1 **H** **Hydrogen** Discovered 1766 From the Greek for water-forming							**2** **He** **Helium** Discovered 1895 From the Greek for sun, 1st found in the sun's corona
3 **Li** **Lithium** Discovered 1817 From the Greek "lithos" (stone)	**4** **Be** **Beryllium** Discovered 1797 From the Greek for beryl, a gemstone	**5** **B** **Boron** Discovered 1808 From the Arabic "burqa" (borax)	**6** **C** **Carbon** Prehistoric From the Latin "carbo" (charcoal)	**7** **N** **Nitrogen** Discovered 1772 From the Greek for nitre-forming	**8** **O** **Oxygen** Discovered 1774 From the Greek for acid-forming	**9** **F** **Fluorine** Discovered 1886 From the Latin "fluere" (to flow)	**10** **Ne** **Neon** Discovered 1898 From the Greek "neos" (new)
11 **Na** **Sodium** Discovered 1807 From the English "soda"	**12** **Mg** **Magnesium** Discovered 1755 For Magnesia, a district in Thessaly, Greece	**13** **Al** **Aluminum** Discovered 1825 From the Latin "alum" (bitter salt)	**14** **Si** **Silicon** Discovered 1824 From the Latin "silex" (flint)	**15** **P** **Phosphorus** Discovered 1669 From the Greek for light-bringing	**16** **S** **Sulfur** Prehistoric Sanskrit "sulvere" or Latin "sulfurium"	**17** **Cl** **Chlorine** Discovered 1774 From the Greek "chloros" (greenish yellow)	**18** **Ar** **Argon** Discovered 1894 From the Greek "argos" (idle)
19 **K** **Potassium** Discovered 1807 From the English "potash"	**20** **CA** **Calcium** Discovered 1808 From the Latin "calex" (lime)	**31** **Ga** **Gallium** Discovered 1875 From the Latin name for France ("Gallia")	**32** **Ge** **Germanium** Discovered 1886 From the Latin name for Germany ("Germania")	**33** **As** **Arsenic** Discovered ~1250 From the Greek "arsenikon" (a yellow pigment)	**34** **Se** **Selenium** Discovered 1817 From the Greek name for the moon ("Selene")	**35** **Br** **Bromine** Discovered 1826 From the Greek "bromos" (stench)	**36** **Kr** **Krypton** Discovered 1898 From the Greek "kryptos" (hidden)

1 Henry Cavendish discovered hydrogen. He showed that when hydrogen is burned, it forms water, ending the belief that water was an element.							**2** Helium was detected in the sun by its spectral lines long before it was found on Earth. It is used to cool superconducting magnets in the Large Hadron Collider and MRI machines.
3 Lithium was discovered from a mineral, while other alkali metals were discovered from plant material. This may explain its name. It has the lowest density of all the metals.	**4** Beryllium is relatively soft used in gears and cogs in the aviation industry. Gemstones beryl and emerald are both forms of beryllium aluminum silicate.	**5** Boron is essential for the cell walls of plants. Some boron compounds are being studied as a possible treatment for brain tumors. It is also used in flares; it gives a green color.	**6** Carbon is unique in its ability to form strongly bonded chains, sealed off by hydrogen atoms. These hydrocarbons occur naturally as fossil fuels.	**7** Nitrogen in the form of ammonium chloride was known to alchemists as sal ammonia. It was manufactured by heating a mixture of dung, salt and urine.	**8** Oxygen first appeared in the Earth's atmosphere 2 billion yrs ago, It is soluble in water, which makes aerobic life in rivers, lakes and oceans possible.	**9** Fluorine is the most reactive of all the elements and quickly attacks all metals. Steel wool bursts into flames when exposed to	**10** In a vacuum discharge tube neon glows a reddish orange color. But only red signs contain pure neon. Other inert gases provide different colors in many "neon" signs.
11 Salt (sodium chloride) used to flavor and preserve food and soda (sodium carbonate) used to make glass have been known since prehistoric times.	**12** Chlorophyll, used by plants for photosynthesis, is a magnesium-centered porphyrin complex. Without magnesium, life as we know it would not exist!	**13** This malleable, corrosion-resistant non-toxic metal is used in numerous products. Ornaments found in a 3rd century Chinese leader's tomb were 85% aluminum	**14** Silicon makes up 27.7% of the Earth's crust by mass and is the 2nd most abundant element (after O). Silica flints were some of the 1st tools made by early humans.	**15** Phosphorus was 1st made by Hennig Brandt who evaporated urine and heated the residue. He thought he had found the Philosopher's Stone which could turn base metals into gold.	**16** Sulfur is mentioned 15 times in the *Bible*, and was best known for destroying Sodom and Gomorrah. Burning sulfur is known as "brimstone."	**17** Chlorine is a toxic gas, used as a chemical weapon but the chloride ion is essential to life. We get the chloride we need	**18** Found by W. Ramsey and M. Williams, this totally inert gas was anticipated by Henry Cavendish in 1785, who noted that 1% of air does not react even under extreme conditions. Argon!
19 Potassium salts and potash were used for centuries in gunpowder and soap-making. Humphry Davy exposed potash to electric current and found the metal.	**20** Lime (calcium oxide) was used for centuries to make mortar and plaster. Calcium phosphate is the main component of bone. The average human contains ~1kg of calcium.	**31** Ga was predicted by Mendeleev and discovered by Lecoq de Boisbaudran. He observed a violet line in the atomic spectrum of some zinc and knew an unknown element was present.	**32** In Sept 1885 a miner working in a silver mine near Freiberg, Germany came across an unusual ore. Clemens Winkler identified Ge, as predicted by Mendeleev.	**33** Arsenic was known to ancient Egyptians, used in gilding metals. Prawns contain high levels of arsenic, in an organo-arsenic form which is not harmful to health.	**34** Selenium was discovered by Jöns Jacob Berzelius in Stockholm. He was intrigued by the red-brown sediment at the bottom of chambers where sulfuric acid was made.	**35** The only element other than mercury that is liquid at room temperature, bromine is a deep-red, oily, toxic liquid with a very unpleasant smell.	**36** Krypton was discovered accidently by W. Ramsey and M. Williams, during their search for Argon. It is used to fill fluo-

37 **Rb** **Rubidium** Discovered 1861 From the Latin “rubidius” (deepest red)	**38** **Sr** **Strontium** Discovered 1790 For Strontian, a town in Scotland	**49** **In** **Indium** Discovered 1863 From the Latin “indicium” (indigo)	**50** **Sn** **Tin** ~ 2,100 BC From the Anglo-Saxon word “tin”	**51** **Sb** **Antimony** ~1,600 BC From the Greek “anti-monos” (not alone)	**52** **Te** **Tellurium** Discovered 1783 From the Latin “tellus” (Earth)	**53** **I** **Iodine** Discovered 1811 From the Greek “iodes” (violet)	**54** **Xe** **Xenon** Discovered 1898 From the Greek “xenos” (stranger)
55 **Cs** **Cesium** Discovered 1860 From the Latin “caesius” (sky blue)	**56** **Ba** **Barium** Discovered 1808 From the Greek “barys” (heavy)	**81** **Tl** **Thallium** Discovered 1861 From the Greek “thallos” (a green twig)	**82** **Pb** **Lead** Ancient From the Anglo-Saxon word for lead	**83** **Bi** **Bismuth** ~ 1,500 From the German “bisemutum” loosely “white	**84** **Po** **Polonium** Discovered 1898 Named for Poland, native country of Marie Curie	**85** **At** **Astatine** Discovered 1940 From the Greek “astatos” (unstable)	**86** **Rn** **Radon** Discovered 1900 From radium, as it was detected from radioactive decay
87 **Fr** **Francium** Discovered 1939 Named for France	**88** **Ra** **Radium** Discovered 1898 From the Latin “radius” (ray)	**113** **Nh** **Nihonium** Discovered 2004 From the Japanese name for Japan	**114** **Fl** **Flerovium** Discovered 1999 Named to honor Russian physicist Georgy Flerov	**115** **Mc** **Moscovium** Discovered 2010 Named for Moscow, Russia	**116** **Lv** **Livermorium** Discovered 2000 Named for Law-rence Livermore National Laboratory	**117** **Ts** **Tennessine** Discovered 2010 Named for the state of Tennessee	**118** **Og** **Oganesson** Discovered 2006 Named to honor Russian physicist Yuri Oganessian

37 R. Bunsen and G. Kirchhoff isolated Rb from lepidolite and examined its atomic spectrum. Two intense ruby red lines indicated a new element, now named after this color.

38 Sr is best known for the brilliant reds its salts give to fireworks. Strontium aluminate is used in glow-in-the-dark products; it absorbs light during the day and releases it slowly.

49 Most indium is used to make indium tin oxide for touch screens, flatscreen TVs and solar panels. It conducts electricity, bonds strongly to glass and is transparent.

50 When copper is alloyed with tin it produces bronze, a hard metal that is ideal for tools and weapons. The Bronze Age began in the region of Egypt and Mesopotamia ~3,000 BC.

51 Ancient Egyptians used antimony sulfide as a mascara. It was used in "reusable" laxative pills in the Middle Ages. Today it is used to make semiconductor devices.

52 Franz Joseph Müller von Reichenstein was intrigued by a metallic ore which he suspected was native antimony or bismuth. It was actually gold telluride ($AuTe_2$).

53 Iodine is a black, shiny, crystalline solid, but when heated, iodine sublimes to form a purple vapor. Many species of seaweed contain iodine.

54 Xenon was discovered by W. Ramsey and M. Williams who distilled krypton and isolated the new gas. In a vacuum tube, it gave a beautiful blue glow.

55 Cesium is a soft, gold-colored metal that is quickly attacked by air and reacts explosively in water. Mr. Dingle probably spells it "caesium."

56 All barium compounds are toxic; but barium sulfate is insoluble and so can be safely swallowed. It enables x-rays of the stomach and intestines.

81 Thallium may be the deadliest element, as it mimics other biochemicals (*e.g.* K). Previously used in rat poisons, it was banned in the US in 1972, but poisonings still occur.

82 Lead has been mined for more than 6,000 years. "White lead" was the base for paints until 1978, when it was restricted due to growing concerns about its toxicity.

83 A whitish metal with a pink hue, bismuth burns with a blue flame and emits yellow fumes. Despite sitting among so many poisons, Bi is the active ingredient in Pepto-Bismol

84 Discovered by Pierre and Marie Curie, Polonium is most famously known for being the poison used to kill former KGB agent Alexander Litvinenko in London in 2006.

85 Dangerously radioactive, the half-life of astatine's most stable isotope is only 8 hours. Chemically, it behaves like other halogens, particularly iodine.

86 Radon is a colorless and odorless gas. It is chemically inert, but radioactive. It decays into radioactive polonium and alpha particles. This emitted radiation is used in cancer therapy.

87 Mendeleev predicted this element, which was found by Marguerite Perey at the Curie Institute in Paris. With a half-life of only 22 minutes, it has no known uses.

88 Radium is always found with uranium ores. It was discovered by Marie and Pierre Curie, who extracted 1 mg of radium from ten tons of uranium ore pitchblende.

113 IUPAC confirmed the discovery of Nh by scientists from RIKEN (The Institute of Physical and Chemical Research) in Japan in 2015. Little is known about it.

114 Georgy Flerov founded the Joint Institute for Nuclear Research in Dubna, Russia in 1956 as an international research center for nuclear science.

115 Moscovium and Tennessine were discovered by collaborating scientists from Dubna, Russia, Livermore Labs in California and Oak Ridge National Labs in Tennessee.

116 Livermorium does not occur naturally. It is made by bombarding curium atoms with calcium. The most stable isotope has a half-life of about 53 milliseconds.

117 Oak Ridge National Labs in TN produced the radioisotope berkelium-249 used to find this element. The "ine" suffix indicates that it is a halogen.

118 Oganesson has the highest atomic number and highest atomic mass all known elements. Highly radioactive and very unstable, only 4 atoms have been detected.

21	22	23	24	25	26	27	28
Sc	**Ti**	**V**	**Cr**	**Mn**	**Fe**	**Co**	**Ni**
Scandium	**Titanium**	**Vanadium**	**Chromium**	**Manganese**	**Iron**	**Cobalt**	**Nickel**
Discovered 1879	Discovered 1791	Discovered 1801	Discovered 1798	Discovered 1774	~3,500 BC	Discovered 1730	Discovered 1669
From the Latin for Scandinavia	From Titans in Greek mythology	For Vanadis, the old Norse name for goddess Freyja	From the Greek “chroma” (color)	Maybe from the Latin “magnes” (magnet)	From the Anglo-Saxon word “iren”	From the German “kobald” (goblin)	From the German “kupfernickel” (devil’s copper)

29	30
Cu	**Zn**
Copper	**Zinc**
Prehistoric	Known to Greeks, Romans, 200 BC
From the Latin “Cyprium aes” (a metal from Cyprus)	From Persian “sing” (stone)

39	40	41	42	43	44	45	46
Y	**Zr**	**Nb**	**Mo**	**Tc**	**Ru**	**Rh**	**Pd**
Yttrium	**Zirconium**	**Niobium**	**Molybdenum**	**Technetium**	**Ruthenium**	**Rhodium**	**Palladium**
Discovered 1794	Discovered 1789	Discovered 1801	Discovered 1781	Discovered 1937	Discovered 1844	Discovered 1803	Discovered 1803
For Ytterby, a town in Sweden	From the Arabic “zargun” (gold-colored)	For Niobe, daughter of King Tantalus in Greek myth	From the Greek “molybdos” (lead)	From the Greek “tekhnetos” (artificial)	From the Latin name for Russia (“Ruthenia”)	From the Greek “rhodon” (rose-colored)	For the asteroid, Pallas (Greek Goddess of wisdom)

47	48
Ag	**Cd**
Silver	**Cadmium**
~3,000 BC	Discovered 1817
From the Anglo-Saxon “siolfur”	From the Latin “cadmia” (the mineral calmine)

21 Predicted by Mendeleev, Scania was discovered by Lars Frederik Nilson of the Univ. of Uppsala, Sweden. It is used in an alloy with aluminum in high-end bicycle frames.

22 Although identified by William Gregor in 1791, it was not until 1910 that a General Electric scientist made pure titanium by heating titanium tetrachloride and sodium metal.

23 Vanadium was discovered in 1801 by Andrés Manuel del Rio in Mexico City, but his findings were disputed by French chemists. He was vindicated by Swedish chemists in 1831.

24 Discovered by the French chemist Nicholas Louis Vauquelin, who was Intrigued by the range of colors that it produced. The green color of emeralds is due to chromium.

25 Manganese in the form of the black ore pyrolucite (manganese dioxide) was used by the pre-historic cave painters of the Lascaux region of France around 30,000 years ago.

26 Iron objects found in Egypt date from 3500 BC. They contain about 7.5% nickel, which indicates a meteoric origin. The Hittites were smelting iron by 1500 BC.

27 Cobalt has been used as a blue pigment for glass and pottery for millennia. King Tut's tomb (1352 BC) contained a small glass object colored deep blue with cobalt.

28 Nickel resists corrosion and is used to plate other metals to protect them. Baked beans contain a surprising amount of nickel, which is an essential element of many beans.

29 Copper beads more than 10 thousand years old have been excavated in northern Iraq. Copper was widely used in the ancient world as bronze, its alloy with tin.

30 Zinc was known to the Romans but rarely used. Today zinc is used to galvanize other metals, such as iron, to prevent rusting. Galvanized steel is used to make car bodies.

39 The 1st of 7 rare earth elements discovered in rocks from a mine in Ytterby, Sweden. It was found by Johan Gadolin, for whom element 64 is named.

40 Gems that contain zirconium are known as zircon. Ancient Egyptians used zircon gemstones in jewelry. Cubic zirconia is similar to diamond in refractivity and appearance.

41 Niobium is used in alloys such as stainless steel. It improves the strength of the alloys, particularly at low temperatures. These alloys are used in jet engines and rockets.

42 A master sword maker in 14th century Japan added Mo to steel to make coveted samurai swords, whose blades never dulled. His secret recipe died with him and was lost for 500 yrs.

43 Technetium was discovered by Emilio Segrè while investigating Mo that had been exposed to high energy radiation. Today, it is extracted from spent nuclear fuel rods.

44 Ruthenium is one of the most effective hardeners for platinum and palladium, and is alloyed with these metals to make electrical contacts for severe wear resistance.

45 Rhodium is the rarest of all non-radioactive metals. It occurs uncombined in nature, along with other platinum metals, in river sands in North and South America.

46 By 1700 miners in Brazil knew of a metal called *ouro podre (*worthless gold) which is an alloy of palladium and gold. William Wollaston isolated Pd from ordinary platinum in 1803.

47 Slag heaps near ancient mines in Turkey and Greece prove that silver mining started around 3000 BC. Sterling silver contains 92.5% silver. The rest is copper or another metal.

48 Cadmium occurs naturally in the Earth's crust. 80% of cadmium produced is used in rechargeable nickel-cadmium batteries, but it is being phased out due to its toxicity.

57	72	73	74	75	76	77	78
La	**Hf**	**Ta**	**W**	**Re**	**Os**	**Ir**	**Pt**
Lanthanum	**Hafnium**	**Tantalum**	**Tungsten**	**Rhenium**	**Osmium**	**Iridium**	**Platinum**
Discovered 1839	Discovered 1923	Discovered 1802	Discovered 1783	Discovered 1925	Discovered 1803	Discovered 1803	Known in S. America
From the Greek “lanthanein” (to lie hidden)	From the Latin name for Copen-hagen (Hafnia)	For Tantalus, the legendary Greek King	From the Swedish “tung sten” (heavy stone)	From the Latin name for the river Rhine (“Rhenus”)	From the Greek ”osme” (smell)	For the Greek Goddess of the Rainbow (Iris)	From the Spanish “platina” (little silver)

79	80
Au	**Hg**
Gold	**Mercury**
~ 3,000 BC	~ 1,500 BC
Anglo-Saxon or Germanic: “gehl” or “gulþą ” (to gleam)	For the Roman God and planet Mercury

89	104	105	106	107	108	109	110
Ac	**Rf**	**DB**	**Sg**	**Bh**	**Hs**	**Mt**	**Ds**
Actinium	**Rutherfordium**	**Dubnium**	**Seaborgium**	**Bohrium**	**Hassium**	**Meitnerium**	**Darmstadtium**
Discovered 1899	Discovered 1964	Discovered 1968-70	Discovered 1974	Discovered 1981	Discovered 1984	Discovered 1982	Discovered 1994
From the Greek “actinos” (a ray)	Named to honor Ernest Rutherford, who explained the structure of atoms	For the Russian town, Dubna (near Moscow)	Named to honor Glenn Seaborg, who found 10 elements	Named to honor Danish physicist Niels Bohr	For the German state of Hesse where it was 1st made	Named to honor Austrian physicist Lise Meitner	For Darmstadt, Germany where it was 1st made

111	112
Rg	**Cn**
Rontgenium	**Copernicum**
Discovered 1994	Discovered 1996
Named to honor German physicist Wilhelm Röentgen	Named to honor Renaissance scientist Nicolaus Copernicus

57 Lanthanum is the 1st of the 15 lanthanide elements, which with the chemically similar scandium and yttrium, are often collectively known as the rare earth elements.

72 Hafnium is chemically very similar to Zirconium. Hafnium is pyrophoric, meaning that fine particles can spontaneously combust when exposed to air.

73 One of the main uses of tantalum is in the production of electronic components. It causes no immune response in mammals, and is used surgical implants.

74 Tungsten has the highest melting point of all metals, it is alloyed with other metals to strengthen them The Chinese used it for centuries to create peach-colored porcelain.

75 Rhenium was the last stable, non-radioactive, naturally-occurring element to be discovered. It can best be described as

76 Osmium is the densest of all the elements, twice as dense as lead. Its name reflects the strong odor it gave off when it was

77 Iridium is the most corrosion-resistant material known and one of the rarest natural elements. A very thin layer exists in

78 Unknown in Europe prior to Columbus' voyages, native South Americans used platinum in burial goods dating

79 Gold's symbol (Au) comes from its Latin name, *Aurum.* It is one of the least reactive chemical elements. This property is

80 Mercury's symbol (Hg) comes from the Greek *hydrargyros* meaning "water silver." It is the only metal that is liquid at

89 Actinium is 1st of the 15 elements in the actinide series. These elements are all radioactive. Actinium was 1st extracted from uranium ore pitchblende by André Debierne.

104 Ernest Rutherford was a New Zealand physicist who discovered the concept of radioactive half-life and differentiated between alpha and beta particles. He is called the father of nuclear physics.

105 This element was originally named for Otto Hahn, who unfairly received the 1945 Nobel Prize for Lise Meitner's work on nuclear fission. The IUPAC decided to name it dubnium.

106 Glenn Seaborg was an American chemist whose involvement in the synthesis and discovery elements earned him a share of the 1951 Nobel Prize in Chemistry.

107 Niels Bohr provided critical insights into atomic structure and quantum theory. During WWII, he helped numerous Jewish scientists escape the Nazi regime in Europe.

108 Hassium does not occur in nature. Highly radioactive, its most stable known isotope has a half-life of only 9.7 seconds.

109 Lise Meitner was the 1st physicist to recognize the discovery of nuclear fission. The 1945 Nobel Prize for her work was unfairly given to a collaborator, Otto Hahn.

110 A team headed by Yuri Oganessian made isotope-273 by bombarding plutonium with sulfur. Of its 15 known isotopes, the heaviest is the longest-lived, with a half-life of 4 min

111 Wilhelm Röentgen was the 1st to study electromagnetic radition waves that he called x-rays. For this, he won the 1st Nobel Prize in Physics in 1901

112 Copernicium is a synthetic element of which only a few atoms have ever been made. It is formed by fusing lead and zinc atoms in a heavy ion accelerator.

58	59	60	61	62	63	64	65
Ce	**Pr**	**Nd**	**Pm**	**Sm**	**Eu**	**Gd**	**Tb**
Ceres	**Praseodymium**	**Neodymium**	**Promethium**	**Samarium**	**Europium**	**Gadolinium**	**Terbium**
Discovered 1839	Discovered 1885	Discovered 1885	Discovered 1945	Discovered 1879	Discovered 1901	Discovered 1880	Discovered 1843
For the asteroid, Ceres (Roman goddess of agriculture)	From the Greek “prasios didymos” (green twin)	From the Greek “neos didymos” (new twin)	From Prometheus of Greek myth, who stole fire	From “samarskite” mineral from which it was isolated	Named for Europe	Named to honor Johan Gadolin, a Finnish scientist	Also named to honor Ytterby, Sweden

66	67	68	69	70	71		
Dy	**Ho**	**Er**	**Tm**	**Yb**	**Lu**	**Lanthanide series**	**Actinide series**
Dysprosium	**Holmium**	**Erbium**	**Thulium**	**Ytterbium**	**Lutetium**		
Discovered 1886	Discovered 1878	Discovered 1843	Discovered 1879	Discovered 1878	Discovered 1907		
From the Greek “dysprositos” (hard to get)	From the Latin name for Stockholm (Holmia)	3rd element named to honor Ytterby, Sweden	From Thule, an ancient name for Scandinavia	4th element named to honor Ytterby, Sweden	From the Latin name for Paris (Lutetia)		

90	91	92	93	94	95	96	97
Th	**Pa**	**U**	**Np**	**Pu**	**Am**	**Cm**	**Bk**
Thorium	**Protactinium**	**Uranium**	**Neptunium**	**Plutonium**	**Americium**	**Curium**	**Berkelium**
Discovered 1829	Discovered 1913	Discovered 1789	Discovered 1940	Discovered 1940	Discovered 1944	Discovered 1944	Discovered 1949
For the Scandinavian God Thor	From the Greek “protos” (first) and actinium	For the planet Uranus	For the planet Neptune	For the (then) planet Pluto	Named for America, where it was first made	Named to honor Pierre and Marie Curie	Named for Berkeley, California

98	99	100	101	102	103
Cf	**Ei**	**Fm**	**Md**	**No**	**Lr**
Californium	**Einsteinium**	**Fermium**	**Mendelevium**	**Nobelium**	**Lawrencium**
Discovered 1950	Discovered 1952	Discovered 1953	Discovered 1955	Discovered 1963	Discovered 1965
From the State and University of California	Named to honor Albert Einstein	Named to honor Enrico Fermi	Named to honor Dmitri Mendeleev, creator of this table	Named to honor Alfred Nobel, founder of Nobel Prize	Named to honor Ernest Lawrence, inventor of cyclotron

58 Cerium is the most abundant of the lanthanides. It is little used because it tarnishes easily, reacts with water and burns

59 Didymium was an element for 40 years but it was really a mix of lanthanoids. Carl Auer von Welsbach succeeded in splitting didymium into its two components, Pr and Nd in 1885.

60 Neodymium is used in an alloy with iron and boron to make very strong magnets. This discovery in 1983 made it possible to miniaturize electronic devices, mobile phones.

61 Promethium's longest-lived isotope has a half-life of only 18 years, so it is not found naturally on Earth. It was 1st created in a UC cyclotron in 1939.

62 Paul-Émile Lecoq de Boisbaudran extracted didymium from the mineral samarskite, and precipitated the new element samarium. Sm then yielded other rare-earths: Gd and Eu.

63 Europium is used in the printing of euro banknotes. It glows red under UV light, and forgeries can be detected by the lack

64 Famous for his discovery of the 1st rare earth element, Yttrium. He also demonstrated that the rocks held other unknown "earths." Six were later found.

65 The 3rd element to be named after Ytterby, terbium is easier to observe today as it has fluoresces a brilliant yellow green.

66 Dy was discovered by Paul-Émile Lecoq de Boisbaudran, but pure samples didn't exist until Frank Spedding and others at Iowa State developed ion-exchange chromatography in 1950.

67 Another of the rare earths to be extracted from ytterbium, holmium can absorb neutrons, so it is used in nuclear reactors to keep a chain reaction under control.

68 In 1843 Stockholm, Carl Mosander obtained two new metal oxides from yttrium. One was erbium oxide, which was pink. (The other was terbium oxide, which was yellow.)

69 Tm was 1st isolated as its oxide by Per Teodor Cleve. In 1911, Theo. Richards performed 15,000 recrystallizations of thulium bromate in order to obtain a pure sample and determine its atomic weight.

70 A pure sample of Yb was not obtained until 1953. It is increasingly being used as an industrial catalyst, replacing other catalysts that are too toxic or polluting.

71 The story began with the discovery of yttrium in 1794 from which other elements – the rare earths (aka lanthanoids) – were to be separated, starting with erbium in 1843 and ending with lutetium in 1907.

90 The radioactivity of thorium was demonstrated in 1898 by Gerhard Schmidt and confirmed by Marie Curie. Its isotopes have long half-lives; thorium-232's half life is 14 billion yrs.

91 Mendeleev predicted an element between Th and U, but it evaded detection until K. Fajans and O. Göhring found isotope protactinium-234, which has a half-life of 6 hrs 42 mins.

92 Ancient natural nuclear fission reactors exist in Oklo, Gabon. The uranium ore fissioned in prehistoric times when 3% of the natural uranium existed as u-235, enough to sustain the chain reaction.

93 Np was first made at Berkeley. It came from a uranium target that had been bombarded with slow neutrons and which then emitted unusual beta-rays indicating a new isotope.

94 Pu was first made at Berkeley by Glenn Seaborg's team. By 1945 the Americans had several kilograms, enough to make 3 atomic bombs, one of which exploded over Nagasaki.

95 Am once existed on Earth, having been produced in ancient natural nuclear reactions in Oklo, Gabon These reactors died a billion years ago, and no natural Am remains.

96 Curium was first made by the team of Glenn Seaborg, Ralph James, and Albert Ghiorso in 1944, using the cyclotron at Berke-

97 Berkelium was first produced at UC Berkeley. Seaborg's team took americium-241, bombarded it with alpha particles for hours in the 60-inch cyclotron.

98 Cf is a very strong neutron emitter. It is used in portable metal detectors, for identifying gold and silver ores, to detect metal fatigue and stress in airplanes

99 Einsteinium was discovered by Berkeley physicists in the fall-out debris of the first thermonuclear explosion which took place on a Pacific atoll, on 1 November 1952.

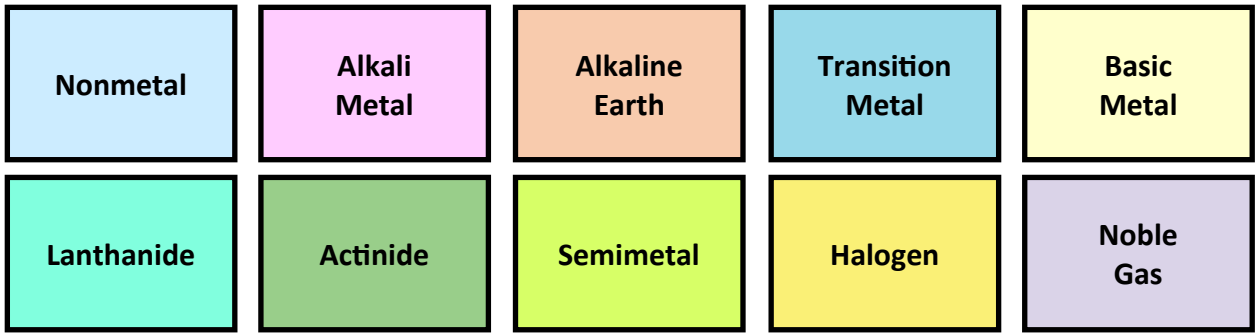
100 Italian physicist Enrico Fermi created the world's first nuclear reactor at the Univ. of Chicago. He has been called the "architect of the nuclear age."

101 Russian chemist Dmitri Mendeleev described the periodic law, created the first modern periodic table, and predicted 8 unknown elements. (He is to blame for all of this!)

102 US and Russia both discovered this element in 1958. In 1992, IUPAC determined that the Russians were 1st, but ratified Nobelium as the name, for Alfred Nobel, the inventor of dynamite.

103 In 1934 Ernest Lawrence invented the cyclotron, a type of particle accelerator. He won the 1939 Nobel Prize for this invention.

Legend



Tasting Notes

The Transition Metals plus the Lanthanide and Actinide series element cupcakes are chocolate!

IUPAC refers to the **International Union of Pure and Applied Chemistry**. IUPAC standardizes nomenclature in chemistry.

Number of elements named for:
- **Mythological figures: 14**
- **People: 15**
- **Places: 28**
- **Their own properties: 59**
- **Other things: 2 (cobalt, nickel)**

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