

## 3.7: Metalloids

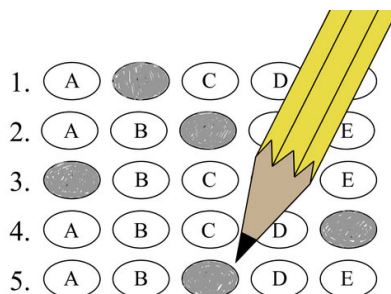


Figure 3.7.1 (Credit: Laura Guerin; Source: CK-12 Foundation; License: [CC BY-NC 3.0\(opens in new window\)](#))

### Have you ever taken a multiple-choice test?

Most of the time the answers are specific choices – is the answer possibility a or possibility b? Quite often you can “think through” the choices to come up with the correct answer. More frustrating is the choice “none of the above.” You feel very uncertain checking that possibility.

### Metalloids

Some elements are “none of the above.” They don’t fit neatly into the categories of metal or non-metal because of their characteristics. A **metalloid** is an element that has properties that are intermediate between those of metals and nonmetals. Metalloids can also be called semimetals. On the periodic table, the elements colored yellow, which generally border the stair-step line, are considered to be metalloids. Notice that aluminum borders the line, but it is considered to be a metal since all of its properties are like those of metals.

Figure 3.7.2 (Credit: Christopher Auyeung; Source: CK-12 Foundation; License: [CC BY-NC-SA 3.0\(opens in new window\)](#))



### Examples of Metalloids

Silicon is a typical metalloid (see figure below). It has luster like a metal, but is brittle like a nonmetal. Silicon is used extensively in computer chips and other electronics because its electrical conductivity is in between that of a metal and a nonmetal.



Figure 3.7.3: Silicon. (Credit: User:Enricoros/Wikipedia; Source: <http://commons.wikimedia.org/wiki/File:SiliconCroda.jpg> (opens in new window); License: Public Domain)

Boron is a versatile element that can be incorporated into a number of compounds (see figure below). Borosilicate glass is extremely resistance to thermal shock. Extreme changes in the temperature of objects containing borosilicates will not create any damage to the material, unlike other glass compositions, which would crack or shatter. Because of their strength, boron filaments are used as light, high-strength materials for airplanes, golf clubs, and fishing rods. Sodium tetraborate is widely used in fiberglass as insulation and also is employed in many detergents and cleaners.

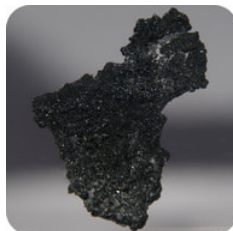


Figure 3.7.4: Boron. (Credit: User:Jurii/Wikimedia Commons; Source: <http://commons.wikimedia.org/wiki/File:Boron.jpg> (opens in new window); License: CC-SA;CC-BY 3.0)

Arsenic has long played a role in murder mysteries, being used to commit the foul deed (see figure below). This use of the material is not very smart since arsenic can be easily detected on autopsy. We find arsenic in pesticides, herbicides, and insecticides, but the use of arsenic for these applications is decreasing due to the toxicity of the metal. Its effectiveness as an insecticide has led arsenic to be used as a wood preservative.

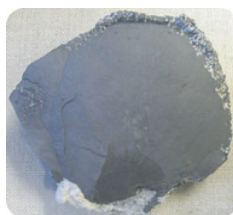


Figure 3.7.5: Arsenic. (Credit: Aram Dulyan (Wikimedia: Aramgutang); Source: [http://commons.wikimedia.org/wiki/File:Native\\_arsenic.jpg](http://commons.wikimedia.org/wiki/File:Native_arsenic.jpg) (opens in new window); License: Public Domain)

Antimony is a brittle, bluish-white metallic material that is a poor conductor of electricity (see figure below). Used with lead, antimony increases the hardness and strength of the mixture. This material plays an important role in the fabrication of electronic and semiconductor devices. About half of the antimony used industrially is employed in the production of batteries, bullets, and alloys.



Figure 3.7.6: Antimony. (Credit: Aram Dulyan (User:Aramgutang/Wikimedia Commons); Source: [http://commons.wikimedia.org/wiki/File:Antimony\\_massive.jpg](http://commons.wikimedia.org/wiki/File:Antimony_massive.jpg) (opens in new window); License: Public Domain)

## Summary

- Metalloids are elements with properties intermediate between those of metals and non-metals
- Silicon is a metalloid because it has luster, but is brittle.
- Boron, arsenic, and antimony are metalloids with a variety of uses.

## Review

1. Define “metalloid.”
2. Why would it be difficult to decide whether or not an element was a metalloid based on its properties?
3. Why is silicon used extensively in electronics?
4. What are borosilicates used for?
5. Why is the use of arsenic as an insecticide decreasing?
6. What is a main application of antimony?

---

This page titled [3.7: Metalloids](#) is shared under a [CK-12](#) license and was authored, remixed, and/or curated by [Theodore Chan](#) via [source content](#) that was edited to the style and standards of the LibreTexts platform.