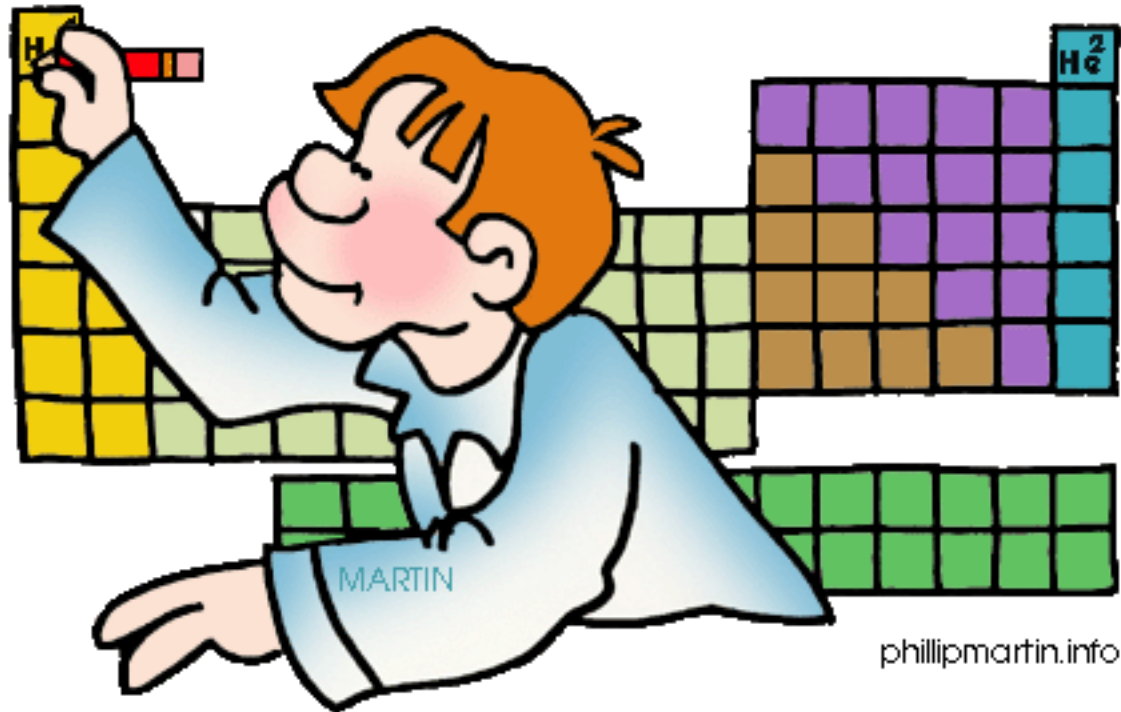


The Elements and the Periodic Table



Periodic Table Timeline



Periodic Table Timeline

1669 – An unknown element (**phosphorus**) is discovered.

How? Hennig Brand attempted to make gold by boiling urine.



Antoine Lavoisier

1789 – Known elements are grouped by metals (**solids**) and nonmetals (**gases**).

Periodic Table Timeline

1809 – At least 47 elements have been discovered. Scientists are noticing other **patterns**.

1829 – Known elements are being sorted by chemical **properties**. Predictions about known elements are being made.

Johann Döbereiner looked at the reactions of lithium, sodium, and potassium when they were placed in water.

Li	Lithium
Na	Sodium
K	Potassium
Rb	Rubidium
Cs	Cesium
Fr	Francium

Periodic Table Timeline

1860 – A list is released with the atomic masses of known elements.

1869 – The Father of the Modern Periodic Table arranges Periodic Table based on known properties.

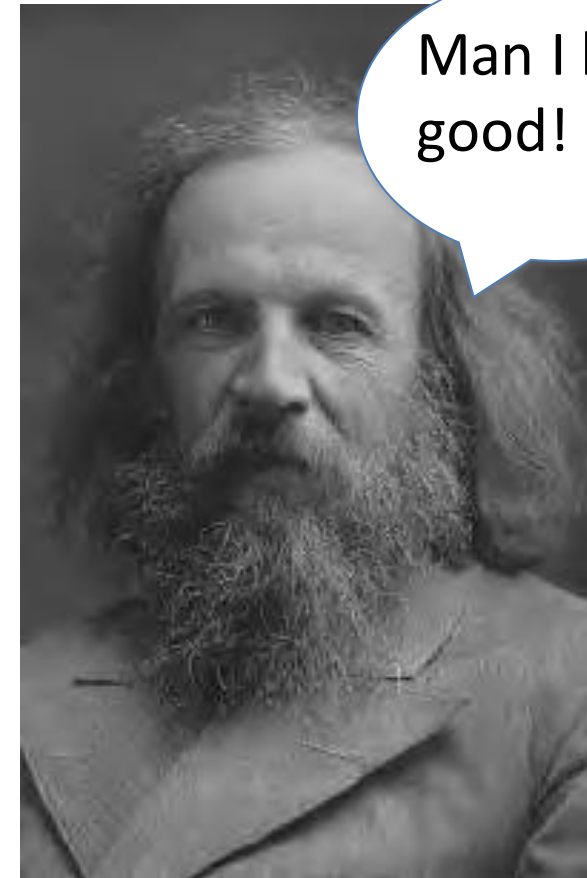
Hydrogen
Azot
Carbon
Ammonia
Oxygen
Water
Phosphorus
Phosphuretted hydrogen
Nitrous gas
Ether
Gaseous oxide of carbon
Nitrous oxide
Sulphur
Nitric acid
Sulphuretted hydrogen
Carbonic acid
Alcohol
Sulphurous acid
Sulphuric acid
Carburetted hydrogen from stagnant water

1
4.2
4.3
5.2
5.5
6.5
7.2
8.2
9.3
9.6
9.8
13.7
14.4
15.2
15.4
15.3
15.1
19.9
26.4
6.3



Dmitri Mendeleev

- In 1869, Dmitri Mendeléev created the first periodic table based off element properties and atomic masses
- He discovered a pattern!
 - Columns showed similar properties



I	II	III	IV	V	VI	VII			
H 1.01									
Li 6.94	Be 9.01	B 10.8	C 12.0	N 14.0	O 16.0	F 19.0			
Na 23.0	Mg 24.3	Al 27.0	Si 28.1	P 31.0	S 32.1	Cl 35.5	VIII		
K 39.1	Ca 40.1		Ti 47.9	V 50.9	Cr 52.0	Mn 54.9	Fe 55.9	Co 58.9	Ni 58.7
Cu 63.5	Zn 65.4			As 74.9	Se 79.0	Br 79.9			
Rb 85.5	Sr 87.6	Y 88.9	Zr 91.2	Nb 92.9	Mo 95.9		Ru 101	Rh 103	Pd 106
Ag 108	Cd 112	In 115	Sn 119	Sb 122	Te 128	I 127			
Ce 133	Ba 137	La 139		Ta 181	W 184		Os 194	Ir 192	Pt 195
Au 197	Hg 201	Tl 204	Pb 207	Bi 209					
			Th 232		U 238				

Modern Periodic Table

THE UPDATED
PERIODIC
TaBLE
SONG

Elements are arranged:

Vertically into Families or Groups

4
Be
12
Mg
20
Ca
38
Sr
56
Ba
88
Ra


Each family has distinct properties..

- All groups/families share similar properties and the same number of electrons in their outer shell.

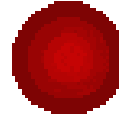
Periodic Table of Elements																	
1 IA	2 IIA											13 IIIA	14 IVA	15 VA	16 VIA	17 VIIA	18 VIIIA
1 H												5 B	6 C	7 N	8 O	9 F	10 Ne
2 Li	4 Be											13 Al	14 Si	15 P	16 S	17 Cl	18 Ar
3 Na	12 Mg	3 IIIB	4 IVB	5 VB	6 VIB	7 VIIB	8 VIIIB	9 VIIIB	10 VIIIB	11 IB	12 IIB	13 Al	14 Si	15 P	16 S	17 Cl	18 Ar
4 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 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 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 Fr	88 Ra	89 Ac	104 Rf	105 Db	106 Sg	107 Bh	108 Hs	109 Mt	110 Uun	111 Uuu	112 Uub						

Lanthanides	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
Actinides	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

Periodic Table of the Elements



Hydrogen Group



- Has one electron
- Very flammable gas



- *Fact:*
 - *The Hindenburg blimp exploded because it was filled with hydrogen*
 - *Hydrogen is the most abundant element in the universe, because it makes up stars*

Periodic Table of the Elements

Periodic Table of Elements

Group 1: Alkali Metals

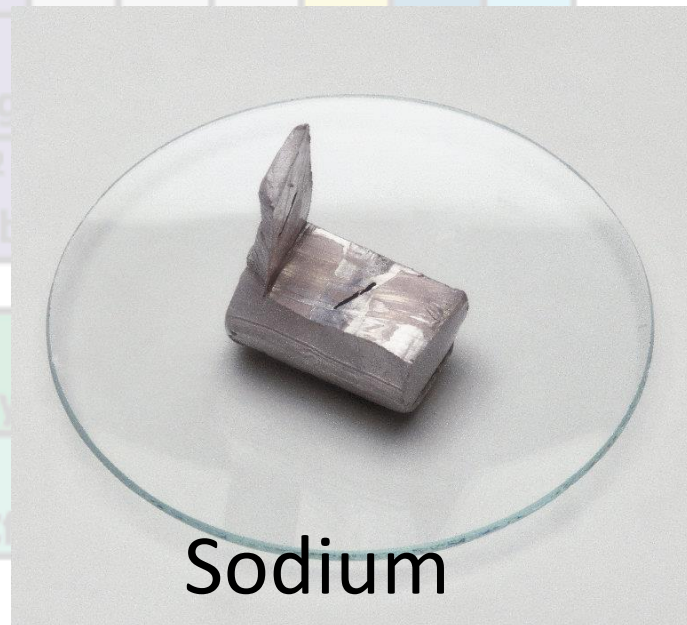
- Soft, silvery metals
- Loses one electron
- Very reactive (especially with water)

1 IA	2 IIA	13 IIIA	14 IVA	15 VA	16 VIA	17 VIIA	18 VIIIA
1 H							2 He
3 Li	4 Be						10 Ne
11 Na	12 Mg	3 Al	4 Si	5 P	6 S	7 Cl	18 Ar
19 K	20 Ca	21 Sc	22 Ti	23 V	24 Cr	25 Mn	36 Kr
37 Rb	38 Sr	39 Y	40 Zr	41 Nb	42 Mo	43 Tc	54 Xe
55 Cs	56 Ba	57 La	58 Ce	59 Pr	60 Nd	61 Pm	
87 Fr	88 Ra	89 Ac	90 Th	91 Pa	92 U	93 Np	

Lanthanides

Actinides

58 Ce	59 Pr	60 Nd	61 Pm	62 Sm	63 Eu	64 Gd	65 Tb	66 Dy
90 Th	91 Pa	92 U	93 Np	94 Pu	95 Am	96 Cm	97 Bk	98 Cf



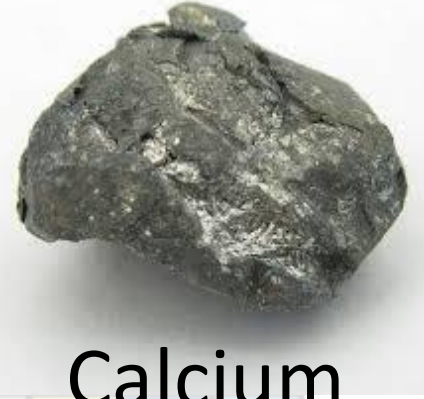
Sodium

Periodic Table of the Elements

Group 2:

Alkaline Earth Metals

- Silvery-White Metals
- Loses two electrons
- Reactive
- Found in rocks in the earth's crust
- Used in fireworks and flares



Calcium

Lanthanides

Actinides

Periodic Table of the Elements

Group 3-12:

Transition Metals

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
IA	IIA	IIIB	IVB	VB	VIB	VII	VIII	VIII	VIII	IB	IIB	IIIA	IIIA	IIIA	IIIA	IIIA	IIIA
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
H	He	Li	Be	B	C	N	O	F	Ne	Na	Mg	Al	Si	P	S	Cl	Ar
3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Li	Be	B	C	N	O	F	Ne	Na	Mg	Al	Si	P	S	Cl	Ar	K	Ca
11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28
Na	Mg	Al	Si	P	S	Cl	Ar	K	Ca	Sc	Ti	V	Cr	Mn	Fe	Co	Ni
19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36
K	Ca	Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn	Ga	Ge	As	Se	Br	Kr
37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54
Rb	Sr	Y	Zr	Nb	Mo	Tc	Ru	Rh	Pd	Ag	Cd	In	Sn	Sb	Te	I	Xe
55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72
Cs	Ba	La	Ce	Pr	Nd	Pm	Sm	Eu	Gd	Tb	Dy	Ho	Er	Tm	Yb	Lu	Hf
87	88	89	90	91	92	93	94	95	96	97	98	99	100	101	102	103	104
Fr	Ra	Ac	Th	Pa	U	Np	Pu	Am	Cm	Bk	Cf	Es	Fm	Md	No	Lr	Ta
7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Fr	Ra	Ac	Th	Pa	U	Np	Pu	Am	Cm	Bk	Cf	Es	Fm	Md	No	Lr	Hf



Copper



Iron

- Good & excellent conductors of heat and electricity
- Malleable and ductile
- Electrons vary (N/A)



Periodic Table of the Elements



Group 13: Boron Family

Periodic Table of the Elements

- Gains/shares/loses **five** electrons
- **Aluminum** is the most abundant metal in Earth's crust.



Aluminum

- *Fun Facts:*
 - *Named after the first element in the family.*
 - *Aluminum is used for foil wrap, pop cans, cooking pans, and siding on houses.*
 - *Aluminum was once seen as more precious than gold*

Periodic Table of the Elements



Group 14: Carbon Family

Periodic Table of the Elements

The image shows a simplified periodic table with a yellow highlight on Group 14 (Carbon Family). The table is organized into rows and columns, with the highlighted group consisting of elements from Carbon (C) to Lead (Pb). The label 'Periodic Table of the Elements' is at the top.

- Shares/gains/loses four electrons
- The element carbon is called the “basis of life”.
- Silicon is mostly found in sand.
- Includes a non-metal (carbon), metalloids, and metals.

- *Facts:*

- *Named after first element in the family.*
- *There is an entire branch of chemistry devoted to carbon compounds called organic chemistry.*
- *Silicon is 2nd only to oxygen in abundance in Earth’s crust.*



Silicon

Periodic Table of the Elements



Group 15: Nitrogen Family

Periodic Table of the Elements

- Gains or shares **three** electrons
- **Nitrogen** makes up 78% of our atmosphere.
- *Facts:*
 - *Phosphorus is used for many things such as water softeners, match heads, and fine china.*
 - *Antimony and bismuth are added to other metals to lower their melting point. Bismuth is used on fire-sprinkler heads.*

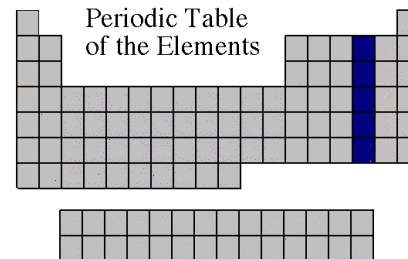
Phosphorus



Periodic Table of the Elements

Group 16: Oxygen Family

Periodic Table of the Elements



- Gains or shares **two** electrons
- **Oxygen** is the most abundant element in the earth's crust
- *Facts:*
 - *Sulfur is a non-metal that combines with metals to form sulfides with distinct colors that are used in paints.*
 - *Selenium is needed in trace amounts in your diet. It is also used in photocopiers.*

Sulfur



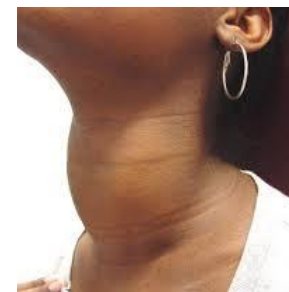
Periodic Table of the Elements

Group 17: Halogens

[YouTube Video](#)

- Most are Poisonous
- Gains or shares one electron
- Very reactive
- React with alkali metals to form salts
- *Facts:*

- Fluorine is the most reactive element
- Chlorine is used in pools and cleaning products
- Bromine is used in dyes in cosmetics
- Iodine is essential in diets



Chlorine Gas was used as a chemical weapon during World War I.

It was used by the Nazis in World War II.



Periodic Table of the Elements

1
IA

Periodic Table of Elements

18
VIIIA

Group 18: Noble Gases

[YouTube Video](#)

- Non-reactive; inert
- Does not gain or lose electrons
- Colorless gases


13 IIIA	14 IVA	15 VA	16 VIA	17 VIIA	2 He
5 B	6 C	7 N	8 O	9 F	10 Ne
13 Al	14 Si	15 P	16 S	17 Cl	18 Ar
31 Ga	32 Ge	33 As	34 Se	35 Br	36 Kr
49 In	50 Sn	51 Sb	52 Te	53 I	54 Xe
81 Tl	82 Pb	83 Bi	84 Po	85 At	86 Rn



58 Ce	59 Pr	60 Nd	61 Pm	62 Sm	63 Eu	64 Gd	65 Tb	66 Dy	67 Ho	68 Er
90 Th	91 Pa	92 U	93 Np	94 Pu	95 Am	96 Cm	97 Bk	98 Cf	99 Es	100 Fm



Periodic Table of the Elements



Rare Earth Metals

- At the bottom of the Periodic Table
- Composed of two series

1) Lanthanide Series

- Top row (#s 57-71)
- Very reactive
- Typically silver in color

2) Actinide Series

- Bottom Row (#s 89-103)
- All are radioactive

Lanthanides

Actinides

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

