurities.[185] Alloys of the metal with aluminium, cadmium, copper and manganese are used to make high-performance, low density aircraft parts (see also Lithium-aluminium alloys).[186] Lithium has been found effective in assisting the perfection of silicon nano-welds in electronic components for electric batteries and other devices.[187] Lithium is used in flares and pyrotechnics is due to its rose-red flame.[188] Lithium compounds are used as pyrotechnic colorants and oxidizers in red fireworks and flares.[22][189] Lithium chloride and lithium bromide are hygroscopic and are used as desiccants for gas streams.[22] Lithium hydroxide and lithium peroxide are the salts most commonly used in confined areas, such as aboard spacecraft and submarines, for carbon dioxide removal and air purification. Lithium hydroxide absorbs carbon dioxide from the air by forming lithium carbonate, and is preferred over other alkaline hydroxides for its low weight. Lithium peroxide (Li_2O_2) in presence of moisture not only reacts with carbon dioxide to form lithium carbonate, but also releases oxygen.[190][191] The reaction is as follows: $2\ Li_2O_2 + 2\ CO_2 \rightarrow 2\ Li_2CO_3 + O_2$ Some of the aforementioned compounds, as well as lithium perchlorate, are used in oxygen candles that supply submarines with oxygen. These can also include small amounts of boron, magnesium, aluminium, silicon, titanium, manganese, and iron.[192] Lithium fluoride, artificially grown as crystal, is clear and transparent and often used in specialist optics for IR, UV and VUV (vacuum UV) applications. It has one of the lowest refractive indices and the furthest transmission range in the deep UV of most common materials.[193] Finely divided lithium fluoride powder has been used for thermoluminescent radiation dosimetry (TLD): when a sample of such is exposed to radiation, it accumulates crystal defects which, when heated, resolve via a release of bluish light whose intensity is proportional to the absorbed dose, thus allowing this to be quantified.[194] Lithium fluoride is sometimes used in focal lenses of telescopes.[22][195] The high non-linearity of lithium niobate also makes it useful in non-linear optics applications. It is used extensively in telecommunication products such as mobile phones and optical modulators, for such components as resonant crystals. Lithium applications are used in more than 60% of mobile phones.[196] Organolithium compounds are widely used in the production of polymer and fine-chemicals. In the polymer industry, which is the dominant consumer of these reagents, alkyl lithium compounds are catalysts/initiators[197] in anionic polymerization of unfunctionalized olefins.[198][199][200] For the production of fine chemicals, organolithium compounds function as strong bases and as reagents for the formation of carbon-carbon bonds. Organolithium compounds are prepared from lithium metal and alkyl halides.[201] Many other lithium compounds are used as reagents to prepare organic compounds. Some popular compounds include lithium aluminium hydride ($LiAlH_4$), lithium triethylborohydride, n-butyllithium and tert-butyllithium. The launch of a torpedo using lithium as fuel Metallic lithium and its complex hydrides, such as lithium aluminium hydride ($LiAlH_4$), are used as high-energy additives to rocket propellants.[40] $LiAlH_4$ can also be used by itself as a solid fuel.[202] The Mark 50 torpedo stored chemical energy propulsion system (SCEPS) uses a small tank of sulfur hexafluoride, which is sprayed over a block of solid lithium. The reaction generates heat, creating steam to propel the torpedo in a closed Rankine cycle.[203] Lithium hydride containing lithium-6 is used in thermonuclear weapons, where it serves as fuel for the fusion stage of the bomb.[204] Lithium-6 is valued as a source material for tritium production and as a neutron absorber in nuclear fusion. Natural lithium contains about 7.5% lithium-6 from which large amounts of lithium-6 have been produced by isotope separation for use in nuclear weapons.[205] Lithium-7 gained interest for use in nuclear reactor coolants.[206] Lithium deuteride was used as fuel in the Castle Bravo nuclear device. Lithium deuteride was the fusion fuel of choice in early versions of the hydrogen bomb. When bombarded by neutrons, both 6Li and 7Li produce tritium — this reaction, which was not fully understood when hydrogen bombs were first tested, was responsible for the runaway yield of the Castle Bravo nuclear test. Tritium fuses with deuterium in a fusion reaction that is relatively easy to achieve. Although details remain secret, lithium-6 deuteride apparently still plays a role in modern nuclear weapons as a fusion material.[207] Lithium fluoride, when highly enriched in the lithium-7 isotope, forms the basic constituent of the fluoride salt mixture LiF-BeF_2 used in liquid fluoride nuclear reactors. Lithium fluoride is exceptionally chemically stable and LiF-BeF_2 mixtures have low melting points. In addition, 7Li, Be, and F are among the few nuclides with low enough thermal neutron capture cross-sections not to poison the fission reactions inside a nuclear fission reactor.[note 4][208] In conceptualized (hypothetical) nuclear fusion power plants, lithium will be used to produce tritium in magnetically confined reactors using deuterium and tritium as the fuel. Naturally occurring tritium is extremely rare and must be synthetically produced by surrounding the reacting plasma with a 'blanket' containing lithium, where neutrons from the deuterium-tritium reaction in the plasma will fission the lithium to produce more tritium: $6Li + n \rightarrow 4He + 3H$. Lithium is also used as a source for alpha particles, or helium nuclei. When 7Li is bombarded by accelerated protons 8Be is formed, which almost immediately undergoes fission to form two alpha particles. This feat, called "splitting the atom" at the time, was the first fully human-made nuclear reaction. It was produced by Cockroft and Walton in 1932.[209][210] Injection of lithium powders is used in fusion reactors to manipulate plasma-material interactions and dissipate energy in the hot thermo-nuclear fusion plasma boundary.[211][212] In 2013, the US Government Accountability Office said a shortage of lithium-7 critical to the operation of 65 out of 100 American nuclear reactors "places their ability to continue to provide electricity at some risk." The problem stems from the decline of US nuclear infrastructure. The equipment needed to separate lithium-6 from lithium-7 is mostly a cold war leftover. The US shut down most of this machinery in 1963, when it had a huge surplus of separated lithium, mostly consumed during the twentieth century. The report said it would take five years and $10 million to $12 million to reestablish the ability to separate lithium-6 from lithium-7.[213] Reactors that use lithium-7 heat water under high pressure and transfer heat through heat exchangers that are prone to corrosion. The reactors use lithium to counteract the corrosive effects of boric acid, which is added to the water to absorb excess neutrons.[213] Main article: Lithium (medication) Lithium is useful in the treatment of bipolar disorder.[214] Lithium salts may also be helpful for related diagnoses, such as schizoaffective disorder and cyclic major depressive disorder. The active part of these salts is the lithium ion Li^+.[214] Lithium may increase the risk of developing Ebstein's cardiac anomaly in infants born to women who take lithium during the first trimester of pregnancy.[215] Lithium Hazards GHS labelling: Pictograms Signal word Danger Hazard statements H260, H314 Precautionary statements P223, P231+P232, P280, P305+P351+P338, P370+P378, P422[216] NFPA 704 (fire diamond) [217] 3 2 2W Chemical compound Lithium metal is corrosive and requires special handling to avoid skin contact. Breathing lithium dust or lithium compounds (which are often alkaline) initially irritate the nose and throat, while higher exposure can cause a buildup of fluid in the lungs, leading to pulmonary edema. The metal itself is a handling hazard because contact with moisture produces the caustic lithium hydroxide. Lithium is safely stored in non-reactive compounds such as naphtha.[218] Cosmological lithium problem Dilithium Halo nucleus Isotopes of lithium List of countries by lithium production Lithia water Lithium–air battery Lithium burning Lithium compounds (category) Lithium-ion battery Lithium Tokamak Experiment ^ a b Appendixes Archived 6 November 2011 at the Wayback Machine. By USGS definitions, the reserve base "may encompass those parts of the resources that have a reasonable potential for becoming economically available within planning horizons beyond those that assume proven technology and current economics. The reserve base includes those resources that are currently economic (reserves), marginally economic (marginal reserves), and some of those that are currently subeconomic (subeconomic resources)." ^ In 2013 ^ Excludes U.S. production ^ Beryllium and fluorine occur only as one isotope, 9Be and 19F respectively. These two, together with 7Li, as well as 2H, 11B, 15N, 209Bi, and the stable isotopes of C, and O, are the only nuclides with low enough thermal neutron capture cross sections aside from actinides to serve as major constituents of a molten salt breeder reactor fuel. ^ "Standard Atomic Weights: Lithium". CIAAW. 2009. ^ Prohaska, Thomas; Irrgeher, Johanna; Benefield, Jacqueline; Böhlke, John K.; Chesson, Lesley A.; Coplen, Tyler B.; Ding, Tiping; Dunn, Philip J. H.; Gröning, Manfred; Holden, Norman E.; Meijer, Harro A. J. (4 May 2022). "Standard atomic weights of the elements 2021 (IUPAC Technical Report)". Pure and Applied Chemistry. doi:10.1515/pac-2019-0603. ISSN 1365-3075. ^ a b c Arblaster, John W. (2018). Selected Values of the Crystallographic Properties of Elements. Materials Park, Ohio: ASM International. ISBN 978-1-62708-155-9. ^ Li(–1) has been observed in the gas phase; see R. H. Sloane; H. M. Love (1947). "Surface Formation of Lithium Negative Ions". 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(in German) ^ Gmelin,

increased heart rate, delirium, and agitation. Symptoms of severe lithium toxicity include increased temperature, seizures, and low blood pressure. Severe lithium toxicity is serious and can be life threatening.If a person has symptoms of lithium toxicity, they should seek medical help right away.BipolarDepressionMental HealthDrugs