



UNIT 2: Matter and its changes

Mrs. Turner



Preassessment

- Take out a sheet of paper and number it from 1-25.
- Write down your answers to plug them into your clickers.
- Don't worry about not knowing an answer you will know them all by the end of this 9 weeks. Work at a good pace. We have a few things on our agenda.



Matter



- Anything that has mass and takes up space.
- Examples: Gas (air- mixture of gases), hand, bones, astronaut suit.

SO PRETTY MUCH EVERYTHING!!!

Well..... Except for sound and light (we'll get to this later!)



Atomic Structure



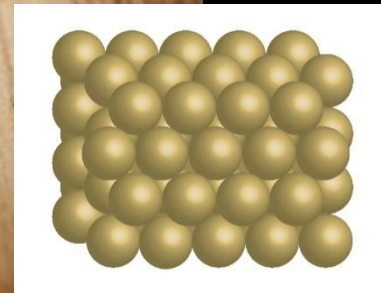
What is an atom?

- Atom: the smallest unit of matter that retains the identity of the substance.
- Which means, these tiny particles make up matter. Even though they make up matter, they still have the same properties (i.e. smell-odor, taste, color, etc).



Gold (Au)

Cut gold into fragments of gold. Those fragments into the smallest piece (hypothetically) these would be the gold atoms.



Just how small is an atom?

- <https://www.youtube.com/watch?v=yQP4UJhNn0I>



Atomic Structure

- The inside of the atom is called its structure. The atom's structure is made of 3 elementary particles, the neutron, electron, and the proton.
- An elementary particle cannot be broken down any further.
- Matter (Solid, liquid, gas)~Atoms
~Elementary particles (Subatomic)



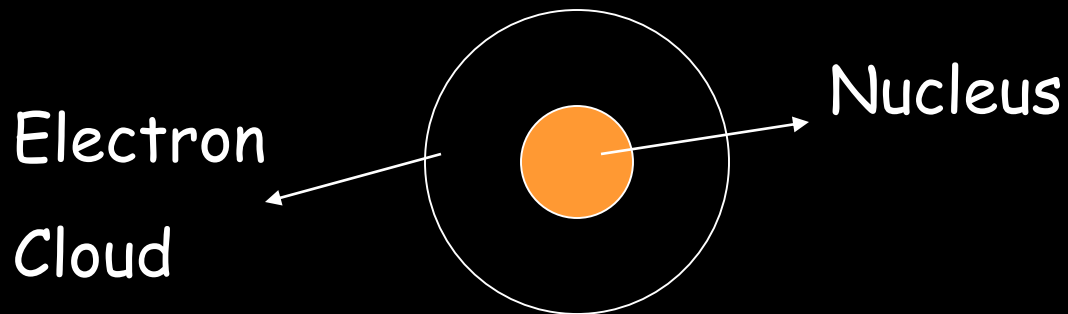
10/15/15 Warm up

- What is matter?
- What is an atom?
- Did you know that atoms are about 10 - 10 meters in diameter? This means you could fit millions of atoms in the period at the end of this sentence!



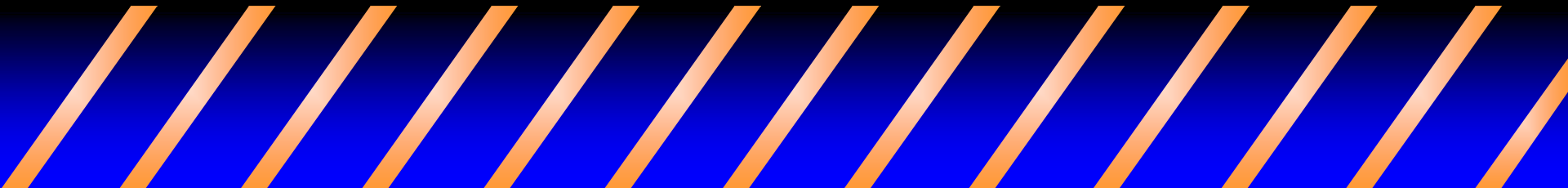
Atomic Structure

- Atoms have 2 regions
 - 1) Nucleus: the center of the atom that contains *most of the mass* of the atom.
 - 2) Electron cloud: surrounds the nucleus & takes up *most of the space* of the atom.



What's in the Nucleus?

- In the nucleus we find:
 - Protons: positively charged subatomic particles
 - Mass of 1 amu ($1.67 \times 10^{-24}g$)
 - Neutrons: neutrally (0) charged subatomic particles
 - Mass of 1 amu ($1.67 \times 10^{-24}g$)
 - These are larger and more massive than the electron.



What's in the Electron Cloud?

- In the electron cloud we find:
 - Electrons: the subatomic particle with a negative charge and *relatively* no mass
 - Mass of $\sim 1/1836$ amu



Quick Check

- Which part of the atom has a negative electrical charge?
- Electron
- Which part of the atom has a positive charge? No charge?
- Proton; Neutron



Subatomic Particles

Particle	Charge	Mass (g)	Location
Electron (e ⁻)	-1	9.11 x 10 ⁻²⁸ We'll just say none	Electron cloud
Proton (p ⁺)	+1	1.67 x 10 ⁻²⁴	Nucleus
Neutron (n ⁰)	0	1.67 x 10 ⁻²⁴	Nucleus

What is an element?

- Matter made of only one kind of atom.
- In other words, groups or collections of the same atom.
- At least 110 of these elements are known and at least 90 of them occur naturally on Earth.



A way to chart the elements

Periodic Table of the Elements

Group	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1A	2A	3B	4B	5B	6B	7B	8B	8B	8B	10B	11B	12B	3A	4A	5A	6A	7A	8A
1	H Hydrogen 1.0078																	He Helium 4.0026
2	Li Lithium 6.938	Be Beryllium 9.0122											B Boron 10.806	C Carbon 12.009	N Nitrogen 14.006	O Oxygen 15.999	F Fluorine 18.998	Ne Neon 20.180
3	Na Sodium 22.990	Mg Magnesium 24.305											Al Aluminum 26.982	Si Silicon 28.084	P Phosphorus 30.974	S Sulfur 32.059	Cl Chlorine 35.446	Ar Argon 39.948
4	K Potassium 39.098	Ca Calcium 40.078	Sc Scandium 44.956	Ti Titanium 47.867	V Vanadium 50.942	Cr Chromium 51.996	Mn Manganese 54.938	Fe Iron 55.845	Co Cobalt 58.933	Ni Nickel 58.693	Cu Copper 63.546	Zn Zinc 65.38	Ga Gallium 69.723	Ge Germanium 72.63	As Arsenic 74.922	Se Selenium 78.96	Br Bromine 79.904	Kr Krypton 83.798
5	Rb Rubidium 85.468	Sr Strontium 87.62	Y Yttrium 88.906	Zr Zirconium 91.224	Nb Niobium 92.906	Mo Molybdenum 95.96	Tc Technetium 98.9062	Ru Ruthenium 101.07	Rh Rhodium 102.91	Pd Palladium 106.42	Ag Silver 107.87	Cd Cadmium 112.41	In Indium 114.82	Sn Tin 118.71	Sb Antimony 121.76	Te Tellurium 127.60	I Iodine 126.90	Xe Xenon 131.29
6	Cs Cesium 132.91	Ba Barium 137.33		Hf Hafnium 178.49	Ta Tantalum 180.95	W Tungsten 183.84	Re Rhenium 186.21	Os Osmium 190.23	Ir Iridium 192.22	Pt Platinum 195.08	Au Gold 196.97	Hg Mercury 200.59	Tl Thallium 204.38	Pb Lead 207.2	Bi Bismuth 208.98	Po Polonium (209)	At Astatine (210)	Rn Radon (222)
7	Fr Francium (223)	Ra Radium (226)		Rf Rutherfordium (261)	Db Dubnium (262)	Sg Seaborgium (266)	Bh Bohrium (264)	Hs Hassium (269)	Mt Meitnerium (268)	Ds Darmstadtium (268)	Rg Roentgenium (268)	Cn Copernicium (268)	Uut Ununtrium (268)	Fl Flerovium (268)	Uup Ununpentium (268)	Lv Livermorium (268)	Uus Ununseptium (268)	Uuo Ununoctium (268)
			La Lanthanum 138.91	Ce Cerium 140.12	Pr Praseodymium 140.91	Nd Neodymium 144.24	Pm Promethium (243)	Sm Samarium 150.36	Eu Europium 151.96	Gd Gadolinium 157.25	Tb Terbium 158.93	Dy Dysprosium 162.50	Ho Holmium 164.93	Er Erbium 167.26	Tm Thulium 168.93	Yb Ytterbium 173.04	Lu Lutetium 174.97	
			Ac Actinium (227)	Th Thorium 232.04	Pa Protactinium 231.04	U Uranium 238.03	Np Neptunium (237)	Pu Plutonium (244)	Am Americium (243)	Cm Curium (247)	Bk Berkelium (247)	Cf Californium (251)	Es Einsteinium (252)	Fm Fermium (257)	Md Mendelevium (258)	No Nobelium (259)	Lr Lawrencium (262)	

11 — Atomic number
Na — Element symbol
 Sodium — Element name
 22.990 — Atomic weight

- Alkali metals
- Alkaline earth metals
- Lanthanides
- Actinides
- Transition metals
- Unknown properties
- Post-transition metals
- Metalloids
- Other nonmetals
- Halogens
- Noble gases

Quick look at the periodic table

- Elements are listed in squares. It's abbreviated (i.e. latin name, scientist, region, or first letter of element.
- Look at Helium (He).
- As all elements are made of the same particles (n,p,e) how can there be over 100? Let's take a look!!

www.LiveScience.com

Periodic Table of the Elements

Group	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18														
IA	2A	3B	4B	5B	6B	7B	8	8B	10	11B	12B	3A	4A	5A	6A	7A	8A															
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The number of protons determine the identity of an element!

- How do we know the number of protons in an atom?
- Atomic number (#) = # of protons in an atom (the number at the top)
 - Ex: Hydrogen's atomic # is 1
 - hydrogen has 1 proton
 - Ex: Carbon's atomic # is 6
 - carbon has 6 protons

**The number of protons identifies the atom-it's an atom's fingerprint.

A decorative graphic at the bottom of the slide consisting of several parallel diagonal stripes in shades of orange and yellow, set against a dark blue background.

How do we know the number of neutrons in an atom?

- Atomic Mass # (the number on the bottom):
the # of protons plus neutrons in the nucleus.
- How do we find the number of neutrons?
- # of neutrons = mass # - atomic #

Example

- Li has a mass # of 7 and an atomic # of 3
 - Protons = 3 (same as atomic #)
 - Neutrons = $7 - 3 = 4$ (mass # - atomic #)

How do we find the number of electrons in an atom?

- Most atoms are neutral (have no overall charge)
- Because the only charged subatomic particles are the protons and electrons... they must balance each other out in an electrically neutral atom.
- Therefore..
 - # Electrons = # Protons *

* (in a neutral atom..)



Examples

- He (Helium) has a mass # of 4 and an atomic # of 2
 - $p^+ = 2$ $n^0 = 2$ $e^- = 2$
- Cl (Chlorine) has a mass # of 35 and an atomic # of 17
 - $p^+ = 17,$ $n^0 = 18,$ $e^- = 17$



Quick check!

- How is atomic mass number different from atomic number?
- Atomic mass number includes the protons and neutrons in the nucleus. Atomic number is the number of protons in the nucleus.



Atoms: Independent Practice (INB 46)

Each element is made of groups of a single type of atom.

Atoms are made of _____, _____ and _____ which are subatomic particles.

The atomic number is the number of protons in the nucleus.

Every element has a certain number of protons in its nucleus. The number of protons is element's unique fingerprint- unique identity.

Nucleus

Central part of the atom

Contains most of atom's
_____ (extremely dense)

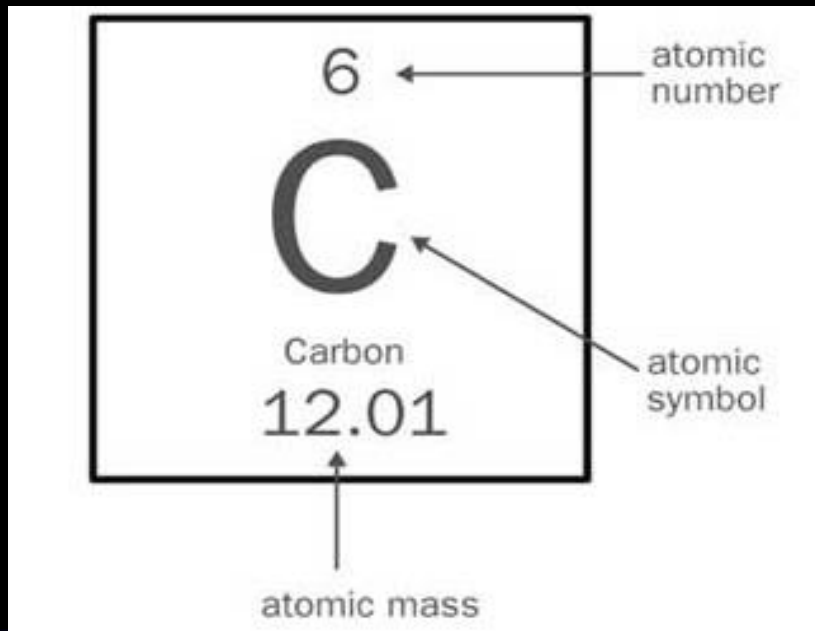
_____ move rapidly
around it

Made of protons and

It is positively charged as it
contains a proton (+ charge)
and a neutron (0 charge).

On the bottom of page 46

- Write what the atomic # is and the atomic mass # is after drawing this.
- Using your textbook, turn to page 78 and draw the model of an atom.



Homework: Review Notes and complete drawing

Ticket out the door

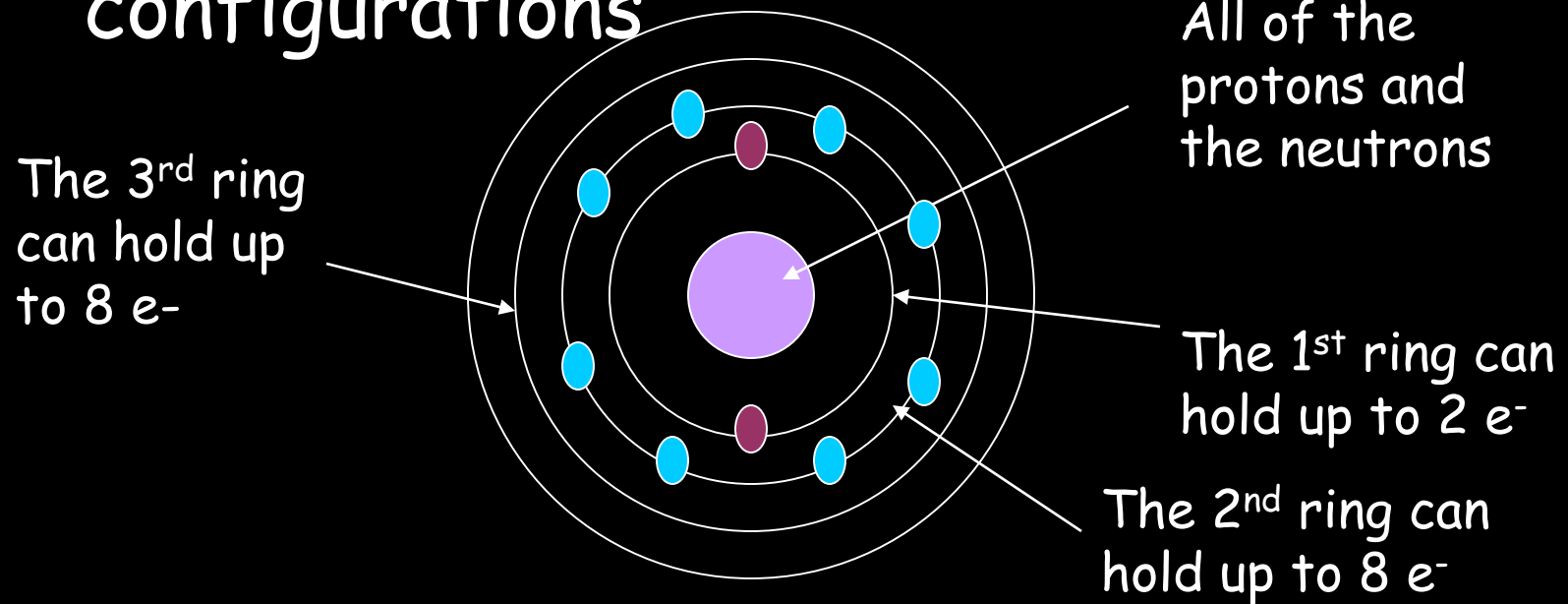
- How are atoms and elements related?
- What are elementary particles/subatomic particles?

Homework: Review Notes and complete drawing



How exactly are the particles arranged?

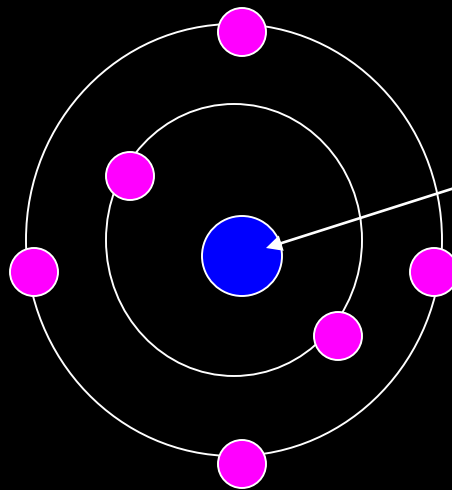
- Bohr Model of the atom: electron configurations



What does carbon look like?

Mass # = 12

atomic # = 6



6 p and 6 n live
in the nucleus

$p^+ = 6$

$n^0 = 6$

$e^- = 6$

Build an atom

- https://phet.colorado.edu/sims/html/build-an-atom/latest/build-an-atom_en.html



Warm up 10/19/15 (Write the definitions and question)

- 1. An element is a substance that can't be separated into simpler substances by physical or chemical means. A pure substance is a substance in which there's only one type of particle (atom).
- By using this definition, is an element a pure substance?
- Yes, because an element contains only one type of particle (atom). Ex. Piece of iron is made up of billions of iron atoms (particles)

[Agenda]

- Atomic Model Video
- Periodic Table Video
- Periodic Table Notes/Diagram
- Periodic Table- Element uses (BP)
- Homework: Practice learning the groups (families) and the characteristics of each. Review chemical symbols in the back of textbook. (WRITE THIS DOWN)

Test this Friday! Study Guide will be given on Thursday

■ Test this Friday on:

Atoms and its subatomic particles
(neutrons, protons, and electrons)

Periodic Table (families vs periods, 3
categories of elements)

Electron Configurations (valence
electrons).

Ions, Compounds, Molecules, and
elements

Periodic Table of Elements

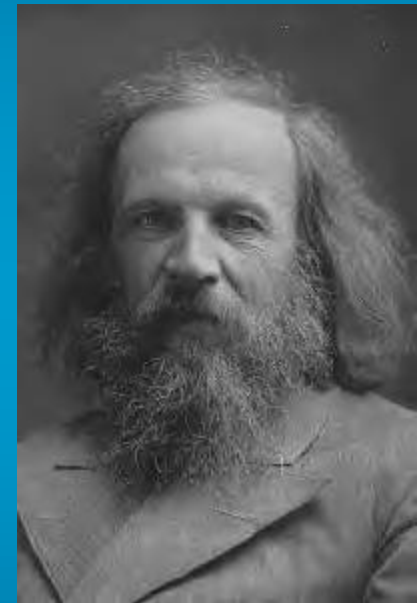
Periodic Table of the Elements

1	IA																2	0																		
1	H	IIA																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	106	107	107	108	108	109	109	110	110																

* Lanthanide Series	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
+ Actinide Series	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

[Mendeleev]

- In 1869, Dmitri Ivanovitch Mendeléeév created the first accepted version of the periodic table.
- He grouped elements according to their atomic mass, and as he did, he found that the families had similar chemical properties.
- Blank spaces were left open to add the new elements he predicted would occur.



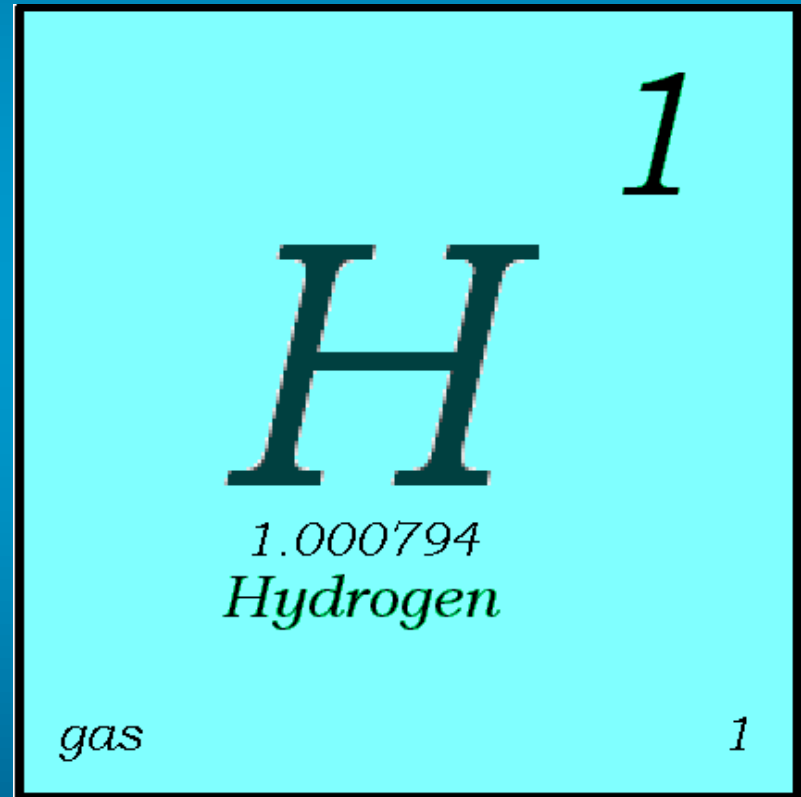
Periodic Table of the Elements

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
<i>IA</i>												<i>IIIA</i>	<i>IVA</i>	<i>VA</i>	<i>VIA</i>	<i>VIIA</i>	<i>VIIIA</i>
1 H 1.008																	2 He 4.003
3 Li 6.941	4 Be 9.012											5 B 10.81	6 C 12.01	7 N 14.01	8 O 16.00	9 F 19.00	10 Ne 20.18
11 Na 22.99	12 Mg 24.31											13 Al 26.98	14 Si 28.09	15 P 30.97	16 S 32.07	17 Cl 35.45	18 Ar 39.95
19 K 39.10	20 Ca 40.08	21 Sc 44.96	22 Ti 47.87	23 V 50.94	24 Cr 52.00	25 Mn 54.94	26 Fe 55.85	27 Co 58.93	28 Ni 58.69	29 Cu 63.55	30 Zn 65.41	31 Ga 69.72	32 Ge 72.64	33 As 74.92	34 Se 78.96	35 Br 79.90	36 Kr 83.80
37 Rb 85.47	38 Sr 87.62	39 Y 88.91	40 Zr 91.22	41 Nb 92.91	42 Mo 95.94	43 Tc (97.9)	44 Ru 101.1	45 Rh 102.9	46 Pd 106.4	47 Ag 107.9	48 Cd 112.4	49 In 114.8	50 Sn 118.7	51 Sb 121.8	52 Te 127.6	53 I 126.9	54 Xe 131.3
55 Cs 132.9	56 Ba 137.3	57 La* 138.9	72 Hf 178.5	73 Ta 180.9	74 W 183.8	75 Re 186.2	76 Os 190.2	77 Ir 192.2	78 Pt 195.1	79 Au 197.0	80 Hg 200.6	81 Tl 204.4	82 Pb 207.2	83 Bi 209.0	84 Po (209)	85 At (210)	86 Rn (222)
87 Fr (223)	88 Ra (226)	89 Ac~ (227)	104 Rf (261)	105 Db (262)	106 Sg (266)	107 Bh (264)	108 Hs (277)	109 Mt (268)	110 Ds (271)	111 Uuu (272)	112 Uub (277)	113 Uut	114 Uuq	115 Uup	116 Uuh		

*Lanthanides	58 Ce 140.1	59 Pr 140.9	60 Nd 144.2	61 Pm (145)	62 Sm 150.4	63 Eu 152.0	64 Gd 157.3	65 Tb 158.9	66 Dy 162.5	67 Ho 164.9	68 Er 167.3	69 Tm 168.9	70 Yb 173.0	71 Lu 175.0
	~Actinides	90 Th 232.0	91 Pa (231)	92 U (238)	93 Np (237)	94 Pu (244)	95 Am (243)	96 Cm (247)	97 Bk (247)	98 Cf (251)	99 Es (252)	100 Fm (257)	101 Md (258)	102 No (259)

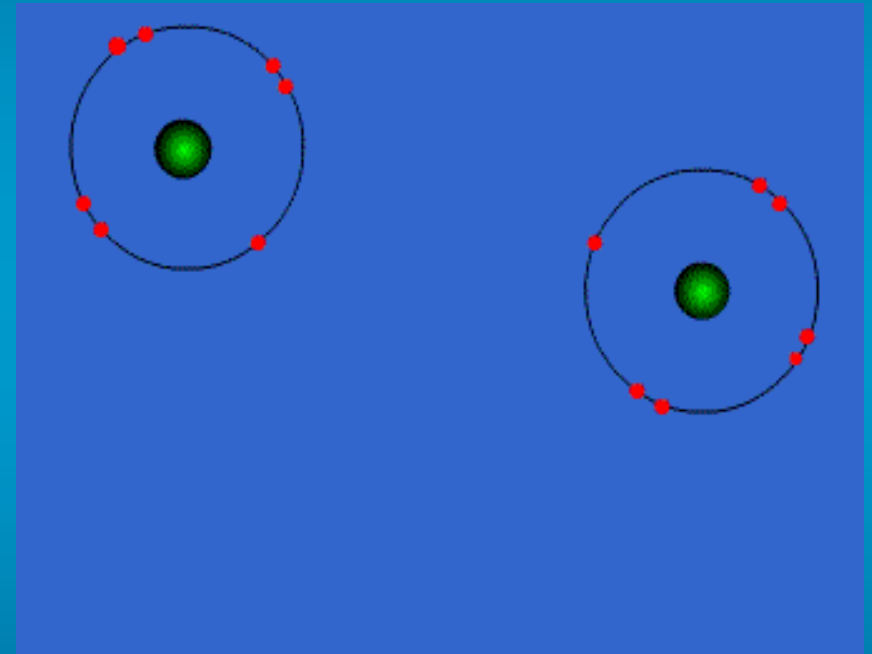
What's in a square?

- Different periodic tables can include various bits of information, but usually:
 - atomic number
 - symbol
 - atomic mass
 - number of valence electrons
 - state of matter at room temperature.

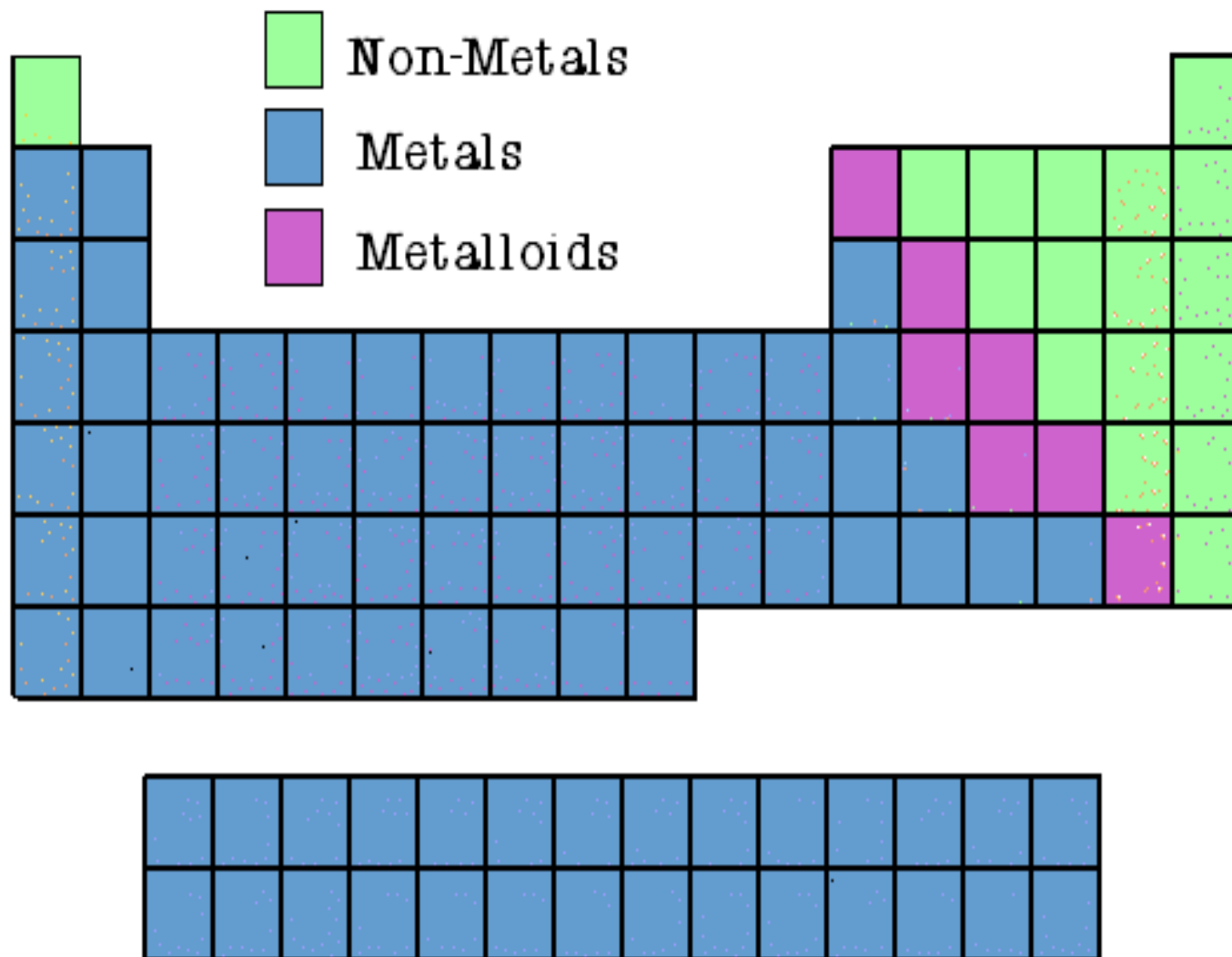


[Valence Electrons]

- The number of **valence electrons** an atom has may also appear in a square.
- Valence electrons are the electrons in the outer energy level of an atom.
- These are the electrons that are transferred or shared when atoms bond together. (Chemical bonds)
- WE'LL DISCUSS THIS MORE SOON! 😊

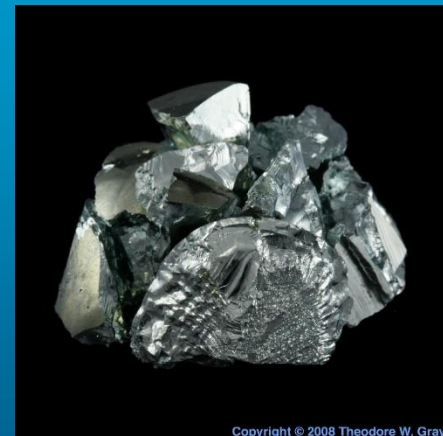


The elements of the periodic table can be divided into three main categories: Metals, Non-Metals, and Metalloids.



[Properties of Metals]

- Metals are **good conductors of heat and electricity**.
- Metals are **shiny**.
- Metals are **ductile** (can be stretched into thin wires).
- Metals are **malleable** (can be pounded or bent into thin sheets).
- A chemical property of metal is its reaction with water which results in corrosion.
- Gold, Copper, iron, silver, lead, etc



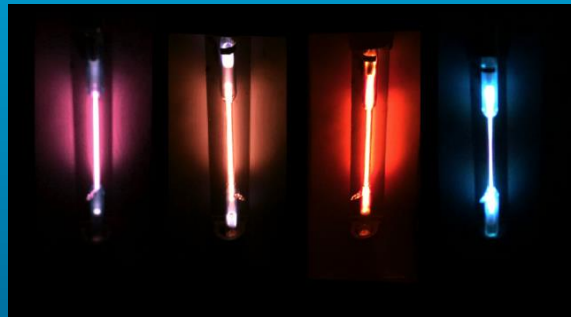
Properties of Non-Metals



Bromine (Br)



Sulfur



Variety of heated gases

- Non-metals are **poor conductors of heat and electricity.**
- Non-metals are not ductile or malleable.
- Solid non-metals are **brittle and break easily.**
- They are **dull.**
- Many non-metals are **gases.** (Located on right)
- **Oxygen, Chlorine, Nitrogen, Carbon, Bromine, Neon, etc**

Properties of Metalloids



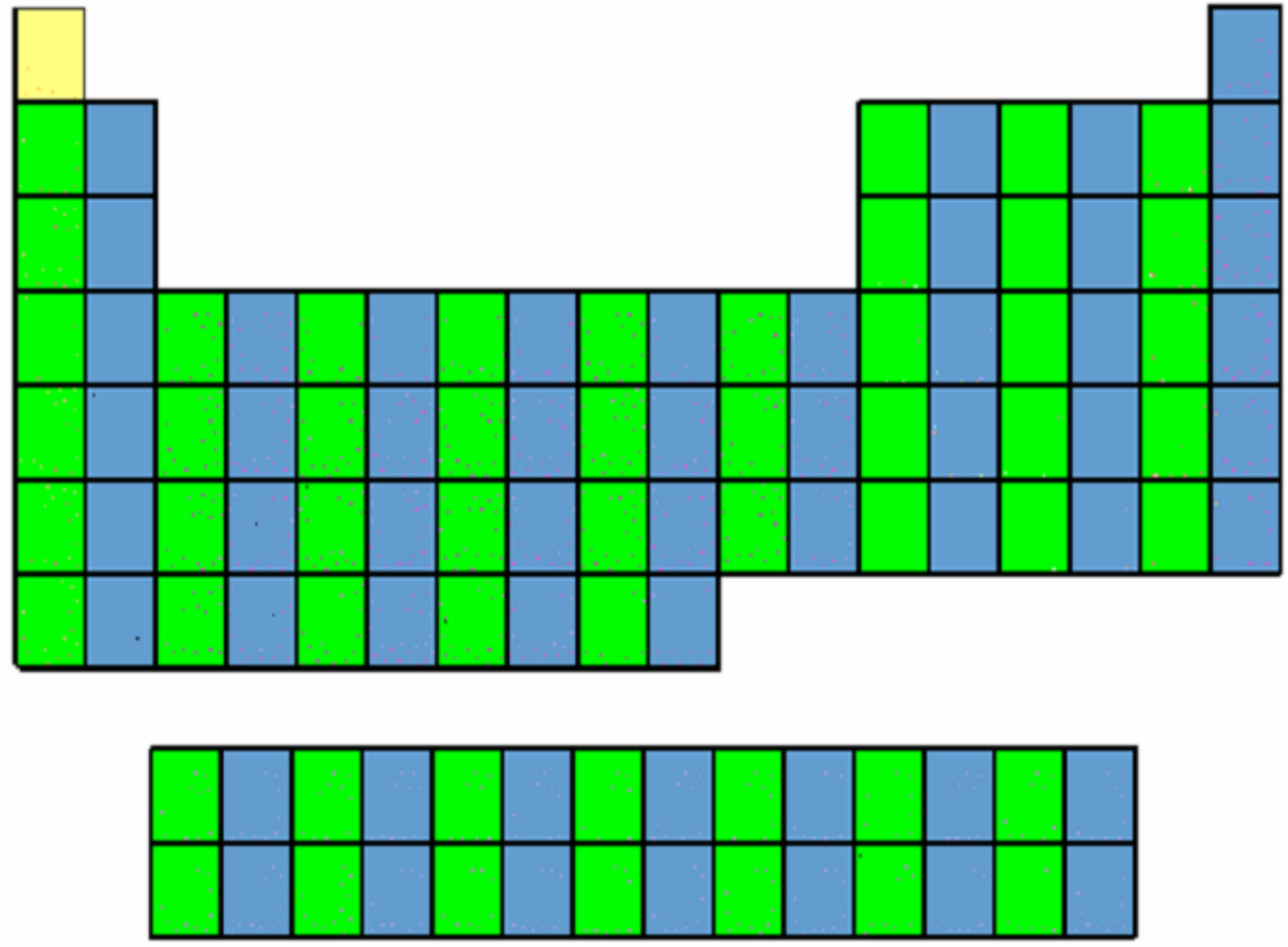
Silicon



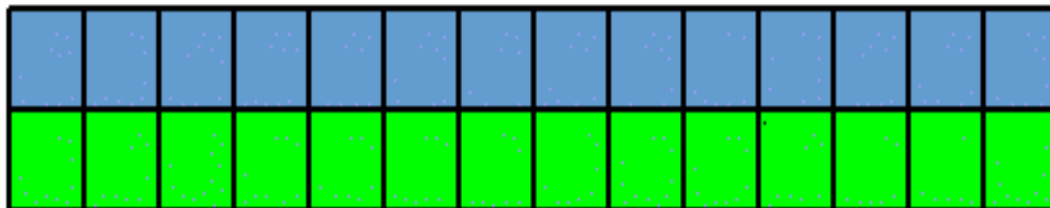
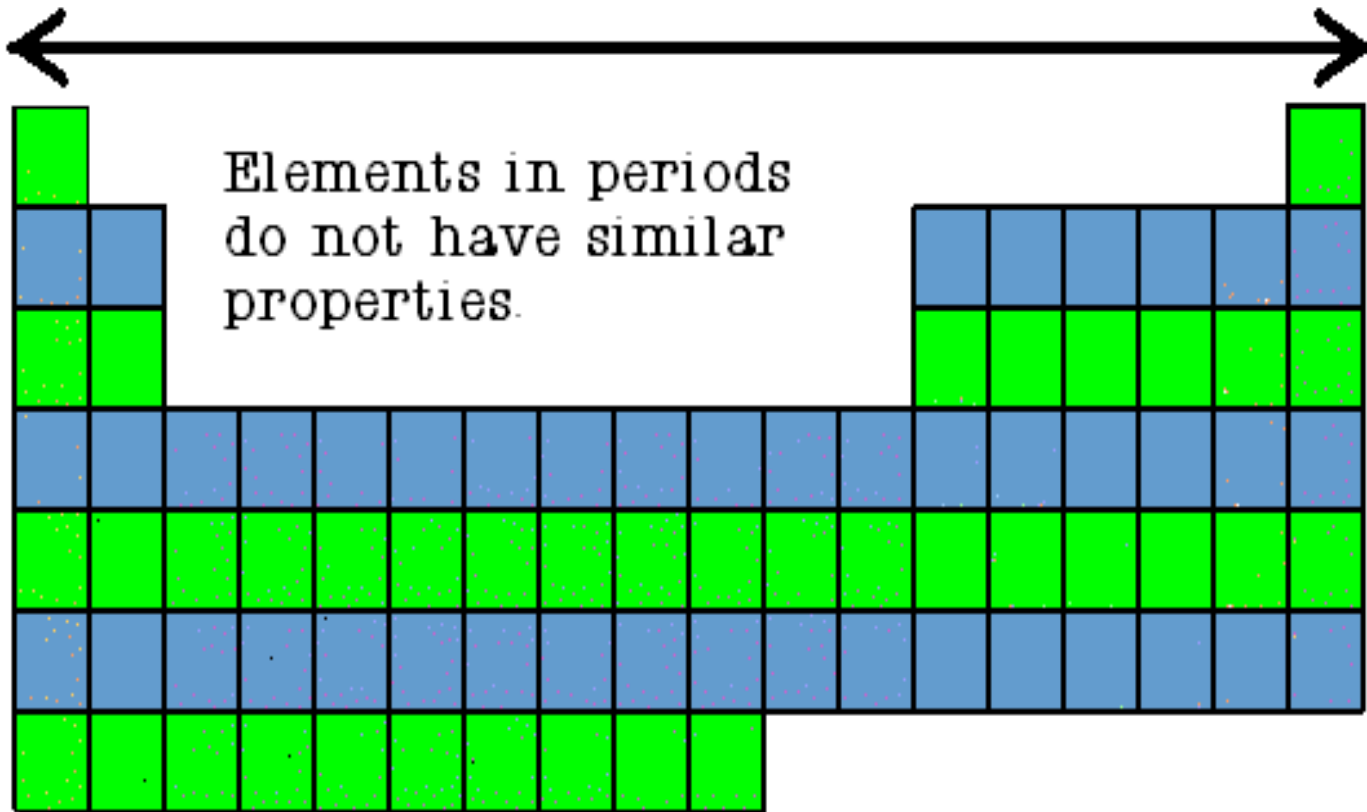
Antimony

- Metalloids (metal-like) have **properties of both metals and non-metals**.
- They are **solids** that can be **shiny or dull**.
- They conduct heat and electricity better than non-metals but not as well as metals.
- They are ductile and malleable.
- **Ex. Silicon** which can be used in electronic circuits in computers and TV.

Elements in the periodic table are also grouped into families, which are the columns. Elements in families have similar properties.



The elements are also categorized into periods, or horizontal rows.



They all have the same # of electron shells (shells are the paths electrons take as they travel

Families

- Columns of elements are called groups or families.
- Elements in each family have similar but not identical properties.
- For example, lithium (Li), sodium (Na), potassium (K), and other members of family group 1 are all soft, white, shiny metals.
- All elements in a family have the same number of valence electrons. (NUMBER OF ELECTRONS IN OUTER shell)
- They are the electrons involved in chemical bonds with other elements.

Periods

- Each horizontal row of elements is called a period.
- The elements in a period are not alike in properties, but have the same # of electron shells.
- In fact, the properties change greatly across a given row.
- The first element in a period is always an extremely active solid. The last element in a period, is always an inactive gas.

[

]

Families

Periodic Table of the Elements

A stylized periodic table grid consisting of 7 rows and 18 columns. The first column is highlighted in yellow. The grid contains various colored dots: purple dots are scattered in the first six rows of the first 10 columns; blue dots are scattered in the first six rows of the 11th and 12th columns; orange dots are scattered in the first six rows of the 15th and 16th columns. The 7th row contains purple dots in the first 10 columns. The 17th and 18th columns are empty.

A separate 2x14 grid of cells. Each cell contains a pattern of blue dots arranged in a roughly rectangular shape, similar to the blue dots in the main periodic table grid.

Periodic Table of the Elements

A stylized periodic table grid with 7 rows and 18 columns. The grid is divided into several regions: a blue region in the first column (rows 2-6), a purple region in the second column (rows 2-6), a grey region in the first column (rows 1, 3, 4, 5, 7), a grey region in the second column (rows 1, 3, 4, 5, 7), a grey region in the third to tenth columns (rows 3-7), a grey region in the eleventh to fourteenth columns (rows 1-3), a grey region in the eleventh to fourteenth columns (rows 4-7), a grey region in the fifteenth to sixteenth columns (rows 1-7), and a grey region in the seventeenth to eighteenth columns (rows 1-7). Scattered dots are present in various cells: orange dots in the first column (rows 2-6), purple dots in the second column (rows 2-6), blue dots in the third to tenth columns (rows 3-7), orange dots in the eleventh to fourteenth columns (rows 1-3), purple dots in the eleventh to fourteenth columns (rows 4-7), orange dots in the fifteenth to sixteenth columns (rows 1-7), and purple dots in the seventeenth to eighteenth columns (rows 1-7).

A rectangular grid consisting of 14 columns and 2 rows. Each cell contains a pattern of scattered blue dots.

Periodic Table of the Elements

A schematic periodic table grid with 7 rows and 18 columns. The grid is divided into several sections: a top-left section with 3 rows and 2 columns; a top-right section with 4 rows and 6 columns; a middle section with 4 rows and 12 columns; and a bottom section with 1 row and 10 columns. A vertical column of 4 red cells is located in the 13th column, spanning rows 2 through 5. The other cells are gray. Scattered dots are present in various cells: orange dots in the top-left section, purple dots in the middle section, and blue dots in the bottom section.

A 2x14 grid of gray cells. Each cell contains a small number of scattered blue dots.

Periodic Table of the Elements

A schematic periodic table grid consisting of 7 rows and 18 columns. The grid is divided into several sections: a left block (columns 1-2, rows 1-3), a central block (columns 3-10, rows 3-7), a right block (columns 11-18, rows 1-6), and a bottom block (columns 1-14, rows 8-9). A vertical column of 6 cells (rows 1-6, column 12) is highlighted in yellow. Various colored dots (orange, purple, blue) are scattered within the cells of the grid.

A separate grid consisting of 2 rows and 14 columns. Each cell in this grid contains a pattern of small blue dots.

Periodic Table of the Elements

A stylized periodic table of elements. The table is composed of gray cells with black borders. A single column of cells is highlighted in bright green. The highlighted column is the 14th column from the left. The table is arranged in a standard periodic table layout, with the first two columns on the left, a gap, and the remaining columns on the right. The highlighted column is the 14th column from the left. The table is arranged in a standard periodic table layout, with the first two columns on the left, a gap, and the remaining columns on the right. The highlighted column is the 14th column from the left.

A separate row of 14 gray cells, arranged horizontally. Each cell contains a small cluster of blue dots. The row is positioned below the main periodic table.

Periodic Table of the Elements

A stylized periodic table with a grid structure. The table is composed of several rows and columns of cells. The cells are filled with a light gray background and contain small, scattered dots in various colors (orange, purple, blue). A vertical column of cells, located in the right-hand section of the table, is highlighted in a solid dark blue color. The table is missing the central block of elements (transition metals) and the lanthanide and actinide series.

A separate grid consisting of two rows and fourteen columns of cells. Each cell contains a light gray background with scattered blue dots. This grid is positioned below the main periodic table structure.

Periodic Table of the Elements

A schematic periodic table with a grid of cells. The cells are colored in three ways: grey, yellow, and light blue. The yellow cells form a vertical column in the second-to-last column from the right. The light blue cells form a horizontal row in the second row from the top. The remaining cells are grey. The table has 7 rows and 18 columns. The first two columns have 7 cells each. The last two columns have 7 cells each. The middle 14 columns have 7 cells each. The yellow column is the 16th column from the left. The light blue row is the 2nd row from the top.

A 2x14 grid of light blue cells. The cells are arranged in two rows and 14 columns. Each cell contains a pattern of small blue dots.

Periodic Table of the Elements

A stylized periodic table grid. The grid is composed of several rows and columns of cells. The top row has 1 cell on the left and 1 cell on the right. The second row has 2 cells on the left and 5 cells on the right. The third row has 2 cells on the left and 5 cells on the right. The fourth row has 16 cells in a single row. The fifth row has 16 cells in a single row. The sixth row has 16 cells in a single row. The seventh row has 10 cells in a single row. The rightmost column of the grid is highlighted in orange. The other cells are light gray. Scattered dots of various colors (orange, purple, blue) are present in many of the cells.

A rectangular grid consisting of 2 rows and 10 columns of cells. All cells are light gray and contain scattered blue dots.

Periodic Table of the Elements

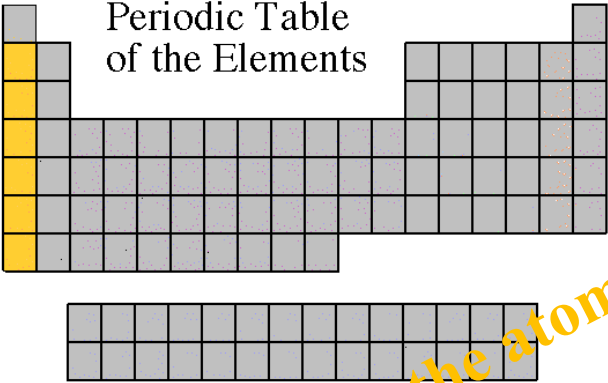
A stylized periodic table of elements represented by a grid of gray cells. The grid is composed of 7 rows and 18 columns. The first two columns are filled with orange dots, the next 10 columns with purple dots, and the last two columns with blue dots. The grid is missing the bottom-right portion, specifically the last two columns of the 6th and 7th rows.

A separate grid of 14 blue cells arranged in two rows of seven. Each cell contains a small cluster of purple dots.

Alkali Metals – Group 1

- The alkali family is found in the first column of the periodic table.
- All are metals and solid at room temp.
- Only one is a gas (Hydrogen)
- 1 valence electron in outermost shell
- Very reactive, especially with water.
- Soft, silvery and shiny.
- Conductors of electricity.

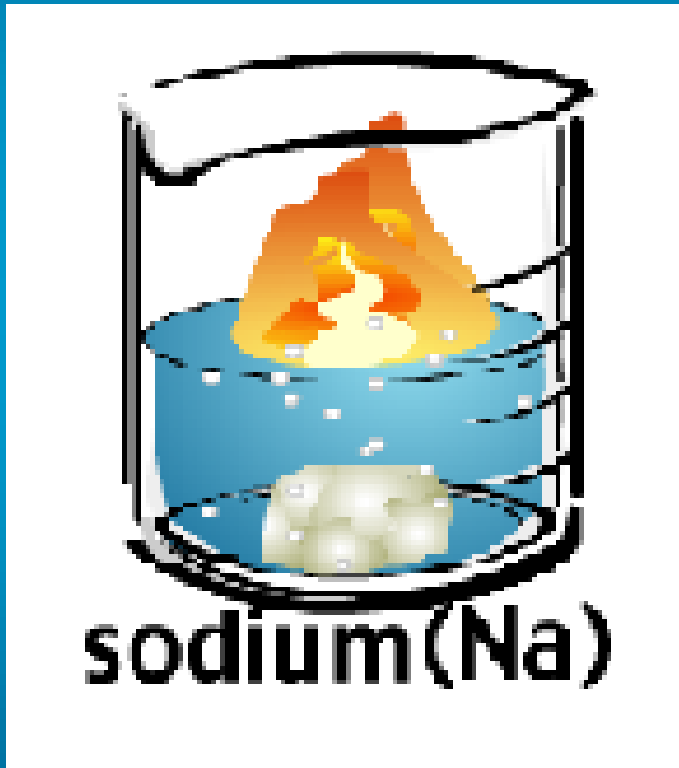
Periodic Table of the Elements



The image shows a simplified periodic table with a grid of cells. The first column on the left is highlighted in yellow, representing the alkali metals. The rest of the table is grey. The title 'Periodic Table of the Elements' is centered at the top.



Alkali Metals



- They are the most reactive metals.
- They react violently with water.
- Alkali metals are never found as free elements in nature. They are always bonded with another element.

[Alkaline Earth Metals- Group 2]

- They are never found uncombined in nature.
- They have two valence electrons.
- Alkaline earth metals include magnesium and calcium, among others. (Solid metal)
- White silvery and malleable.
- Reactive, but less than Alkali
- Conductors of electricity

Periodic Table
of the Elements

The diagram shows a simplified periodic table with a grid of 18 columns and 7 rows. The first two columns are highlighted in blue, representing the Alkaline Earth Metals. The rest of the grid is grey. Below the main grid is a separate row of 18 cells, representing the Lanthanide and Actinide series.

Transition Metals

- These are the metals you are probably most familiar: copper, tin, zinc, iron, nickel, gold, and silver.
- Transition Elements are mostly metal (solid) except for Mercury-liquid metal.
- 1 or 2 valence electrons
- Less reactive than Alkali and Alkaline.
- They are good conductors of heat and electricity.
- They're unique as they have 2 unhappy electron shells that need to bond to another element

Periodic Table of the Elements



[Transition Metals]



- The compounds of transition metals are usually brightly colored and are **often used to color paints**.
- Transition elements have 1 or 2 valence electrons, which they lose when they form bonds with other atoms. Some transition elements can lose electrons in their next-to-outermost level.

Boron Family- Group 3

- The Boron Family is named after the first element in the family.
- Atoms in this family have **3 valence electrons**.
- This family includes a **metalloid (boron)**, and the rest are metals.
- This family includes the most abundant metal in the earth's crust (aluminum).
- **Solid** at room temp. and reactive

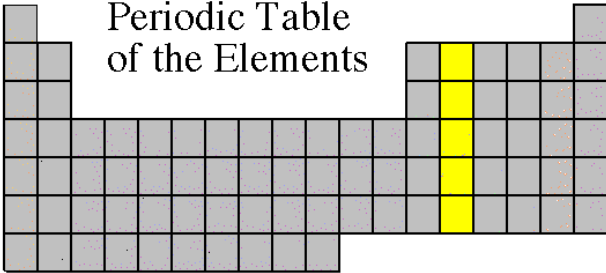


Periodic Table of the Elements

[Carbon Family- Group 4]

- Atoms of this family have 4 valence electrons.
- This family includes a non-metal (carbon), metalloids, and metals.
- Reactivity varies
- Solids at room temp.

Periodic Table of the Elements



The image shows a schematic periodic table with a grid of grey cells. The title 'Periodic Table of the Elements' is centered at the top. A vertical column of four cells, representing Group 4, is highlighted in yellow. These cells are located in the fourth, fifth, sixth, and seventh rows of the main body of the table. Below the main body, there is a separate row of ten cells, representing the lanthanide and actinide series, which are not highlighted.

Germanium has important semiconductor properties and is used in the computer industry. It is one of the few elements that expand when frozen. Lead has long been used for plumbing and is also used to block radiation. Tin was once used to make cans because it is relatively stable -- unreactive.

[Oxygen Family- Group 6]

- Atoms of this family have 6 valence electrons.
- Most elements in this family share electrons when forming compounds.
- **Reactive (can bond with other elements).**
- Oxygen is the only gas the rest are solids.

Periodic Table of the Elements

The image shows a simplified periodic table with a grid of cells. The title 'Periodic Table of the Elements' is centered at the top. A vertical column of six cells is highlighted in dark blue, representing the Oxygen Family (Group 6). The grid is composed of grey cells, with the highlighted column being the only one in dark blue. The grid is arranged in a standard periodic table layout, with the highlighted column being the sixth column from the left.

Halogen Family- Group 7

- The elements in this family are fluorine, chlorine, bromine, iodine, and astatine.
- Halogens have 7 valence electrons, which explains why they are the most active non-metals (VERY ACTIVE). They are never found free in nature.

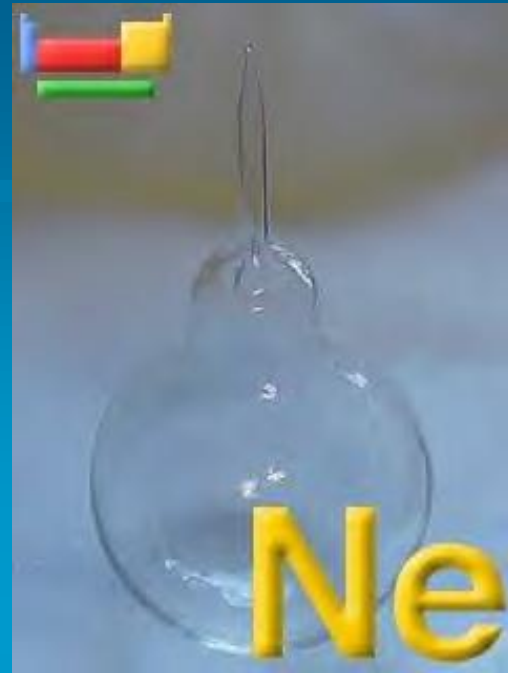
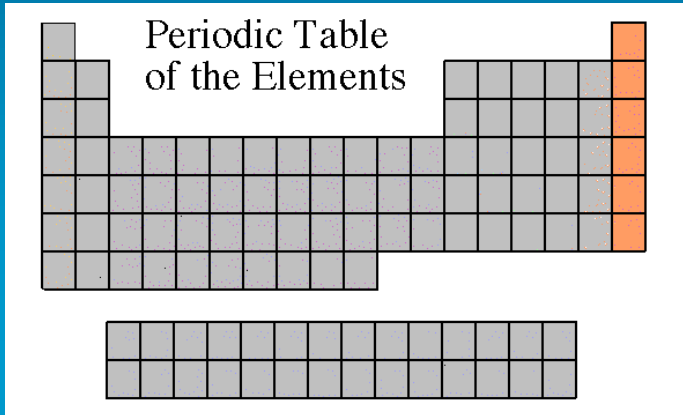
Periodic Table of the Elements

The diagram shows a periodic table with the halogen group (Group 7) highlighted in yellow. This group is located in the second column from the right of the main body of the table. The elements in this group are fluorine, chlorine, bromine, iodine, and astatine. The rest of the periodic table is shown in grey, with the noble gases in Group 8 also highlighted in grey.

- Halogen atoms only need to gain 1 electron to fill their outermost energy level.
- They react with alkali metals to form salts.
- Has 2 gases, 1 liquid (Br) and 2 solids.

Noble Gases- G8

Periodic Table of the Elements



- Noble Gases are colorless gases that are extremely un-reactive.
- One important property of the noble gases is their inactivity. They are inactive because their outermost energy level is full. (Happy atom)
- 8 electrons in the outer most shell.
- Nonmetals
- The fact that their outer shells are full means they are quite happy and don't need to react with other elements. In fact, they rarely combine with other elements.

Rare Earth Elements

Periodic Table of the Elements

The diagram shows a schematic periodic table with 7 rows and 18 columns. The first two rows are partially filled with grey blocks. The third row is filled with grey blocks. The fourth and fifth rows are filled with grey blocks. The sixth row is filled with grey blocks. The seventh row is filled with grey blocks. Below the main table, there are two rows of blue blocks, representing the lanthanide and actinide series. The first row of blue blocks has 14 cells, and the second row has 14 cells.

- The thirty rare earth elements are composed of the lanthanide and actinide series.
- One element of the lanthanide series and most of the elements in the actinide series are called trans-uranium, which means synthetic or man-made.
- Radioactive!

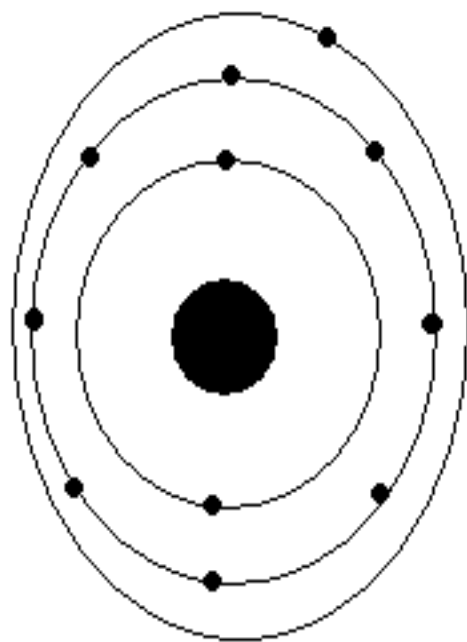
[Complete your chart]

- Write in symbols and color each family a different color.

What does it mean to be reactive?

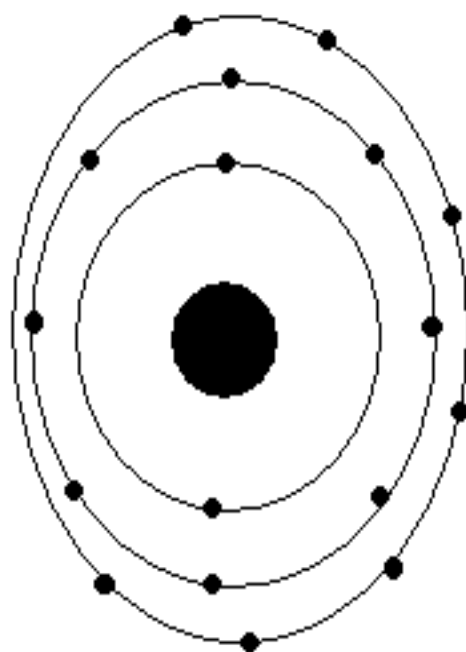
- We will be describing elements according to their reactivity.
- Elements that are reactive bond easily with other elements to make compounds.
- Some elements are only found in nature bonded with other elements.
- What makes an element reactive?
 - An incomplete valence electron level.
 - All atoms (except hydrogen) want to have 8 electrons in their very outermost energy level (This is called the rule of octet.)
 - Atoms bond until this level is complete. Atoms with few valence electrons lose them during bonding. Atoms with 6, 7, or 8 valence electrons gain electrons during bonding.

Sodium



1 valence
electron

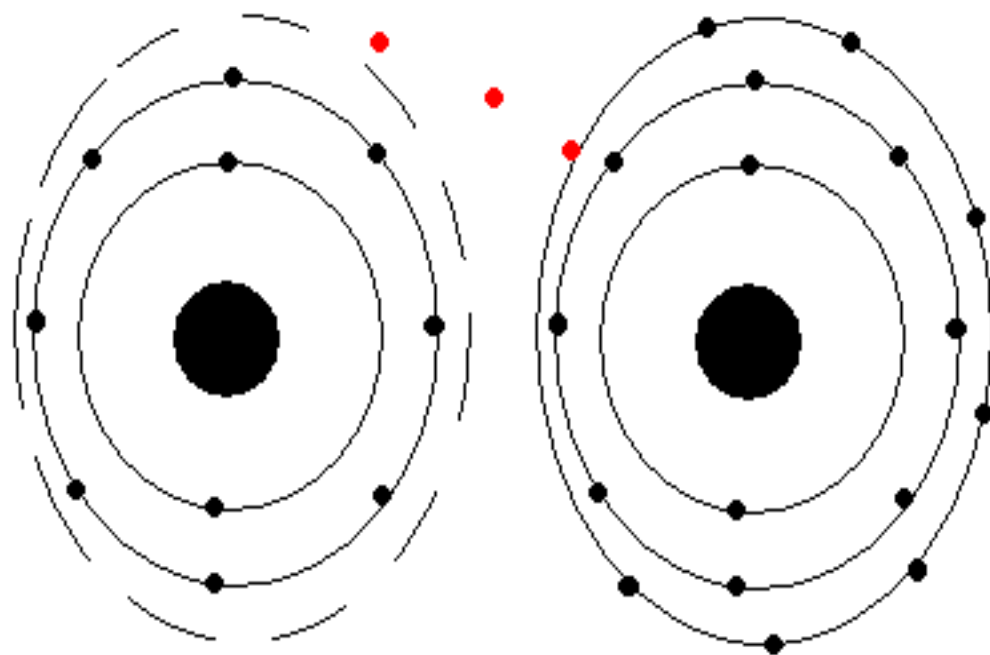
Chlorine



7 valence
electrons

Sodium

Chlorine



Sodium loses one electron.
Chlorine gains one electron.

Sodium Chloride

