

**Lesson Topic:** Metals, Metalloids, and Nonmetals

**Objective:**

Students will be able to:

1. Identify the properties of metals, metalloids, and nonmetals.
2. Identify metals, metalloids, and nonmetals on a Periodic Table.
3. Create an element superhero that applies the properties of the element.

**Time Required:** 75 minutes

**Materials Needed:**

- Teacher computer with internet access
- Projector/Smartboard
- 1 computer/laptop/iPad per student with internet access
- Coloring utensils
- White paper (1 per group)
- Metals, Metalloids, and Nonmetals handout (attached)
- Science Website to help in choosing their element: <https://sciencenotes.org/>
- A real life example of a metal, nonmetal, and metalloid
  - Suggestion: silver necklace or silverware, helium filled balloon, electronic device (silicon)

**Teacher Preparation:**

- Assign a Legends of Learning Content Review [Quick Play](#) playlist for the day(s) you will be teaching the lesson.
  - Content Review - Middle School - Metals, Metalloids, and Nonmetals
- Make copies of Metals, Metalloids, and Nonmetals Worksheet (1 per student)

**Engage (5 minutes):**

1. Show students an example of a metal, nonmetal, and a metalloid: Silver necklace, electronic device - silicon, helium balloon.
2. Tell students “Here we have a silver necklace, my iPhone and a balloon. With the person sitting next to you, discuss what these three objects have in common.”
  - a. Give students time to discuss.
3. Ask “What did you come up with?” (Answers may vary)
4. Tell students “Each of these items is made from a raw material found on the periodic table. In fact, they are all part of a different group on the periodic table that we are going to be talking about today: Metals, Metalloids, and Nonmetals.”

**Explore (20 minutes):**

1. Pass out the Metals, Metalloids, and Nonmetals handout.
2. Put students into groups of three.
  - a. Each student in the group will represent a metal, nonmetal, or metalloid on the periodic table.
3. Tell students “Go to the website at the top of the page.”
  - a. Type in the name of the group you were assigned into the search bar.

- i. A list of elements should pop up.
    - b. Based on the type of element you are (metal, nonmetal, or metalloid) choose one of the elements.
  4. Tell students “Research and take notes on that element for the next 10 minutes. You are free to use other websites, just be sure to write down the sources you use.”
  5. After ten minutes, tell students “Now that you know something about your element, come up with a superhero based on its characteristics. Look at the example in the handout.
    - a. Fill out the handout based on your element.
  6. Give students time to work.

**Explain (15 minutes):**

1. Tell students “Before we begin looking at the Periodic Table, let’s write down some key vocabulary (write on the board):
  - a. Key is attached.
2. Tell students to turn to the Periodic Table of Elements in their handout and display a copy on the projector/document camera.
  - a. Complete the below steps with students on an overhead projector or doc camera.
3. With a colored pencil, shade the elements that are metals (key attached).
  - a. Be sure to label which color is the metals in the margins.
4. With another color, shade the elements that are metalloids (key attached).
  - a. Notice a stair step is made separating the metals and the metalloids.
5. With a third color, shade the elements that are nonmetals (key attached).
  - a. Notice a stair step is made separating the metalloids and the nonmetals.
6. Tell students “Notice that the Periodic Table is designed with the elements grouped and separated in this way.”
7. Ask “Which element seems to be out of order?” (Hydrogen)
  - a. Tell students ‘Hydrogen is a nonmetal, but because of other characteristics, is situated with the alkali metals on the left hand side of the periodic table.’”

**Elaborate (25 minutes):**

1. Have students get together with their group of three.
2. Have each of them share their Element Superhero with their group.
3. Tell students “Throughout comic book history, there have been powerful trios of superheroes, such as Batman, Robin, and Batgirl, or the Avengers Prime with Thor, Captain America and Ironman.
  - a. Put together your superhero trio of elements. How do they work together as a superhero group? How are their powers complementary and how are they different?”
4. Give each group a piece of white paper.
5. Have students draw and color their trio.
6. Follow the instructions on the handout.
7. Tell students “Be prepared to present your Superhero Trio.”
8. When students are finished, let them share their posters and back stories with small groups or with the whole class.

**Evaluate (10 minutes):**

1. Have your students [sign in to Legends of Learning](#). Instruct students to complete the Content Review playlist.
2. [Analyze student results](#) to determine what concepts need to be a focus for reteaching.

**Additional Lesson Strategies:**

- To use Legends for additional instruction, create a [custom playlist](#) with an [instructional game](#) and pre and post [assessment](#).
- To use Legends for a quick formative assessment, create a 5-question [assessment](#) in a [playlist](#).
- To use Legends for a student-directed experience, create a [targeted freeplay](#) playlist.
- Encourage students to play on their own at home in [Legends of Learning: Awakening](#) for a student-driven experience including avatars, battling, and quests all centered around topics they are covering in class.



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

## Metals, Metalloids, and Nonmetals

Go to the following website: <https://sciencenotes.org/>

1. What type of element have you been assigned? (Metals, Metalloids, or Nonmetals)
2. What element did you choose?

Write your notes below.

## Element Superhero



**Carbon Man**

**Powers:** the ability to duplicate himself and link together in long chains and shapeshift.

**Alter Ego:** Colin Baldwin, factory worker.

**Nemesis:** Climate X

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1. What is the name of your superhero?
2. What kind of powers does he/she have?
3. What is the name of its alter ego (regular name and job)?  
Hint: Clark Kent and Superman
4. Who is your superhero's nemesis (villain)?
5. What does he/she look like?

Vocabulary

<b>Metal</b>	<b>Metalloid</b>	<b>Nonmetal</b>

### Periodic Table of Elements

hydrogen 1 1.0079 litium	beryllium 4 9.0122																	helium 2 4.0026 neon	
3 Li 6.941 sodium	4 Be 9.0122 magnesium																	10 Ne 20.180 argon	
11 Na 22.990 potassium	12 Mg 24.305 calcium																	18 Ar 39.948 krypton	
19 K 39.098 rubidium	20 Ca 40.078 strontium																	36 Kr 83.80 xenon	
37 Rb 85.468 caesium	38 Sr 87.62 barium																	54 Xe 131.29 radon	
55 Cs 132.91 francium	56 Ba 137.33 caesium																	86 Rn 222 astatine	
71 Lu 174.967 lutetium	72 Hf 178.49 rutherfordium	73 Ta 180.947 tantalum	74 W 183.84 wolfram	75 Re 186.207 rhenium	76 Os 190.23 osmium	77 Ir 192.22 iridium	78 Pt 195.084 platina	79 Au 196.9665 aurum	80 Hg 200.59 hydrargyrum	81 Tl 204.38 thallium	82 Pb 207.2 plumbum	83 Bi 208.9804 bismuthum	84 Po 209 polonium	85 At 210 astatine	86 Rn 222 radon				
87 Fr 223 francium	88 Ra 226 radium	89-102 Lanthanide series	103 Lr 260 lawrencium	104 Rf 261 rutherfordium	105 Db 262 dubnium	106 Sg 263 seaborgium	107 Bh 264 bohrium	108 Hs 265 hassium	109 Mt 266 meitnerium	110 Uun 267 unbinilium	111 Uuu 268 ununilium	112 Uub 269 ununbium	113 Uuq 270 ununquadium	114 Uuq 271 ununquadium	115 Uup 272 ununpentium	116 Uuq 273 ununquadium	117 Uuh 274 ununheptium	118 Uuo 276 ununoctium	
119 Uue 288 ununennium	120 Uuq 289 ununquadium	121 Uuq 290 ununquadium	122 Uuq 291 ununquadium	123 Uuq 292 ununquadium	124 Uuq 293 ununquadium	125 Uuq 294 ununquadium	126 Uuq 295 ununquadium	127 Uuq 296 ununquadium	128 Uuq 297 ununquadium	129 Uuq 298 ununquadium	130 Uuq 299 ununquadium	131 Uuq 300 ununquadium	132 Uuq 301 ununquadium	133 Uuq 302 ununquadium	134 Uuq 303 ununquadium	135 Uuq 304 ununquadium	136 Uuq 305 ununquadium	137 Uuq 306 ununquadium	138 Uuq 307 ununquadium
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### Superhero Trio

1. What are the elements in your trio?
2. Circle the elements on the Periodic Table above.
3. What are the names of the Superheroes in your trio?
4. What is the name of your trio (Ex: Avenger Prime)?
5. How did the three of you meet?
6. How do your powers work together?

Draw and color your superhero trio on the paper provided. Be prepared to present your trio.



**KEY**

<b>Metal</b>	<b>Metalloid</b>	<b>Nonmetal</b>
<ul style="list-style-type: none"> <li>· chemical elements</li> <li>· solid</li> <li>· relatively high melting points</li> <li>· hard</li> <li>· strong</li> <li>· durable</li> <li>· shiny</li> <li>· silvery gray in color</li> <li>· good conductors of electricity and heat</li> <li>· easy to work into various different shapes and forms (such as thin sheets and wires).</li> </ul>	<p>All properties are somewhere in between a metal and a nonmetal</p>	<ul style="list-style-type: none"> <li>· chemical element that is nearly the complete opposite of a metal.</li> <li>· Has a relatively low melting point, boiling point, and density.</li> <li>· brittle when solid</li> <li>· has poor thermal conductivity and electrical conductivity.</li> </ul>

1 H																	2 He															
3 Li	4 Be											5 B	6 C	7 N	8 O	9 F	10 Ne															
11 Na	12 Mg											13 Al	14 Si	15 P	16 S	17 Cl	18 Ar															
19 K	20 Ca	21 Sc	22 Ti	23 V	24 Cr	25 Mn	26 Fe	27 Co	28 Ni	29 Cu	30 Zn	31 Ga	32 Ge	33 As	34 Se	35 Br	36 Kr															
37 Rb	38 Sr	39 Y	40 Zr	41 Nb	42 Mo	43 Tc	44 Ru	45 Rh	46 Pd	47 Ag	48 Cd	49 In	50 Sn	51 Sb	52 Te	53 I	54 Xe															
55 Cs	56 Ba			72 Hf	73 Ta	74 W	75 Re	76 Os	77 Ir	78 Pt	79 Au	80 Hg	81 Tl	82 Pb	83 Bi	84 Po	85 At	86 Rn														
87 Fr	88 Ra			104 Rf	105 Db	106 Sg	107 Bh	108 Hs	109 Mt	110 Ds	111 Rg	112 Cn																				
																		57 La	58 Ce	59 Pr	60 Nd	61 Pm	62 Sm	63 Eu	64 Gd	65 Tb	66 Dy	67 Ho	68 Er	69 Tm	70 Yb	71 Lu
																		89 Ac	90 Th	91 Pa	92 U	93 Np	94 Pu	95 Am	96 Cm	97 Bk	98 Cf	99 Es	100 Fm	101 Md	102 No	103 Lr

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Blue = metal; Green = metalloid; Red = nonmetal