

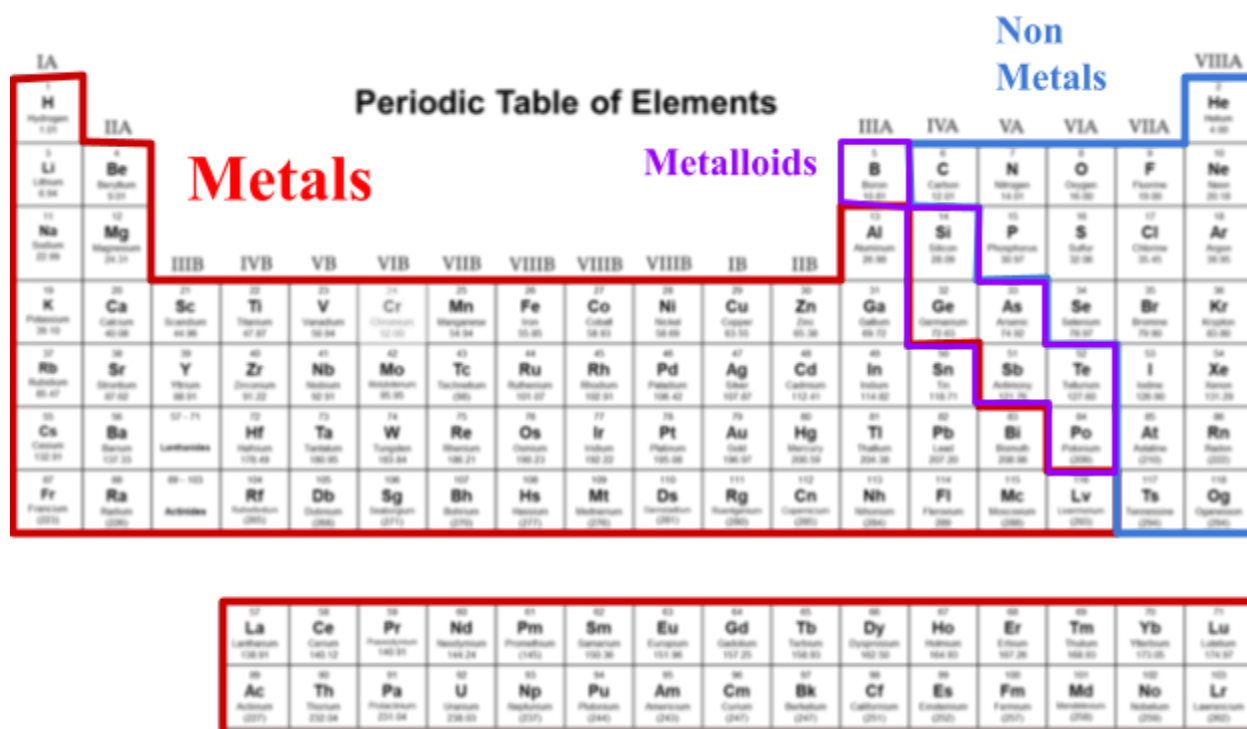
Unit 7: Periodicity

Metals vs. Nonmetals

This worksheet will cover the difference between metals and nonmetals, as well as electronegativity and physical properties. Elements on the periodic table can be divided into metals, metalloids and nonmetals. They each have different physical and chemical properties that differentiate them.

Shown Below are the Metals (Red) and Nonmetals (Blue).

Periodic Table of Elements



The periodic table is color-coded as follows:

- Metals (Red):** Groups IA, IIA, IIIA, IVB, VB, VIB, VIIB, VIIIB, VIIIIB, VIIIIB, VIIIIB, IB, IIB, and the f-block (lanthanides and actinides).
- Metalloids (Purple):** B, Si, Ge, As, Sb, Te, Po, At.
- Nonmetals (Blue):** H, He, C, N, O, F, Ne, Ar, Kr, Xe, Rn, and the noble gases.

Some properties of Metals are:	Some properties of Metalloids are:	Some properties of Nonmetals are:
<ul style="list-style-type: none"> - Metallic luster - High melting and boiling point - Good conductors - Malleable and ductile - Form cations 	<ul style="list-style-type: none"> - Conduct electricity, but not as well as metals (Semiconductors) - Solid - Have metallic luster - Brittle 	<ul style="list-style-type: none"> - Dull, colorful to colorless - Low melting and boiling point - Bad conductors - Brittle - Form anions

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1. Sort the following elements into Metals and Nonmetals.

Be	Ar	Cl	Pt	Mg	Co	P	Ts
Metals:				Nonmetals:			

2. Which element has properties more similar to Lithium? Carbon or Magnesium? Explain.

3. Which element will create an ion smaller than its atom? Tungsten or Fluorine? Explain why.

4. An unknown element X is a solid that is: brittle, nonconductive, and low melting point. Which group could this element be from?

5. Is it true that metals have a high electronegativity? Explain.

6. Which element would create an ion larger than its atom? Oxygen or Cesium?

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7. Challenge Question:

An ionic compound is composed of an unknown element X and Chlorine. Is element X more likely to be a metal or nonmetal?

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ANSWER KEY

1. Sort the following elements into Metals and Nonmetals.

Be	Ar	Cl	Pt	Mg	Co	P	Ts
Metals: Be, Mg, Co, Pt				Nonmetals: Ar, Cl, P, Ts			

2. Which element has properties more similar to Lithium? Carbon or Magnesium? Explain.

Lithium is a metal. Carbon is a nonmetal and magnesium is a metal. Due to both being metals, magnesium is more similar to lithium than carbon.

3. Which element will create an ion smaller than its atom? Tungsten or Fluorine? Explain why.

Metals create cations or positive ions. Positive ions are smaller than their atoms. Positive ions lose electrons to create a positive charge, and this results in a greater positive electromagnetic force. The protons will be able to exert their force on fewer bodies resulting in a smaller and tighter radius. Tungsten is a metal and therefore will create a cation. Fluorine is a nonmetal and would instead make an anion, which is typically larger than its neutral state.

4. An unknown element X is a solid that is: brittle, nonconductive, and low melting point. Which group could this element be from?

An acceptable answer would be groups 14, 15, 16 and 17. Any group with solid nonmetals would be correct. Group 18 are all noble gasses, and gasses can't be described as brittle. Groups 1, 2 and 13 contain metals or metalloids that don't match the description above that is of nonmetals.

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5. Is it true that metals have a high electronegativity? Explain.

Electronegativity is the measure of how well an atom can attract a bonding pair of electrons. Metals do not have a high electronegativity in general. They have few valence electrons and thus want to lose electrons rather than gain to achieve an octet. Metals are known to conduct electricity, in order to do so they must be able to readily lose their electrons. As this is the case, they do not have a strong desire to gain electrons.

6. Which element would create an ion larger than its atom? Oxygen or Cesium?

Oxygen would create an ion larger than its atom. Oxygen gains electrons to become a negative ion (anion). Nonmetals like oxygen will increase in size when creating negative ions due to a weaker pull on the electrons from the nuclei when an additional electron is added. This is because there are more electrons than protons when an anion is formed.

7. Challenge Question:

An ionic compound is composed of an unknown element X and Chlorine. Is element X more likely to be a metal or nonmetal?

Element X would be a metal. Ionic compounds are composed of metals and nonmetals. Since chlorine is a nonmetal, element X has to be a metal.