Edgenuity

Warm-Up | Metalloids

Lesson Question

Lesson Goals

Identify characteristics of _____ .

Describe the characteristic _____ of metalloids.

Identify the _____ of metalloids on the periodic table.

Explain why most metalloids are used as _____ .

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.

amphoteric	a substance that can chemically react as an _____ or as a _____
semiconductor	a material that is able to conduct _____ better than insulators but not as well as conductors

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Metals and Nonmetals

- Characteristics of metals:
  - Are _____ and malleable
  - Are thermal and electrical _____
  - React as _____
  - Usually solid at room temperature
- Characteristics of nonmetals:
  - Are _____ with low density
  - Are thermal and electrical _____
  - React as _____
  - Often gases at room temperature

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Metalloids 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.

Identify the location of metalloids on the periodic table.

	1 1A												13 3A	14 4A	15 5A	16 6A	17 7A	18 8A
1	1 H Hydrogen 1.01	2 2A																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 208.98	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 Rutherfordiu 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 Darmstadtiu 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 Unknown	118 Uuo Ununoctium 294.00
6				57 La Lanthanum 138.91	58 Ce Cerium 140.12	59 Pr Praseodymiu 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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Properties of Metalloids: Like and Unlike Metals and Nonmetals

- Similar to metals:
  - [ ]
  - Mostly [ ] at room temperature
- Similar to nonmetals:
  - [ ]

Properties of Metalloids: Unique Properties

- Have “ [ ] ” properties
- Are [ ]
  - Can form acidic or basic compounds
- Are better [ ] than nonmetals but [ ] as good as metals
- Can form [ ]
  - Silica—silicon dioxide

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Metalloids as Semiconductors

- Are _____
- Intermediate electrical _____
- Give engineers more control
- “ _____ ” semiconductors are used instead of vacuum _____.
- _____ of metalloids _____ based on certain factors (heat and amount of _____).

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Groups Containing Metalloids

- Groups 13, 14, 15, and 16 contain some _____.
- There are 7 metalloids: boron, _____, germanium, arsenic, _____, tellurium, and polonium
- Group 14 elements all have _____ valence electrons.
- Equally easy to gain _____ or lose _____ to have a full outer _____

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Structure of a Metalloid Atom

- Group 14 elements have [ ] valence electrons, which means it is [ ] likely that they will [ ] 4 or [ ] 4 to form their [ ] outer shell of 8.
  - The [ ] down in a group an element is located, the more electron shells there are, and the easier it is to [ ] the ones in the outermost layer.
  - In groups that have almost no valence electrons or almost a full shell, there are no [ ] .
  - In groups that have an in-between number of valence electrons, the elements that are farther down behave more like [ ], and the ones that are higher up behave more like [ ] .
  - The metalloids fall closer to the [ ] in groups with fewer valence electrons and closer to the [ ] in groups with more valence electrons. This leads to the “diagonal” pattern of metalloids seen in the periodic table.

Summary | Metalloids

Lesson Question	How are metalloids identified?

Answer

Summary | Metalloids

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Review: Key Concepts

- Properties of metalloids:
  - Metallic—[ ], lustrous
  - Nonmetallic—[ ]
  - Intermediate—amphoteric, [ ]
- Metalloids as semiconductors:
  - Solid-state semiconductors smaller than [ ] tubes
  - [ ] easily manipulated
- Location of metalloids:
  - Groups with medium number of valence electrons ([ ] through [ ])
  - Behavior more [ ] when more electron shells
  - Group number correlates with [ ] location.

Summary | Metalloids

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