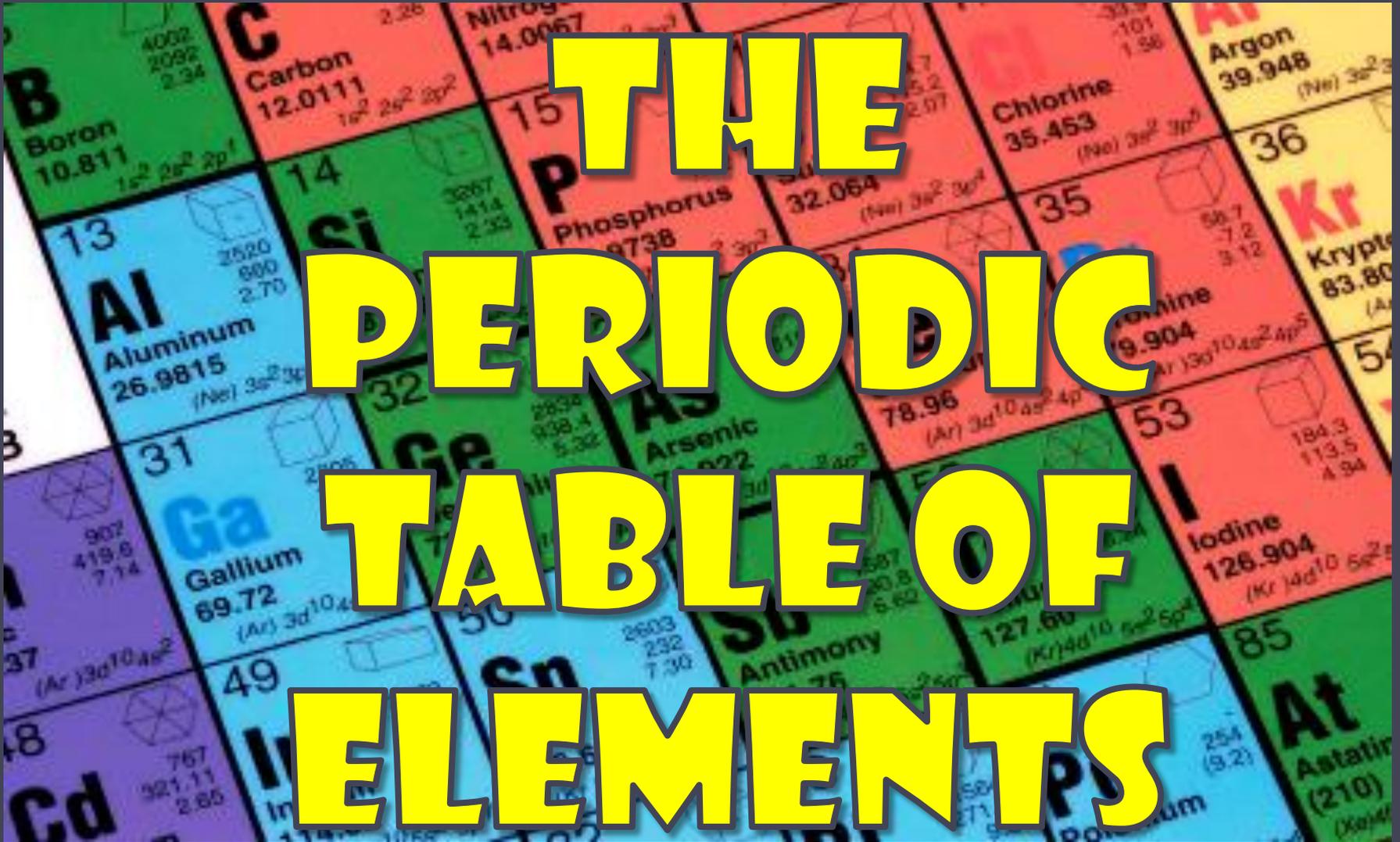


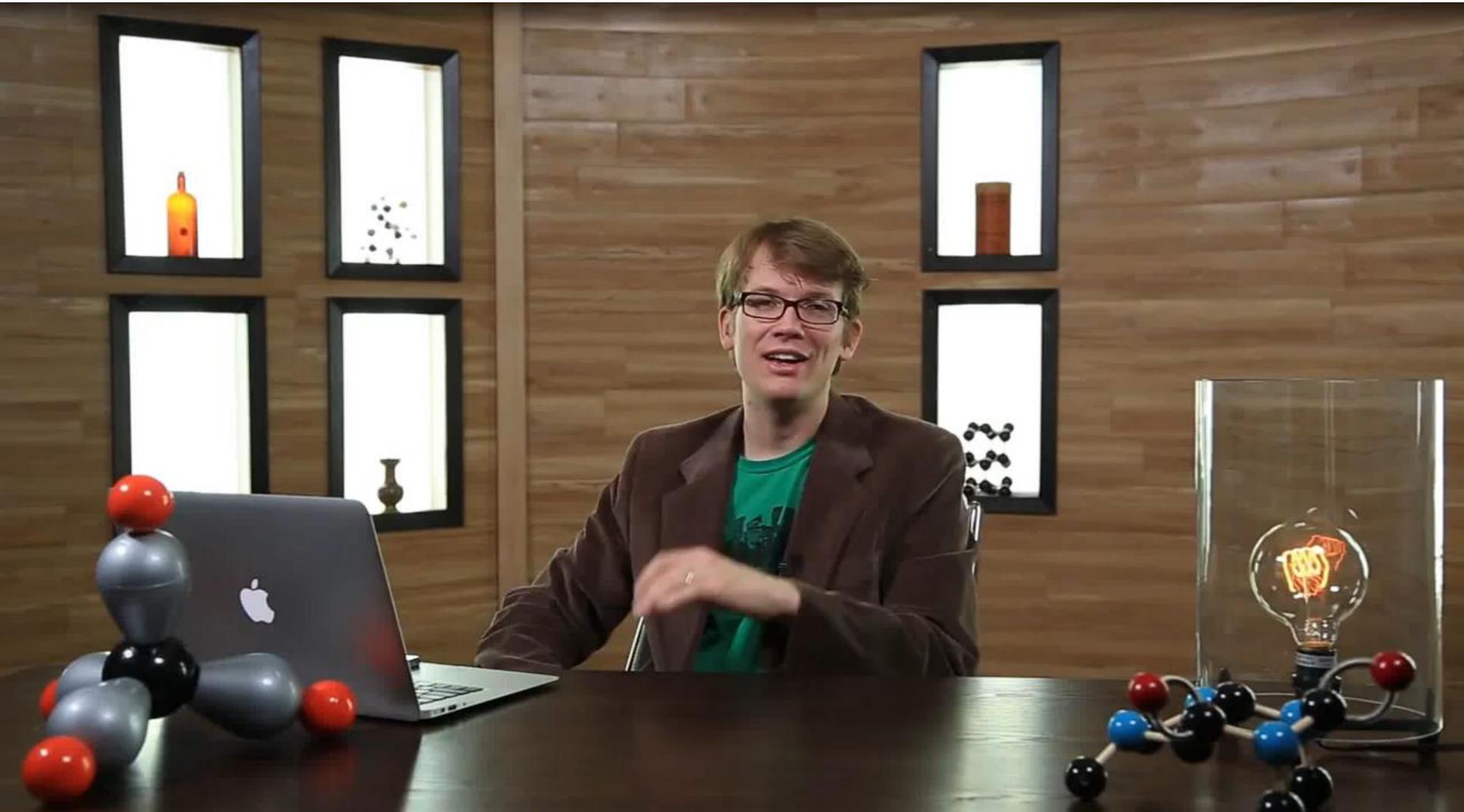
LEARNING GOAL

I will be able to identify relationships among elements on the periodic table.

THE PERIODIC TABLE OF ELEMENTS



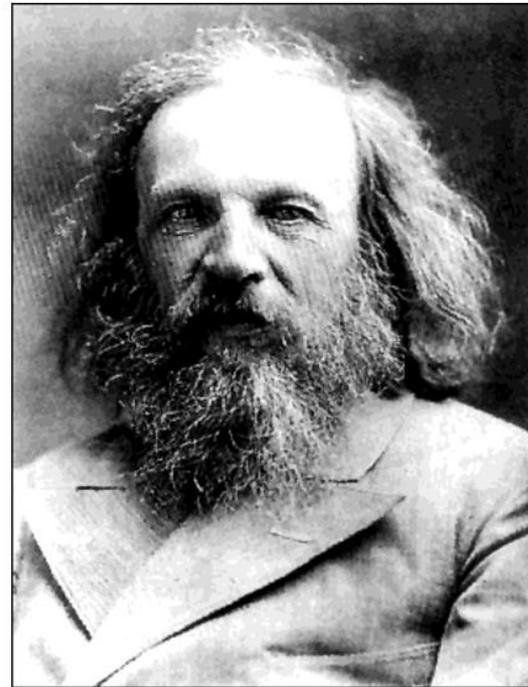
Sci Show Intro.



Who Invented the Periodic Table?

Dmitri Mendeleev

- Russian
- Invented periodic table
- Organized elements by *properties*
- Arranged elements by atomic mass
- Predicted existence of several unknown elements
- Element 101 **mendelevium**



Dmitri Mendeleev



Sci Show

What are Elements?

- All **matter** is made up of elements
- An element is a substance that **cannot be broken down** into simpler substances.
- Elements are made up of **one kind** of matter.
- Eg. Gold is made up of gold particles and copper is made up of copper particles. Copper and gold have different properties because they are made of different kinds of particles.

What is the Periodic Table?

- Shows **all known** elements in the universe that occur naturally and those that are man-made.
- **Organizes** the elements by **chemical properties**
- There are **118** elements
- The heaviest element is uranium with 92 protons and is the last naturally occurring element.

Synthetic Elements...

- \approx 20 synthetic elements, very radioactive, unstable, and short half lives (decay quickly)
 - So any element that may have existed when the Earth was formed have long since decayed.
 - Atoms of synthetic elements only occur on Earth as product of atomic bombs or experiments that involve nuclear reactors / nuclear fission.
- 9 other elements were first created artificially but then found to exist naturally in the Earth's crust
 - Eg. Plutonium was synthesized in 1940, later found to exist naturally

First Synthesized Elements



- First
- This
- the
- exp
- The
- ein
- fer
- stu
- det



DEBRIS Both einsteinium and fermium were discovered in the debris of the "Mike" hydrogen bomb test.

1936.
le and
exist
e gap)
e
ile

New Element 115,



1869

115 elements on the
Periodic Table.

vanished. After a fraction of a second, this
one was gone too.

Some Interesting Elements?



Organization of the Periodic Table

The periodic table is split into 3 categories

- ▣ Metals

- ▣ Non-metals

- ▣ Metalloids

Organization of the Periodic Table

Choose three coloured pencil crayons to represent **metals**, **metalloids**, and **non-metals** on your periodic table. Use the diagram as a reference.

1 1A																	13 3A	14 4A	15 5A	16 6A	17 7A	18 8A
1 H 1.00794, 1.00811 HYDROGEN																	5 B 10.811, 10.821 BORON	6 C 12.0107, 12.0108 CARBON	7 N 14.0064, 14.0070 NITROGEN	8 O 15.999, 15.9994 OXYGEN	9 F 18.998, 18.9984 FLUORINE	10 Ne 20.179, 20.1797 NEON
3 Li 6.938, 6.941 LITHIUM	4 Be 9.0122 BERYLLIUM	<div style="display: flex; justify-content: space-around; margin-bottom: 5px;"> METALS METALLOIDS NONMETALS </div>										13 Al 26.981, 26.982 ALUMINUM	14 Si 28.0855, 28.0858 SILICON	15 P 30.973, 30.974 PHOSPHORUS	16 S 32.059, 32.070 SULFUR	17 Cl 35.446, 35.453 CHLORINE	18 Ar 39.948, 39.962 ARGON					
11 Na 22.990 SODIUM	12 Mg 24.305 MAGNESIUM	3 3B	4 4B	5 5B	6 6B	7 7B	8 8B	9 8B	10 8B	11 1B	12 2B	13 Al 26.981, 26.982 ALUMINUM	14 Si 28.0855, 28.0858 SILICON	15 P 30.973, 30.974 PHOSPHORUS	16 S 32.059, 32.070 SULFUR	17 Cl 35.446, 35.453 CHLORINE	18 Ar 39.948, 39.962 ARGON					
19 K 39.098 POTASSIUM	20 Ca 40.078 CALCIUM	21 Sc 44.956 SCANDIUM	22 Ti 47.867 TITANIUM	23 V 50.942 VANADIUM	24 Cr 51.996 CHROMIUM	25 Mn 54.938 MANGANESE	26 Fe 55.845 IRON	27 Co 58.933 COBALT	28 Ni 58.693 NICKEL	29 Cu 63.546 COPPER	30 Zn 65.382 ZINC	31 Ga 69.723 GALLIUM	32 Ge 72.630 GERMANIUM	33 As 74.922 ARSENIC	34 Se 78.96 SELENIUM	35 Br 79.904 BROMINE	36 Kr 83.801 KRYPTON					
37 Rb 85.468 RUBIDIUM	38 Sr 87.62 STRONTIUM	39 Y 88.906 YTRIUM	40 Zr 91.224 ZIRCONIUM	41 Nb 92.906 NIOBIUM	42 Mo 95.94 MOLYBDENUM	43 Tc 97.907 TECHNETIUM	44 Ru 101.07 RUTHENIUM	45 Rh 101.066 RHODIUM	46 Pd 106.42 PALLADIUM	47 Ag 107.868 SILVER	48 Cd 112.411 CADMIUM	49 In 114.818 INDIUM	50 Sn 118.710 TIN	51 Sb 121.757 ANTIMONY	52 Te 127.603 TELLURIUM	53 I 126.905 IODINE	54 Xe 131.29 XENON					
55 Cs 132.905 CESIUM	56 Ba 137.327 BARIUM	57-71 La-Lu LANTHANIDES	72 Hf 178.49 HAFNIUM	73 Ta 180.948 TANTALUM	74 W 183.84 TUNGSTEN	75 Re 186.207 RHENIUM	76 Os 190.23 OSMIUM	77 Ir 192.222 IRIDIUM	78 Pt 195.084 PLATINUM	79 Au 196.967 GOLD	80 Hg 200.59 MERCURY	81 Tl 204.384, 204.387 THALLIUM	82 Pb 207.2 LEAD	83 Bi 208.980 BISMUTH	84 Po 209 POLONIUM	85 At 209 ASTATINE	86 Rn 222 RADON					
87 Fr 223 FRANCIUM	88 Ra 226 RADIUM	89-103 Ac-Lr ACTINIDES	104 Rf 261 RUTHENIUM	105 Db 262 DUBNIUM	106 Sg 263 SEABORGIUM	107 Bh 264 BOHRNIUM	108 Hs 265 HASSIUM	109 Mt 266 MEITNERIUM	110 Ds 271 DARMSTADIUM	111 Rg 272 ROENTGENIUM	112 Cn 277 COPIERNICIUM	113 Uut 284 UNUNTRIUM	114 Uuq 284 UNUNQUADIUM	115 Uup 288 UNUNPENTIUM	116 Uuh 288 UNUNHEXIUM	117 Uus 294 UNUNSEPTIUM	118 Uuo 294 UNUNOCTIUM					

LANTHANIDES

57 La 138.905 LANTHANUM	58 Ce 140.12 CERIUM	59 Pr 140.908 PRASEODYMIUM	60 Nd 144.242 NEODYMIUM	61 Pm 144.913 PROMETHIUM	62 Sm 150.352 SAMARIUM	63 Eu 151.964 EUROPIUM	64 Gd 157.253 GADOLINIUM	65 Tb 158.925 TERBIUM	66 Dy 162.500 DYSPROSIUM	67 Ho 164.930 HOLMIUM	68 Er 167.259 ERBIUM	69 Tm 168.934 THULIUM	70 Yb 173.043 YTTERIUM	71 Lu 174.967 LUTETIUM
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ACTINIDES

89 Ac 227.027 ACTINIUM	90 Th 232.038 THORIUM	91 Pa 231.036 PROTACTINIUM	92 U 238.029 URANIUM	93 Np 237.048 NEPTUNIUM	94 Pu 244.064 PLUTONIUM	95 Am 243.061 AMERICIUM	96 Cm 247.070 CURIUM	97 Bk 247.070 BERKELIUM	98 Cf 251.080 CALIFORNIUM	99 Es 252.083 EINSTEINIUM	100 Fm 257.095 FERMIUM	101 Md 258.106 MENDELEVIUM	102 No 259.108 NOBELIUM	103 Lr 262.105 LAWRENCIUM
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Metals, Nonmetals, and Metalloids

H																	He
Li	Be											B	C	N	O	F	Ne
Na	Mg											Al	Si	P	S	Cl	Ar
K	Ca	Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn	Ga	Ge	As	Se	Br	Kr
Rb	Sr	Y	Zr	Nb	Mo	Tc	Ru	Rh	Pd	Ag	Cd	In	Sn	Sb	Te	I	Xe
Cs	Ba	La	Hf	Ta	W	Re	Os	Ir	Pt	Au	Hg	Tl	Pb	Bi	Po	At	Rn
Fr	Ra	Ac	Rf	Db	Sg	Bh	Hs	Mt	Ds	Rg	Uub	—	Uuq	—	—	—	—

metals

metalloids

nonmetals

Ce	Pr	Nd	Pm	Sm	Eu	Gd	Tb	Dy	Ho	Er	Tm	Yb	Lu
Th	Pa	U	Np	Pu	Am	Cm	Bk	Cf	Es	Fm	Md	No	Lr

Metal	Metalloid	Nonmetal	Unknown
s-block	p-block	d-block	f-block

1 H																	2 He
3 Li	4 Be											5 B	6 C	7 N	8 O	9 F	10 Ne
11 Na	12 Mg											13 Al	14 Si	15 P	16 S	17 Cl	18 Ar
19 K	20 Ca	21 Sc	22 Ti	23 V	24 Cr	25 Mn	26 Fe	27 Co	28 Ni	29 Cu	30 Zn	31 Ga	32 Ge	33 As	34 Se	35 Br	36 Kr
37 Rb	38 Sr	39 Y	40 Zr	41 Nb	42 Mo	43 Tc	44 Ru	45 Rh	46 Pd	47 Ag	48 Cd	49 In	50 Sn	51 Sb	52 Te	53 I	54 Xe
55 Cs	56 Ba	*	72 Hf	73 Ta	74 W	75 Re	76 Os	77 Ir	78 Pt	79 Au	80 Hg	81 Tl	82 Pb	83 Bi	84 Po	85 At	86 Rn
87 Fr	88 Ra	**	104 Rf	105 Db	106 Sg	107 Bh	108 Hs	109 Mt	110 Ds	111 Rg	112 Cn	113 Uut	114 Fl	115 Uup	116 Lv	117 Uus	118 Uuo

*	57 La	58 Ce	59 Pr	60 Nd	61 Pm	62 Sm	63 Eu	64 Gd	65 Tb	66 Dy	67 Ho	68 Er	69 Tm	70 Yb	71 Lu
**	89 Ac	90 Th	91 Pa	92 U	93 Np	94 Pu	95 Am	96 Cm	97 Bk	98 Cf	99 Es	100 Fm	101 Md	102 No	103 Lr

Group IA																	VIIIA														
Period 1	1 H	IIA														10 Ne															
2	3 Li	4 Be															5 B	6 C	7 N	8 O	9 F	10 Ne									
3	11 Na	12 Mg															13 Al	14 Si	15 P	16 S	17 Cl	18 Ar									
4	19 K	20 Ca	21 Sc	22 Ti	23 V	24 Cr	25 Mn	26 Fe	27 Co	28 Ni	29 Cu	30 Zn	31 Ga	32 Ge	33 As	34 Se	35 Br	36 Kr													
5	37 Rb	38 Sr	39 Y	40 Zr	41 Nb	42 Mo	43 Tc	44 Ru	45 Rh	46 Pd	47 Ag	48 Cd	49 In	50 Sn	51 Sb	52 Te	53 I	54 Xe													
6	55 Cs	56 Ba	57* La	72 Hf	73 Ta	74 W	75 Re	76 Os	77 Ir	78 Pt	79 Au	80 Hg	81 Tl	82 Pb	83 Bi	84 Po	85 At	86 Rn													
7	87 Fr	88 Ra	89† Ac	104 Rf	105 Db	106 Sg	107 Bh	108 Hs	109 Mt	110 Uun	111 Uuu	112 Uub		114 Uuq		116 Uuh															
				* 58 Ce															59 Pr	60 Nd	61 Pm	62 Sm	63 Eu	64 Gd	65 Tb	66 Dy	67 Ho	68 Er	69 Tm	70 Yb	71 Lu
				† 90 Th															91 Pa	92 U	93 Np	94 Pu	95 Am	96 Cm	97 Bk	98 Cf	99 Es	100 Fm	101 Md	102 No	103 Lr

Metals

Metalloids

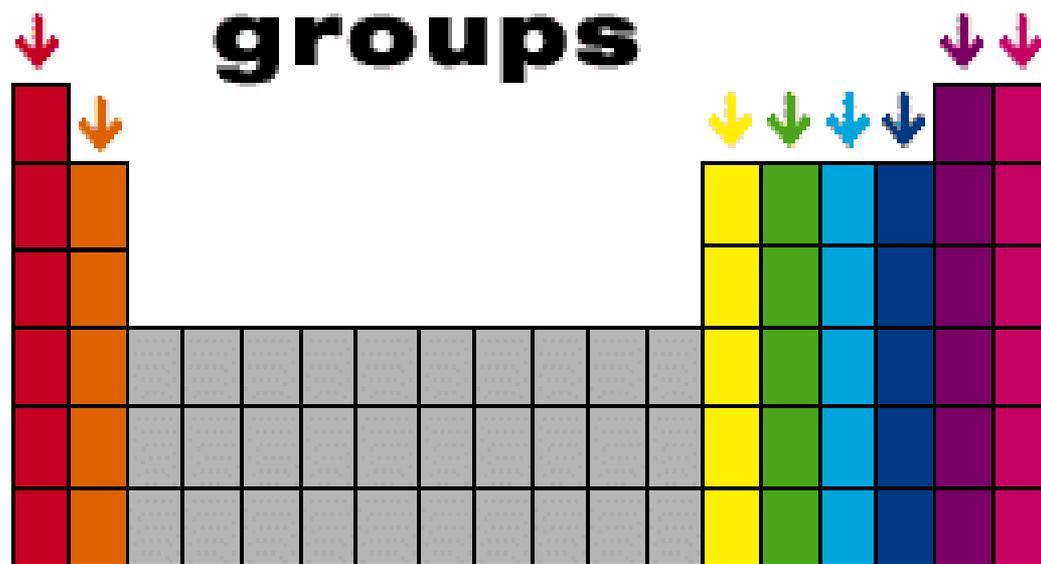
Nonmetals

Properties of Metals, Non-metals, Metalloids

	Metals	Metalloids	Non-metals
Location on PT	Left	Along staircase	Right
Conductor or Insulator	Conductor	Semi-conductor	Insulator
Malleable / Ductile (yes/no)	Yes	Depends on element	No
Shiny (yes/no)	Yes	Depends on element	No

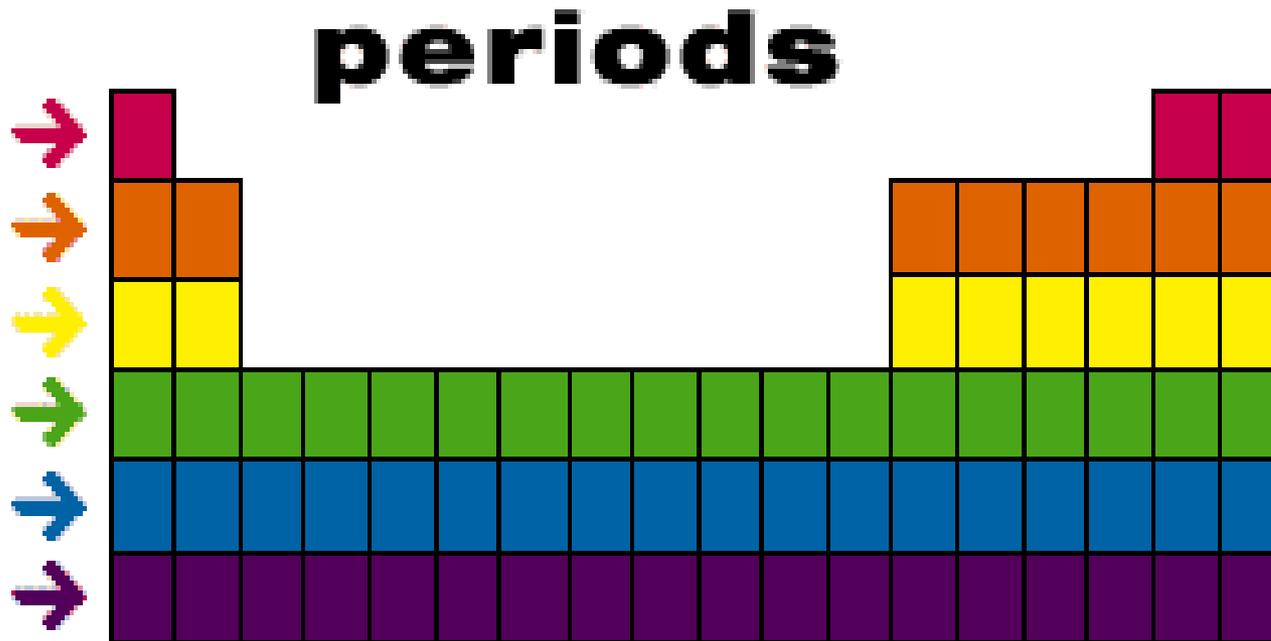
Groups on the Periodic Table

- The **vertical** columns of the table are called groups or **families**.
- Element in the same group have **similar** but not identical characteristics
- Numbered from **1 to 18**.



Periods on the Periodic Table

- The horizontal rows of the table are called **periods**.
- Numbered from **1 to 7**.



Periodic Table of the Elements

Groups →

Periods ↓

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1	1 H																	2 He
2	3 Li	4 Be											5 B	6 C	7 N	8 O	9 F	10 Ne
3	11 Na	12 Mg											13 Al	14 Si	15 P	16 S	17 Cl	18 Ar
4	19 K	20 Ca	21 Sc	22 Ti	23 Y	24 Cr	25 Mn	26 Fe	27 Co	28 Ni	29 Cu	30 Zn	31 Ga	32 Ge	33 As	34 Se	35 Br	36 Kr
5	37 Rb	38 Sr	39 Y	40 Zr	41 Nb	42 Mo	43 Tc	44 Ru	45 Rh	46 Pd	47 Ag	48 Cd	49 In	50 Sn	51 Sb	52 Te	53 I	54 Xe
6	55 Cs	56 Ba	57 *La	72 Hf	73 Ta	74 W	75 Re	76 Os	77 Ir	78 Pt	79 Au	80 Hg	81 Tl	82 Pb	83 Bi	84 Po	85 At	86 Rn
7	87 Fr	88 Ra	89 +Ac	104 Rf	105 Ha	106	107	108	109	110								

Alkali Metals Other Metals
 Alkali Earth Metals Non Metals
 Transition Metals Halogens
 Rare Earth Metals Noble Gases

Group and period numbers can help you identify / locate elements on the periodic table.

Name that Element

What element is in:

- Group 4 and Period 4 **Titanium**
- Group 2 and Period 6 **Barium**
- Group 17 and Period 3 **Chlorine**
- Group 14 and Period 5 **Tin**

Families on the Periodic Table

Alkali Metals

Properties

- Soft metals
- Shiny luster
- Very reactive with water

H																	He	
Li	Be											B	C	N	O	F	Ne	
Na	Mg											Al	Si	P	S	Cl	Ar	
K	Ca		Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn	Ga	Ge	As	Se	Br	Kr
Rb	Sr		Y	Zr	Nb	Mo	Tc	Ru	Rh	Pd	Ag	Cd	In	Sn	Sb	Te	I	Xe
Cs	Ba	*	Lu	Hf	Ta	W	Re	Os	Ir	Pt	Au	Hg	Tl	Pb	Bi	Po	At	Rn
Fr	Ra	**	Lr	Rf	Db	Sg	Bh	Hs	Mt	Uun	Uuu	Uub		Uuq				

Families on the Periodic Table

Alkaline Earth Metals

Properties

- Harder than alkali metals
- **Shiny** luster

H																He		
Li	Be											B	C	N	O	F	Ne	
Na	Mg											Al	Si	P	S	Cl	Ar	
K	Ca		Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn	Ga	Ge	As	Se	Br	Kr
Rb	Sr		Y	Zr	Nb	Mo	Tc	Ru	Rh	Pd	Ag	Cd	In	Sn	Sb	Te	I	Xe
Cs	Ba	*	Lu	Hf	Ta	W	Re	Os	Ir	Pt	Au	Hg	Tl	Pb	Bi	Po	At	Rn
Fr	Ra	**	Lr	Rf	Db	Sg	Bh	Hs	Mt	Uun	Uuu	Uub		Uuq				

Families on the Periodic Table

□ Halogens

Properties

- Non-metals
- Highly **reactive**
- Often **poisonous**

H																He		
Li	Be											B	C	N	O	F	Ne	
Na	Mg											Al	Si	P	S	Cl	Ar	
K	Ca		Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn	Ga	Ge	As	Se	Br	Kr
Rb	Sr		Y	Zr	Nb	Mo	Tc	Ru	Rh	Pd	Ag	Cd	In	Sn	Sb	Te	I	Xe
Cs	Ba	*	Lu	Hf	Ta	W	Re	Os	Ir	Pt	Au	Hg	Tl	Pb	Bi	Po	At	Rn
Fr	Ra	**	Lr	Rf	Db	Sg	Bh	Hs	Mt	Uun	Uuu	Uub		Uuq				

Families on the Periodic Table

□ Noble Gases

Properties

- Colourless, odourless, tasteless
- Rarely react

H																		He
Li	Be											B	C	N	O	F		Ne
Na	Mg											Al	Si	P	S	Cl		Ar
K	Ca		Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn	Ga	Ge	As	Se	Br	Kr
Rb	Sr		Y	Zr	Nb	Mo	Tc	Ru	Rh	Pd	Ag	Cd	In	Sn	Sb	Te	I	Xe
Cs	Ba	*	Lu	Hf	Ta	W	Re	Os	Ir	Pt	Au	Hg	Tl	Pb	Bi	Po	At	Rn
Fr	Ra	**	Lr	Rf	Db	Sg	Bh	Hs	Mt	Uun	Uuu	Uub		Uuq				

Inside the BOX

