Warm-Up | Nonmetals

Lesson Question

How are nonmetals identified?

Lesson Goals

Distinguish characteristics of nonmetals.

Describe the characteristic properties of nonmetals.

Identify the location of nonmetals in the periodic table.

Explain how and why the reactivity 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.

E brittle

C thermal insulator

A halide

B volatile

D electrical insulator

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

B. evaporates easily

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

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

E. easily broken or shattered

© Edgenuity, Inc.

Warm-Up | Nonmetals

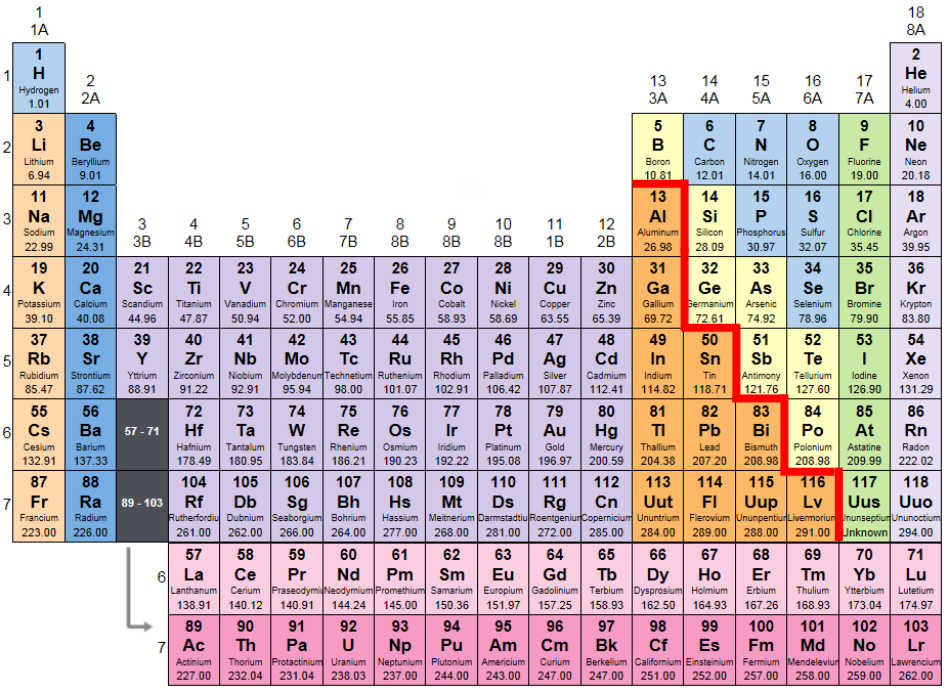
Review of Metallic Characteristics

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

Characteristics of metals:

- Are **malleable**
- Are **ductile**
- **Conduct** heat and electricity
- Form **positive** ions
- **Decrease** in reactivity from left to right
- **Increase** in reactivity from top to bottom

Draw the line that separates metals from the other elements.



© Edgenuity, Inc.

Instruction | Nonmetals

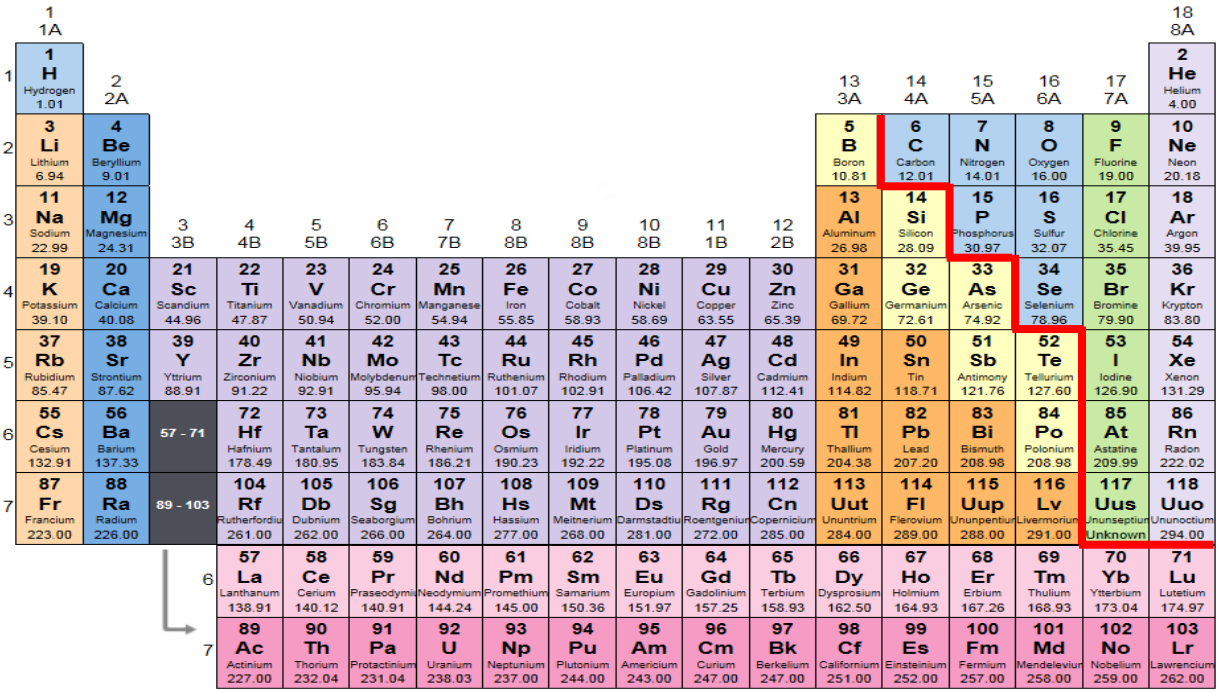
Slide 1

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.



© Edgenuity, Inc.

Instruction | Nonmetals

Slide 2

Physical Properties of Nonmetals: Brittleness and Density

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

Physical Properties of Nonmetals: Volatility

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

© Edgenuity, Inc.

Instruction | Nonmetals

Slide 4

Physical Properties of Nonmetals: Conductivity

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

Slide 7

Group 17: The Halogens

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

- Only family containing all [three] states of matter at [room] temperature
- Most [reactive] nonmetals:
  - Create [halides] with metallic compounds
  - Form [acids] with hydrogen
  - Can form molecules of one [element] (e.g., Cl_2)
  - Are [toxic] because of high reactivity

© Edgenuity, Inc.

Instruction | Nonmetals

Slide 7

Group 18: The Noble Gases

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

Slide 10

Reactivity Trends in Periods of the Periodic Table: Valence Electrons

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

© Edgenuity, Inc.

Instruction | Nonmetals

Slide 10

Reactivity Trends in Periods of the Periodic Table: Noble Gases

- Noble gases are the exception; elements in this group have a full outer shell.
- A full outer shell means that these elements do not need to gain or lose electrons in order to have a stable configuration.
- Noble gases hardly react at all, making group 18 the least reactive group.
- The trend ends with group 17, which is the most reactive group.

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

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

© Edgenuity, Inc.

Summary | Nonmetals

Lesson Question

How are nonmetals identified?

Answer

(Sample answer) Nonmetals are identified by their physical properties. Nonmetals are brittle, have low density, are electrical and thermal insulators, and are volatile and mostly gaseous at room temperature. Nonmetals can also be identified by their reactivity, which changes as you move across a period and down a group of the periodic table.

© Edgenuity, Inc.

Summary | Nonmetals

Slide 2

Review: Key Concepts

Properties of nonmetals:

- Brittle, low density
- Thermal and electrical insulators
- Volatile, gaseous at room temperature

Groups containing nonmetals:

- Halogens: Group 17
- Noble gases: Group 18

Reactivity trends in nonmetals:

- Increase in reactivity from left to right
- Increase in reactivity from bottom to top
- Exception—noble gases

© Edgenuity, Inc.

Summary | Nonmetals

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

© Edgenuity, Inc.