

Organization of the Periodic Table/ Properties of Elements

LEARNING GOALS:

- I will understand how the periodic table is arranged.
- I will be able to identify **physical and chemical properties** of elements on the periodic table.

Periodic Law

- The **chemical and physical properties** of the elements repeat in a regular, periodic pattern when they are arranged according to their **atomic number**.



Organization of The Periodic Table

Metals																		Metalloids						Nonmetals			
Period																		Group/Family									
1	2															13	14	15	16	17	18						
3	4															5	6	7	8	9	10						
11	12															13	14	15	16	17	18						
19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36										
37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54										
55	56	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86										
87	88	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118										
Lanthanide series		57	58	59	60	61	62	63	64	65	66	67	68	69	70												
Actinide series		89	90	91	92	93	94	95	96	97	98	99	100	101	102												

Ordered by atomic number. Columns arranged to form groups with similar properties.

Groups in the Periodic Table

- GROUP 1 = Alkali Metals
- GROUP 2 = Alkaline Earth Metals
- GROUP 17 (MAIN GROUP 7) = Halogens
- GROUP 18 (MAIN GROUP 8) = Noble Gases
- GROUP 3 – 12 = Transition Metals

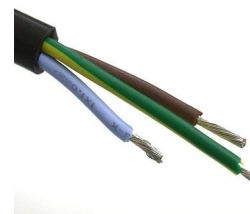
Videos: [Alkali Metals in water](#);
[Helium is Boring!](#)

Metals, Metalloids, and Nonmetals

Metals																		Metalloids						Nonmetals			
1	2															13	14	15	16	17	18						
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Metals

- **Shiny**
- **Solids (at room temp)**
- **Malleable** – can be hammered flat
- **Ductile** – can be pulled into wire
- **High Conductivity** – ability to transfer heat or electricity to another object



Nonmetals

- Not shiny (**dull**)
- **Mostly gases** (at room temperature)
- **Brittle** (not malleable)
- **Not ductile**
- **Poor conductors**



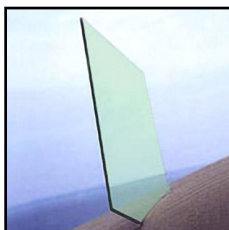
Sulfur

Some Important Nonmetals

- **Carbon** – important element for making up living organisms.
- **Noble Gases** – group 18
= very nonreactive; have full valence shell.

Metalloids

- In between metals and nonmetals; some are **shiny**, others are **dull**
- **Solids** (at room temp)
- **Brittle**
- **Not ductile**
- **Semiconductors** – can conduct electricity under some conditions but not others.
*very important for computer chips
- Most common example – **Silicon** – in sand and glass.



Reactivity

- The ease and speed with which an element combines, or reacts, with other elements or compounds.



Pure sodium reacts explosively with air

GROUPS of elements have similar reactivity

Group 1: metals that react violently with water

Group 18: Gases that barely react at all

Why do groups/families of elements react the same way?
= **same # of VALENCE electrons!**

Questions

For the first 3 periods:

- 1) How many electrons does each element in each group above need to fill its Valence shell?
- 2) Which groups are the most likely to react with one another?
- 3) Which group is least likely to react with any other group?

Reactivity: Periods 1 – 3 *MAIN GROUP ELEMENTS

1) How many electrons does each element in each group above need to **fill its valence shell**?

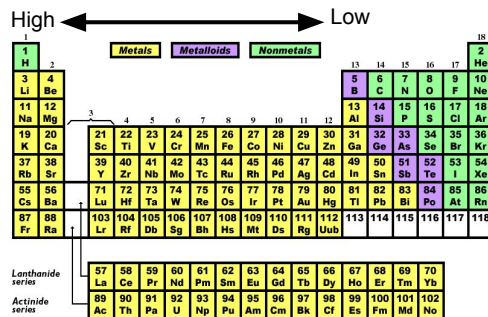
Group 1: _____ Group 2: _____ Group 3: _____ Group 4: _____
Group 5: _____ Group 6: _____ Group 7: _____ Group 8: _____

2) Which groups are the **most likely to react** with one another?

Group 1 & _____ Group 5 & _____
Group 2 & _____ Group 6 & _____
Group 3 & _____ Group 7 & _____
Group 4 & _____ Group 8 & _____

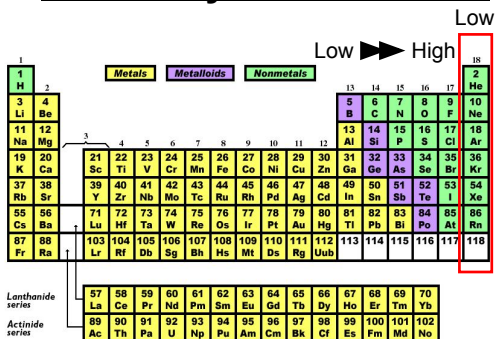
3) Which group is **least likely** to react with any other group?

Reactivity of Metals



Metals will usually **lose electrons** when they react with other elements

Reactivity of Nonmetals



Nonmetals will usually **gain or share electrons** when they react with other elements

Assessment

- The atomic number is the number of
 - valence electrons
 - neutrons
 - protons in the nucleus
 - electrons in the nucleus

Assessment

- Which element has the greatest atomic mass?
 - Lithium
 - Sodium
 - Potassium
 - Rubidium

Assessment

- The periodic table is a chart of the elements that shows the repeating pattern of their
 - energies
 - properties
 - element symbols
 - names

Assessment

- 4) Which piece of information cannot be found in a square on the periodic table?
- a) **Atomic mass**
 - b) **Chemical symbol**
 - c) **Atomic number**
 - d) **Number of neutrons**

Assessment

- 5) Which element will have properties most similar to Calcium?
- a) **Potassium**
 - b) **Scandium**
 - c) **Magnesium**
 - d) **Bromine**

Assessment

- 6) Which group is most likely to lose/share 2 of its electrons in a chemical reaction?
- a) **1**
 - b) **2**
 - c) **17**
 - d) **18**

Assessment

- 7) Which side of the periodic table contains most of the **nonmetals**?
- a) **Left side**
 - b) **Right side**
 - c) **Middle**

Assessment

- 8) Which is **not** a property of nonmetals?
- a) **Brittle**
 - b) **Nonmalleable**
 - c) **High conductivity**
 - d) **Most are gases at room temperature**

Assessment

- 9) Which **metal** is probably the **most** reactive?
- a) **Potassium**
 - b) **Calcium**
 - c) **Scandium**
 - d) **Titanium**

Assessment

10) Which **nonmetal** is probably the most reactive?

- a) Nitrogen
- b) Oxygen
- c) Fluorine
- d) Neon