

## Cover Sheet | Observing Metallic and Non-Metallic Character (VCE Unit 1 AoS1)

<b>Related Key Knowledge or Key Science Skills</b>	the periodic table as an organisational tool to identify patterns and trends in, and relationships between, the structures (including shell and subshell electronic configurations and atomic radii) and properties (including electronegativity, first ionisation energy, metallic and non-metallic character and reactivity) of elements
<b>Recommended time of activity</b>	<ul style="list-style-type: none"><li>● Students understand the patterns and trends in the periodic table. Now can they see any of these trends in the Physical properties? I used this in the second session of the double, <math>\frac{1}{3}</math> to <math>\frac{1}{4}</math> of the class at the time and discussed. A chance to meet the students and talk a little of chemistry, and how Chemistry is just what we see in the chemicals.</li><li>● A chance to go over Metallic and Non-Metallic Character a second time.</li><li>● An opportunity to discuss the chemistry</li><li>● Recap Metals and Non-metals before Bonding Between (Periodic Table and Bonding)</li></ul>
<b>Post Activity Reflection</b>	<ul style="list-style-type: none"><li>● I tightened the lesson for the other Unit 1 &amp; 2 Chemistry Teacher (see V2 file) to focus on the clearer differences).</li><li>● If I had my time again, at the start of the unit I would define pattern and trends, and then look for patterns and trend in the Physical properties of the elements (before the periodic table trends). I would then circle back at the end of Periodic Table trends, and discuss can we observe any of these trends? Why/why not? Focusing on the second part, and why we can't (also provides a metal/non-metal recap).</li></ul>

### Pre Reading

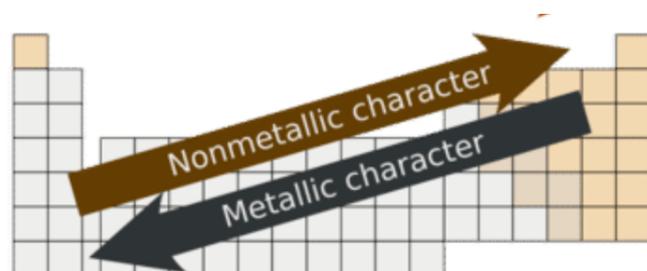
#### Period Trends

Periodic trends are specific patterns that are present in the periodic table that illustrate different aspects of a certain element, including its size and its electronic properties. Major periodic trends include: electronegativity, ionization energy, atomic radius, melting point, and metallic character.

Periodic trends, arising from the arrangement of the periodic table, provide chemists with an invaluable tool to quickly predict an element's properties. These trends exist because of the similar atomic structure of the elements within their respective group families or periods, and because of the periodic nature of the elements.

#### Metallic and Non-Metallic Character

Metallic character refers to the level of reactivity of a metal (or chemical properties associated with metals). Metals tend to lose electrons in chemical reactions, as indicated by their low ionization energies. Within a compound, metal atoms have relatively low attraction for electrons, as indicated by their low electronegativities. By following the trend summary in the figure below, you can see that the most reactive metals would reside in the lower left portion of the periodic table.



The most reactive metal is cesium, which is not found in nature as a free element. It reacts explosively with water and will ignite spontaneously in air. Francium is below cesium in the alkali metal group, but is so rare that most of its properties have never been observed.

In general, the properties of metals arise from the fact that they readily lose electrons.

Non-metallic character refers to the level of reactivity of a non-metals (or chemical properties associated with non-metals). Nonmetals tend to gain electrons in chemical reactions, and have a high attraction for electrons within a compound. The most reactive nonmetals reside in the upper right portion of the periodic table. Since the noble gases are a special group because of their lack of reactivity, the element fluorine is the most reactive nonmetal. It is not found in nature as a free element. Fluorine gas reacts explosively with many other elements and compounds, and is considered to be one of the most dangerous known substances.

Note that there is no clear division between metallic and non-metallic character. As we move across the periodic table, there is an increasing tendency to accept electrons (nonmetallic) and a decrease in the possibility that an atom will give up one or more electrons.

Adapted from:

[https://chem.libretexts.org/Bookshelves/Inorganic\\_Chemistry/Supplemental\\_Modules\\_and\\_Websites\\_\(Inorganic\\_Chemistry\)/Descriptive\\_Chemistry/Periodic\\_Trends\\_of\\_Elemental\\_Properties/Periodic\\_Trends](https://chem.libretexts.org/Bookshelves/Inorganic_Chemistry/Supplemental_Modules_and_Websites_(Inorganic_Chemistry)/Descriptive_Chemistry/Periodic_Trends_of_Elemental_Properties/Periodic_Trends)

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# Observing Metallic and Non-Metallic Character

Name: \_\_\_\_\_

## Pre-Activity

1. Define the following terms, and list the properties associated with high metallic and high non-metallic character.

Term	Definition	Associated Properties
Trend		
Metallic Character		
Non-Metallic Character		

## Activity

2a. Using the physical element set, identify an element with high metallic character, and high non-metallic character. Justify your response referring to the properties of the elements.

	Element	Justification
Metal		
Non-Metal		

3. Using the physical element set, describe the metallic and non-metallic character trends in:

- the following **Periods**:

Period	Elements	Description of the trend in metallic character
2	B, C, N	
3	Mg, Al, Si, S	
4	Ti, V, Mn, Fe, Co, Ni, Cu, Zn, Ga, Se	
5	Zr, Nb, Mo, Ag, Cd, In, Sn, Sb, Te	
6	Ta, W, Au, Pb, Bi	

- the following **Groups**:

Group	Elements	Description of the trend in metallic character
13	B, Al, Ga, In	
14	C, Si, Sn, Pb	
15	N, Sb, Bi	
16	S, Se, Te	

### Post Activity

**Accuracy:** The extent to which an experimental result obtained from an investigation agrees with the accepted, or 'true', value of the particular quantity being measured.

1a. Do you think the trends observed are an accurate measure of metallic and non-metallic character? Why/why not?

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1b. Describe a more accurate way to measure metallic character or non-metallic character.

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4. In Year 7 & 8 you learnt about metals, non-metal and metalloids (properties of metals and non-metals). Using your understanding of metal and non-metal character trends, explain the shapes of the metal, metalloid and non-metal sections.

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		H																	He														
		Li	Be															B	C	N	O	F	Ne										
		Na	Mg															Al	Si	P	S	Cl	Ar	metals									
		K	Ca	Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn	Ga	Ge	As	Se	Br	Kr														
		Rb	Sr	Y	Zr	Nb	Mo	Tc	Ru	Rh	Pd	Ag	Cd	In	Sn	Sb	Te	I	Xe	metalloids													
		Cs	Ba	La	Hf	Ta	W	Re	Os	Ir	Pt	Au	Hg	Tl	Pb	Bi	Po	At	Rn														
		Fr	Ra	Ac	Rf	Db	Sg	Bh	Hs	Mt	Ds	Rg	Uub	—	Uuq	—	—	—	nonmetals														
																				Ce	Pr	Nd	Pm	Sm	Eu	Gd	Tb	Dy	Ho	Er	Tm	Yb	Lu
																				Th	Pa	U	Np	Pu	Am	Cm	Bk	Cf	Es	Fm	Md	No	Lr