

1

H

2

He

3

Li

4

Be

5

B

6

C

7

N

8

O

Helium

Nº 2 · 4.0026 · Noble gas

Second-most-abundant element in the universe. Lifts balloons, cools MRI magnets, and makes your voice high-pitched because sound moves faster through it.

Hydrogen

Nº 1 · 1.008 · Nonmetal

The lightest element. Bonds to almost everything - it is in water, in every acid, and in every fuel.

Beryllium

Nº 4 · 9.0122 · Alkaline earth metal

Used in alloys for spacecraft and in the windows of X-ray tubes. Toxic to inhale; otherwise hard, light, and strong.

Lithium

Nº 3 · 6.94 · Alkali metal

Lightest metal. Soft enough to cut with a butter knife. Powers every rechargeable phone battery on Earth.

Carbon

Nº 6 · 12.011 · Nonmetal

The backbone of every organic molecule. Diamonds are pure carbon. So is graphite, and so are you.

Boron

Nº 5 · 10.81 · Metalloid

In every borosilicate glass beaker (Pyrex). In semiconductors. Has only 3 valence electrons - the famous octet exception that explains BF_3 's flat trigonal-planar shape.

Oxygen

Nº 8 · 15.999 · Nonmetal

21% of the air. Makes fire possible. Bonded to almost everything in your body, mostly via water.

Nitrogen

Nº 7 · 14.007 · Nonmetal

78% of the air you are breathing right now is N_2 . Almost inert at room temperature; reactive enough to make every protein in your body.

9

F

10

Ne

11

Na

12

Mg

13

Al

14

Si

15

P

16

S

Neon

Nº 10 · 20.18 · Noble gas

Inert. Glows orange-red when current passes through it - every old-school neon sign uses real neon.

Fluorine

Nº 9 · 18.998 · Halogen

The most electronegative element. Steals electrons from anything it touches. It is what etches glass and what is in your toothpaste - same atom, very different doses.

Magnesium

Nº 12 · 24.305 · Alkaline earth metal

Burns with a brilliant white flame - old camera flashes and modern flares. Center of every chlorophyll molecule.

Sodium

Nº 11 · 22.99 · Alkali metal

Soft, silver, and explosive in water. Half of table salt (NaCl). Half the ions running through every nerve in your body.

Silicon

Nº 14 · 28.085 · Metalloid

The element of glass, sand, semiconductors, and Silicon Valley. Second-most-abundant element in the crust.

Aluminum

Nº 13 · 26.982 · Post-transition metal

The most abundant metal in Earth's crust. Foil, cans, plane fuselages. Until 1886 it was more expensive than gold.

Sulfur

Nº 16 · 32.06 · Nonmetal

Yellow when pure. Smells like rotten eggs (as H₂S) but the element itself is odorless. Lives near volcanoes and in every protein with a disulfide bridge.

Phosphorus

Nº 15 · 30.974 · Nonmetal

In every strand of your DNA, in every match head, and in the matrix of bone. Glows in the dark on first isolation - hence the name.

17

Cl

18

Ar

19

K

20

Ca

21

Sc

22

Ti

23

V

24

Cr

Argon

Nº 18 · 39.95 · Noble gas

Inert noble gas. Fills incandescent bulbs to keep the filament from burning. About 1% of the air you breathe.

Chlorine

Nº 17 · 35.45 · Halogen

Yellow-green gas. Used as a chemical weapon in WWI; in lower doses, it is what kills bacteria in your tap water and in pools.

Calcium

Nº 20 · 40.078 · Alkaline earth metal

Bones, teeth, and chalk. The structural metal of life. Burns red-orange in a flame test.

Potassium

Nº 19 · 39.098 · Alkali metal

More violent in water than sodium - bursts into purple flame. Vital electrolyte; bananas are famous for it.

Titanium

Nº 22 · 47.867 · Transition metal

Half the weight of steel at twice the strength. Jets, surgical implants, golf clubs, the SR-71 Blackbird.

Scandium

Nº 21 · 44.956 · Transition metal

Lightweight, strong, used in baseball bats and aerospace alloys. Mendeleev predicted it before it was found.

Chromium

Nº 24 · 51.996 · Transition metal

The shine on a chrome bumper. Stainless steel is iron + chromium. Toxic in the +6 oxidation state (the Erin Brockovich case).

Vanadium

Nº 23 · 50.942 · Transition metal

Hardens steel for tools, springs, and Crescent wrenches. Color of every Vanadium compound depends on its oxidation state.

25

Mn

26

Fe

27

Co

28

Ni

29

Cu

30

Zn

31

Ga

32

Ge

Iron

Nº 26 · 55.845 · Transition metal

Most-used metal on Earth. Building beams, cars, ships, hemoglobin in your blood.

Manganese

Nº 25 · 54.938 · Transition metal

Hardens steel beyond what carbon alone can do. The black streak on a manganese-rich rock. In every alkaline battery you own.

Nickel

Nº 28 · 58.693 · Transition metal

The metal in every stainless-steel fork and most US coins. Magnetic at room temperature. A nickel allergy triggers itching on jewelry contact.

Cobalt

Nº 27 · 58.933 · Transition metal

The blue in cobalt-blue glass and Renaissance paintings. Vitamin B12. The catalyst in lithium-ion batteries.

Zinc

Nº 30 · 65.38 · Transition metal

Galvanized steel resists rust because Zinc oxidizes first. Zn^{2+} runs hundreds of enzymes in your body. Brass is copper + zinc.

Copper

Nº 29 · 63.546 · Transition metal

Reddish metal of pennies, wiring, and the Statue of Liberty (the green is copper carbonate from oxidation).

Germanium

Nº 32 · 72.63 · Metalloid

The original semiconductor element - first transistors were Germanium, not silicon. Still in fiber-optic cables and night-vision lenses.

Gallium

Nº 31 · 69.723 · Post-transition metal

Melts in your hand at body temperature (29.8°C). LEDs. Solar cells. The trick element of every chemistry-magic show.

33

As

34

Se

35

Br

36

Kr

37

Rb

38

Sr

39

Y

40

Zr

Selenium

Nº 34 · 78.971 · Nonmetal

In photocopier drums (light hits Se, charge flows). In dandruff shampoo. Trace mineral; deficiency causes Keshan disease.

Arsenic

Nº 33 · 74.922 · Metalloid

The poisoner's metalloid, ground-water contaminant in Bangladesh, semiconductor dopant in solar cells. Yellow as orpiment ore.

Krypton

Nº 36 · 83.798 · Noble gas

Inert noble gas. Slow leaks in physics labs. Comic-book Krypton (Superman's home planet) is fictional.

Bromine

Nº 35 · 79.904 · Halogen

The only liquid nonmetal at room temperature. Red-brown, foul-smelling, in pool sanitizer and old film chemistry.

Strontium

Nº 38 · 87.62 · Alkaline earth metal

The bright red in fireworks and old TV phosphors. Sr-90 is the famous fallout isotope from atmospheric nuclear tests.

Rubidium

Nº 37 · 85.468 · Alkali metal

Even more reactive than potassium - alkali metal trend continues. The atomic-clock element before cesium took over.

Zirconium

Nº 40 · 91.224 · Transition metal

Cubic Zirconia in the engagement-ring case. Nuclear-reactor cladding. Resists corrosion better than stainless steel.

Yttrium

Nº 39 · 88.906 · Transition metal

Yttrium-aluminum-garnet (YAG) lasers cut steel and tattoo skin. Old red TV phosphors. Holds the record with three siblings (Tb, Er, Yb) named for one quarry.

41

Nb

42

Mo

43

Tc

44

Ru

45

Rh

46

Pd

47

Ag

48

Cd

Molybdenum

Nº 42 · 95.95 · Transition metal

The Mo in “moly” - molybdenum-steel armor plate, jet-engine alloys, and the stuff that hardens drill bits. Trace nutrient in nitrogen-fixing bacteria.

Niobium

Nº 41 · 92.906 · Transition metal

Superconducting magnets in MRI machines and the LHC. Steel alloys for jet engines. Sits next to Tantalum because the two are nearly chemical twins.

Ruthenium

Nº 44 · 101.07 · Transition metal

Catalyzes hydrogen fuel cells. Ru-doped solar cells (Grätzel cells). Rarer than gold; the platinum-group metal nobody talks about.

Technetium

Nº 43 · [98] · Transition metal

The first synthetic element - no stable isotopes exist on Earth. Tc-99m is the most-used medical-imaging tracer in nuclear medicine.

Palladium

Nº 46 · 106.42 · Transition metal

Catalytic converters scrub car exhaust clean. Pd-based hydrogenation in industrial chemistry. Soaks up 900× its volume in hydrogen gas.

Rhodium

Nº 45 · 102.91 · Transition metal

Catalytic converter on every gasoline car. Rhodium-plated white gold in jewelry. One of the rarest stable elements in the crust.

Cadmium

Nº 48 · 112.41 · Transition metal

Yellow-orange paint pigment used by Monet and Van Gogh - also a heavy-metal poison that crosses the placenta. NiCd batteries before lithium took over.

Silver

Nº 47 · 107.87 · Transition metal

Best electrical and thermal conductor of any metal. Photographic film, antibacterial coatings, jewelry.

49

In

50

Sn

51

Sb

52

Te

53

I

54

Xe

55

Cs

56

Ba

Tin

Nº 50 · 118.71 · Post-transition metal

Bronze is copper + tin. Tin cans (until they became steel cans). Resists corrosion, low melting point.

Indium

Nº 49 · 114.82 · Post-transition metal

Indium-tin-oxide (ITO) is the transparent conductor in every touchscreen, OLED, and solar panel. Soft enough to leave a streak on paper.

Tellurium

Nº 52 · 127.6 · Metalloid

The Earth-named twin of Selenium (the moon). In solar-cell thin films and steel alloys. Garlic-breath smell at trace exposure.

Antimony

Nº 51 · 121.76 · Metalloid

Brittle metalloid. Used in flame retardants, lead-acid batteries, and historically in cosmetics that probably killed people.

Xenon

Nº 54 · 131.29 · Noble gas

High-intensity headlamps on luxury cars. Anesthetic in surgery. Ion-thruster propellant on the SpaceX Starlink and NASA Dawn missions.

Iodine

Nº 53 · 126.9 · Halogen

Antiseptic tincture on every battlefield wound until WWII. Iodized salt prevents goiter. Purple vapor when warmed.

Barium

Nº 56 · 137.33 · Alkaline earth metal

The “Barium swallow” for X-ray imaging - dense enough to block X-rays. Bright green in fireworks. Toxic as soluble salt; safe as insoluble BaSO₄.

Cesium

Nº 55 · 132.91 · Alkali metal

The atomic-clock element - the second is defined by Cesium-133 hyperfine transitions. Liquid above 28°C; reacts violently with water.

57

La

58

Ce

59

Pr

60

Nd

61

Pm

62

Sm

63

Eu

64

Gd

Cerium

Nº 58 · 140.12 · Lanthanide

The flint in every cigarette lighter. Cerium oxide polishes glass. Most abundant lanthanide despite being called “rare earth.”

Lanthanum

Nº 57 · 138.91 · Lanthanide

Kicks off the lanthanide row. Used in carbon-arc lamps and the Hollywood lens of every classic studio camera (lanthanum-glass).

Neodymium

Nº 60 · 144.24 · Lanthanide

NdFeB magnets - the strongest permanent magnets ever made. In headphones, hard drives, electric motors, and wind turbines.

Praseodymium

Nº 59 · 140.91 · Lanthanide

The green filter in welder's goggles. Pr-Nd magnets. Once mistaken for a single element with neodymium, until 1885 split them.

Samarium

Nº 62 · 150.36 · Lanthanide

SmCo magnets work hot where NdFeB fails. Sm-149 is a key neutron poison in reactor control. The first element named for a real living person.

Promethium

Nº 61 · [145] · Lanthanide

No stable isotopes - vanishingly rare on Earth. Used in luminous paint and miniature nuclear batteries. The lanthanide that almost wasn't.

Gadolinium

Nº 64 · 157.25 · Lanthanide

MRI contrast agent - Gd³⁺'s seven unpaired f-electrons make it magnetically loud. Highest neutron-capture cross-section of any element.

Europium

Nº 63 · 151.96 · Lanthanide

The red phosphor in old CRT TV tubes. Anti-counterfeit fluorescent ink in euro banknotes. Most reactive of the rare earths.

65

Tb

66

Dy

67

Ho

68

Er

69

Tm

70

Yb

71

Lu

72

Hf

Dysprosium

Nº 66 · 162.5 · Lanthanide

Hard drive heads, wind turbine magnets, electric vehicle motors. The rare earth China cornered the supply chain on. Geopolitically heavy.

Terbium

Nº 65 · 158.93 · Lanthanide

Green phosphor in fluorescent lamps and trichromatic LEDs. One of four Ytterby-quarry siblings. Magnetostrictive - changes shape in a magnetic field.

Erbium

Nº 68 · 167.26 · Lanthanide

Erbium-doped fiber amplifiers (EDFAs) carry the entire internet across oceans. Pink-rose color in glass. The fourth Ytterby sibling.

Holmium

Nº 67 · 164.93 · Lanthanide

The Ho:YAG laser vaporizes kidney stones and prostate tissue. Highest magnetic permeability of any element. Strong red-yellow color in solution.

Ytterbium

Nº 70 · 173.05 · Lanthanide

Ytterbium atomic clocks beat cesium for precision. Sole stable +2 lanthanide. Last of the four Ytterby siblings.

Thulium

Nº 69 · 168.93 · Lanthanide

Portable X-ray sources for industrial and medical imaging. Rarest of the stable lanthanides. The “Ultima Thule” of the periodic table.

Hafnium

Nº 72 · 178.49 · Transition metal

Nuclear-reactor control rods (high neutron-capture cross-section). Modern computer chip transistors (HfO₂ as gate dielectric).

Lutetium

Nº 71 · 174.97 · Lanthanide

Last lanthanide, hardest to isolate. PET-scan crystal scintillators. Petroleum-cracking catalyst.

73

Ta

74

W

75

Re

76

Os

77

Ir

78

Pt

79

Au

80

Hg

Tungsten

Nº 74 · 183.84 · Transition metal

Highest melting point of any element (3422°C). Old incandescent filaments, modern jet-engine alloys, drill bits.

Tantalum

Nº 73 · 180.95 · Transition metal

Capacitors in every smartphone (Ta_2O_5 dielectric). Surgical implants - Ta is biocompatible. Refuses to react with most acids.

Osmium

Nº 76 · 190.23 · Transition metal

Densest stable element (22.59 g/cm³). Used in fountain-pen tips, electrical contacts. Notoriously stinky as the volatile oxide OsO_4 .

Rhenium

Nº 75 · 186.21 · Transition metal

Jet-engine turbine blades - Re superalloys survive higher temperatures than any others. One of the rarest stable elements in the crust.

Platinum

Nº 78 · 195.08 · Transition metal

Catalytic converters. Lab crucibles that survive any acid. The “platinum standard.” Conquistadors threw it out as worthless impure silver.

Iridium

Nº 77 · 192.22 · Transition metal

The iridium-rich Cretaceous-Paleogene boundary layer marks the dinosaur-killing asteroid. Spark-plug tips, deep-sea cables. Most corrosion-resistant metal.

Mercury

Nº 80 · 200.59 · Transition metal

The only metal liquid at room temperature. Old thermometers, historical hat-making (where “mad as a hatter” comes from), still in some fluorescent lights.

Gold

Nº 79 · 196.97 · Transition metal

Soft, dense, almost chemically inert at room temperature. Jewelry, electronics contacts, monetary reserves.

81

Tl

82

Pb

83

Bi

84

Po

85

At

86

Rn

87

Fr

88

Ra

Lead

Nº 82 · 207.2 · Post-transition metal

Dense, soft, toxic. Roman pipes, old paint, old gasoline, modern car batteries and radiation shielding.

Thallium

Nº 81 · 204.38 · Post-transition metal

The “poisoner’s poison” - odorless, tasteless, lethal. Once in rat killer, banned. Still in some IR-detector electronics.

Polonium

Nº 84 · [209] · Metalloid

Marie Curie’s first new element, named for her occupied homeland. The radioisotope used to assassinate Alexander Litvinenko in 2006.

Bismuth

Nº 83 · 208.98 · Post-transition metal

Pepto-Bismol (bismuth subsalicylate) coats your stomach pink. Forms the most beautifully iridescent rainbow crystals of any common element.

Radon

Nº 86 · [222] · Noble gas

Colorless, odorless, radioactive gas seeping out of granite. Second-leading cause of lung cancer in the US, after smoking.

Astatine

Nº 85 · [210] · Halogen

The rarest naturally-occurring element on Earth - less than 30 grams in the entire crust at any given moment. Half-life of hours.

Radium

Nº 88 · [226] · Alkaline earth metal

Marie Curie’s glow-in-the-dark element. Painted on watch dials by the Radium Girls - many died of radiation poisoning. Still glows in old notebooks.

Francium

Nº 87 · [223] · Alkali metal

The rarest of the “naturally-occurring” elements after astatine. Half-life: 22 minutes. Total mass on Earth at any moment: a few atoms.

89

Ac

90

Th

91

Pa

92

U

93

Np

94

Pu

95

Am

96

Cm

Thorium

Nº 90 · 232.04 · Actinide

Potential next-generation nuclear fuel - abundant, can't weaponize easily. Burned in old gas-mantle lanterns. Half-life longer than the age of the universe.

Actinium

Nº 89 · [227] · Actinide

Glows blue in the dark from the radiation it emits. Ac-225 is in cutting-edge cancer therapy. Kicks off the actinide row.

Uranium

Nº 92 · 238.03 · Actinide

Heaviest element found in significant amounts in nature. Heart of every nuclear reactor and weapon. U-235 fissions; U-238 doesn't.

Protactinium

Nº 91 · 231.04 · Actinide

Decays into Actinium - that is the entire reason for its name. One of the rarest naturally-occurring actinides. Acutely toxic, intensely radioactive.

Plutonium

Nº 94 · [244] · Actinide

The Trinity test core. Modern weapons. Voyager 1 and 2 still run on Pu-238 thermoelectric generators 47 years after launch.

Neptunium

Nº 93 · [237] · Actinide

First element beyond Uranium synthesized (1940). Trace amounts in spent reactor fuel. The first transuranic element.

Curium

Nº 96 · [247] · Actinide

Power source for Mars rovers (in some configurations). NASA spacecraft alpha-particle X-ray spectrometers. Glows blue in the dark.

Americium

Nº 95 · [243] · Actinide

The radioactive isotope inside every household ionization smoke detector. Synthesized at the Manhattan Project, first isolated 1944.

97

Bk

98

Cf

99

Es

100

Fm

101

Md

102

No

103

Lr

104

Rf

Californium

Nº 98 · [251] · Actinide

Strong neutron emitter - used in oil-well logging, treatment of cervical cancer, and as a starting material for heavier elements.

Berkelium

Nº 97 · [247] · Actinide

Synthesized at UC Berkeley by Glenn Seaborg's team in 1949. Used as a target to make heavier elements. Microgram-quantity production.

Fermium

Nº 100 · [257] · Actinide

Heaviest element accessible by neutron-capture cascade - beyond Fm requires heavy-ion bombardment. First found in the same Ivy Mike fallout as Es.

Einsteinium

Nº 99 · [252] · Actinide

First identified in the fallout of the "Ivy Mike" hydrogen-bomb test (1952). Named after the man whose equation explained why bombs work.

Nobelium

Nº 102 · [259] · Actinide

Discovery contested between Berkeley, Dubna, and the Nobel Institute in Stockholm - name was the political compromise.

Mendelevium

Nº 101 · [258] · Actinide

First synthesized one atom at a time at UC Berkeley (1955). Named for the man who predicted gaps in the periodic table the synthetics would fill.

Rutherfordium

Nº 104 · [267] · Transition metal

First element of the d-block super-heavy. Decays in seconds. Naming was contested for decades between the US and USSR.

Lawrencium

Nº 103 · [266] · Actinide

Last actinide. Synthesized at Berkeley using Lawrence's cyclotron. Marks the end of the f-block and the start of the d-block super-heavy.

105

Db

106

Sg

107

Bh

108

Hs

109

Mt

110

Ds

111

Rg

112

Cn

Seaborgium

Nº 106 · [269] · Transition metal

The only element officially named for a person who was alive at the naming. Glenn Seaborg co-discovered nine actinides plus Sg itself.

Dubnium

Nº 105 · [268] · Transition metal

Synthesized at the JINR (Joint Institute for Nuclear Research) in Dubna, Russia. Existed for 28 hours before claim was disputed.

Hassium

Nº 108 · [269] · Transition metal

Synthesized at GSI in Darmstadt. Predicted to be the densest element ever, surpassing osmium. Only a few atoms exist at any time.

Bohrium

Nº 107 · [270] · Transition metal

Synthesized at GSI Darmstadt (1981). Decays in tenths of a second. Honors the physicist whose model of the atom every student still draws.

Darmstadtium

Nº 110 · [281] · Transition metal

Synthesized at GSI Darmstadt in 1994. The German town that has now hosted the synthesis of six different super-heavy elements.

Meitnerium

Nº 109 · [278] · Transition metal

Honors the unrecognized co-discoverer of nuclear fission. Lise Meitner explained Hahn's 1938 results that he won the 1944 Nobel for. She got an element instead.

Copernicium

Nº 112 · [285] · Transition metal

Closes the d-block. Synthesized at GSI Darmstadt (1996). Predicted to be a volatile metal - possibly even gaseous at room temperature.

Roentgenium

Nº 111 · [282] · Transition metal

Honors the discoverer of X-rays. Synthesized at GSI Darmstadt in 1994. The "gold-like" super-heavy expected to share Au's row chemistry.

113

Nh

114

Fl

115

Mc

116

Lv

117

Ts

118

Og

Flerovium

Nº 114 · [289] · Post-transition metal

In the predicted “island of stability” - Fl-298 may have a half-life of years rather than seconds, if anyone can ever make it.

Nihonium

Nº 113 · [286] · Post-transition metal

First element discovered in Asia. Synthesized at RIKEN, Japan (2004). Marks the start of the post-d-block 7p super-heavy.

Livermorium

Nº 116 · [293] · Post-transition metal

Synthesized 2000 at Dubna in collaboration with Lawrence Livermore. The California national-lab partner credited in the name.

Moscovium

Nº 115 · [290] · Post-transition metal

Synthesized at Dubna (2003). Conspiracy theorists once claimed a UFO was powered by element 115 - actual chemistry decays in milliseconds.

Oganesson

Nº 118 · [294] · Noble gas

Heaviest element ever synthesized. Sits below Radon as a “noble gas” - though it likely behaves more like a solid post-transition metal at this scale.

Tennesine

Nº 117 · [294] · Halogen

The newest halogen - sits below astatine on the periodic table. Synthesized 2010 at Dubna using a curium target made at Oak Ridge, Tennessee.