

# Atoms – Level 1

Reviewed 2025

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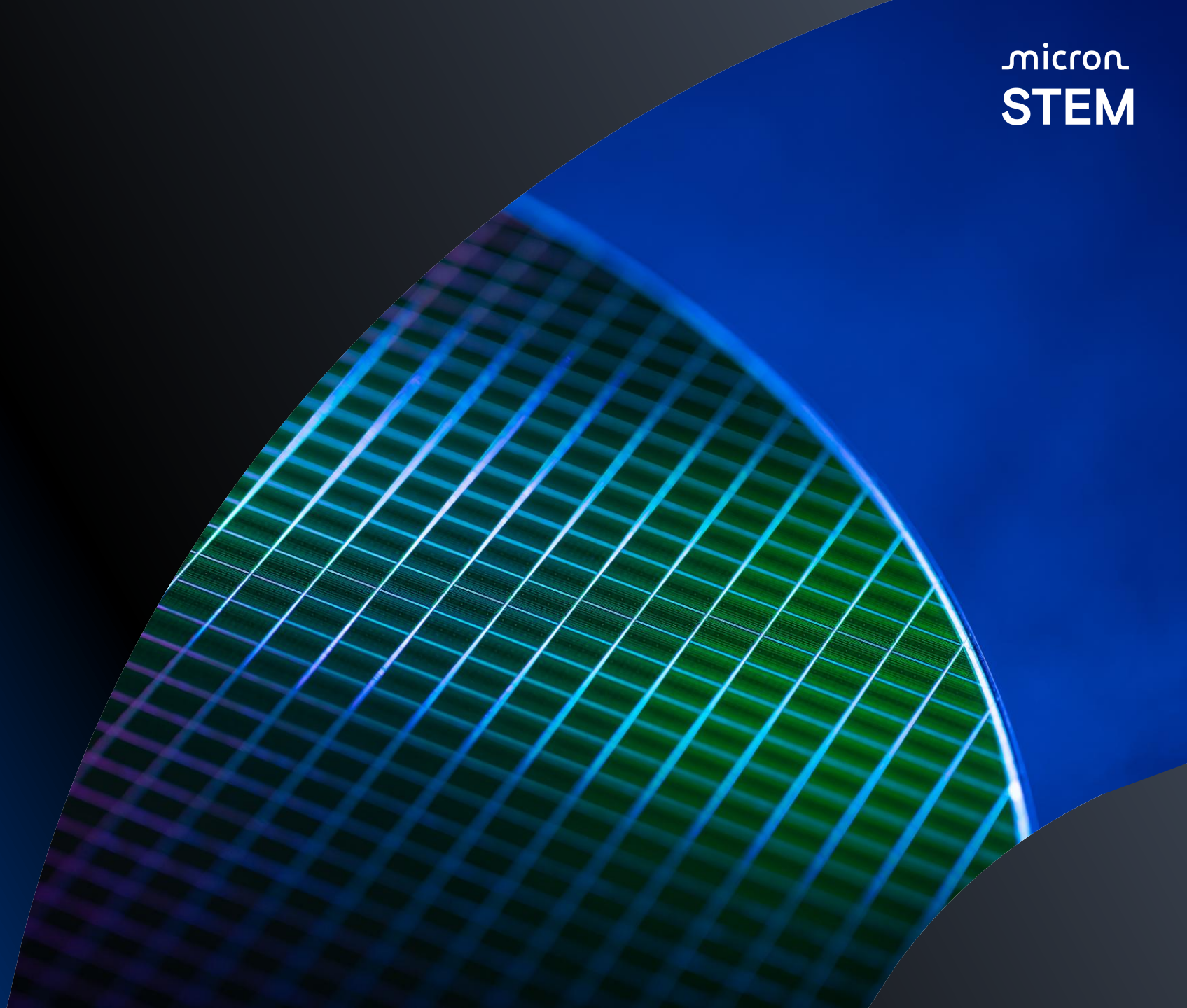
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# Atoms

K-12 Semiconductor Topics  
Level 1



Hi, I'm Mike Rawn,  
and I will be your  
learning guide  
through this  
module!





Sand, the sea, rocks, toys



Gases



What is everything made of?

Food



This girl and the bubbles



Our friends, the classroom



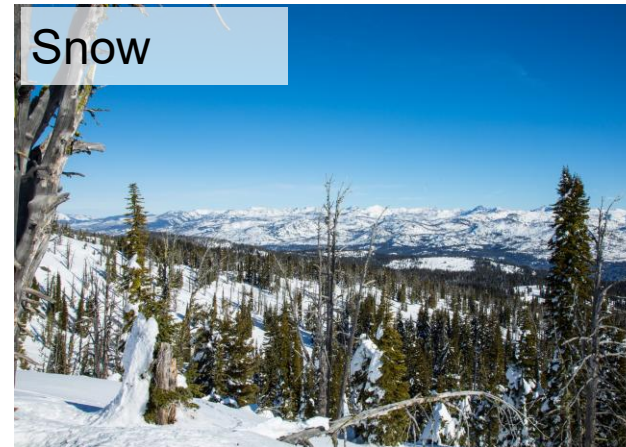
Trees, people, buildings



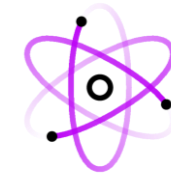
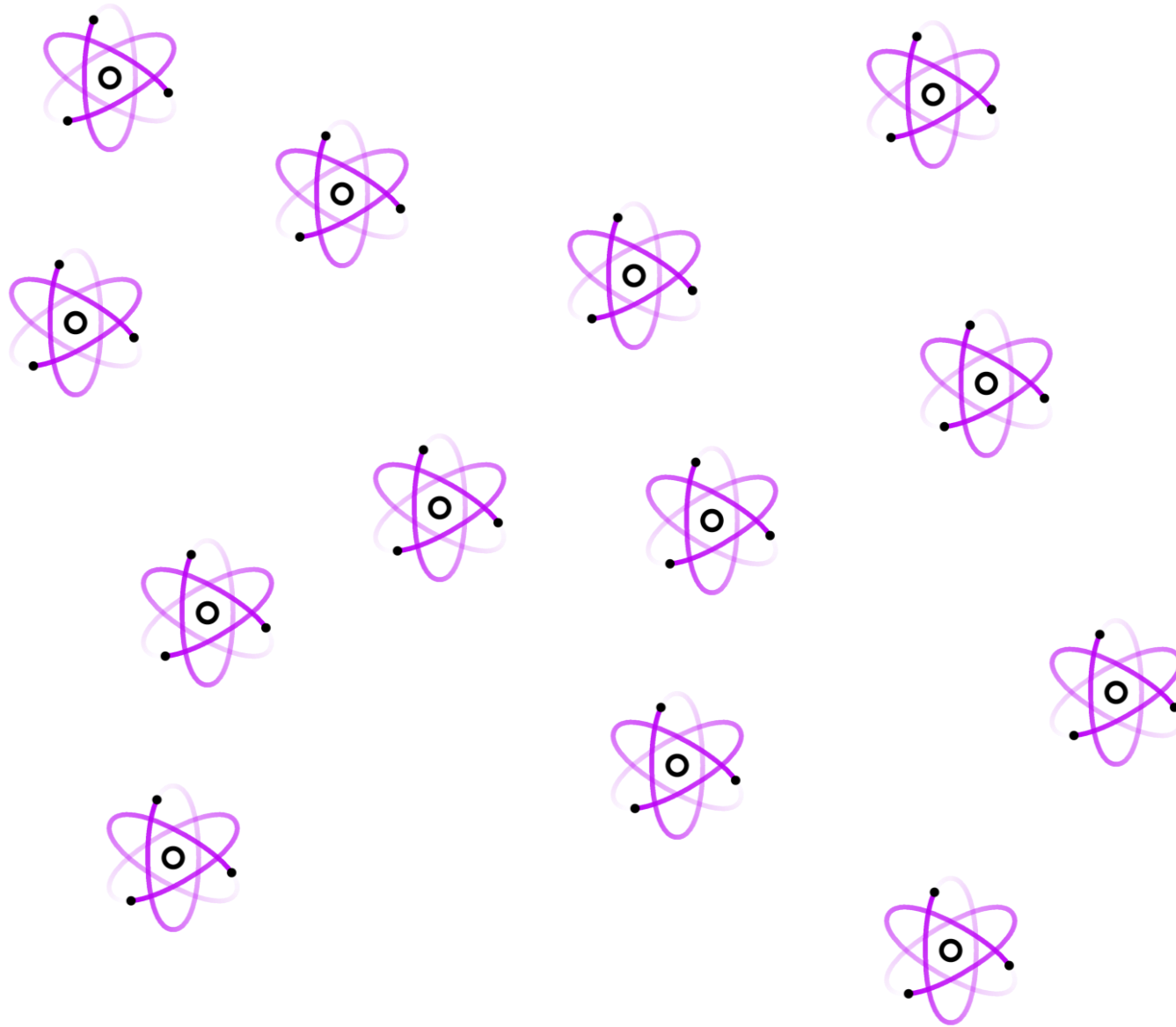
This lion



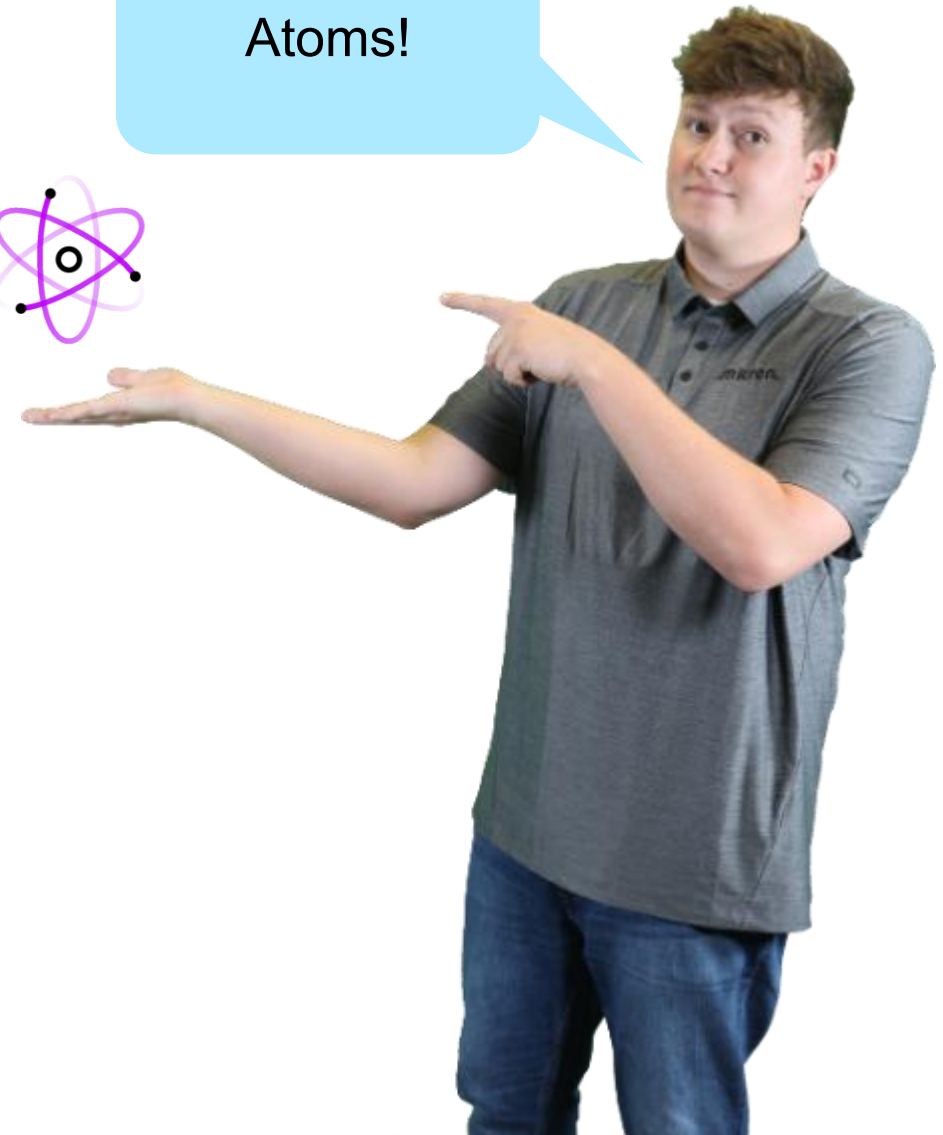
Snow







Atoms!



# Brief History Lesson: Meet Democritus

Greek philosopher – lived 460-370B.C.



Origin of the word 'atom' - Greek word meaning “uncuttable”



Scientists that study atoms are chemists and physicists



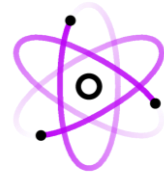
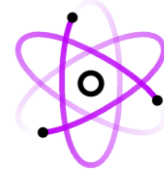
For thousands of years, scientists believed atoms were the smallest pure substances, until the early 20<sup>th</sup> century when it was discovered that atoms are made up of sub-atomic particles



Never trust an atom...

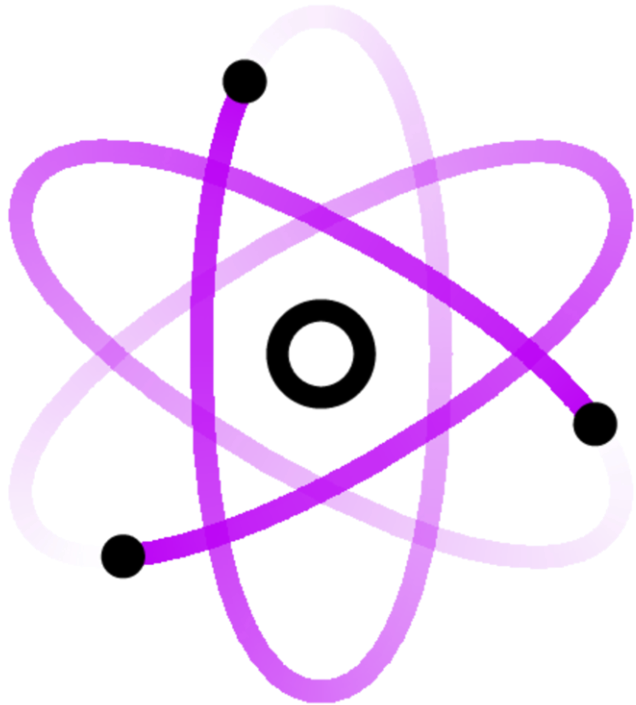


They make up everything!



# Atomic Structure

Parts of an atom (sub-atomic particles)



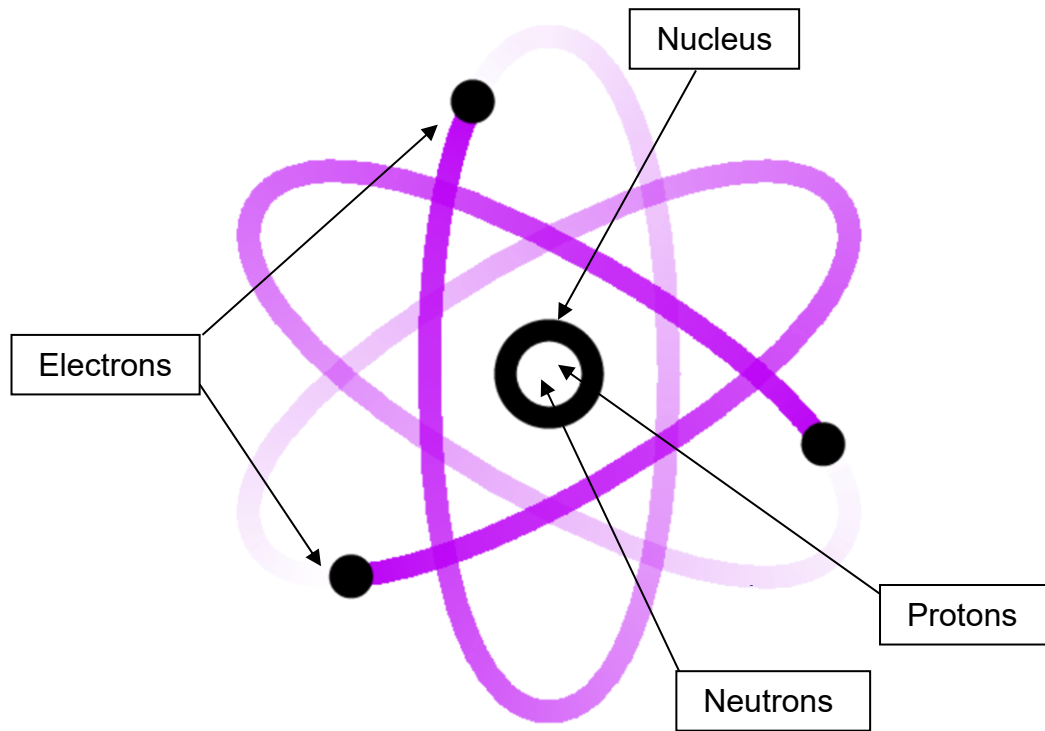
Atoms are so, so, small that we can't see them with our eyes. Not even with a magnifying glass!



# 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

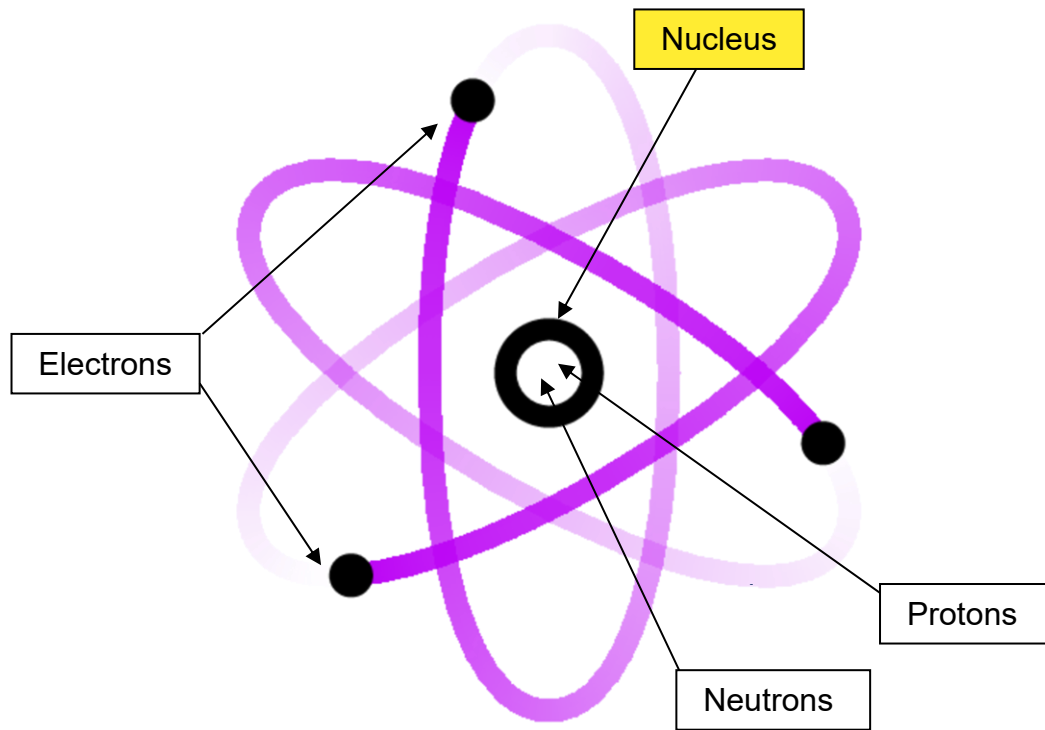
Electron



# Atomic Structure

Parts of an atom (sub-atomic particles)

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



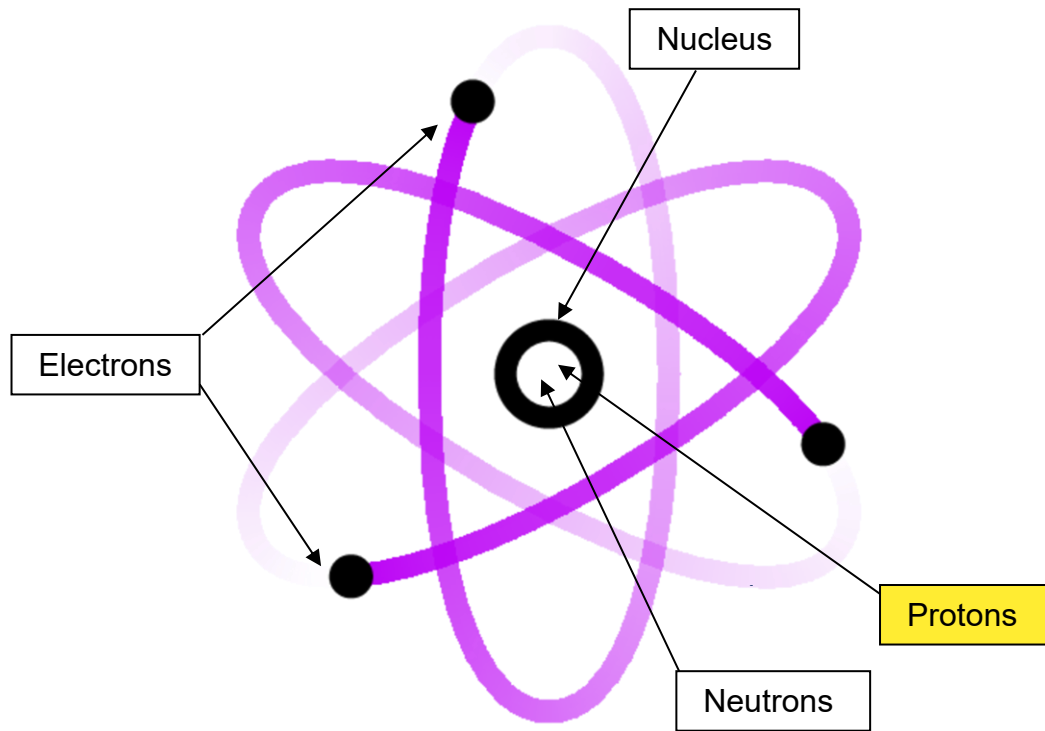
## Nucleus

- Positive charge - from Proton(s)
- Center of the Atom
- Houses Protons and Neutrons

# Atomic Structure

Parts of an atom (sub-atomic particles)

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



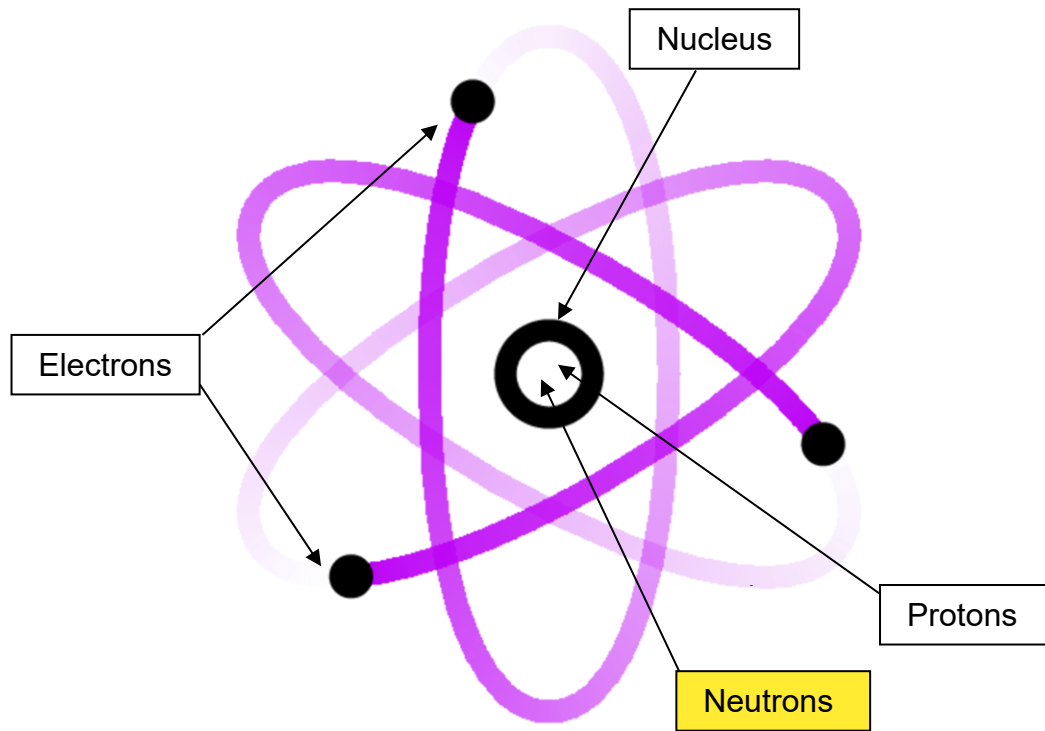
## Proton

- Positive charge (+)
- Number of protons is unique to every atom
- Greek word: "First"

# Atomic Structure

Parts of an atom (sub-atomic particles)

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



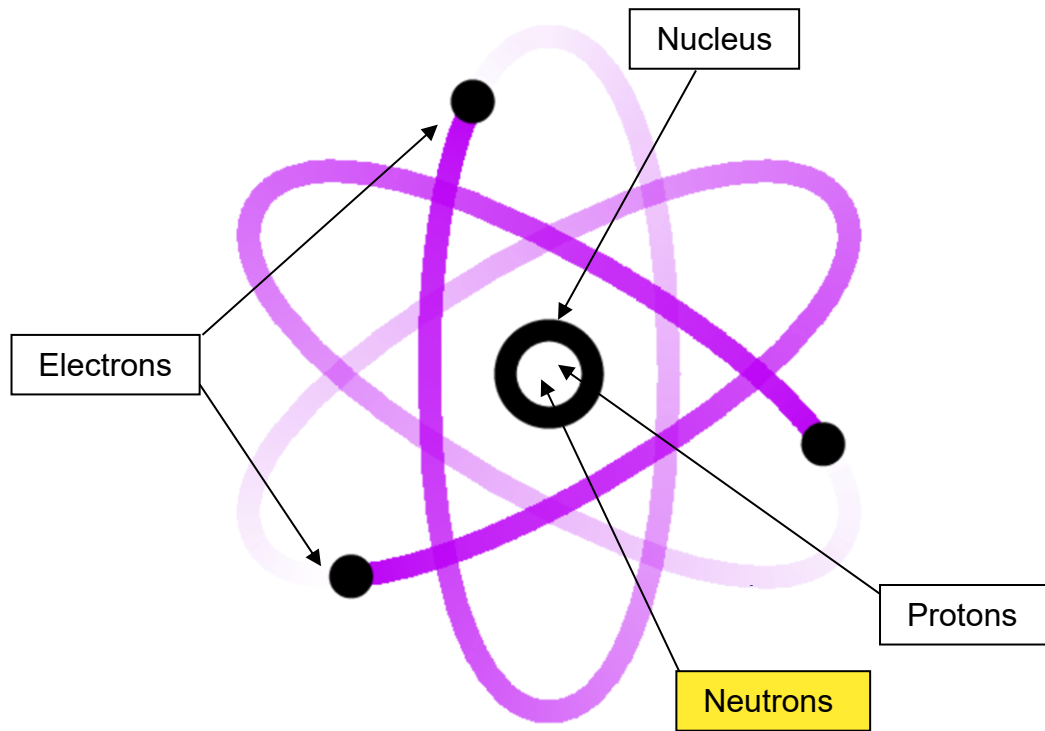
## Neutron

- No charge
- Defines the mass of the atom
- Latin word: “Neutral”

# Atomic Structure

Parts of an atom (sub-atomic particles)

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



A **neutron** walks into a restaurant. The waitress says, “For you, no charge!”



## Neutron

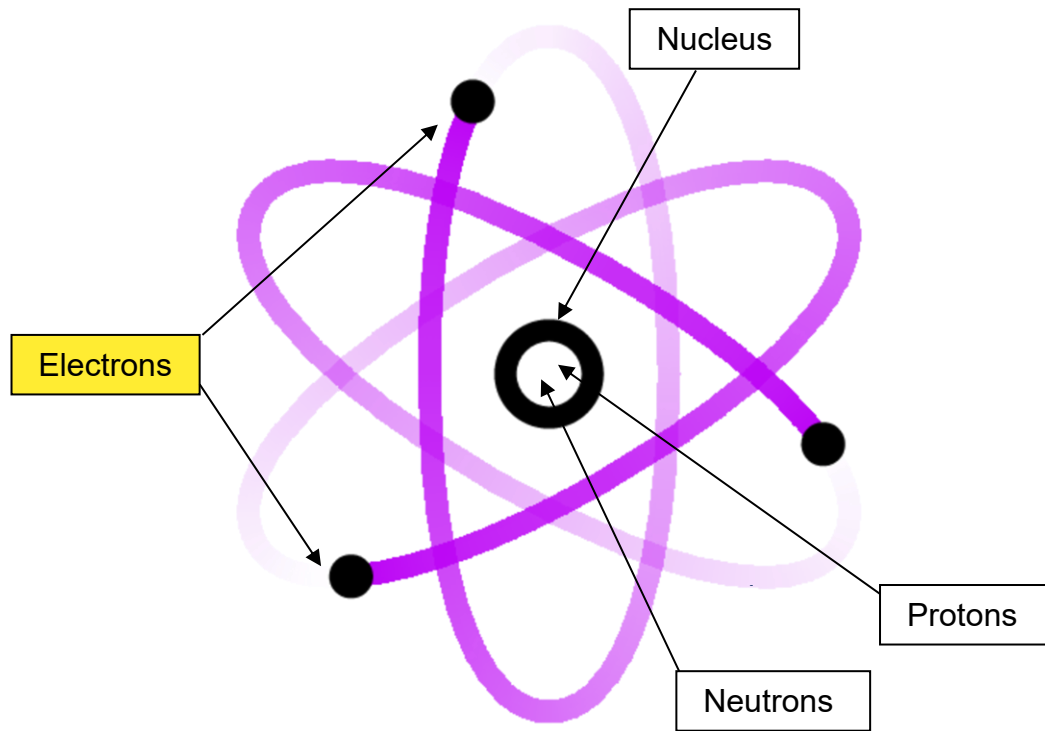
- No charge
- Defines the mass of the atom
- Latin word: “Neutral”



# Atomic Structure

Parts of an atom (sub-atomic particles)

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



## Electron

- Negative charge (-)
- Almost 2000 times smaller than a proton or neutron
- Not part of the nucleus
- Can be shared between atoms
- Certain atoms can lose or gain electrons



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# PERIODIC TABLE OF ELEMENTS

GROUP																		18					
1		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>	<div>57-71</div> <div>Lanthanides</div>	<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>	<div>89-103</div> <div>Actinides</div>	<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>				

78

Pt

Platinum

195.1

Atomic Number

Symbol

Name

Average Atomic Mass

Alkali Metals

Alkaline Earth Metals

Transition Metals

Other Metals

Metalloids

Non-metals

Halogens

Noble Gases

Lanthanides

Actinides

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>
<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>

- Alkali Metals
- Alkaline Earth Metals
- Transition Metals
- Other Metals
- Metalloids
- Non-metals
- Halogens
- Noble Gases
- Lanthanides
- Actinides

78 — Atomic Number

**Pt** — Symbol

Platinum — Name

195.1 — Average Atomic Mass

# Periodic Table of the Elements

Elements is another term for atoms

- Table initially designed in 1869 by scientist Dmitri Mendeleev.
- Elements are identified by their symbols (example: O for oxygen)
- Each element has their own cell with the following information:

- Atomic Number
- Atomic Symbol
- Name
- Atomic Mass

<b>1</b>
<b>H</b>
<b>Hydrogen</b>
<b>1.008 (1)</b>

Atomic Number

Atomic Symbol

Name

Atomic Mass

<b>11</b>
<b>Na</b>
<b>Sodium</b>
<b>22.99 (23)</b>

# A look at the Sodium atom

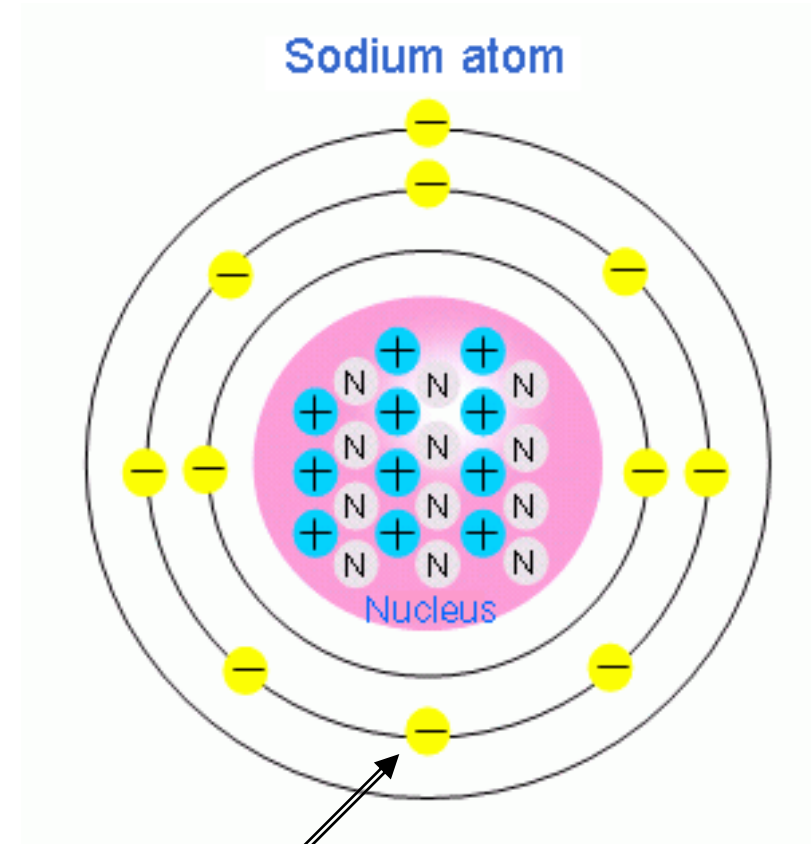
Atomic Number	<b>11</b>
Atomic Symbol	<b>Na</b>
Name	<b>Sodium</b>
Atomic Mass	<b>22.99 (23)</b>

Atomic Number = Number of Protons = **11**

Atomic Mass - Atomic Number = Number of Neutrons

$$23 - 11 = 12$$

Number of Protons = Number of Electrons = **11**

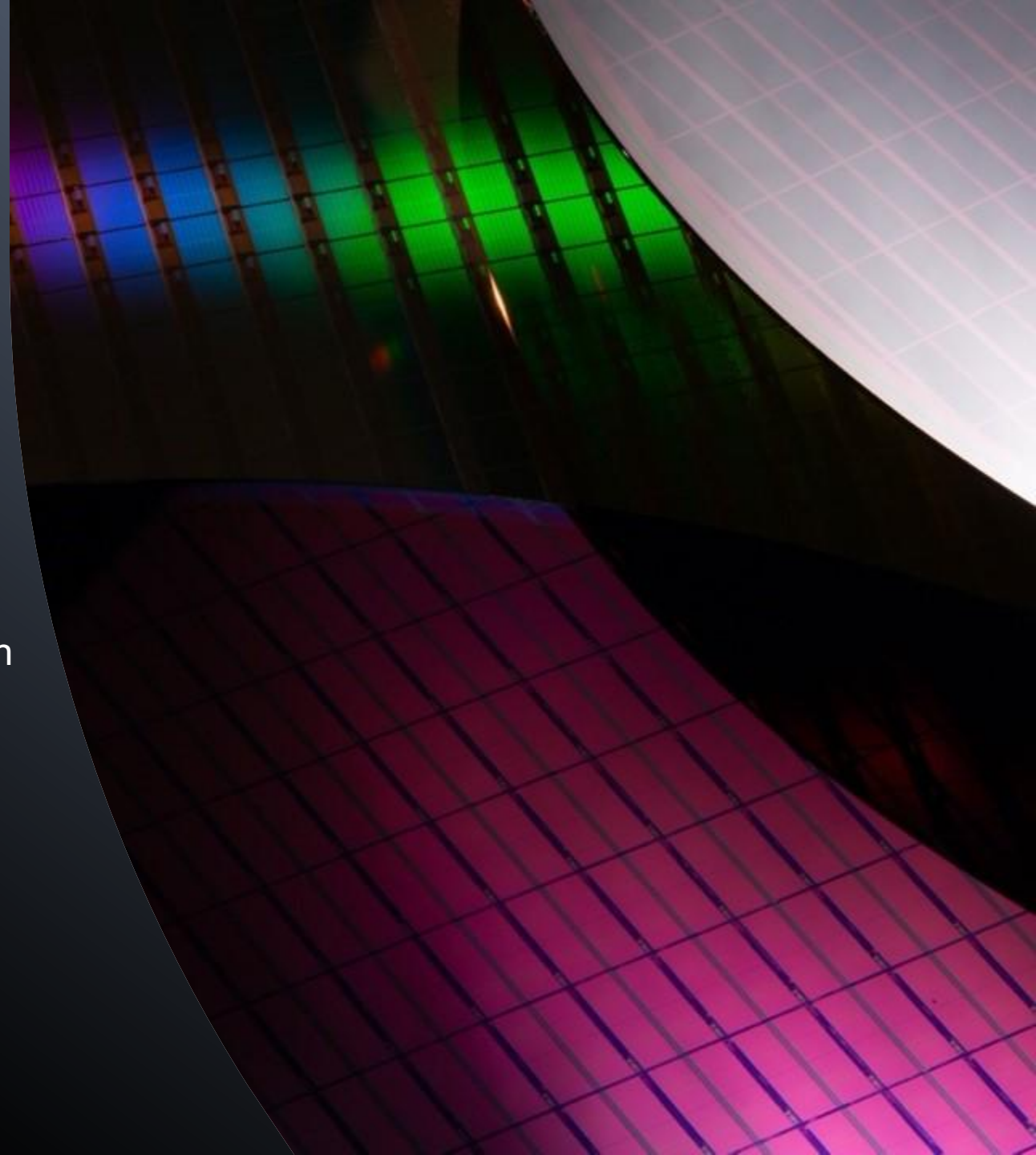




# Chemistry is used to make memory chips

Technology is constantly evolving and advancing, which makes STEM jobs exciting.

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# PERIODIC TABLE OF ELEMENTS

GROUP	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
PERIOD	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1	<b>H</b> Hydrogen 1.008																	<b>He</b> Helium 4.003
2	<b>Li</b> Lithium 6.94	<b>Be</b> Beryllium 9.012											<b>B</b> Boron 10.81	<b>C</b> Carbon 12.01	<b>N</b> Nitrogen 14.01	<b>O</b> Oxygen 16.00	<b>F</b> Fluorine 19.00	<b>Ne</b> Neon 20.18
3	<b>Na</b> Sodium 22.99	<b>Mg</b> Magnesium 24.31											<b>Al</b> Aluminum 26.98	<b>Si</b> Silicon 28.09	<b>P</b> Phosphorus 30.97	<b>S</b> Sulfur 32.06	<b>Cl</b> Chlorine 35.45	<b>Ar</b> Argon 39.95
4	<b>K</b> Potassium 39.10	<b>Ca</b> Calcium 40.08	<b>Sc</b> Scandium 44.96	<b>Ti</b> Titanium 47.88	<b>V</b> Vanadium 50.94	<b>Cr</b> Chromium 52.00	<b>Mn</b> Manganese 54.94	<b>Fe</b> Iron 55.85	<b>Co</b> Cobalt 58.93	<b>Ni</b> Nickel 58.69	<b>Cu</b> Copper 63.55	<b>Zn</b> Zinc 65.39	<b>Ga</b> Gallium 69.72	<b>Ge</b> Germanium 72.64	<b>As</b> Arsenic 74.92	<b>Se</b> Selenium 78.96	<b>Br</b> Bromine 79.90	<b>Kr</b> Krypton 83.79
5	<b>Rb</b> Rubidium 85.47	<b>Sr</b> Strontium 87.62	<b>Y</b> Yttrium 88.91	<b>Zr</b> Zirconium 91.22	<b>Nb</b> Niobium 92.91	<b>Mo</b> Molybdenum 95.96	<b>Tc</b> Technetium (98)	<b>Ru</b> Ruthenium 101.1	<b>Rh</b> Rhodium 102.9	<b>Pd</b> Palladium 106.4	<b>Ag</b> Silver 107.9	<b>Cd</b> Cadmium 112.4	<b>In</b> Indium 114.8	<b>Sn</b> Tin 118.7	<b>Sb</b> Antimony 121.8	<b>Te</b> Tellurium 127.6	<b>I</b> Iodine 126.9	<b>Xe</b> Xenon 131.3
6	<b>Cs</b> Caesium 132.9	<b>Ba</b> Barium 137.3	<b>57-71</b> Lanthanides	<b>Hf</b> Hafnium 178.5	<b>Ta</b> Tantalum 180.9	<b>W</b> Tungsten 183.9	<b>Re</b> Rhenium 186.2	<b>Os</b> Osmium 190.2	<b>Ir</b> Iridium 192.2	<b>Pt</b> Platinum 195.1	<b>Au</b> Gold 197.0	<b>Hg</b> Mercury 200.5	<b>Tl</b> Thallium 204.38	<b>Pb</b> Lead 207.2	<b>Bi</b> Bismuth 209.0	<b>Po</b> Polonium (209)	<b>At</b> Astatine (210)	<b>Rn</b> Radon (222)
7	<b>Fr</b> Francium (223)	<b>Ra</b> Radium (226)	<b>89-103</b> Actinides	<b>Rf</b> Rutherfordium (261)	<b>Db</b> Dubnium (268)	<b>Sg</b> Seaborgium (271)	<b>Bh</b> Bohrium (270)	<b>Hs</b> Hassium (277)	<b>Mt</b> Meitnerium (276)	<b>Ds</b> Darmstadtium (281)	<b>Rg</b> Roentgenium (280)	<b>Cn</b> Copernicium (285)	<b>Nh</b> Nihonium (284)	<b>Fl</b> Flerovium (289)	<b>Mc</b> Moscovium (288)	<b>Lv</b> Livermorium (293)	<b>Ts</b> Tennessine (294)	<b>Og</b> Oganesson (294)
				<b>La</b> Lanthanum 138.9	<b>Ce</b> Cerium 140.1	<b>Pr</b> Praseodymium 140.9	<b>Nd</b> Neodymium 144.2	<b>Pm</b> Promethium (145)	<b>Sm</b> Samarium 150.4	<b>Eu</b> Europium 152.0	<b>Gd</b> Gadolinium 157.2	<b>Tb</b> Terbium 158.9	<b>Dy</b> Dysprosium 162.5	<b>Ho</b> Holmium 164.9	<b>Er</b> Erbium 167.3	<b>Tm</b> Thulium 168.9	<b>Yb</b> Ytterbium 173.0	<b>Lu</b> Lutetium 175.0
				<b>Ac</b> Actinium (227)	<b>Th</b> Thorium 232.0	<b>Pa</b> Protactinium 231.0	<b>U</b> Uranium 238.0	<b>Np</b> Neptunium (237)	<b>Pu</b> Plutonium (244)	<b>Am</b> Americium (243)	<b>Cm</b> Curium (247)	<b>Bk</b> Berkelium (247)	<b>Cf</b> Californium (251)	<b>Es</b> Einsteinium (252)	<b>Fm</b> Fermium (257)	<b>Md</b> Mendelevium (258)	<b>No</b> Nobelium (259)	<b>Lr</b> Lawrencium (262)

- Alkali Metals
- Alkaline Earth Metals
- Transition Metals
- Other Metals
- Metalloids
- Non-metals
- Halogens
- Noble Gases
- Lanthanides
- Actinides

78 — Atomic Number

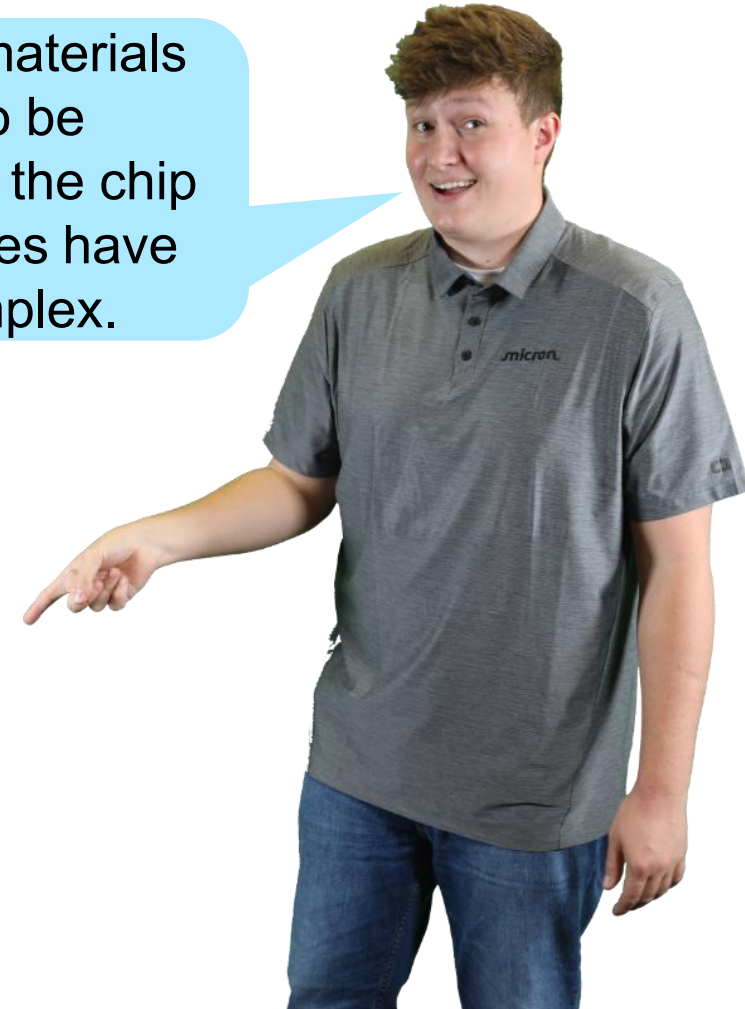
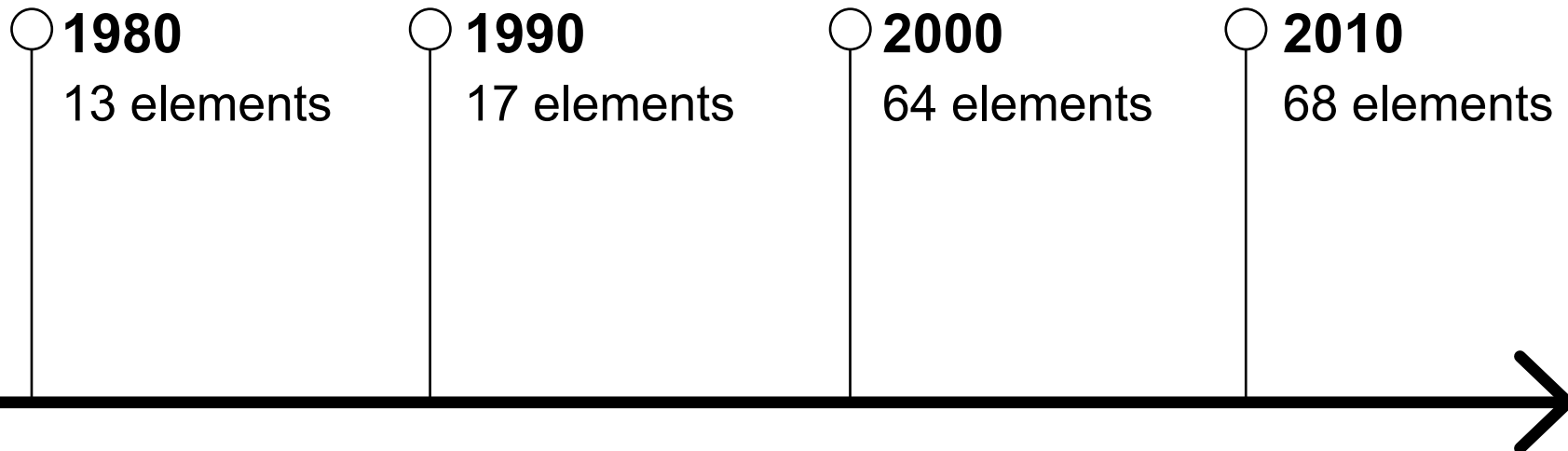
**Pt** — Symbol

Platinum — Name

195.1 — Average Atomic Mass

# The number of elements used in silicon chip fabrication has grown over the decades

Over the years new materials (elements) had to be incorporated because the chip designs and processes have become more complex.



# Atoms Activities

Atom Structure (activity paper is on next slide)

Periodic Table Cards (not shown in this slide deck)



# ATOMS

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

Refer to a Periodic Table and the Key below to fill out this table for each element. Start with helium as your first atom to make.

1. Fill out the table below with the correct values.
2. Assemble the nucleus using the proper number of large colored and white marshmallows, sticking them together with toothpicks.
3. Select the proper number of small colored marshmallows (all one color) as your electrons. Attach them one at a time to the nucleus with toothpicks, away from the nucleus.

ATOM	ATOMIC SYMBOL	ATOMIC NUMBER	NUMBER OF PROTONS (see key)	ATOMIC MASS (ROUNDED)	NUMBER OF NEUTRONS (see key)	NUMBER OF ELECTRONS (see key)
Hydrogen	<i>H</i>	<i>1</i>	<i>1</i>	<i>1.00</i>	<i>0</i>	<i>1</i>
Helium						
Lithium						
Beryllium						

Atomic Number

**1**

Atomic Symbol

**H**

Name

**Hydrogen**

Atomic Mass

**1.00794**

## KEY

**Number of Protons** = Atomic Number

(Use the large colored marshmallows for protons)

**Number of Neutrons** = Subtract Atomic Number from Atomic Mass

(Use the large white marshmallows for neutrons)

**Number of Electrons** = Number of Protons

(Use the small colored marshmallows for electrons)

Congratulations on  
completing the Atoms –  
Level 1 module!



Ready for more? Check out  
other modules at the Micron  
Educator Hub. See you soon!

# micron STEM

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