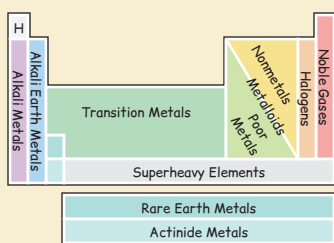


The Periodic Table of the Elements, in Pictures and Words



© 2005-2016 Keith Enevoldsen
Creative Commons Attribution-ShareAlike 4.0 International License

elements.wlonk.com

Solid
The color of the symbol is the color of the element in its most common pure form.

Liquid

Gas
at room temperature

Examples: metallic solid, red liquid, colorless gas

Human Body
top ten elements by weight

Earth's Crust
top eight elements by weight

Magnetic
ferromagnetic at room temperature

Noble Metals
corrosion-resistant

Radioactive
all isotopes are radioactive

Only Traces Found in Nature
less than a millionth percent of earth's crust

Never Found in Nature
only made by people

elements.wlonk.com

Solid
The color of the symbol is the color of the element in its most common pure form.

Liquid

Gas
at room temperature

Examples: metallic solid, red liquid, colorless gas

Human Body
top ten elements by weight

Earth's Crust
top eight elements by weight

Magnetic
ferromagnetic at room temperature

Noble Metals
corrosion-resistant

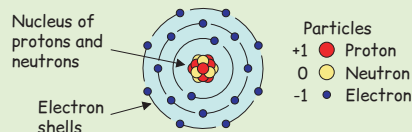
Radioactive
all isotopes are radioactive

Only Traces Found in Nature
less than a millionth percent of earth's crust

Never Found in Nature
only made by people

elements.wlonk.com

Atoms



An **atom** has a **nucleus**, made of **protons** and **neutrons**, surrounded by **electrons** orbiting in cloud-like **shells**. Smaller shells are surrounded by larger shells.

The **atomic number** is the number of protons in an atom. This determines the chemical properties of the atom.

Protons have positive **electric charge**, neutrons are neutral, and electrons are negative. Normally, an atom has equal numbers of protons and electrons. An **ion** is a charged atom with more or fewer electrons than protons.

The **atomic weight** of an element is the average number of protons plus neutrons. You can easily estimate the atomic weight: it is usually 2 to 2.5 times the atomic number.

An **element** is a substance made from one or more atoms of the same atomic number. A **compound** is a substance made from two or more elements chemically bonded.

elements.wlonk.com

Solid
The color of the symbol is the color of the element in its most common pure form.

Liquid

Gas
at room temperature

Examples: metallic solid, red liquid, colorless gas

Human Body
top ten elements by weight

Earth's Crust
top eight elements by weight

Magnetic
ferromagnetic at room temperature

Noble Metals
corrosion-resistant

Radioactive
all isotopes are radioactive

Only Traces Found in Nature
less than a millionth percent of earth's crust

Never Found in Nature
only made by people

elements.wlonk.com

Solid
The color of the symbol is the color of the element in its most common pure form.

Liquid

Gas
at room temperature

Examples: metallic solid, red liquid, colorless gas

Human Body
top ten elements by weight

Earth's Crust
top eight elements by weight

Magnetic
ferromagnetic at room temperature

Noble Metals
corrosion-resistant

Radioactive
all isotopes are radioactive

Only Traces Found in Nature
less than a millionth percent of earth's crust

Never Found in Nature
only made by people

elements.wlonk.com

Hydrogen belongs to no definite group. It forms compounds by either donating an electron like an alkali metal or accepting an electron like a halogen.

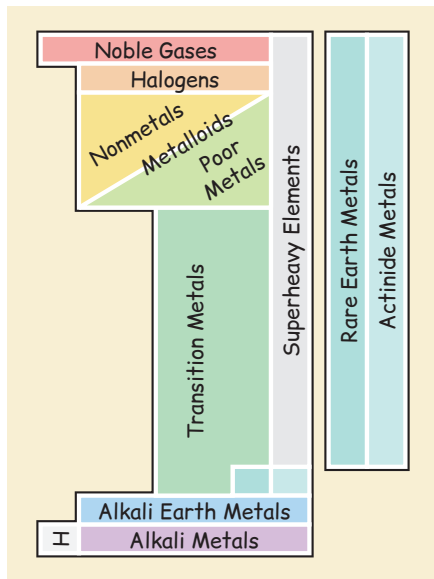
elements.wlonk.com

Alkali Metals are very reactive and readily form compounds but are not found free in nature. They form salts and alkali (acid-neutralizing) compounds such as baking soda. In pure form, they are very soft metals which catch fire on contact with water.

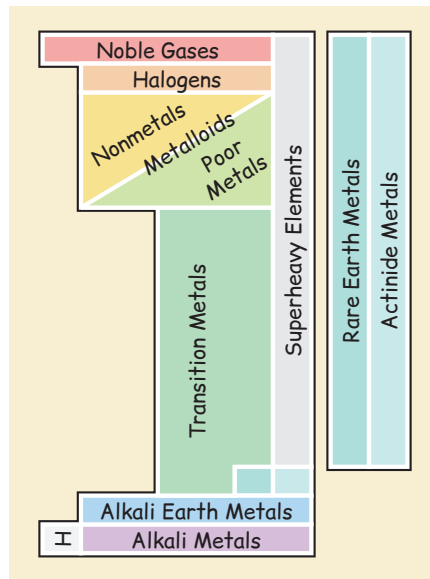
elements.wlonk.com

Alkali Earth Metals are reactive and readily form compounds but are not found free in nature. Their oxides are called alkali earths. In pure form, they are soft and somewhat brittle metals.

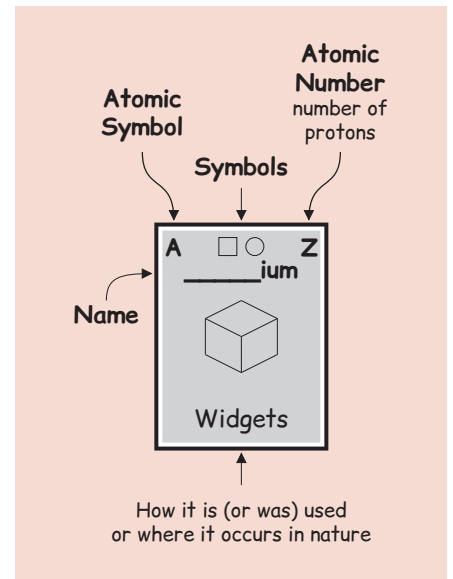
elements.wlonk.com



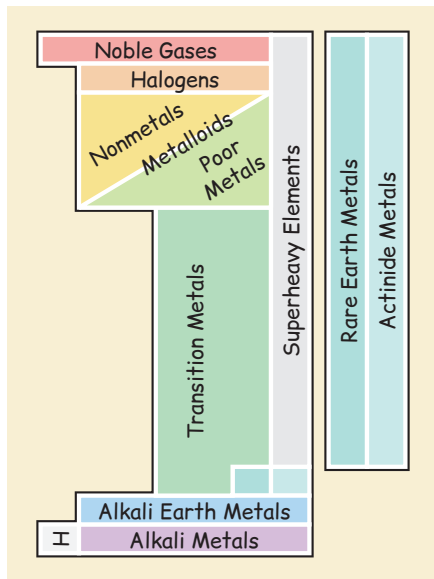
elements.wlonk.com



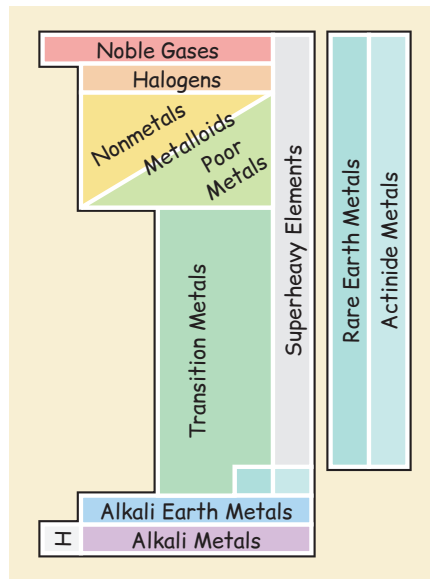
elements.wlonk.com



elements.wlonk.com



elements.wlonk.com



elements.wlonk.com

Chemical Bonding

Atoms form molecules by bonding together. Atoms give, take, or share electrons to achieve full outer electron shells.

Ionic bond

One atom takes an electron from another atom and the oppositely charged ions attract.

Salt

NaCl

Covalent bond

Atoms share their outer electrons.

Water

H2O

Metallic bond

Shared outer electrons flow, conducting heat and electricity.

Silver

Ag

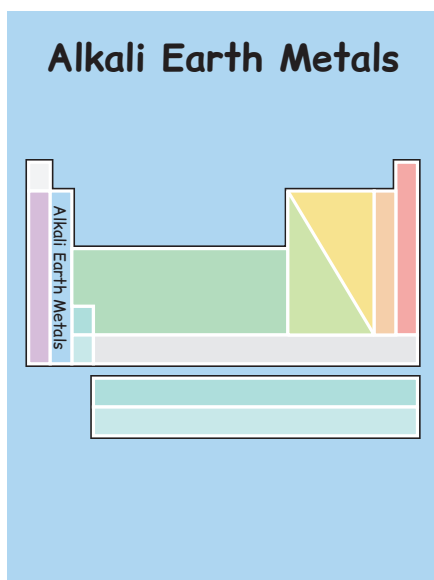
Groups

Elements in the same group, or column, are similar because they typically have the same number of outer electrons. This table shows some easy-to-remember common numbers for each group.

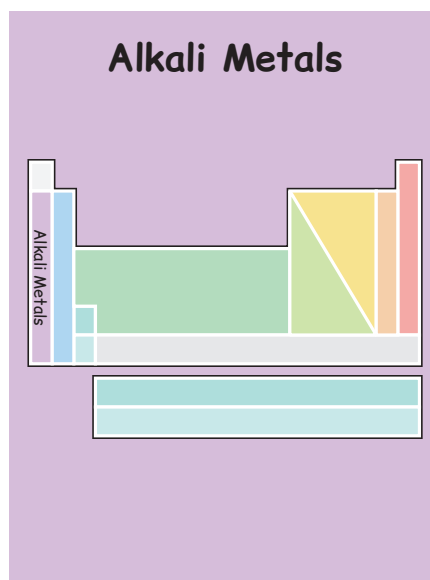
Group number	1	2	3-12	13	14	15	16	17	18
Outer electrons*	1	2	2	3	4	5	6	7	8
Valence number*	+1	+2	+2	+3	+4, -4	-3	-2	-1	0

* typical
The valence number is the number of electrons given (+) or taken (-) when bonding.

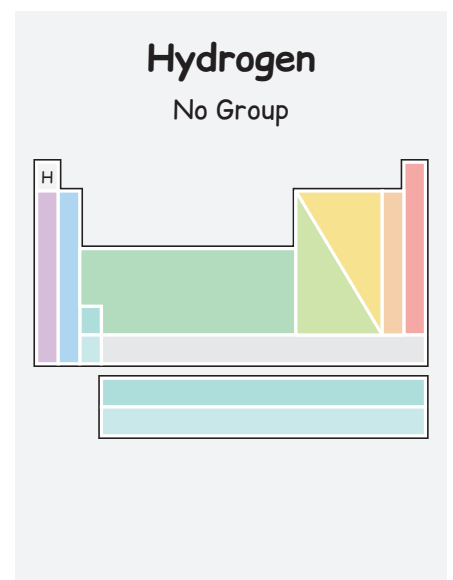
elements.wlonk.com



elements.wlonk.com



elements.wlonk.com



elements.wlonk.com

Halogens are reactive nonmetals and readily form compounds but are not found free in nature. They combine with alkali metals to form salts (halogen means salt-former).

elements.wlonk.com

Noble Gases are inactive, or inert. Each atom has exactly the number of electrons it needs to have a full outer shell, so these atoms almost never bond with other atoms. That is why these are all gases.

elements.wlonk.com

Transition Metals are typical metals: they are strong, shiny, malleable (they can be hammered into shape), flexible (in thin sheets or wires), and they conduct both heat and electricity.

elements.wlonk.com

Poor Metals are usually soft and have low melting temperatures.

elements.wlonk.com

Metalloids are partly like metals and partly like nonmetals. For example, they are semiconductors, which means they conduct electricity in some conditions.
B, Si, Ge, As, Sb, and Te are metalloids.

elements.wlonk.com

Nonmetals, in their solid state, are usually brittle (they break rather than bend) and they are insulators of both heat and electricity.

elements.wlonk.com

Rare Earth Metals are all soft metals. They are chemically similar to scandium and yttrium and are difficult to separate from each other.

elements.wlonk.com

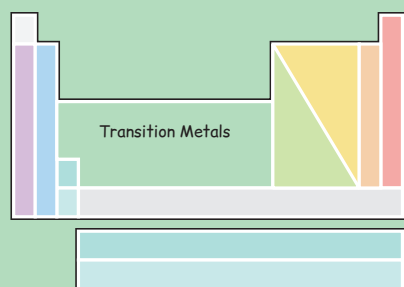
Actinide Metals are all radioactive heavy metals. They are used mainly for their radioactive properties.

elements.wlonk.com

Superheavy Elements are all radioactive and short-lived. They are never found in nature and have no uses except atomic research.

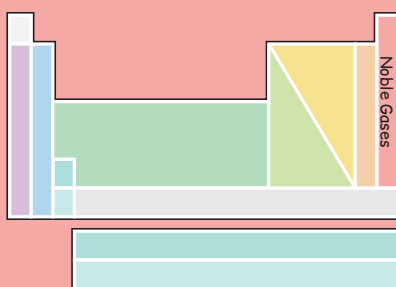
elements.wlonk.com

Transition Metals



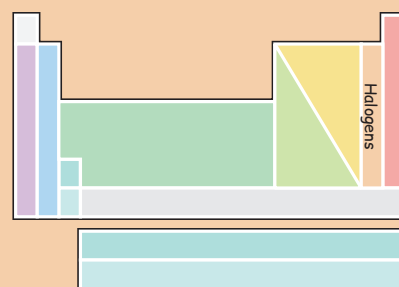
elements.wlonk.com

Noble Gases



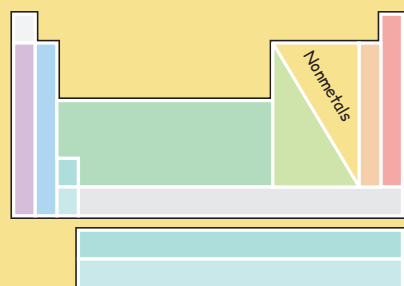
elements.wlonk.com

Halogens



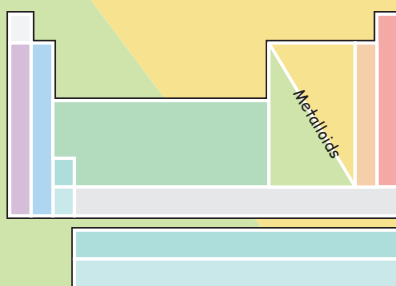
elements.wlonk.com

Nonmetals



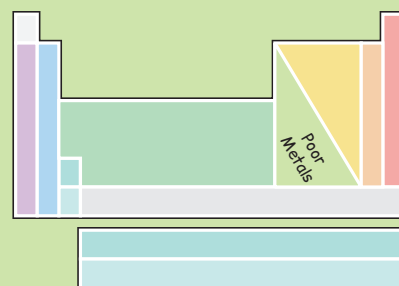
elements.wlonk.com

Metalloids



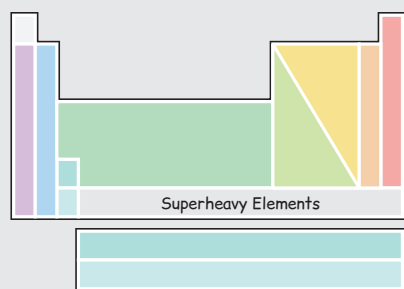
elements.wlonk.com

Poor Metals



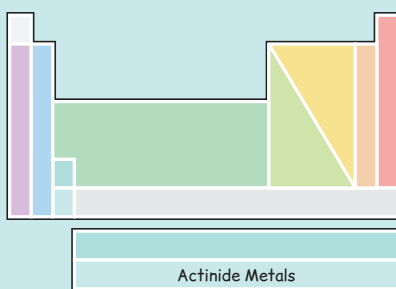
elements.wlonk.com

Superheavy Elements



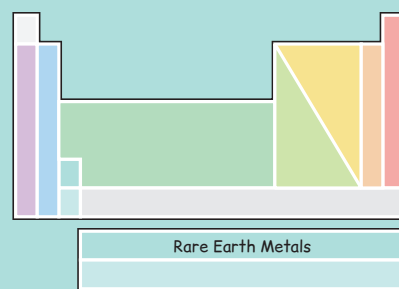
elements.wlonk.com

Actinide Metals



elements.wlonk.com

Rare Earth Metals



elements.wlonk.com

H   1
Hydrogen



Sun and
Stars

elements.wlonk.com

He  2
Helium



Balloons

elements.wlonk.com

Li  3
Lithium



Batteries

elements.wlonk.com

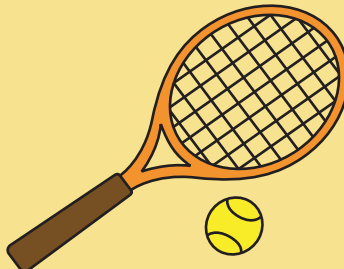
Be  4
Beryllium



Emeralds

elements.wlonk.com

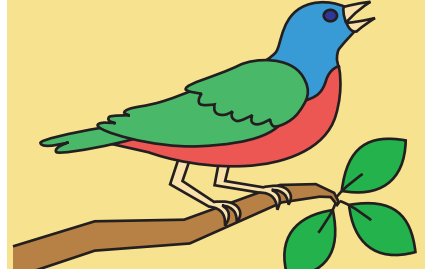
B  5
Boron



Sports
Equipment

elements.wlonk.com

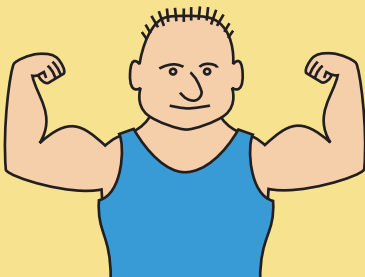
C   6
Carbon



Basis of Life's
Molecules

elements.wlonk.com

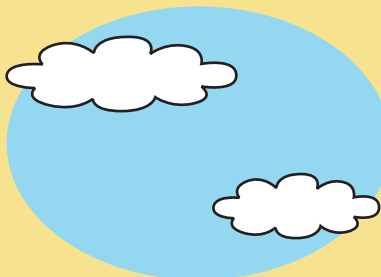
N   7
Nitrogen



Protein

elements.wlonk.com

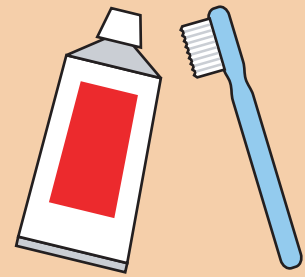
O    8
Oxygen



Air

elements.wlonk.com

F  9
Fluorine



Toothpaste

elements.wlonk.com

Li Lithium 3

lightest metal,
soft, reactive;
lightweight
aluminum alloys,
batteries,
impact-resistant
ceramic cookware,
mood stabilizer

elements.wlonk.com

He Helium 2

inert gas, second
lightest element;
nuclear fusion
in sun and stars,
balloons,
lasers,
supercold
refrigerant

elements.wlonk.com

H Hydrogen 1

explosive gas,
lightest element;
90% of atoms in
the universe,
sun and stars,
water (H₂O),
life's organic
molecules

elements.wlonk.com

C Carbon 6

hard diamond,
soft graphite;
basis of life's
organic molecules,
animals, plants,
CO₂, wood, paper,
cloth, plastic,
coal, oil, gasoline

elements.wlonk.com

B Boron 5

hard black solid;
borax soap,
fertilizer,
stiff fibers,
sports equipment,
heat-resistant
borosilicate glass,
semiconductors

elements.wlonk.com

Be Beryllium 4

lightweight metal;
non-sparking
copper alloy tools,
aerospace,
X-ray windows,
beryl gems:
emeralds and
aquamarines

elements.wlonk.com

F Fluorine 9

yellowish
poison gas,
most reactive
element;
glowing fluorite,
toothpaste,
nonstick cookware,
CFC refrigerants

elements.wlonk.com

O Oxygen 8

colorless gas;
21% of air, H₂O,
65% of the body,
organic molecules,
blood, breathing,
fire, half of
Earth's crust,
minerals, oxides

elements.wlonk.com

N Nitrogen 7

colorless gas;
78% of air,
organic molecules,
protein, muscles,
DNA, ammonia,
fertilizer,
explosives (TNT),
refrigerants

elements.wlonk.com

Ne ☁ 10

Neon



Advertising
Signs

elements.wlonk.com

Na 🧂🧑🌍 11

Sodium



Salt

elements.wlonk.com

Mg 🧂🌍 12

Magnesium



Chlorophyll

elements.wlonk.com

Al 🧂🌍 13

Aluminum



Airplanes

elements.wlonk.com

Si 🧂🌍 14

Silicon

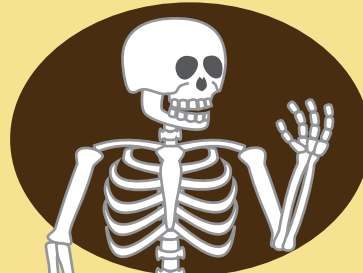


Stone, Sand,
and Soil

elements.wlonk.com

P 🧊🧑 15

Phosphorus

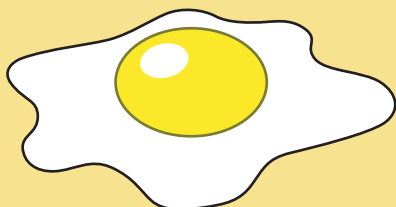


Bones

elements.wlonk.com

S 🟡🧑 16

Sulfur

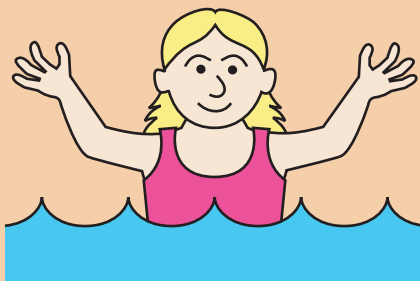


Eggs

elements.wlonk.com

Cl ☁🧑 17

Chlorine

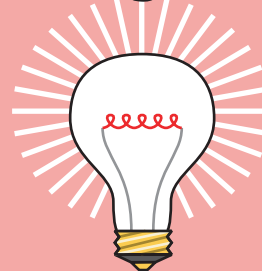


Swimming
Pools

elements.wlonk.com

Ar ☁ 18

Argon



Light Bulbs

elements.wlonk.com

Mg Magnesium 12

lightweight metal;
chlorophyll in
green plants,
talc, basalt,
aluminum alloys,
cars, planes, bikes,
flares, sparklers,
antacids

elements.wlonk.com

Na Sodium 11

soft metal,
reactive;
salt (NaCl), nerves,
baking soda,
antacids, lye, soap,
soda ash, glass,
papermaking,
street lamps

elements.wlonk.com

Ne Neon 10

inert gas;
orange-red
neon tubes for
advertising signs,
lasers,
supercold
refrigerant

elements.wlonk.com

P Phosphorus 15

glowing white waxy
solid (also red
and black forms);
bones, DNA,
energy-storing
phosphates (ATP),
fertilizer, acids,
detergent, matches

elements.wlonk.com

Si Silicon 14

hard metalloid;
quartz, granite,
sand, soil, clay,
ceramics, glass,
algae, diatoms,
semiconductors,
computer chips,
silicone rubber

elements.wlonk.com

Al Aluminum 13

lightweight non-
corroding metal;
kitchenware, cans,
foil, machinery,
cars, planes, bikes,
feldspar, granite,
clay, ceramics,
corundum, gems

elements.wlonk.com

Ar Argon 18

inert gas;
1% of air,
most abundant
inert gas,
light bulbs,
"neon" tubes,
lasers,
welding gas

elements.wlonk.com

Cl Chlorine 17

greenish poison gas;
salt (NaCl), bleach,
stomach acid,
disinfectant,
drinking water,
swimming pools,
PVC plastic
pipes and bottles

elements.wlonk.com

S Sulfur 16

brittle yellow solid;
skin, hair,
eggs, onions,
garlic, skunks,
hot springs,
volcanos, gypsum,
rubber, acids,
papermaking

elements.wlonk.com

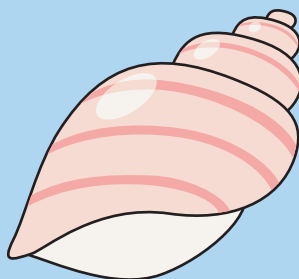
K    19
Potassium



Fruits and
Vegetables

elements.wlonk.com

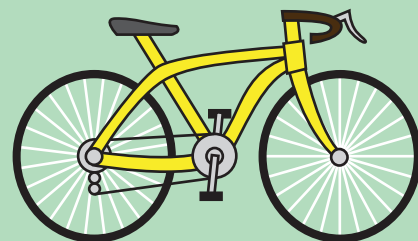
Ca    20
Calcium



Shells and
Bones

elements.wlonk.com

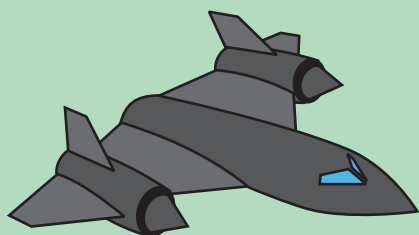
Sc  21
Scandium



Bicycles

elements.wlonk.com

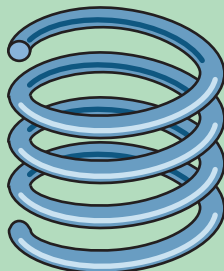
Ti  22
Titanium



Aerospace

elements.wlonk.com

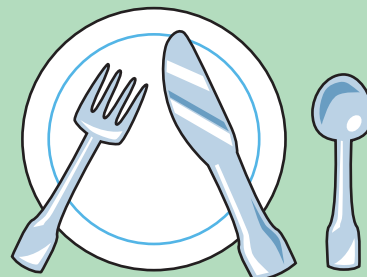
V  23
Vanadium



Springs

elements.wlonk.com

Cr  24
Chromium



Stainless
Steel

elements.wlonk.com

Mn  25
Manganese



Earthmovers

elements.wlonk.com

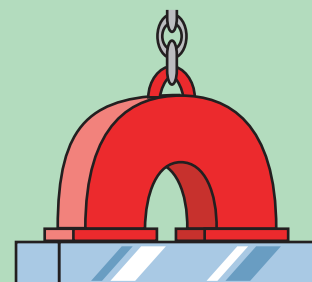
Fe    26
Iron



Steel
Structures

elements.wlonk.com

Co   27
Cobalt



Magnets

elements.wlonk.com

Sc Scandium 21
soft lightweight
metal;
aluminum alloys,
racing bikes,
stadium lamps,
furnace bricks,
aquamarines

elements.wlonk.com

Ca Calcium 20
soft metal;
bones, teeth, milk,
leaves, vegetables,
shells, coral,
limestone, chalk,
gypsum, plaster,
mortar, cement,
marble, antacids

elements.wlonk.com

K Potassium 19
soft metal,
reactive;
salts, nerves,
nutrients in fruits
and vegetables,
soap, fertilizer,
potash, matches,
gunpowder

elements.wlonk.com

Cr Chromium 24
hard shiny metal;
stainless steel
(Fe-Cr-Ni),
kitchenware,
nichrome heaters,
car trim, paints,
recording tape,
emeralds & rubies

elements.wlonk.com

V Vanadium 23
hard metal;
hard strong
resilient steel,
structures,
vehicles, springs,
driveshafts, tools,
aerospace,
violet sapphires

elements.wlonk.com

Ti Titanium 22
strongest
lightweight metal,
heat-resistant;
aerospace,
racing bikes,
artificial joints,
white paint,
blue sapphires

elements.wlonk.com

Co Cobalt 27
hard metal,
magnetic;
hard strong steel,
cutting tools,
turbines,
magnets (Al-Ni-Co),
blue glass, ceramics,
vitamin B-12

elements.wlonk.com

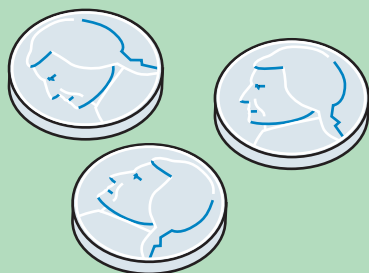
Fe Iron 26
medium-hard
metal, magnetic;
steel alloys
are mostly iron,
structures,
vehicles, magnets,
Earth's core,
red rocks, blood

elements.wlonk.com

Mn Manganese 25
hard metal;
hard tough steel,
earthmovers,
rock crushers,
rails, plows, axes,
batteries,
fertilizer,
amethysts

elements.wlonk.com

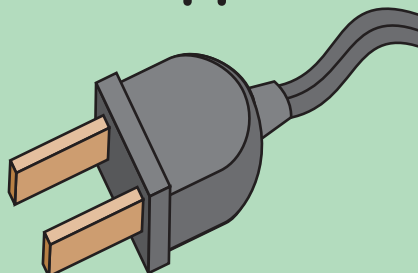
Ni  28
Nickel



Coins

elements.wlonk.com

Cu  29
Copper



Electric
Wires

elements.wlonk.com

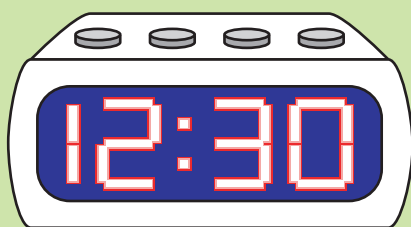
Zn  30
Zinc



Brass
Instruments

elements.wlonk.com

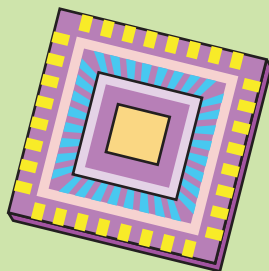
Ga  31
Gallium



Light-Emitting
Diodes (LEDs)

elements.wlonk.com

Ge  32
Germanium



Semiconductor
Electronics

elements.wlonk.com

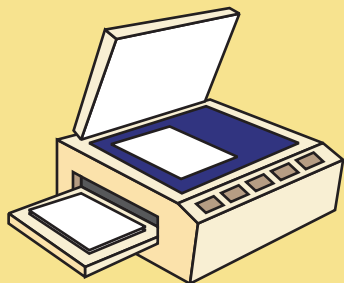
As  33
Arsenic



Poison

elements.wlonk.com

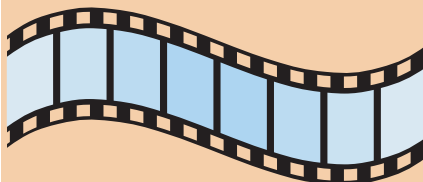
Se  34
Selenium



Copiers

elements.wlonk.com

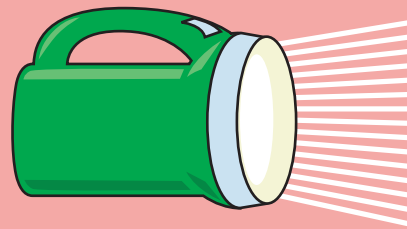
Br  35
Bromine



Photography
Film

elements.wlonk.com

Kr  36
Krypton



Flashlights

elements.wlonk.com

Zn Zinc 30
non-corroding
metal;
galvanized steel,
brass (Cu-Zn),
batteries, white
paint, phosphors
in TVs and lamps,
fertilizer

elements.wlonk.com

Cu Copper 29
colored metal,
conducts heat and
electricity well;
wires, cookware,
brass (Cu-Zn),
bronze (Cu-Sn),
coins, pipes,
blue crab blood

elements.wlonk.com

Ni Nickel 28
medium-hard
metal, magnetic;
stainless steel
(Fe-Cr-Ni),
kitchenware,
nichrome heaters,
nicad batteries,
coins, Earth's core

elements.wlonk.com

As Arsenic 33
brittle metalloid;
poisons,
semiconductors,
light-emitting
diodes (LEDs)
(GaAs),
signal lights,
tiny lasers

elements.wlonk.com

Ge Germanium 32
brittle metalloid;
semiconductors,
transistors,
rectifiers, diodes,
photocells,
lenses,
infrared windows

elements.wlonk.com

Ga Gallium 31
soft metal, melts
on a hot day;
semiconductors,
light-emitting
diodes (LEDs)
(GaAs),
signal lights,
tiny lasers

elements.wlonk.com

Kr Krypton 36
inert gas;
high-intensity
lamps, headlights,
flashlights,
lanterns,
"neon" tubes,
lasers

elements.wlonk.com

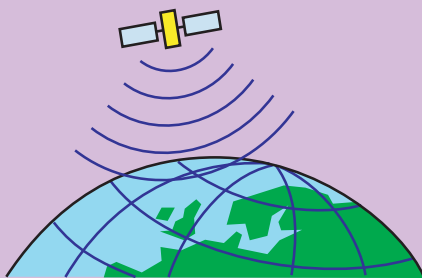
Br Bromine 35
dark red liquid;
disinfectant,
pools and spas,
photo film,
flame retardant,
leaded gasoline,
sedatives

elements.wlonk.com

Se Selenium 34
brittle gray solid;
photocopiers,
laser printers,
photocells,
red glass,
dandruff shampoo,
rubber

elements.wlonk.com

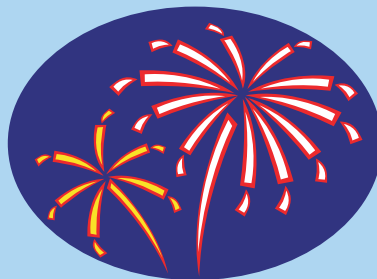
Rb  37
Rubidium



Global
Navigation

elements.wlonk.com

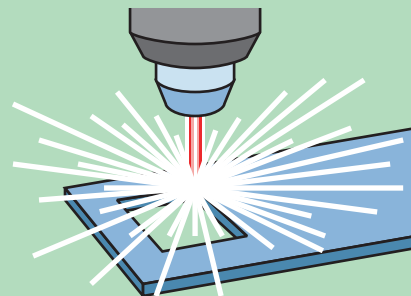
Sr  38
Strontium



Fireworks

elements.wlonk.com

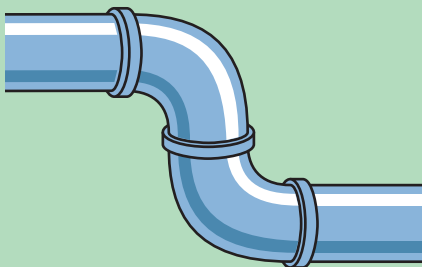
Y  39
Yttrium



Lasers

elements.wlonk.com

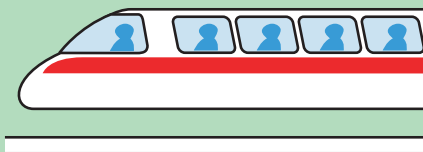
Zr  40
Zirconium



Chemical
Pipelines

elements.wlonk.com

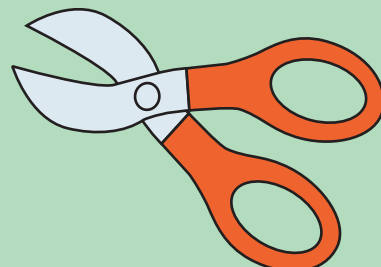
Nb  41
Niobium



Mag Lev
Trains

elements.wlonk.com

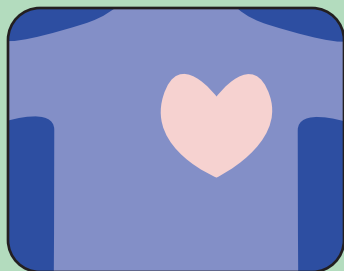
Mo  42
Molybdenum



Cutting
Tools

elements.wlonk.com

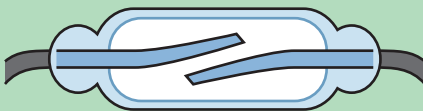
Tc    43
Technetium



Radioactive
Diagnosis

elements.wlonk.com

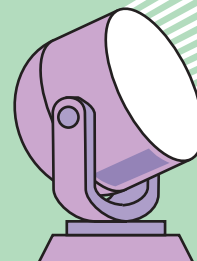
Ru   44
Ruthenium



Electric
Switches

elements.wlonk.com

Rh   45
Rhodium



Searchlight
Reflectors

elements.wlonk.com

Y Yttrium 39
soft metal;
phosphors in
color TVs,
lasers (YAG, YLF),
furnace bricks,
high-temperature
superconductors

elements.wlonk.com

Sr Strontium 38
soft metal;
red fireworks,
flares,
phosphors,
nuclear batteries,
medical
diagnostic tracer,
nuclear fallout

elements.wlonk.com

Rb Rubidium 37
soft metal,
reactive;
atomic clocks,
global navigation
(GPS),
vacuum tube
scavenger

elements.wlonk.com

Mo Molybdenum 42
high-melting-point
metal;
hard steel,
cutting tools,
drill bits,
armor plate,
gun barrels,
fertilizer

elements.wlonk.com

Nb Niobium 41
high-melting-point
non-corroding
metal;
chemical pipelines,
superconductors,
magnetic
levitation trains,
MRI magnets

elements.wlonk.com

Zr Zirconium 40
non-corroding
neutron-resistant
metal;
chemical pipelines,
nuclear reactors,
furnace bricks,
abrasives,
zircon gems

elements.wlonk.com

Rh Rhodium 45
non-corroding
hard shiny metal;
labware,
reflectors,
electric contacts,
thermocouples,
catalyst,
pollution control

elements.wlonk.com

Ru Ruthenium 44
non-corroding
hard metal;
electric contacts,
leaf switches,
pen tips,
catalyst,
hydrogen
production

elements.wlonk.com

Tc Technetium 43
radioactive,
long-lived;
first human-made
element, only
traces on Earth
but found in stars,
medical
diagnostic tracer

elements.wlonk.com

Pd   46
Palladium



Pollution
Control

elements.wlonk.com

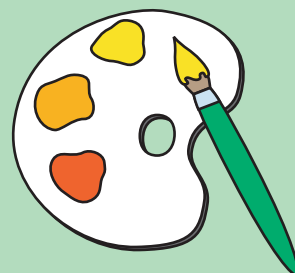
Ag   47
Silver



Jewelry

elements.wlonk.com

Cd  48
Cadmium



Paint

elements.wlonk.com

In  49
Indium



Liquid Crystal
Displays (LCDs)

elements.wlonk.com

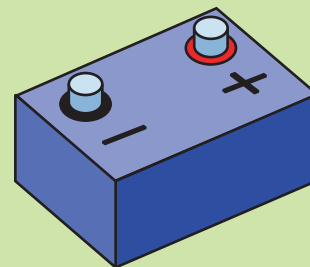
Sn  50
Tin



Plated
Food Cans

elements.wlonk.com

Sb  51
Antimony



Car
Batteries

elements.wlonk.com

Te  52
Tellurium



Thermoelectric
Coolers

elements.wlonk.com

I  53
Iodine



Disinfectant

elements.wlonk.com

Xe  54
Xenon



High-Intensity
Lamps

elements.wlonk.com

Cd Cadmium 48
non-corroding
soft metal, toxic;
electroplated
steel,
nicad batteries,
red and yellow
paints,
fire sprinklers

elements.wlonk.com

Ag Silver 47
soft shiny metal,
conducts
electricity best
of all elements;
jewelry,
silverware, coins,
dentistry,
photo film

elements.wlonk.com

Pd Palladium 46
non-corroding
hard metal,
absorbs hydrogen;
labware,
electric contacts,
dentistry,
catalyst,
pollution control

elements.wlonk.com

Sb Antimony 51
brittle metalloid;
solders,
lead hardener,
batteries, bullets,
semiconductors,
photocells,
matches,
flame retardant

elements.wlonk.com

Sn Tin 50
non-corroding
soft metal;
solders,
plated food cans,
bronze (Cu-Sn),
pewter cups,
glassmaking,
fire sprinklers

elements.wlonk.com

In Indium 49
soft metal;
solders,
glass seals,
glass coatings,
liquid crystal
displays (LCDs),
semiconductors,
diodes, photocells

elements.wlonk.com

Xe Xenon 54
inert gas;
high-intensity
lamps, headlights,
stadium lamps,
projectors,
strobos, lasers,
spacecraft
ion engines

elements.wlonk.com

I Iodine 53
violet-black solid;
disinfectant for
wounds and
drinking water,
added to salt
to prevent
thyroid disease,
photo film

elements.wlonk.com

Te Tellurium 52
brittle metalloid;
alloys,
semiconductors,
photocopiers,
computer disks,
thermo-electric
coolers and
generators

elements.wlonk.com

Cs  55
Cesium



Atomic
Clocks

elements.wlonk.com

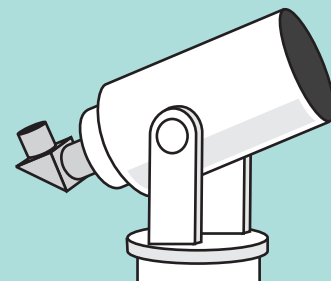
Ba  56
Barium



X-Ray
Diagnosis

elements.wlonk.com

La  57
Lanthanum



Telescope
Lenses

elements.wlonk.com

Ce  58
Cerium



Lighter
Flints

elements.wlonk.com

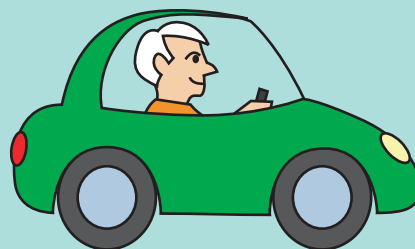
Pr  59
Praseodymium



Torchworkers'
Eyeglasses

elements.wlonk.com

Nd  60
Neodymium



Electric Motor
Magnets

elements.wlonk.com

Pm    61
Promethium



Luminous
Dials

elements.wlonk.com

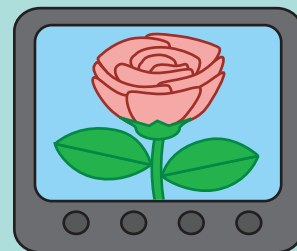
Sm  62
Samarium



Electric Motor
Magnets

elements.wlonk.com

Eu  63
Europium



Color
Televisions

elements.wlonk.com

La Lanthanum 57

soft metal;
optical glass,
telescope
eyepieces,
camera lenses,
lighter flints,
arc lamps

elements.wlonk.com

Ba Barium 56

soft metal,
absorbs X-rays;
stomach X-ray
contrast enhancer,
green fireworks,
whitener and filler
for paper, plastic,
and rubber

elements.wlonk.com

Cs Cesium 55

soft metal, melts
on a hot day,
reactive, largest
stable atoms;
atomic clocks,
global navigation
(GPS), vacuum
tube scavenger

elements.wlonk.com

Nd Neodymium 60

soft metal;
strong magnets
(Nd-Fe-B),
electric motors,
speakers and
headphones,
lasers,
lighter flints

elements.wlonk.com

Pr Praseodymium 59

soft metal;
torchworkers'
didymium eye-
glasses (Pr-Nd),
lighter flints,
arc lamps,
magnets,
yellow glass

elements.wlonk.com

Ce Cerium 58

soft metal;
most abundant
rare earth metal,
lighter flints,
gas lamp mantles,
self-cleaning
ovens,
glass polishing

elements.wlonk.com

Eu Europium 63

soft metal;
phosphors in
color TVs and
trichromatic lamps,
luminous paint,
lasers

elements.wlonk.com

Sm Samarium 62

soft metal;
magnets (Sm-Co),
electric motors,
speakers and
headphones,
infrared sensors,
infrared-absorbing
glass

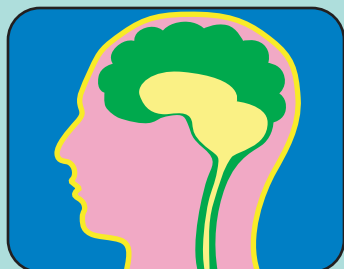
elements.wlonk.com

Pm Promethium 61

radioactive,
long-lived;
human-made,
small traces
in nature,
luminous dials,
sheet thickness
gauges

elements.wlonk.com

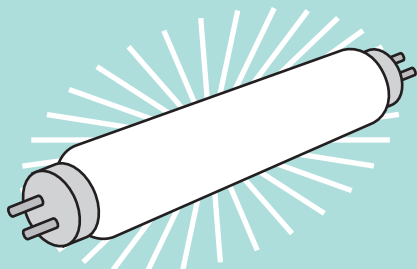
Gd  **64**
Gadolinium



**MRI
Diagnosis**

elements.wlonk.com

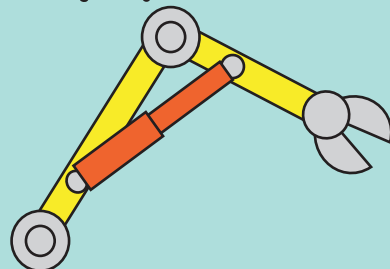
Tb  **65**
Terbium



**Fluorescent
Lamps**

elements.wlonk.com

Dy  **66**
Dysprosium



**Smart Material
Actuators**

elements.wlonk.com

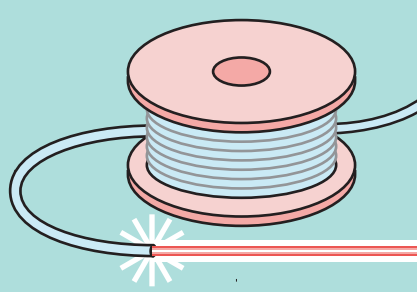
Ho  **67**
Holmium



**Laser
Surgery**

elements.wlonk.com

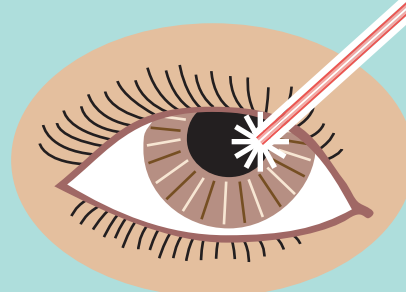
Er  **68**
Erbium



**Optical Fiber
Communications**

elements.wlonk.com

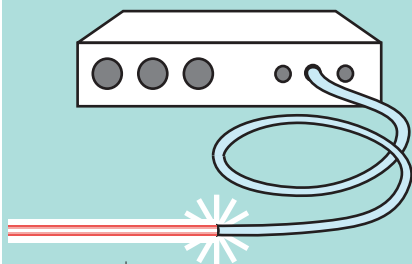
Tm  **69**
Thulium



**Laser
Surgery**

elements.wlonk.com

Yb  **70**
Ytterbium



**Scientific
Fiber Lasers**

elements.wlonk.com

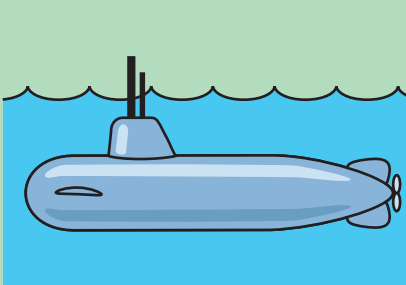
Lu  **71**
Lutetium



**Photodynamic
Medicine**

elements.wlonk.com

Hf  **72**
Hafnium



**Nuclear
Submarines**

elements.wlonk.com

Dy Dysprosium 66
soft metal;
nuclear
control rods,
MRI phosphors,
computer disks,
magnetostrictive
smart materials
(Terfenol-D®)

elements.wlonk.com

Tb Terbium 65
soft metal;
phosphors in
color TVs and
trichromatic lamps,
computer disks,
magnetostrictive
smart materials
(Terfenol-D®)

elements.wlonk.com

Gd Gadolinium 64
soft metal, best
neutron absorber,
magnetic;
magnetic resonance
imaging (MRI)
contrast enhancer,
phosphors, neutron
radiography

elements.wlonk.com

Tm Thulium 69
soft metal;
rarest stable
rare earth metal,
infrared lasers,
laser surgery,
phosphors

elements.wlonk.com

Er Erbium 68
soft metal;
fiber optic
signal amplifiers,
infrared lasers,
laser surgery,
pink glass,
sunglasses,
vanadium alloys

elements.wlonk.com

Ho Holmium 67
soft metal;
infrared lasers,
laser surgery,
eye-safe laser
rangefinders,
computer disks,
yellow glass filters

elements.wlonk.com

Hf Hafnium 72
non-corroding
metal,
absorbs neutrons;
nuclear reactor
control rods in
submarines,
plasma torch
electrodes

elements.wlonk.com

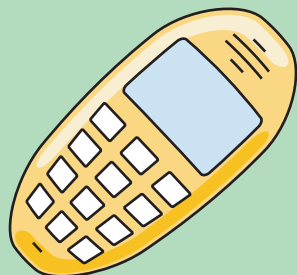
Lu Lutetium 71
soft metal,
densest and
hardest
rare earth metal;
cancer-fighting
photodynamic
(light-activated)
medicine

elements.wlonk.com

Yb Ytterbium 70
soft metal;
fiber optic
signal amplifiers,
infrared
fiber lasers,
stainless steel
alloys

elements.wlonk.com

Ta 73
Tantalum



Mobile
Phones

elements.wlonk.com

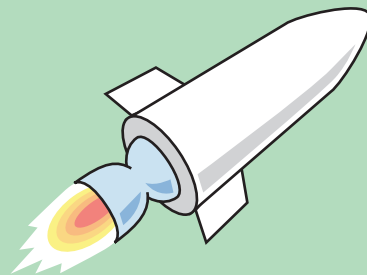
W 74
Tungsten



Lamp
Filaments

elements.wlonk.com

Re 75
Rhenium



Rocket
Engines

elements.wlonk.com

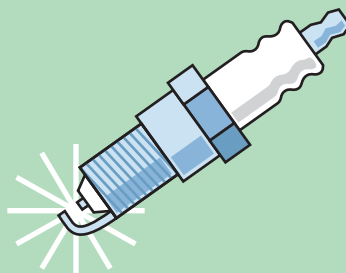
Os 76
Osmium



Pen Points

elements.wlonk.com

Ir 77
Iridium



Spark Plugs

elements.wlonk.com

Pt 78
Platinum



Labware

elements.wlonk.com

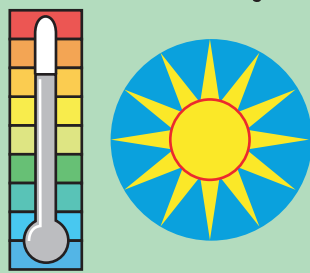
Au 79
Gold



Jewelry

elements.wlonk.com

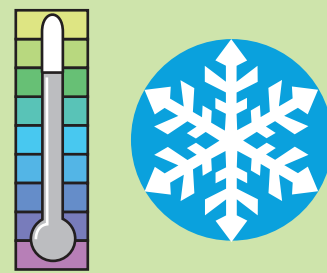
Hg 80
Mercury



Thermometers

elements.wlonk.com

Tl 81
Thallium



Low-Temperature
Thermometers

elements.wlonk.com

Re Rhenium 75
high-melting-point
dense metal;
rocket engines,
heater coils,
lab filaments,
electric contacts,
thermocouples,
catalyst

elements.wlonk.com

W Tungsten 74
highest-melting-
point metal, dense;
filaments in
lamps and TVs,
cutting tools,
abrasives,
thermocouples

elements.wlonk.com

Ta Tantalum 73
high-melting-point
non-corroding
metal;
labware,
surgical tools,
artificial joints,
capacitors,
mobile phones

elements.wlonk.com

Pt Platinum 78
non-corroding
dense metal;
labware,
spark plugs,
catalyst,
pollution control,
petroleum cracking,
processing fats

elements.wlonk.com

Ir Iridium 77
non-corroding
hard metal,
densest element
(same as osmium);
labware,
spark plugs,
pen tips, needles

elements.wlonk.com

Os Osmium 76
non-corroding
high-melting-point
hard metal,
densest element
(same as iridium);
electric contacts,
pen tips, needles,
fingerprint powder

elements.wlonk.com

Tl Thallium 81
soft metal,
toxic;
low-melting-point
mercury alloys,
low-temperature
thermometers,
undersea lamps,
photocells

elements.wlonk.com

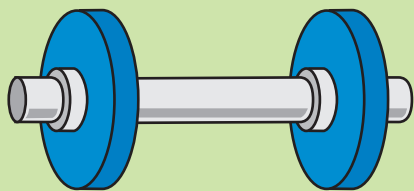
Hg Mercury 80
liquid metal,
toxic;
thermometers,
barometers,
thermostats,
street lamps,
fluorescent lamps,
dentistry

elements.wlonk.com

Au Gold 79
most malleable
element, dense
non-tarnishing
colored metal;
jewelry, coins,
ultra-thin
gold leaf,
electric contacts

elements.wlonk.com

Pb  82
Lead



Weights

elements.wlonk.com

Bi  83
Bismuth



Fire
Sprinklers

elements.wlonk.com

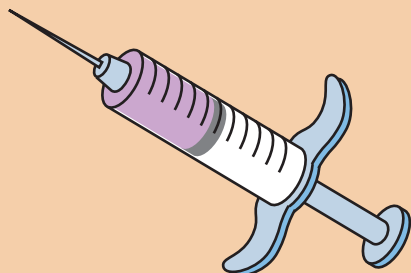
Po    84
Polonium



Anti-Static
Brushes

elements.wlonk.com

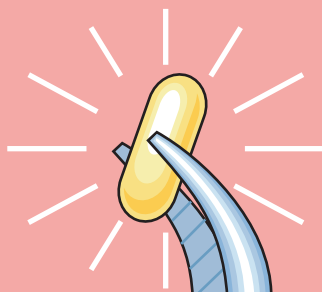
At    85
Astatine



Radioactive
Medicine

elements.wlonk.com

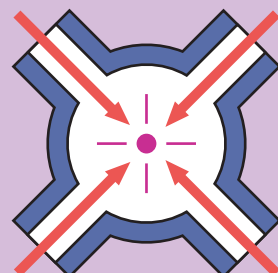
Rn   86
Radon



Surgical
Implants

elements.wlonk.com

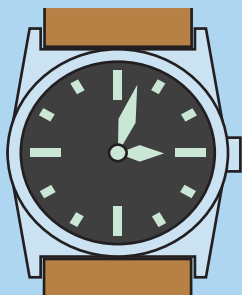
Fr    87
Francium



Laser
Atom Traps

elements.wlonk.com

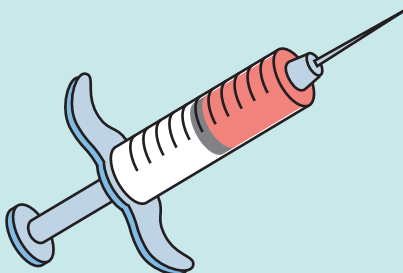
Ra    88
Radium



Luminous
Watches

elements.wlonk.com

Ac    89
Actinium



Radioactive
Medicine

elements.wlonk.com

Th   90
Thorium



Gas Lamp
Mantles

elements.wlonk.com

Po Polonium 84

radioactive,
long-lived;
first radioactive
element found,
small traces
in nature,
anti-static brushes,
tobacco

elements.wlonk.com

Bi Bismuth 83

low-melting-point
brittle metal;
solders, fuses,
fire sprinklers
(plugs melt
when hot),
cosmetics pigment

elements.wlonk.com

Pb Lead 82

dense, soft,
non-corroding
metal, toxic;
weights, solders,
batteries, bullets,
crystal glass,
old plumbing,
radiation shield

elements.wlonk.com

Fr Francium 87

radioactive,
short-lived
atoms larger
than cesium;
small traces
in nature,
studied in
laser atom traps

elements.wlonk.com

Rn Radon 86

radioactive gas,
short-lived;
environmental
hazard,
surgical implants
for cancer
treatment

elements.wlonk.com

At Astatine 85

radioactive,
short-lived;
small traces
in nature,
cancer medicine

elements.wlonk.com

Th Thorium 90

radioactive,
long-lived;
most abundant
radioactive element,
nuclear
reactor fuel,
gas lamp mantles,
tungsten filaments

elements.wlonk.com

Ac Actinium 89

radioactive,
long-lived;
small traces
in nature,
cancer medicine,
neutron source,
radwaste

elements.wlonk.com

Ra Radium 88

radioactive,
long-lived;
luminous watches
(now banned),
medical radon
production,
radiography,
radwaste

elements.wlonk.com

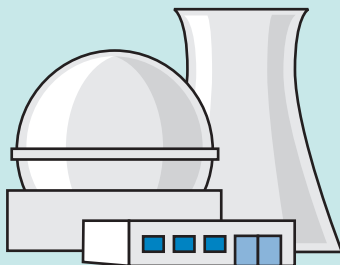
Pa    91
Protactinium



Radioactive
Waste

elements.wlonk.com

U   92
Uranium



Nuclear
Power

elements.wlonk.com

Np    93
Neptunium



Radioactive
Waste

elements.wlonk.com

Pu    94
Plutonium



Nuclear
Weapons

elements.wlonk.com

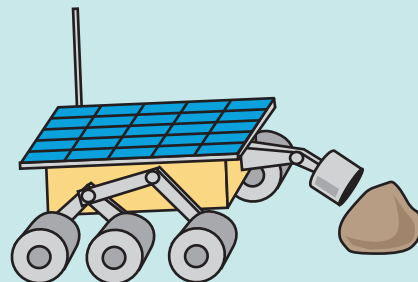
Am    95
Americium



Smoke
Detectors

elements.wlonk.com

Cm    96
Curium



Mineral
Analyzers

elements.wlonk.com

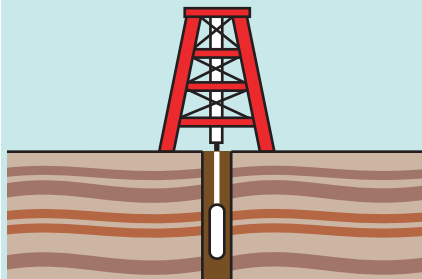
Bk    97
Berkelium



Radioactive
Waste

elements.wlonk.com

Cf    98
Californium



Mineral
Analyzers

elements.wlonk.com

Es    99
Einsteinium

elements.wlonk.com

Np Neptunium 93

radioactive,
long-lived;
small traces
in nature,
neutron detectors,
dosimeters,
nuclear weapons,
radwaste

elements.wlonk.com

U Uranium 92

radioactive,
long-lived, dense;
nuclear
reactor fuel,
nuclear weapons,
counterweights,
armor piercing
bullets

elements.wlonk.com

Pa Protactinium 91

radioactive,
long-lived;
small traces
in nature,
no uses,
radwaste

elements.wlonk.com

Cm Curium 96

radioactive,
long-lived;
never found
in nature,
scientific
instruments,
mineral analyzers,
radwaste

elements.wlonk.com

Am Americium 95

radioactive,
long-lived;
never found
in nature,
smoke detectors,
sheet thickness
gauges,
radwaste

elements.wlonk.com

Pu Plutonium 94

radioactive,
long-lived;
small traces
in nature,
nuclear
reactor fuel,
spacecraft power,
nuclear weapons

elements.wlonk.com

Es Einsteinium 99

radioactive,
short-lived;
never found
in nature,
no uses

elements.wlonk.com

Cf Californium 98

radioactive,
long-lived;
never found
in nature,
scientific
instruments,
mineral analyzers,
radwaste

elements.wlonk.com

Bk Berkelium 97

radioactive,
long-lived;
never found
in nature,
no uses,
radwaste

elements.wlonk.com

Fm   **X 100**
Fermium

elements.wlonk.com

Md   **X 101**
Mendelevium

elements.wlonk.com

No   **X 102**
Nobelium

elements.wlonk.com

Lr   **X 103**
Lawrencium

elements.wlonk.com

Rf  **X 104**
Rutherfordium

elements.wlonk.com

Db  **X 105**
Dubnium

elements.wlonk.com

Sg  **X 106**
Seaborgium

elements.wlonk.com

Bh  **X 107**
Bohrium

elements.wlonk.com

Hs  **X 108**
Hassium

elements.wlonk.com

No 102
Nobelium

radioactive,
short-lived;
never found
in nature,
no uses

elements.wlonk.com

Md 101
Mendelevium

radioactive,
short-lived;
never found
in nature,
no uses

elements.wlonk.com

Fm 100
Fermium

radioactive,
short-lived;
never found
in nature,
no uses

elements.wlonk.com

Db 105
Dubnium

radioactive,
short-lived;
never found
in nature,
no uses

elements.wlonk.com

Rf 104
Rutherfordium

radioactive,
short-lived;
never found
in nature,
no uses

elements.wlonk.com

Lr 103
Lawrencium

radioactive,
short-lived;
never found
in nature,
no uses

elements.wlonk.com

Hs 108
Hassium

radioactive,
short-lived;
never found
in nature,
no uses

elements.wlonk.com

Bh 107
Bohrium

radioactive,
short-lived;
never found
in nature,
no uses

elements.wlonk.com

Sg 106
Seaborgium

radioactive,
short-lived;
never found
in nature,
no uses

elements.wlonk.com

Mt  **X** **109**
Meitnerium

elements.wlonk.com

Ds  **X** **110**
Darmstadtium

elements.wlonk.com

Rg  **X** **111**
Roentgenium

elements.wlonk.com

Cn  **X** **112**
Copernicium

elements.wlonk.com

Nh  **X** **113**
Nihonium

elements.wlonk.com

Fl  **X** **114**
Flerovium

elements.wlonk.com

Mc  **X** **115**
Moscovium

elements.wlonk.com

Lv  **X** **116**
Livermorium

elements.wlonk.com

Ts  **X** **117**
Tennessine

elements.wlonk.com

Rg 111
Roentgenium

radioactive,
short-lived;
never found
in nature,
no uses

elements.wlonk.com

Ds 110
Darmstadtium

radioactive,
short-lived;
never found
in nature,
no uses

elements.wlonk.com

Mt 109
Meitnerium

radioactive,
short-lived;
never found
in nature,
no uses

elements.wlonk.com

Fl 114
Flerovium

radioactive,
short-lived;
never found
in nature,
no uses

elements.wlonk.com

Nh 113
Nihonium

radioactive,
short-lived;
never found
in nature,
no uses

elements.wlonk.com

Cn 112
Copernicium

radioactive,
short-lived;
never found
in nature,
no uses

elements.wlonk.com

Ts 117
Tennessine

radioactive,
short-lived;
never found
in nature,
no uses

elements.wlonk.com

Lv 116
Livermorium

radioactive,
short-lived;
never found
in nature,
no uses

elements.wlonk.com

Mc 115
Moscovium

radioactive,
short-lived;
never found
in nature,
no uses

elements.wlonk.com

Og  X 118
Oganesson

elements.wlonk.com

elements.wlonk.com

elements.wlonk.com

elements.wlonk.com

elements.wlonk.com

elements.wlonk.com

elements.wlonk.com

elements.wlonk.com

elements.wlonk.com

Og **118**
Oganesson

radioactive,
short-lived;
never found
in nature,
no uses

elements.wlonk.com

elements.wlonk.com

elements.wlonk.com

elements.wlonk.com

elements.wlonk.com

elements.wlonk.com

elements.wlonk.com

elements.wlonk.com

elements.wlonk.com