



Lesson Question



Lesson Goals

Distinguish characteristics of .

Describe the

characteristic

of nonmetals.

Identify the

of

nonmetals in the
periodic table.

Explain how and why

the

of nonmetals changes
in the periodic table.



Words to Know

Write the letter of the definition next to the matching word as you work through the lesson. You may use the glossary to help you.

___ brittle

A. a chemical compound formed with at least one halogen element from group 17

___ thermal insulator

B. evaporates easily

___ halide

C. a substance that does not allow heat to pass easily

___ volatile

D. a substance that does not allow electric current to flow easily

___ electrical insulator

E. easily broken or shattered



Review of Metallic Characteristics

Metals are found on the left side of the periodic table.

Characteristics of metals:

- Are
- Are
- heat and electricity
- Form ions
- in reactivity from left to right
- in reactivity from top to bottom

Draw the line that separates metals from the other elements.

1 1A	1 H Hydrogen 1.01	2 2A																	13 3A	14 4A	15 5A	16 6A	17 7A	18 8A	2 He Helium 4.00
2	3 Li Lithium 6.94	4 Be Beryllium 9.01																		5 B Boron 10.81	6 C Carbon 12.01	7 N Nitrogen 14.01	8 O Oxygen 16.00	9 F Fluorine 19.00	10 Ne Neon 20.18
3	11 Na Sodium 22.99	12 Mg Magnesium 24.31	3 3B	4 4B	5 5B	6 6B	7 7B	8 8B	9 8B	10 8B	11 1B	12 2B	13 Al Aluminum 26.98	14 Si Silicon 28.09	15 P Phosphorus 30.97	16 S Sulfur 32.07	17 Cl Chlorine 35.45	18 Ar Argon 39.95							
4	19 K Potassium 39.10	20 Ca Calcium 40.08	21 Sc Scandium 44.96	22 Ti Titanium 47.87	23 V Vanadium 50.94	24 Cr Chromium 52.00	25 Mn Manganese 54.94	26 Fe Iron 55.85	27 Co Cobalt 58.93	28 Ni Nickel 58.69	29 Cu Copper 63.55	30 Zn Zinc 65.39	31 Ga Gallium 69.72	32 Ge Germanium 72.61	33 As Arsenic 74.92	34 Se Selenium 78.96	35 Br Bromine 79.90	36 Kr Krypton 83.80							
5	37 Rb Rubidium 85.47	38 Sr Strontium 87.62	39 Y Yttrium 88.91	40 Zr Zirconium 91.22	41 Nb Niobium 92.91	42 Mo Molybdenum 95.94	43 Tc Technetium 98.00	44 Ru Ruthenium 101.07	45 Rh Rhodium 102.91	46 Pd Palladium 106.42	47 Ag Silver 107.87	48 Cd Cadmium 112.41	49 In Indium 114.82	50 Sn Tin 118.71	51 Sb Antimony 121.76	52 Te Tellurium 127.60	53 I Iodine 126.90	54 Xe Xenon 131.29							
6	55 Cs Cesium 132.91	56 Ba Barium 137.33	57 - 71	72 Hf Hafnium 178.49	73 Ta Tantalum 180.95	74 W Tungsten 183.84	75 Re Rhenium 186.21	76 Os Osmium 190.23	77 Ir Iridium 192.22	78 Pt Platinum 195.08	79 Au Gold 196.97	80 Hg Mercury 200.59	81 Tl Thallium 204.38	82 Pb Lead 207.20	83 Bi Bismuth 208.98	84 Po Polonium 209	85 At Astatine 209.99	86 Rn Radon 222.02							
7	87 Fr Francium 223.00	88 Ra Radium 226.00	89 - 103	104 Rf Rutherfordium 261.00	105 Db Dubnium 262.00	106 Sg Seaborgium 266.00	107 Bh Bohrium 264.00	108 Hs Hassium 277.00	109 Mt Meitnerium 268.00	110 Ds Darmstadtium 281.00	111 Rg Roentgenium 272.00	112 Cn Copernicium 285.00	113 Uut Ununtrium 284.00	114 Fl Flerovium 289.00	115 Uup Ununpentium 288.00	116 Lv Livermorium 291.00	117 Uus Ununseptium 290.99	118 Uuo Ununoctium 294.00							
6	57 La Lanthanum 138.91	58 Ce Cerium 140.12	59 Pr Praseodymium 140.91	60 Nd Neodymium 144.24	61 Pm Promethium 145.00	62 Sm Samarium 150.36	63 Eu Europium 151.97	64 Gd Gadolinium 157.25	65 Tb Terbium 158.93	66 Dy Dysprosium 162.50	67 Ho Holmium 164.93	68 Er Erbium 167.26	69 Tm Thulium 168.93	70 Yb Ytterbium 173.04	71 Lu Lutetium 174.97										
7	89 Ac Actinium 227.00	90 Th Thorium 232.04	91 Pa Protactinium 231.04	92 U Uranium 238.03	93 Np Neptunium 237.00	94 Pu Plutonium 244.00	95 Am Americium 243.00	96 Cm Curium 247.00	97 Bk Berkelium 247.00	98 Cf Californium 251.00	99 Es Einsteinium 252.00	100 Fm Fermium 257.00	101 Md Mendelevium 258.00	102 No Nobelium 259.00	103 Lr Lawrencium 262.00										

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Nonmetals on the Periodic Table

The periodic table is divided into two large regions and one smaller region.

- Metals are the largest group on the periodic table.
- The smallest group, located in the middle, is called the metalloids.
- The nonmetals are the second largest group.

Draw the line that separates the nonmetals from the metalloids.

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Physical Properties of Nonmetals: Brittleness and Density

- :
 - Shatters or breaks easily
- density:
 - Has mass per unit volume
- Weighs less than metal (when comparing same sample size)

Physical Properties of Nonmetals: Volatility

- :
 - Easily transforms into a gas
- Gaseous (at room):
 - Solids: sulfur, , phosphorus, selenium, iodine

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Physical Properties of Nonmetals: Conductivity

- Low conductivity:
 - Prevents heat from moving through
 - Sometimes called thermal
- Low electrical :
 - Prevents electric current from flowing through
 - Sometimes called insulator

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Group 17: The Halogens

Halides are chemical compounds formed with at least one halogen element from group 17.

- Only family containing all states of matter at temperature
- Most nonmetals:
 - Create with metallic compounds
 - Form with hydrogen
 - Can form molecules of one (e.g., Cl₂)
 - Are because of high reactivity

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Group 18: The Noble Gases

- Are almost completely
 - Noble—do not interact with other elements
- Used in gas-discharge
 - Do not , even when exposed to enough electric current to make them glow
- Were hard to discover—names reflect this

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Reactivity Trends in Periods of the Periodic Table: Valence**Electrons**

- have valence electrons, so it is easier to electrons than lose them.
- Moving from left to right, each element has electrons.
- The valence electrons needed to form a full shell, the it is, and the more the element.
- Reactivity from left to right among nonmetals. This is from the trend in the metals.

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Reactivity Trends in Periods of the Periodic Table: Noble Gases

- gases are the exception; elements in this group have a outer shell.
- A full outer shell means that these elements do need to gain or lose electrons in order to have a configuration.
- Noble gases hardly react at all, making group 18 the reactive group.
- The trend ends with group 17, which is the reactive group.

Reactivity Trends in Periods of the Periodic Table: Electron Shell Distance

- Moving a group in the periodic table, the number of electron shells .
- The away from the nucleus an electron shell is, the it is for the nucleus to valence electrons to fill that shell.
- Moving down a group the distance of the shell, so the farther a nonmetallic element is in a group, the reactive it is.



Summary

Nonmetals



**Lesson
Question**

How are nonmetals identified?



Answer

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Review: Key Concepts

Properties of nonmetals:

- , low density
- Thermal and electrical
- , gaseous at room temperature

Groups containing nonmetals:

- : Group 17
- gases: Group 18

Reactivity trends in nonmetals:

- in reactivity from left to right
- in reactivity from bottom to top
- Exception—



Summary

Nonmetals

Use this space to write any questions or thoughts about this lesson.