

Atoms – Level 2

Reviewed 2025

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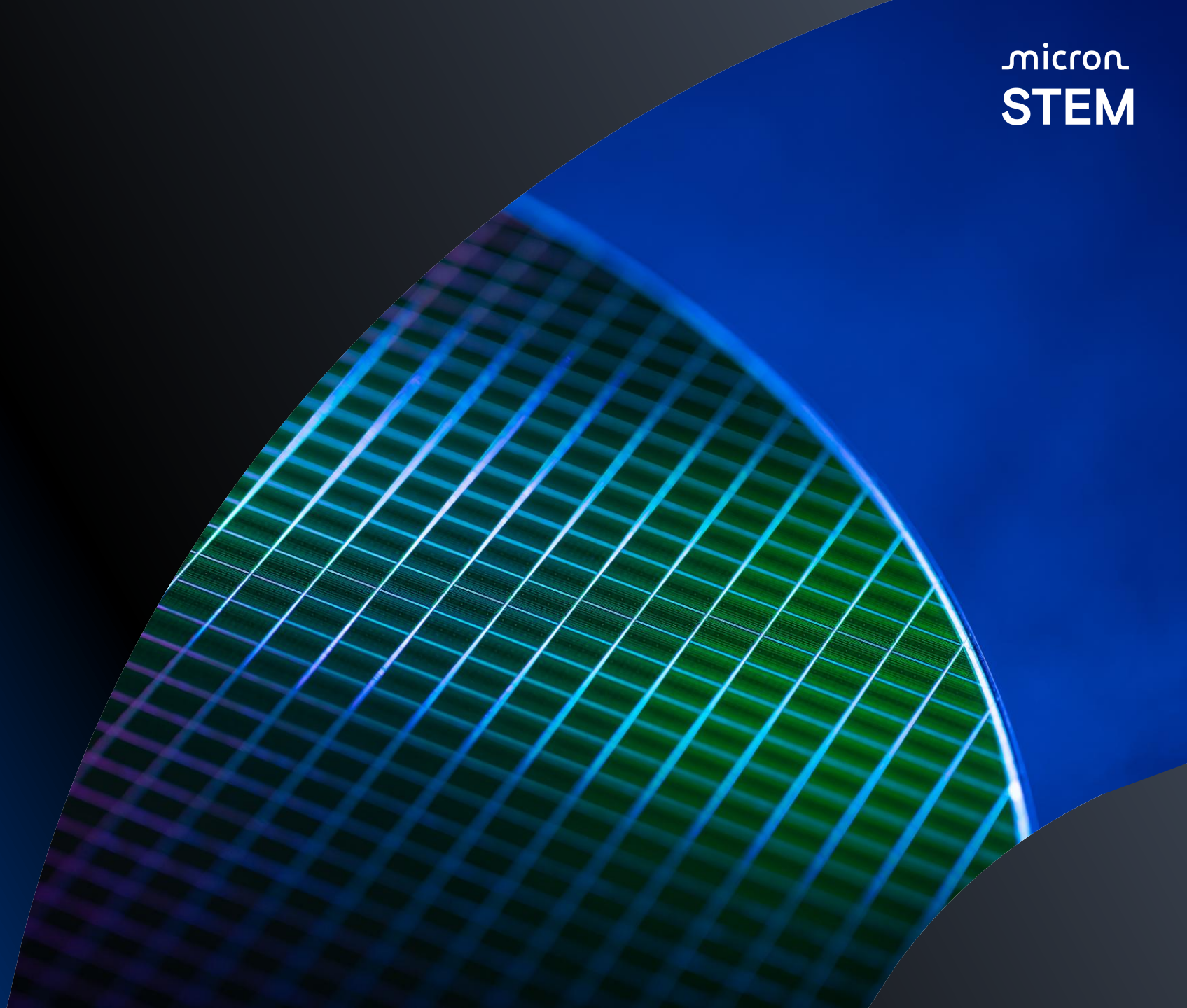
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Atoms

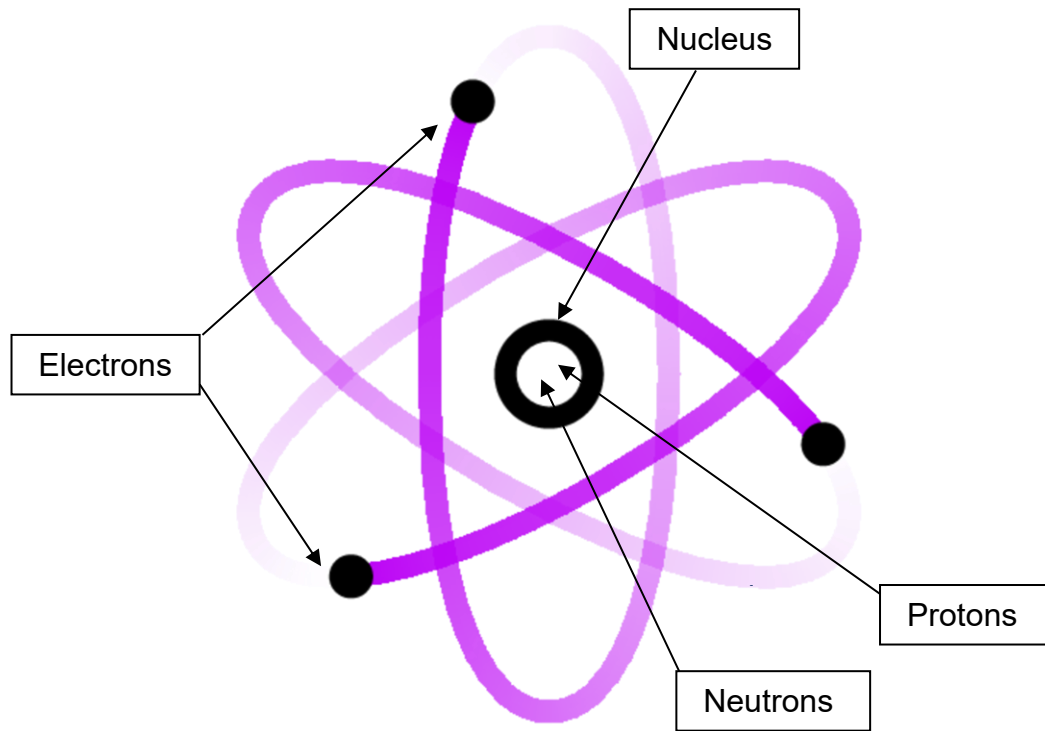
K-12 Semiconductor Topics
Level 2



Atomic Structure

Parts of an atom (sub-atomic particles)

Different combinations of the sub-atomic particles combine to make all the unique elements (atoms)



Nucleus

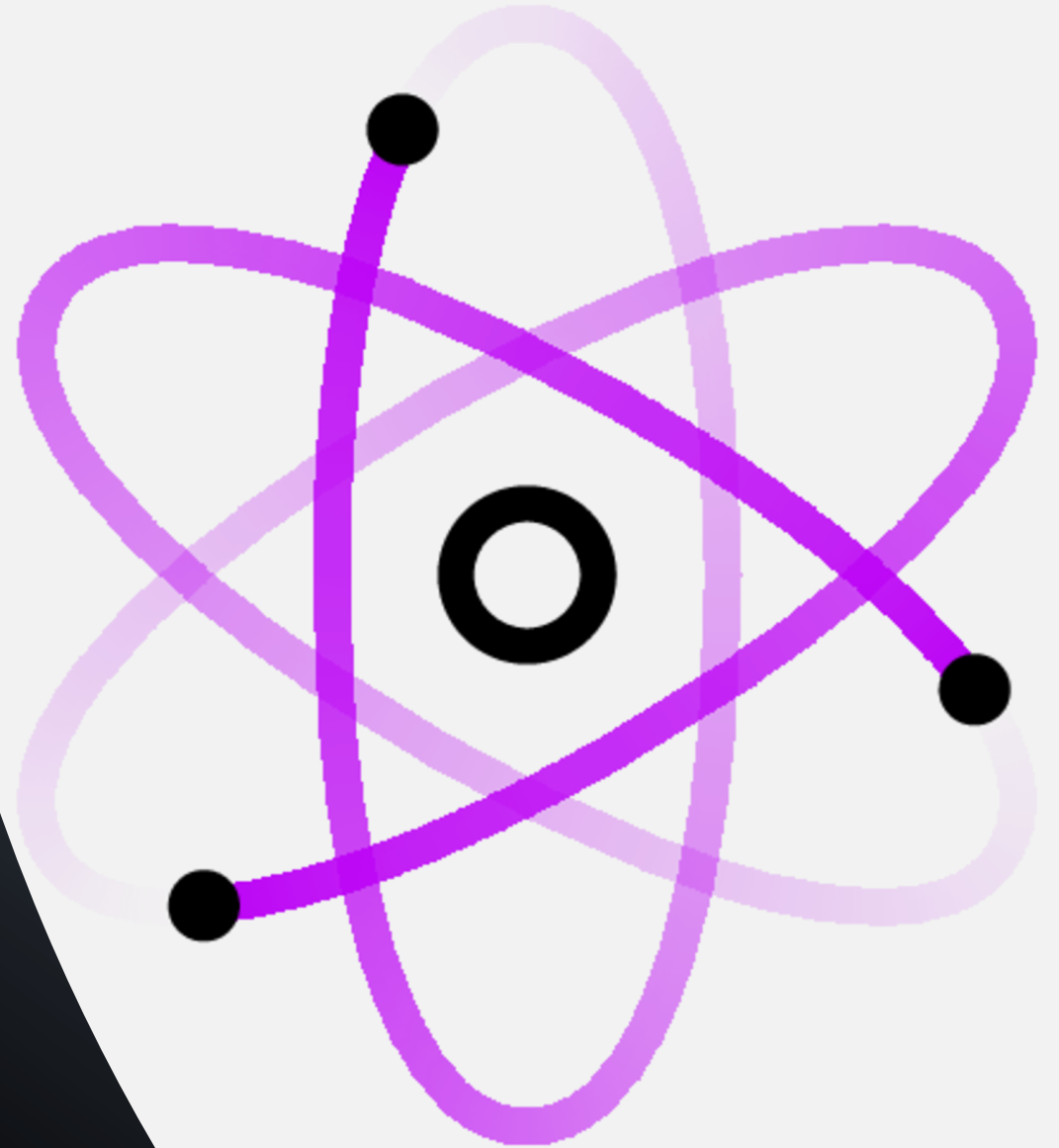
Proton

Neutron

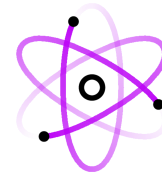
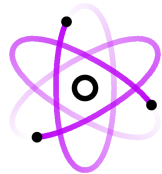
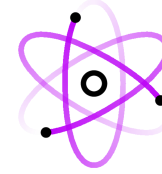
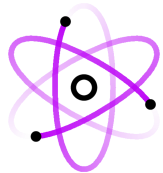
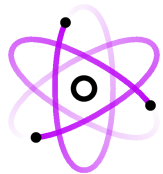
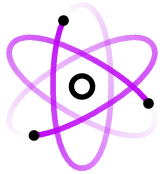
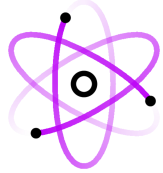
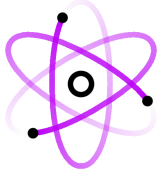
Electron

Orbital Shells and Valence Electrons

micron



Hi there! Mike Rawn here!
Let's keep building our
understanding of atoms
together.



Periodic table of the elements (atoms)

Initially designed in 1869 by scientist Dmitri Mendeleev.

- Elements are shown by their symbols.
- Elements are arranged in mass order (increasing atomic number).
- Horizontal rows are called **periods**.
 - Elements in the same period have similar properties and the same number of orbital shells.
- Vertical columns are called **groups**.
 - Elements in the same groups have the same number of electrons in the outer shell.



Rows = periods
Columns = groups
Got it!



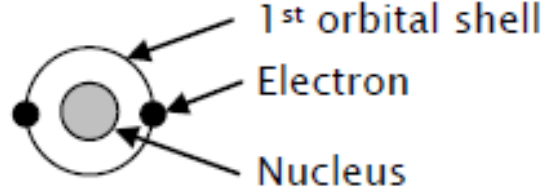
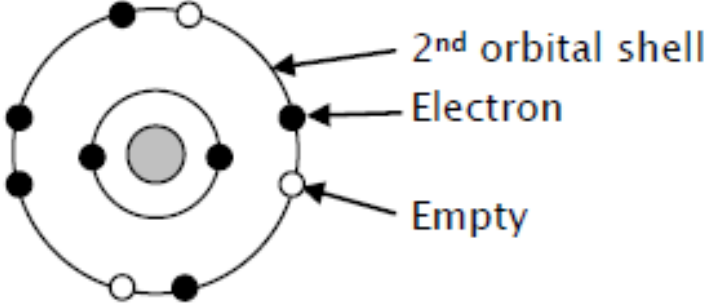
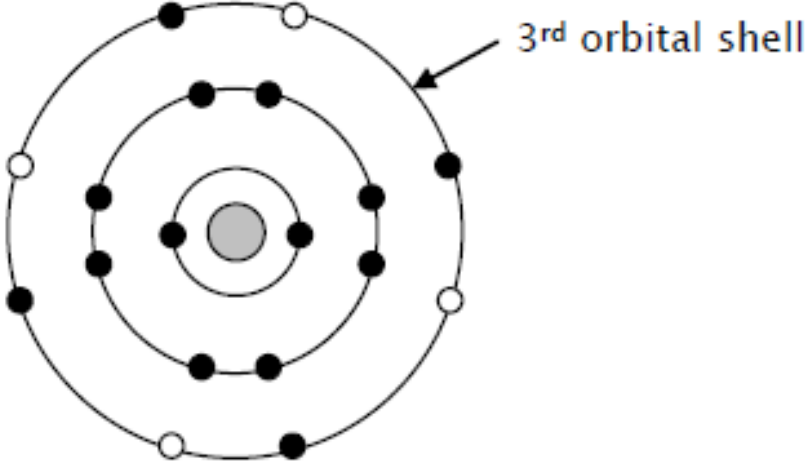
ACS
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PERIODIC TABLE OF ELEMENTS

GROUP																												18					
1		2												13	14	15	16	17										2					
PERIOD	1	<div>H</div> <div>Hydrogen</div> <div>1.008</div>																													<div>He</div> <div>Helium</div> <div>4.003</div>		
	2	<div>Li</div> <div>Lithium</div> <div>6.94</div>	<div>Be</div> <div>Beryllium</div> <div>9.012</div>																<div>B</div> <div>Boron</div> <div>10.81</div>	<div>C</div> <div>Carbon</div> <div>12.01</div>	<div>N</div> <div>Nitrogen</div> <div>14.01</div>	<div>O</div> <div>Oxygen</div> <div>16.00</div>	<div>F</div> <div>Fluorine</div> <div>19.00</div>										<div>Ne</div> <div>Neon</div> <div>20.18</div>
	3	<div>Na</div> <div>Sodium</div> <div>22.99</div>	<div>Mg</div> <div>Magnesium</div> <div>24.31</div>																<div>Al</div> <div>Aluminium</div> <div>26.98</div>	<div>Si</div> <div>Silicon</div> <div>28.09</div>	<div>P</div> <div>Phosphorus</div> <div>30.97</div>	<div>S</div> <div>Sulfur</div> <div>32.06</div>	<div>Cl</div> <div>Chlorine</div> <div>35.45</div>										<div>Ar</div> <div>Argon</div> <div>39.95</div>
	4	<div>K</div> <div>Potassium</div> <div>39.10</div>	<div>Ca</div> <div>Calcium</div> <div>40.08</div>	<div>Sc</div> <div>Scandium</div> <div>44.96</div>	<div>Ti</div> <div>Titanium</div> <div>47.88</div>	<div>V</div> <div>Vanadium</div> <div>50.94</div>	<div>Cr</div> <div>Chromium</div> <div>52.00</div>	<div>Mn</div> <div>Manganese</div> <div>54.94</div>	<div>Fe</div> <div>Iron</div> <div>55.85</div>	<div>Co</div> <div>Cobalt</div> <div>58.93</div>	<div>Ni</div> <div>Nickel</div> <div>58.69</div>	<div>Cu</div> <div>Copper</div> <div>63.55</div>	<div>Zn</div> <div>Zinc</div> <div>65.39</div>	<div>Ga</div> <div>Gallium</div> <div>69.72</div>	<div>Ge</div> <div>Germanium</div> <div>72.64</div>	<div>As</div> <div>Arsenic</div> <div>74.92</div>	<div>Se</div> <div>Selenium</div> <div>78.96</div>	<div>Br</div> <div>Bromine</div> <div>79.90</div>										<div>Kr</div> <div>Krypton</div> <div>83.79</div>					
	5	<div>Rb</div> <div>Rubidium</div> <div>85.47</div>	<div>Sr</div> <div>Strontium</div> <div>87.62</div>	<div>Y</div> <div>Yttrium</div> <div>88.91</div>	<div>Zr</div> <div>Zirconium</div> <div>91.22</div>	<div>Nb</div> <div>Niobium</div> <div>92.91</div>	<div>Mo</div> <div>Molybdenum</div> <div>95.96</div>	<div>Tc</div> <div>Technetium</div> <div>(98)</div>	<div>Ru</div> <div>Ruthenium</div> <div>101.1</div>	<div>Rh</div> <div>Rhodium</div> <div>102.9</div>	<div>Pd</div> <div>Palladium</div> <div>106.4</div>	<div>Ag</div> <div>Silver</div> <div>107.9</div>	<div>Cd</div> <div>Cadmium</div> <div>112.4</div>	<div>In</div> <div>Indium</div> <div>114.8</div>	<div>Sn</div> <div>Tin</div> <div>118.7</div>	<div>Sb</div> <div>Antimony</div> <div>121.8</div>	<div>Te</div> <div>Tellurium</div> <div>127.6</div>	<div>I</div> <div>Iodine</div> <div>126.9</div>										<div>Xe</div> <div>Xenon</div> <div>131.3</div>					
	6	<div>Cs</div> <div>Cesium</div> <div>132.9</div>	<div>Ba</div> <div>Barium</div> <div>137.3</div>	57-71 Lanthanides		<div>Hf</div> <div>Hafnium</div> <div>178.5</div>	<div>Ta</div> <div>Tantalum</div> <div>180.9</div>	<div>W</div> <div>Tungsten</div> <div>183.9</div>	<div>Re</div> <div>Rhenium</div> <div>186.2</div>	<div>Os</div> <div>Osmium</div> <div>190.2</div>	<div>Ir</div> <div>Iridium</div> <div>192.2</div>	<div>Pt</div> <div>Platinum</div> <div>195.1</div>	<div>Au</div> <div>Gold</div> <div>197.0</div>	<div>Hg</div> <div>Mercury</div> <div>200.5</div>	<div>Tl</div> <div>Thallium</div> <div>204.38</div>	<div>Pb</div> <div>Lead</div> <div>207.2</div>	<div>Bi</div> <div>Bismuth</div> <div>209.0</div>	<div>Po</div> <div>Polonium</div> <div>(209)</div>	<div>At</div> <div>Astatine</div> <div>(210)</div>										<div>Rn</div> <div>Radon</div> <div>(222)</div>				
	7	<div>Fr</div> <div>Francium</div> <div>(223)</div>	<div>Ra</div> <div>Radium</div> <div>(226)</div>	89-103 Actinides		<div>Rf</div> <div>Rutherfordium</div> <div>(261)</div>	<div>Db</div> <div>Dubnium</div> <div>(268)</div>	<div>Sg</div> <div>Seaborgium</div> <div>(271)</div>	<div>Bh</div> <div>Bohrium</div> <div>(270)</div>	<div>Hs</div> <div>Hassium</div> <div>(277)</div>	<div>Mt</div> <div>Meitnerium</div> <div>(276)</div>	<div>Ds</div> <div>Darmstadtium</div> <div>(281)</div>	<div>Rg</div> <div>Roentgenium</div> <div>(280)</div>	<div>Cn</div> <div>Copernicium</div> <div>(285)</div>	<div>Nh</div> <div>Nihonium</div> <div>(284)</div>	<div>Fl</div> <div>Flerovium</div> <div>(289)</div>	<div>Mc</div> <div>Moscovium</div> <div>(288)</div>	<div>Lv</div> <div>Livermorium</div> <div>(293)</div>	<div>Ts</div> <div>Tennessine</div> <div>(294)</div>										<div>Og</div> <div>Oganesson</div> <div>(294)</div>				
		57	58	59	60	61	62	63	64	65	66	67	68	69	70	71																	
		<div>La</div> <div>Lanthanum</div> <div>138.9</div>	<div>Ce</div> <div>Cerium</div> <div>140.1</div>	<div>Pr</div> <div>Praseodymium</div> <div>140.9</div>	<div>Nd</div> <div>Neodymium</div> <div>144.2</div>	<div>Pm</div> <div>Promethium</div> <div>(145)</div>	<div>Sm</div> <div>Samarium</div> <div>150.4</div>	<div>Eu</div> <div>Europium</div> <div>152.0</div>	<div>Gd</div> <div>Gadolinium</div> <div>157.2</div>	<div>Tb</div> <div>Terbium</div> <div>158.9</div>	<div>Dy</div> <div>Dysprosium</div> <div>162.5</div>	<div>Ho</div> <div>Holmium</div> <div>164.9</div>	<div>Er</div> <div>Erbium</div> <div>167.3</div>	<div>Tm</div> <div>Thulium</div> <div>168.9</div>	<div>Yb</div> <div>Ytterbium</div> <div>173.0</div>	<div>Lu</div> <div>Lutetium</div> <div>175.0</div>																	
		89	90	91	92	93	94	95	96	97	98	99	100	101	102	103																	
		<div>Ac</div> <div>Actinium</div> <div>(227)</div>	<div>Th</div> <div>Thorium</div> <div>232.0</div>	<div>Pa</div> <div>Protactinium</div> <div>231.0</div>	<div>U</div> <div>Uranium</div> <div>238.0</div>	<div>Np</div> <div>Neptunium</div> <div>(237)</div>	<div>Pu</div> <div>Plutonium</div> <div>(244)</div>	<div>Am</div> <div>Americium</div> <div>(243)</div>	<div>Cm</div> <div>Curium</div> <div>(247)</div>	<div>Bk</div> <div>Berkelium</div> <div>(247)</div>	<div>Cf</div> <div>Californium</div> <div>(251)</div>	<div>Es</div> <div>Einsteinium</div> <div>(252)</div>	<div>Fm</div> <div>Fermium</div> <div>(257)</div>	<div>Md</div> <div>Mendelevium</div> <div>(258)</div>	<div>No</div> <div>Nobelium</div> <div>(259)</div>	<div>Lr</div> <div>Lawrencium</div> <div>(262)</div>																	

Periods & Orbital Shells

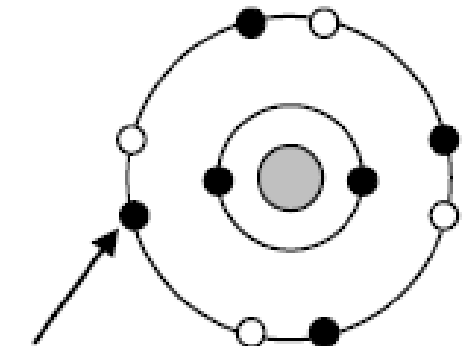
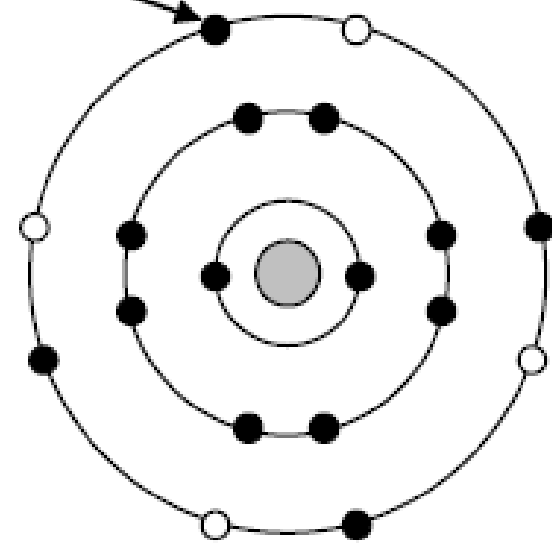
Elements in the same period (row) have similar properties and the same number of orbital shells.

<p>Period 1 elements fill electrons in the 1st orbital shell.</p>	 <p>He</p>
<p>Period 2 elements fill electrons in the 2nd orbital shell.</p> <p>The 1st shell is full.</p>	 <p>N</p>
<p>Period 3 elements fill electrons in the 3rd orbital shell.</p> <p>The 1st & 2nd shells are full.</p>	 <p>Si</p>

Groups & Valence Electrons

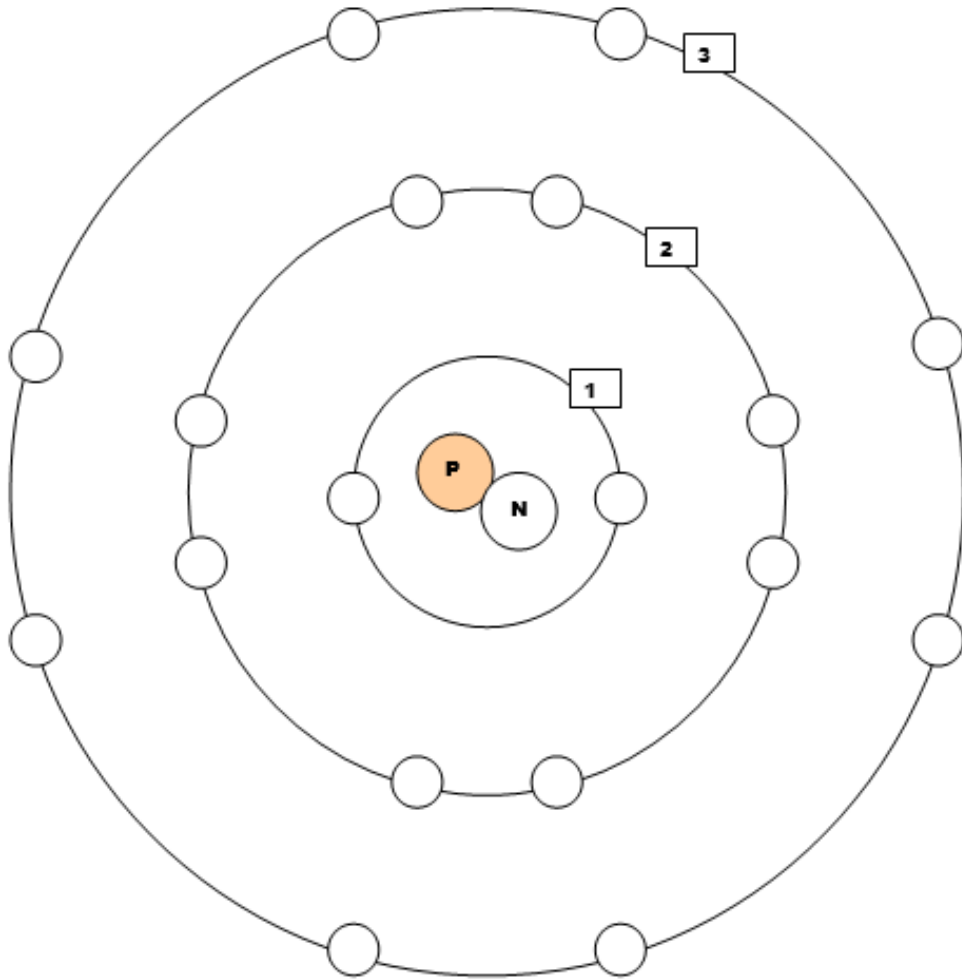
Elements in the same group (column) have the same number of electrons in the outer shell.

Electrons in the outer shell are called Valence Electrons.

Element	Group IV
6 C Carbon	 <p>Valence Electrons = 4</p>
14 Si Silicon	

Activity

Atom Orbitals Activity



Element = _____

Atomic Number = _____

Number of Protons = Atomic Number = _____

Atomic Mass (rounded to nearest whole number) = _____

Number of Neutrons = Atomic Mass - Atomic Number = _____

Number of Electrons = Number of Protons = _____

Period = _____ = Number of Orbitals

Group = _____ = Number of electrons in outermost orbital
(These are called *valence* electrons)

Congratulations on
completing the Atoms –
Level 2 module!



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