Alkali metals/1

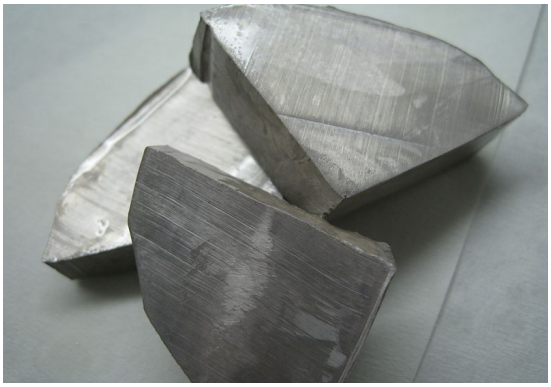


Lithium

Symbol: Li, phase:solid, silvery-white
Used in soap manufacture, batteries & bipolar disorder treatment. Trace amounts of lithium are present in all organisms, but has no apparent vital biological function.

Atomic number	3
Atomic weight	6.94
Melting point (K)	453.65
Boiling point (K)	1603
Speed of sound (m/s)	6000
Discovery	1817 (J.A Arfwedson)

Alkali metals/2



Sodium

Symbol: Na, phase:solid, silvery white metallic
Used in soap manufacture.
Sodium chloride (edible salt) is a de-icing agent and a nutrient for humans and cattle

Atomic number	11
Atomic weight	22.9898
Melting point (K)	370.944
Boiling point (K)	1156.090
Speed of sound (m/s)	3200
Discovery	1807 (H. Davy)

Alkali metals/3



Potassium

Symbol: K, phase:solid, silvery grey
Its name derives from potash, the ahses of plants.
95% of global potassium chemical production is aimed for agricultural fertilizers.

Atomic number	19
Atomic weight	39.098
Melting point (K)	336.7
Boiling point (K)	1032
Speed of sound (m/s)	2000
Discovery	1807 (H. Davy)

Alkali metals/4



Rubidium

Symbol: Rb, phase:solid, grey white
Rubidium metal is easily vaporized and has a convenient spectral absorption range, making it a frequent target for laser manipulation of atoms.

Atomic number	37
Atomic weight	85.468
Melting point (K)	312.45
Boiling point (K)	961
Speed of sound (m/s)	1300
Discovery	1861 (R. Bunsen)

Alkali metals/5



Caesium

Symbol: Cs, phase:solid, silvery gold
Widely used in highly accurate atomic clocks.
As caesium formate used for drilling fluids. Highly reactive, it reacts explosively with water even at low temperatures.

Atomic number	55
Atomic weight	132.905
Melting point (K)	301.7
Boiling point (K)	944
Speed of sound (m/s)	1.8
Discovery	1860 (G. Kirchhoff)

Alkali metals/6



Francium

Symbol: Fr, phase: solid presumably
Bulk francium has never been viewed. As little as 20â??30 g exists at any given time throughout the Earth s crust. The largest amount produced was a cluster of 300,000 atoms.

Atomic number	87
Atomic weight	223
Melting point (K)	300
Boiling point (K)	950
Speed of sound (m/s)	N/A
Discovery	1939 (M. Perey)

Alkaline earth metal/1



Beryllium

Symbol: Be, phase: solid, white-gray metallic

Atomic number	4
Atomic weight	9.012
Melting point (K)	1560
Boiling point (K)	2742
Speed of sound (m/s)	12,890
Discovery	1797 (L.N. Vauquelin)

Alkaline earth metal/2



Magnesium

Symbol: Mg, phase: solid, shiny grey solid
Produced in large, aging stars when they explode
Magnesium ions are sour to the taste.
Its compounds are used medicinally as laxatives

Atomic number	12
Atomic weight	24.305
Melting point (K)	923
Boiling point (K)	1363
Speed of sound (m/s)	4940
Discovery	1755 (J. Black)

Alkaline earth metal/3



Calcium

Symbol: Ca, phase: solid, dull gray, silver, yellow tint
As a major material used in mineralization of bone, teeth and shells, calcium is the most abundant metal by mass in many animals. It poses few environmental problems.

Atomic number	20
Atomic weight	40.078
Melting point (K)	1115
Boiling point (K)	1757
Speed of sound (m/s)	3810
Discovery	1808 (H. Davy)

Alkaline earth metal/4



Strontium

Symbol: Sr, phase: solid, silvery white, pale yellow tint

Atomic number	38
Atomic weight	87.62
Melting point (K)	1050
Boiling point (K)	1650
Speed of sound (m/s)	N/A
Discovery	1787 (W .Cruikshank)

Alkaline earth metal/5

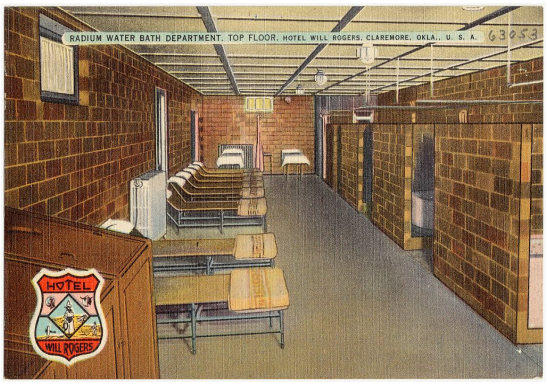


Barium

Symbol: Ba, phase: solid, silvery gray pale yellow tint

Atomic number	56
Atomic weight	137.327
Melting point (K)	1000
Boiling point (K)	2118
Speed of sound (m/s)	1620
Discovery	1772 (C. W Scheele)

Alkaline earth metal/6

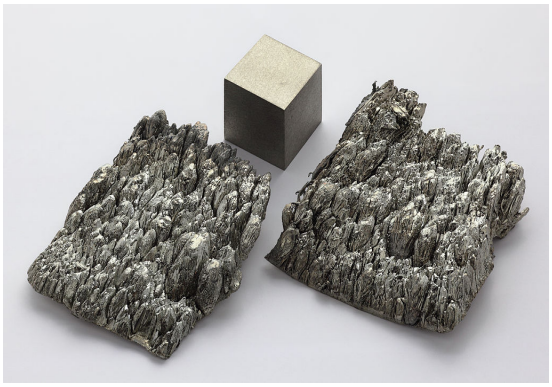


Radium

Symbol: Ra, phase: solid, silvery white metallic
It was formerly used in self-luminous paints
for watches, nuclear panels, aircraft switches, clocks...
From the 1960s the use of radium paint was discontinued.

Atomic number	88
Atomic weight	226
Melting point (K)	973
Boiling point (K)	2010
Speed of sound (m/s)	N/A
Discovery	1898 (P. &M. Curie)

Transition metals I/1



Scandium

Symbol: Sc, phase: solid, silvery white

Atomic number	21
Atomic weight	44.956
Melting point (K)	1814
Boiling point (K)	3109
Speed of sound (m/s)	N/A
Discovery	1879 (L. F. Nilson)

Transition metals I/2



Yttrium

Symbol : Y, phase: solid, silvery white
Named after the village where it was 1st discovered. The most important uses of yttrium are LEDs and phosphors. Exposure to yttrium compounds can cause lung disease.

Atomic number	39
Atomic weight	88.90584
Melting point (K)	1799
Boiling point (K)	3203
Speed of sound (m/s)	3300
Discovery	1794 (J Gadolin)

Transition metals I/3



Titanium

Symbol: Ti, phase: solid, silvery grey-white metallic. Has the highest strength-to-density ratio of any metallic element. Also has a good corrosion resistance and is used in aerospace, sporting goods, medical implants etc.

Atomic number	22
Atomic weight	47.867
Melting point (K)	1941
Boiling point (K)	3560
Speed of sound (m/s)	5090
Discovery	1825 (J. J. Berzelius)

Transition metals I/4



Zirconium

Symbol: Zr, phase: solid, silvery white. The word zircon comes from the Persian zargun, meaning gold-colored. Its main use is as an opacifier, conferring a white, opaque appearance to ceramic materials.

Atomic number	40
Atomic weight	91.224
Melting point (K)	2128
Boiling point (K)	4650
Speed of sound (m/s)	3800
Discovery	1789 (M. H. Klaproth)

Transition metals I/5

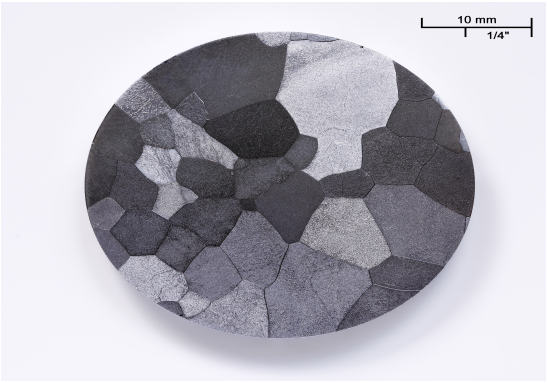


Hafnium

Symbol: Hf, period: solid, steel gray. Named after Hafnia the Latin name for Copenhagen where it was discovered. Used in filaments & electrodes.It is also a good material for neutron absorption in nuclear power plants.

Atomic number	72
Atomic weight	178.49
Melting point (K)	2506
Boiling point (K)	4876
Speed of sound (m/s)	3010
Discovery	1922 (D. Coster)

Transition metals I/6



Vanadium

Symbol: V, phase : solid, blue-silver-grey metal. The 1st large-scale industrial use of vanadium was in the steel alloy chassis of the Ford Model T. Used as dietary supplement by body-builders, with no proven efficiency..

Atomic number	23
Atomic weight	50.9415
Melting point (K)	2183
Boiling point (K)	3680
Speed of sound (m/s)	4560
Discovery	1801 (A. M. del Rio)

Transition metals II/1



Chromium

Symbol: Cr, phase: solid, silvery metallic. Stainless steel and chrome plating together comprise 85% of the commercial use. An essential nutrient in trace amounts in humans for insulin, sugar and lipid metabolism

Atomic number	24
Atomic weight	51.9961
Melting point (K)	2180
Boiling point (K)	2944
Speed of sound (m/s)	5940
Discovery	1797 (L.N. Vauquelin)

Transition metals II/2



Molybdenum

Symbol: Mo, phase: solid, gray metallic. About 86% produced is used in metallurgy, with the rest used in chemical applications. It can withstand extreme temperatures without significantly expanding or softening

Atomic number	42
Atomic weight	95.95
Melting point (K)	2896
Boiling point (K)	4912
Speed of sound (m/s)	5400
Discovery	1178 (C. W. Scheele)

Transition metals II/3



Tungsten

Symbol: W, phase: solid, grayish white, lustrous. Also known as Wolfram, it is the heaviest element to be essential to any living organism. Considered a conflict mineral due to the unethical mining practices observed in DRC.

Atomic number	74
Atomic weight	183.84
Melting point (K)	3695
Boiling point (K)	6203
Speed of sound (m/s)	4620
Discovery	1781 (C. W. Scheele)

Transition metals II/4

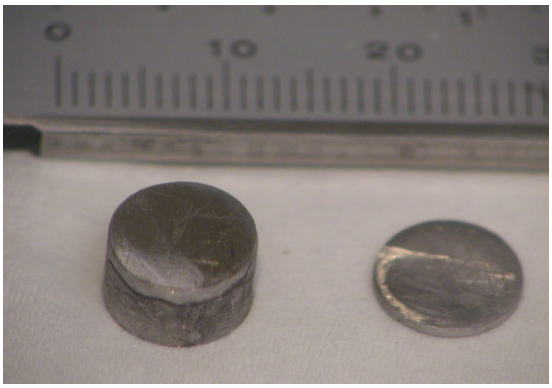


Manganese

Symbol: Mn, phase: solid, silvery metallic

Atomic number	25
Atomic weight	54.938044
Melting point (K)	1519
Boiling point (K)	2334
Speed of sound (m/s)	5150
Discovery	1770 (T. O. Bergman)

Transition metals II/5



Technetium

Symbol: Tc, phase: solid, shiny gray metal. The lowest numbered element in the periodic table of which all isotopes are radioactive. A kg of uranium contains an estimated 1 nanogram (10-9kg) of technetium.

Atomic number	2,439.7
Atomic weight	98.9062
Melting point (K)	2430
Boiling point (K)	4538
Speed of sound (m/s)	16200
Discovery	1937 (E. Segre)

Transition metals II/6



Rhenium

Symbol: Re, phase: solid, silvery-grayish. One of the rarest elements in the Earth s crust, it is named after the river Rhine in Europe. Among the most expensive of metals, with an average price of US$2,750 per kg.

Atomic number	75
Atomic weight	186.207
Melting point (K)	3459
Boiling point (K)	5903
Speed of sound (m/s)	4700
Discovery	1908 (M. Ogawa)

Transition metals III/1



Iron

Symbol: Fe, phase: solid, lustrous metallic with a grayish tinge. By mass the most common element on Earth. A human has about 4 grams of iron in his body. Pure iron is relatively soft but steel (iron + carbon alloy) is 1000x harder.

Atomic number	26
Atomic weight	55.845
Melting point (K)	1811
Boiling point (K)	3134
Speed of sound (m/s)	5120
Discovery	before 5000BC

Transition metals III/2



Ruthenium

Symbol: Ru, phase: solid, silvery white metallic. Named after the Russian empire which Latin name is Ruthenia. Most ruthenium produced is used in wear-resistant electrical contacts and thick-film resistors.

Atomic number	44
Atomic weight	101.07
Melting point (K)	2607
Boiling point (K)	4423
Speed of sound (m/s)	5970
Discovery	1844 (K. E. Claus)

Transition metals III/3



Osmium

Symbol: Os, phase: solid, silvery blue cast. The densest naturally occurring element, with a density of 22.59 g/cm3. Used in the tips of fountain pens, electrical contacts,as they can resist wear from frequent operation.

Atomic number	76
Atomic weight	190.23
Melting point (K)	3306
Boiling point (K)	5285
Speed of sound (m/s)	4940
Discovery	1803 (S. Tennant)

Transition metals III/4



Cobalt

Symbol: Co, phase: solid, hard lustrous bluish gray metal Used in the preparation of magnetic alloys. Cobalt is essential to the metabolism of all animals. It is a key constituent of cobalamin, also known as vitamin B12.

Atomic number	27
Atomic weight	58.933194
Melting point (K)	1768
Boiling point (K)	3200
Speed of sound (m/s)	4720
Discovery	1732 (G. Brandt)

Transition metals III/5



Rhodium

Symbol: Rh, phase: solid, silvery white metallic
One of the rarest and most valuable precious metals.
Used in automobiles as a catalytic converter. At levels
of 100 mg/m3, immediately dangerous to life and health.

Atomic number	45
Atomic weight	102.90550
Melting point (K)	2237
Boiling point (K)	3968
Speed of sound (m/s)	4700
Discovery	1804 (W. H. Wollaston)

Transition metals III/6



Iridium

Symbol: Ir, phase: solid, silvery white. One of the rarest
elements in Earth s crust, with annual production of only
3t.An alloy of 90% platinum and 10% iridium was used in
1889 to construct the International Prototype Metre.

Atomic number	77
Atomic weight	192.217
Melting point (K)	2719
Boiling point (K)	4403
Speed of sound (m/s)	4825
Discovery	1803 (S. Tennant)

Transition metals IV/1

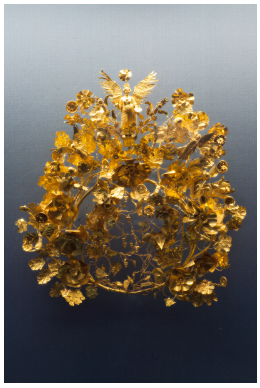


Platinum

Symbol: Pt, phase: solid, silvery white. Because of
its scarcity in Earth only a few hundred tonnes
are produced annually. Compounds containing platinum
are applied in chemotherapy against cancer.

Atomic number	78
Atomic weight	195.084
Melting point (K)	2041
Boiling point (K)	4098
Speed of sound (m/s)	2800
Discovery	1748 (A. de Ulloa)

Transition metals IV/2

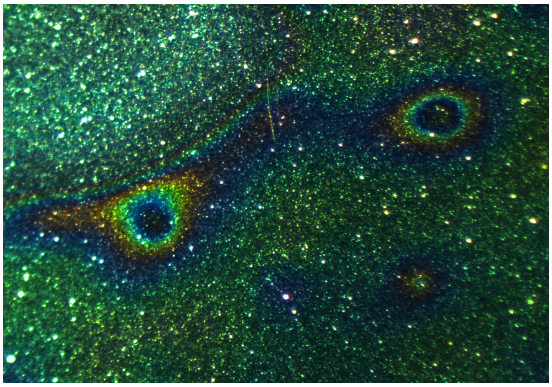


Gold

Symbol: Au, phase: solid, metallic yellow.Gold is thought
to have been produced from the collision of neutron stars
It has been used for coinage, jewelry throughout history.
186,700 tonnes of gold exists above ground.

Atomic number	79
Atomic weight	196.966
Melting point (K)	1337
Boiling point (K)	3243
Speed of sound (m/s)	2030
Discovery	-6000 (Middle East)

Transition metals IV/3



Nickel

Symbol: Ni, phase: solid, lustrous & metallic
The element's name comes from a mischievous sprite of German miner mythology, Nickel. It is an essential nutrient for some microorganisms and plants.

Atomic number	28
Atomic weight	58.6934
Melting point (K)	1728
Boiling point (K)	3003
Speed of sound (m/s)	4900
Discovery	1751 (A.F. Cronstedt)

Transition metals IV/4



Palladium

Symbol: Pd, phase: solid, silvery white
Named after the asteroid Pallas. Mostly used in catalytic converters. Also used in electronics & dentistry. Ore deposits of palladium are rare.

Atomic number	46
Atomic weight	106.42
Melting point (K)	1828.05
Boiling point (K)	3236
Speed of sound (m/s)	3070
Discovery	1803(W. H. Wollaston)

Transition metals IV/5



Copper

Symbol: Cu, phase: solid, red-orange metallic luster
In the Roman era, copper was principally mined on Cyprus,the origin of the name of the metal. It is essential to all living organisms as a trace dietary mineral.

Atomic number	29
Atomic weight	63.546
Melting point (K)	1357.77
Boiling point (K)	2835
Speed of sound (m/s)	3810
Discovery	-9000 (Middle East)

Transition metals IV/6



Silver

Symbol: Ag, phase: solid, lustrous white metal
It exhibits the highest electrical&thermal conductivity and reflectivity of any metal. Used in solar panels, water filtration, jewellery, ornaments, tableware and utensils.

Atomic number	47
Atomic weight	107.8682
Melting point (K)	1234.93
Boiling point (K)	2435
Speed of sound (m/s)	2680
Discovery	-5000

Post-transition metal/2

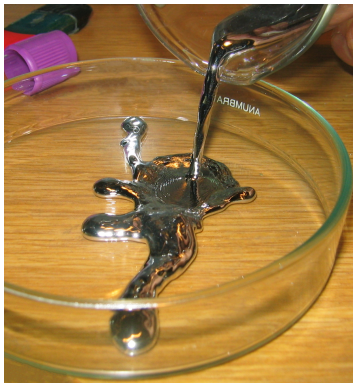


Aluminium

Symbol: Al, phase: solid, silvery gray metallic. By mass aluminium makes up about 8% of the Earth. Remarkable for its low density and ability to resist corrosion. Aluminium & its alloys are vital to the aerospace industry.

Atomic number	13
Atomic weight	26.981
Melting point (K)	933.47
Boiling point (K)	2743
Speed of sound (m/s)	5000
Discovery	1824 (H.C Orsted)

Post-transition metal/3



Mercury

Symbol:Hg, phase: liquid, silvery. Only metallic element that is liquid at standard conditions.Used in baroometers, thermometers, manometer etc...Mercury poisoning can result from exposure to water-soluble forms of mercury.

Atomic number	80
Atomic weight	200.592
Melting point (K)	234.321
Boiling point (K)	629.88
Speed of sound (m/s)	1451.4
Discovery	-2000 (China)

Post-transition metal/3



Cadmium

Symbol : Cd, phase: solid, silvery bluish-gray metallic.Its use is generally decreasing because it is toxic.Smoking is the most important single source of exposure in the general population. Still used in solar panels.

Atomic number	48
Atomic weight	112.414
Melting point (K)	594.22
Boiling point (K)	1040
Speed of sound (m/s)	2310
Discovery	1817 (F. Stromeyer)

Post-transition metal/1



Zinc

Symbol: Zn, phase : solid, silver-gray
An essential mineral, including to pre- and post-natal & development. Applications are in electrical batteries, small castings and alloys such as brass.

Atomic number	30
Atomic weight	65.38
Melting point (K)	692.68
Boiling point (K)	1180
Speed of sound (m/s)	3850
Discovery	-1000 (India)



Happy families

PeriodicTable