

Guiding Question: How can we model the electrons in an atom?

Learning Goal: Draw a Bohr model with electrons for the first 20 elements. Find patterns in the Periodic table for electrons.

Agenda

- 1) Daily Science Review-subatomic particles
- 2) Review/Finish #P, #N, #E
- 3) Bohr Model and Energy Levels Notes
- 4) Practice Bohr Model drawing for First 20
- 5) Card Activity
- 6) Patterns we found in Bohr Model-add to our notes
- 7) Exit Ticket

Words of the day

Electron Shells

Groups/Families

Periods

Energy Levels C-Notes

Electron Location Rules

**Write
Questions**


















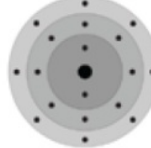


Patterns in Periodic Table

Valence Electrons

Write a summary

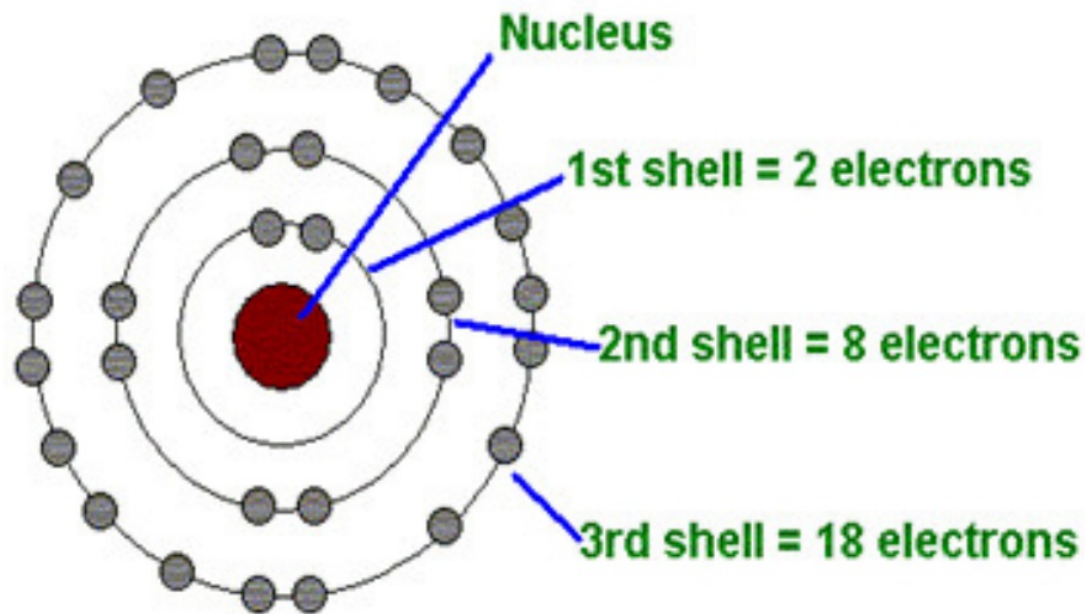
ENERGY LEVELS ELEMENTS 1-20

Complete each energy level model by drawing the correct number of electrons in their corresponding energy levels.

<p>HYDROGEN 1</p>  <p>1.01</p>								<p>HELIUM 2</p>  <p>4.00</p>
<p>LITHIUM 3</p>  <p>6.94</p>	<p>BERYLLIUM 4</p>  <p>9.01</p>	<p>BORON 5</p>  <p>10.81</p>	<p>CARBON 6</p>  <p>12.01</p>	<p>NITROGEN 7</p>  <p>14.01</p>	<p>OXYGEN 8</p>  <p>16.00</p>	<p>FLUORINE 9</p>  <p>19.00</p>	<p>NEON 10</p>  <p>20.18</p>	
<p>SODIUM 11</p>  <p>22.99</p>	<p>MAGNESIUM 12</p>  <p>24.31</p>	<p>ALUMINUM 13</p>  <p>26.98</p>	<p>SILICON 14</p>  <p>28.09</p>	<p>PHOSPHORUS 15</p>  <p>30.97</p>	<p>SULFUR 16</p>  <p>32.07</p>	<p>CHLORINE 17</p>  <p>35.45</p>	<p>ARGON 18</p>  <p>39.95</p>	
<p>POTASSIUM 19</p>  <p>39.10</p>	<p>CALCIUM 20</p>  <p>40.08</p>							

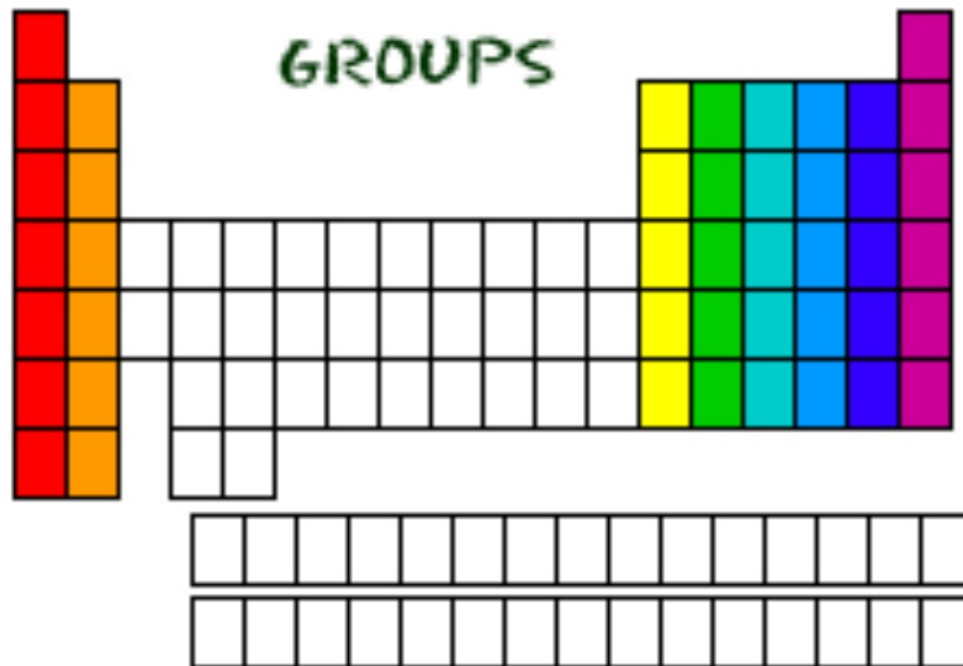
Electron Shells

The location of the electrons around the nucleus, according to Bohr. The electrons "fill" in a regular pattern.



Groups/Families

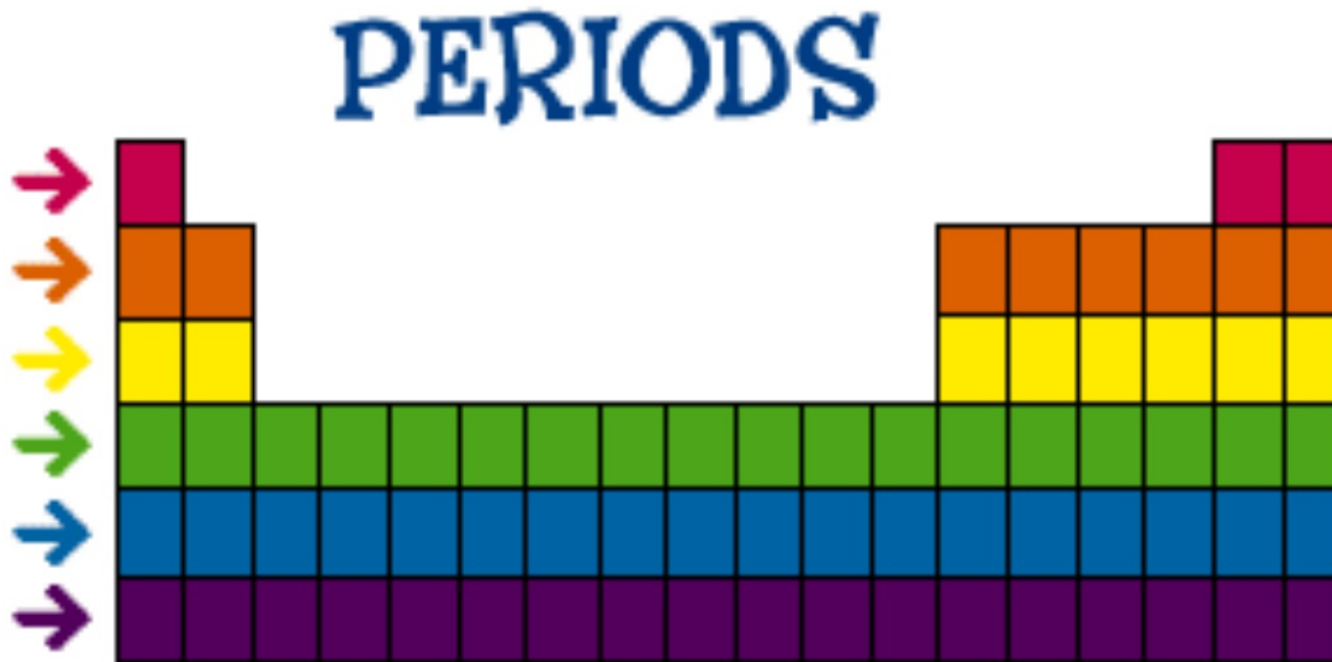
Elements arranged in vertical columns in the periodic table



WOD

Period

Elements arranged in horizontal columns in the periodic table



DSR Today



PERIODIC TABLE ELEMENTS 1-20

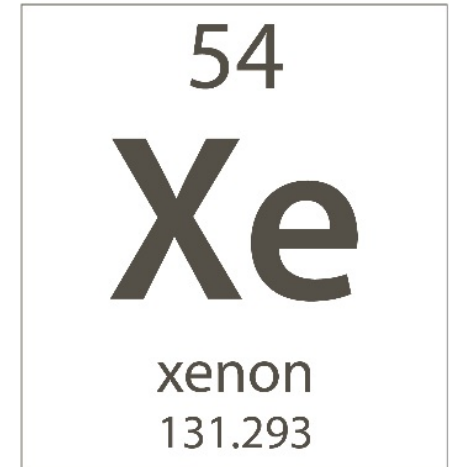
Write the number of protons, electrons, and neutrons in each element.

HYDROGEN 1							HELIUM 2
# of Protons:							# of Protons:
# of Electrons:							# of Electrons:
# of Neutrons:							# of Neutrons:
1.01							4.00
LITHIUM 3	BERYLLIUM 4	BORON 5	CARBON 6	NITROGEN 7	OXYGEN 8	FLUORINE 9	NEON 10
# of Protons:	# of Protons:	# of Protons:	# of Protons:	# of Protons:	# of Protons:	# of Protons:	# of Protons:
# of Electrons:	# of Electrons:	# of Electrons:	# of Electrons:	# of Electrons:	# of Electrons:	# of Electrons:	# of Electrons:
# of Neutrons:	# of Neutrons:	# of Neutrons:	# of Neutrons:	# of Neutrons:	# of Neutrons:	# of Neutrons:	# of Neutrons:
6.94	9.01	10.81	12.01	14.01	16.00	19.00	20.18
SODIUM 11	MAGNESIUM 12	ALUMINUM 13	SILICON 14	PHOSPHORUS 15	SULFUR 16	CHLORINE 17	ARGON 18
# of Protons:	# of Protons:	# of Protons:	# of Protons:	# of Protons:	# of Protons:	# of Protons:	# of Protons:
# of Electrons:	# of Electrons:	# of Electrons:	# of Electrons:	# of Electrons:	# of Electrons:	# of Electrons:	# of Electrons:
# of Neutrons:	# of Neutrons:	# of Neutrons:	# of Neutrons:	# of Neutrons:	# of Neutrons:	# of Neutrons:	# of Neutrons:
22.99	24.31	26.98	28.09	30.97	32.07	35.45	39.95
POTASSIUM 19	CALCIUM 20						
# of Protons:	# of Protons:						
# of Electrons:	# of Electrons:						
# of Neutrons:	# of Neutrons:						
39.10	40.08						

Note: Remember that the number of neutrons is not the same for every atom of an element. The number of neutrons you write in this chart will be a number, that when added to the number of protons, gives a sum as close as possible to the atomic mass.

Exit Ticket

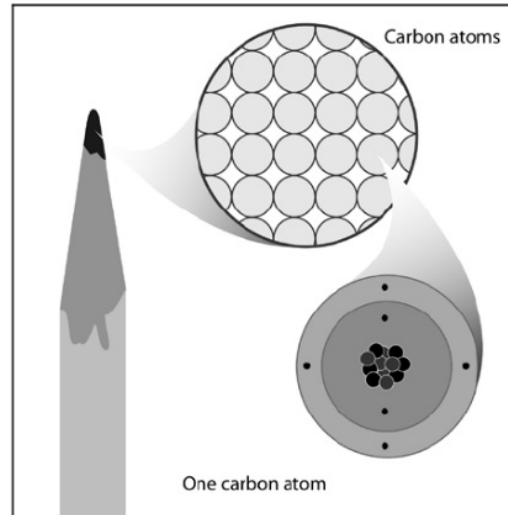
1. What is the name of the element?
2. What is the element's symbol?
3. What is the Atomic Number?
4. What is the atomic Mass?
5. How many of each subatomic particles are there?
Protons:
Neutrons:
Electrons:



INTRODUCTION

If you look closely at the tip of a sharpened pencil, you will see that it is made of graphite. Going deeper, graphite is made of carbon atoms. Deeper still, each carbon atom is made of protons, neutrons, and electrons. In this lesson, you will explore these subatomic particles and their charges.

HOMEWORK



1. Label the nucleus (protons, neutrons) and electrons in the drawing of a carbon atom above.
2. Draw a line between the subatomic particle and its charge.

proton	no charge
electron	positive charge
neutron	negative charge

3. Would the following subatomic particles attract each other or repel one another?

Two protons _____

Two electrons _____

A proton and an electron _____

Element Practice

Atomic Number – Represents both the number of protons and electrons in an element.

Atomic Symbol – a short hand way of writing each elements name.

Most of the mass comes from the neutron and proton. To find the number of neutrons, subtract the atomic weight from the atomic mass.

Atomic Mass – The weight of an element .

²
He
₄

Fill in the necessary information.

² He ₄ element: _____ # protons: _____ # neutrons: _____	²⁶ Fe ₅₆ element: _____ # protons: _____ # neutrons: _____	¹³ Al ₂₇ element: _____ # protons: _____ # neutrons: _____
²⁰ Ca ₄₀ element: _____ # protons: _____ # neutrons: _____	¹⁰ Ne ₂₀ element: _____ # protons: _____ # neutrons: _____	⁶ C ₁₂ element: _____ # protons: _____ # neutrons: _____
⁹ F ₁₉ element: _____ # protons: _____ # neutrons: _____	¹⁷ Cl ₃₅ element: _____ # protons: _____ # neutrons: _____	¹¹ Na ₂₃ element: _____ # protons: _____ # neutrons: _____

Energy Levels C-Notes

Electron Location Rules

**Write
Questions**

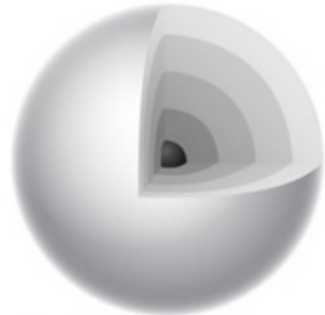
Patterns in Periodic Table

Valence Electrons

Write a summary

Electron Location Rules

1. Electrons are found in shells around the nucleus of the atom also called energy levels



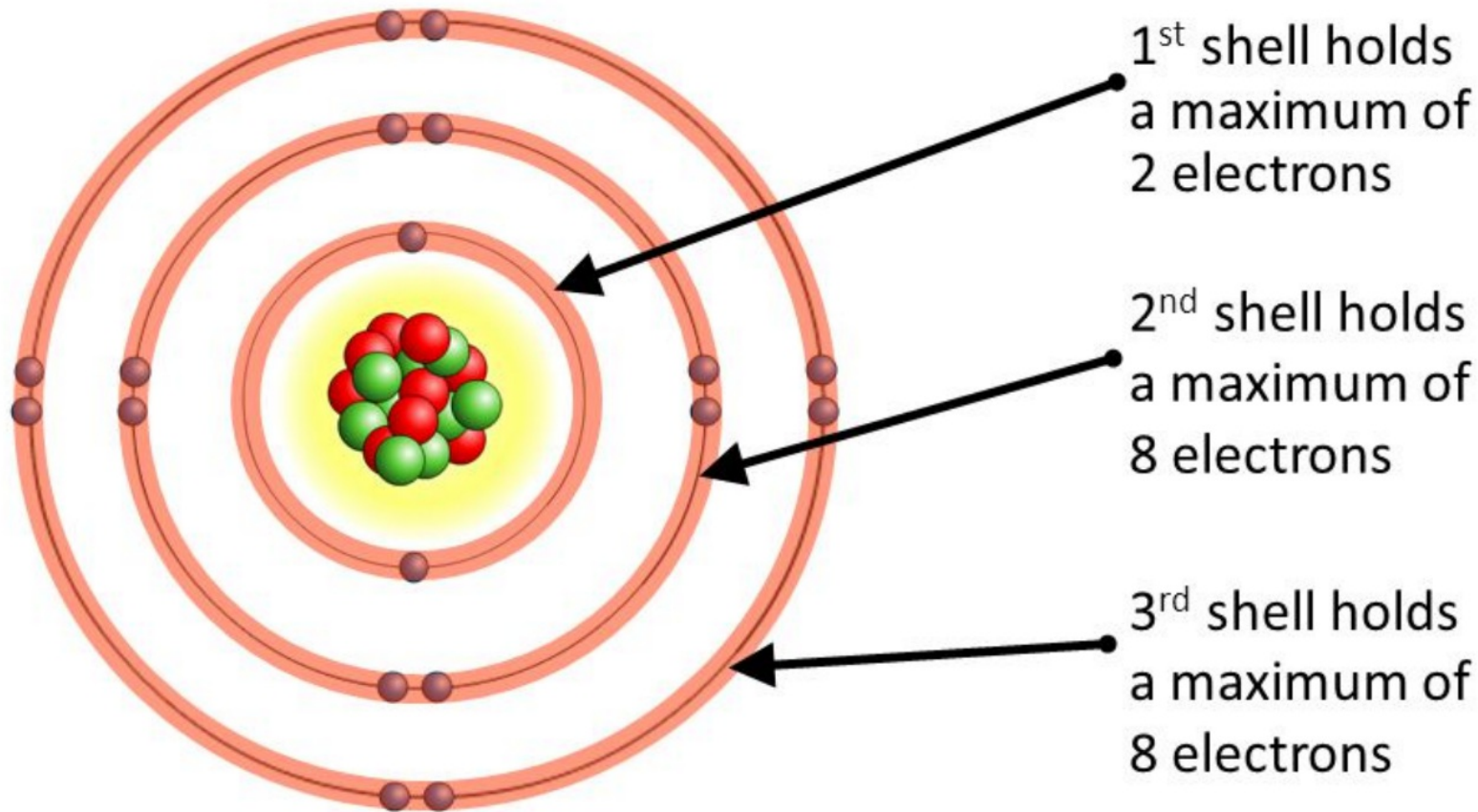
3-D Version



In 2-D

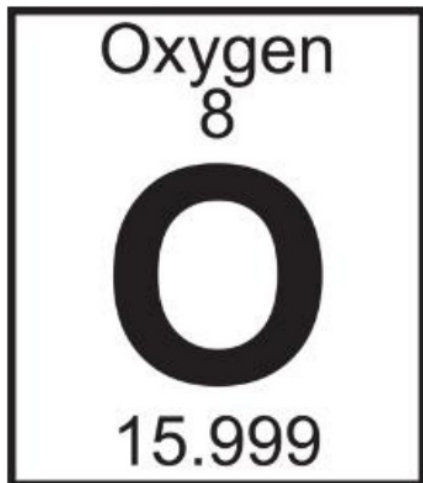
2. Each layer can only hold a certain amount of electrons

Each shell has a maximum number of electrons that it can hold. Electrons will fill the shells nearest the nucleus first.



This **electron arrangement** is written as 2,8,8.

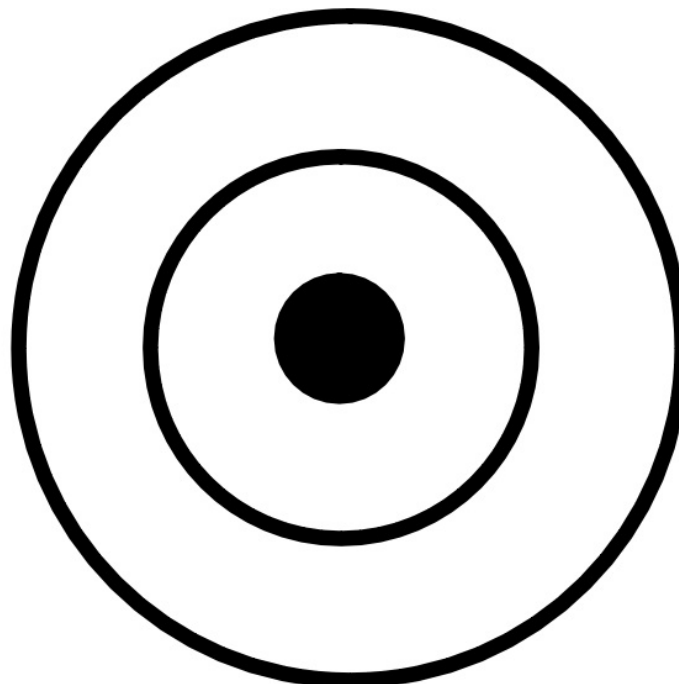
Example



Atomic Number:










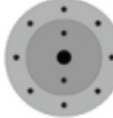







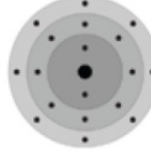


Number of Electrons:

Location of electrons:



ENERGY LEVELS ELEMENTS 1-20

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<p>POTASSIUM 19</p>  <p>39.10</p>	<p>CALCIUM 20</p>  <p>40.08</p>							

The atom you are looking for has this
Energy Level Model:

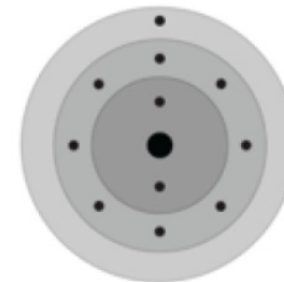


The atom you are looking for is
directly below the atom with this Energy Level.



The atom you are looking for has
2 Electrons on the **First** Energy Level and
no other electrons.

The atom you are looking for is
directly above the atom with this Energy Level.



Patterns in Periodic Table

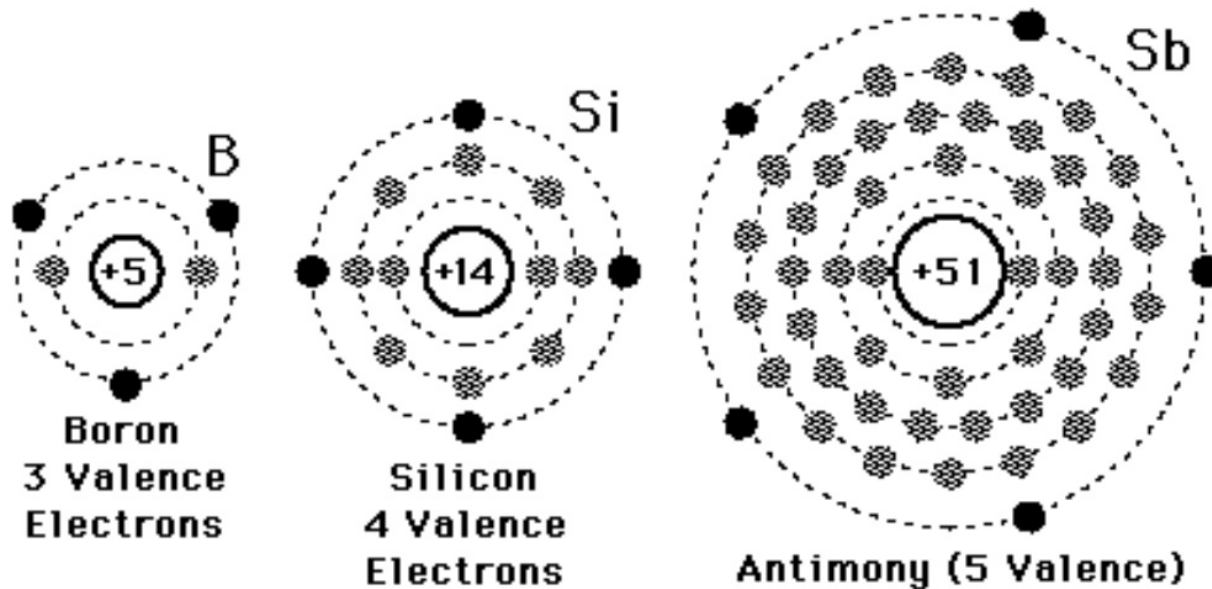
Periods:

Groups/Families:

Valence Electrons

Number of electrons in the outermost shell

Examples

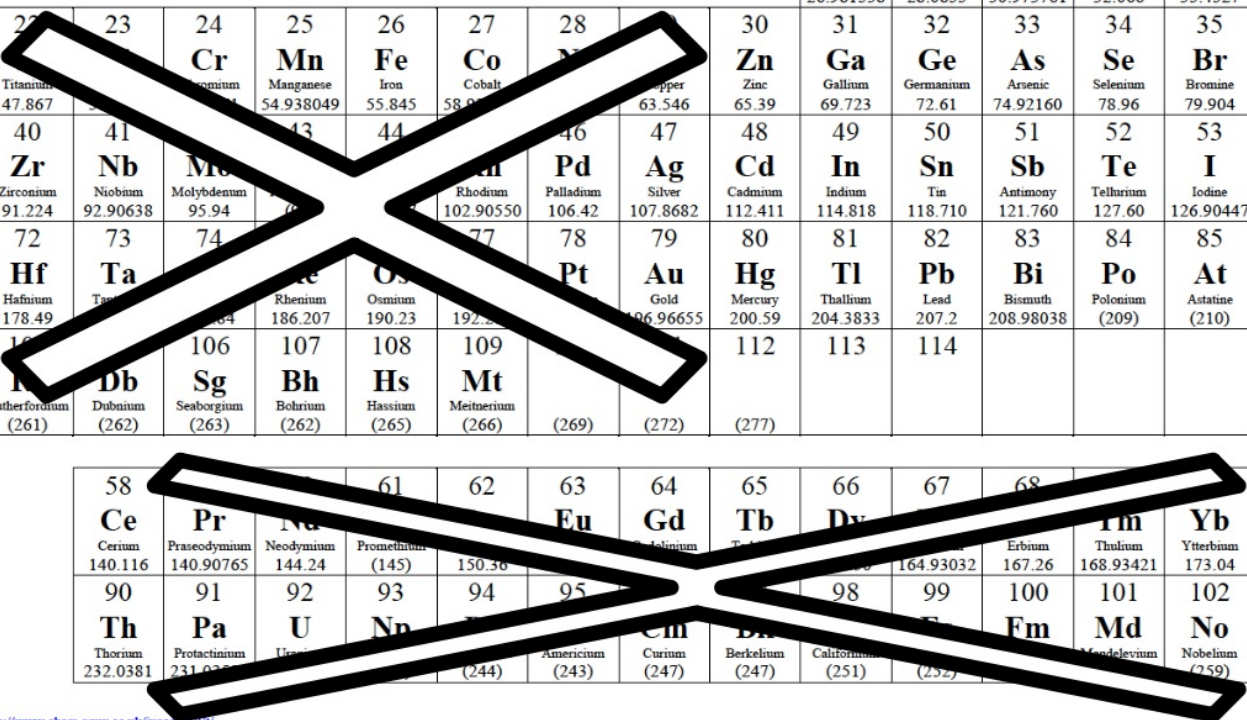


Lets put the patterns on the Periodic Table

Valence Electrons

Energy Level

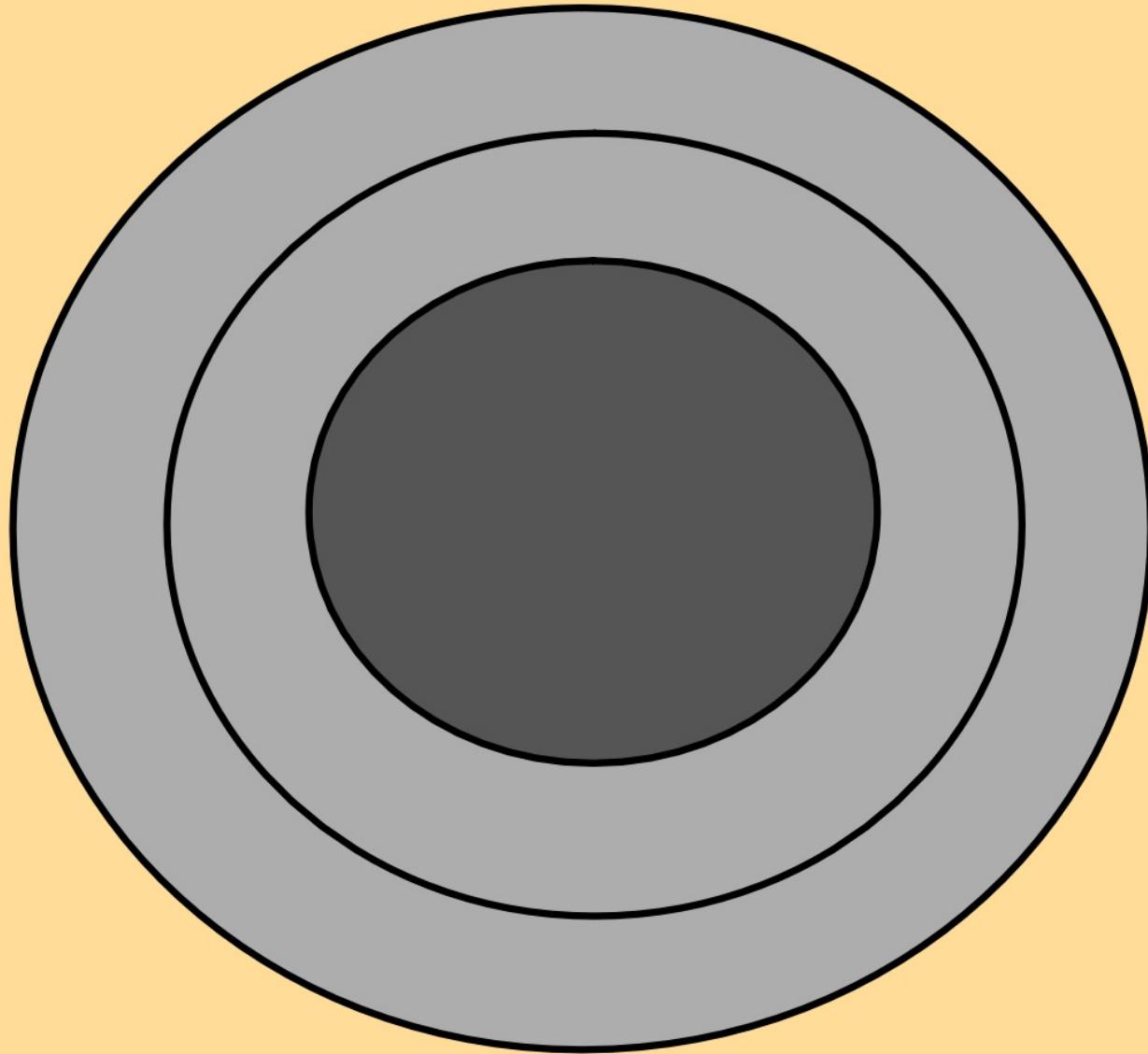
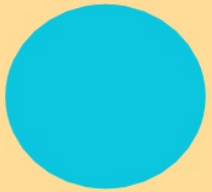
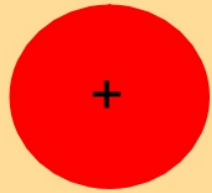
The Periodic Table of the Elements



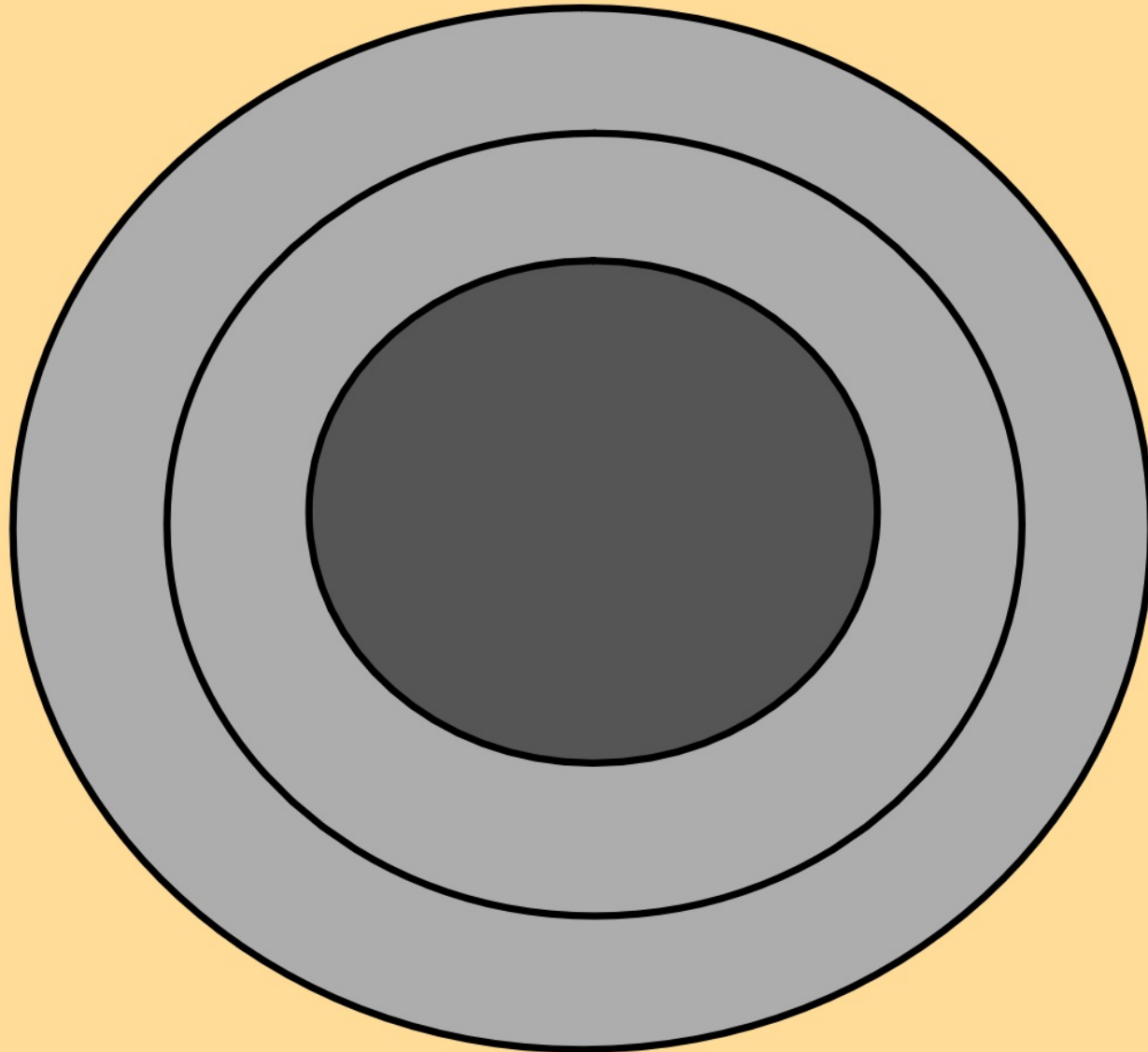
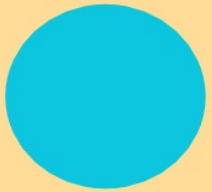
1 H Hydrogen 1.00794																	2 He Helium 4.003
3 Li Lithium 6.941	4 Be Beryllium 9.012182											5 B Boron 10.811	6 C Carbon 12.0107	7 N Nitrogen 14.00674	8 O Oxygen 15.9994	9 F Fluorine 18.9984032	10 Ne Neon 20.1797
11 Na Sodium 22.989770	12 Mg Magnesium 24.3050	← Skip →										13 Al Aluminum 26.981538	14 Si Silicon 28.0855	15 P Phosphorus 30.973761	16 S Sulfur 32.066	17 Cl Chlorine 35.4527	18 Ar Argon 39.948
19 K Potassium 39.0983	20 Ca Calcium 40.078	21 Sc Scandium 44.955910	22 Ti Titanium 47.867	23 V Vanadium 50.9415	24 Cr Chromium 51.9961	25 Mn Manganese 54.938049	26 Fe Iron 55.845	27 Co Cobalt 58.9332	28 Ni Nickel 58.6934	29 Cu Copper 63.546	30 Zn Zinc 65.39	31 Ga Gallium 69.723	32 Ge Germanium 72.61	33 As Arsenic 74.92160	34 Se Selenium 78.96	35 Br Bromine 79.904	36 Kr Krypton 83.80
37 Rb Rubidium 85.4678	38 Sr Strontium 87.62	39 Y Yttrium 88.90585	40 Zr Zirconium 91.224	41 Nb Niobium 92.90638	42 Mo Molybdenum 95.94	43 Tc Technetium (98)	44 Ru Ruthenium 101.07	45 Rh Rhodium 102.90550	46 Pd Palladium 106.42	47 Ag Silver 107.8682	48 Cd Cadmium 112.411	49 In Indium 114.818	50 Sn Tin 118.710	51 Sb Antimony 121.760	52 Te Tellurium 127.60	53 I Iodine 126.90447	54 Xe Xenon 131.29
55 Cs Cesium 132.90545	56 Ba Barium 137.327	57 La Lanthanum 138.9055	58 Ce Cerium (140)	59 Pr Praseodymium 140.90765	60 Nd Neodymium 144.24	61 Pm Promethium (145)	62 Sm Samarium 150.36	63 Eu Europium 151.964	64 Gd Gadolinium 157.25	65 Tb Terbium 158.92535	66 Dy Dysprosium 162.50	67 Ho Holmium 164.93032	68 Er Erbium 167.26	69 Tm Thulium 168.93421	70 Yb Ytterbium 173.04	71 Lu Lutetium 174.967	
87 Fr Francium (223)	88 Ra Radium (226)	89 Ac Actinium (227)	90 Th Thorium 232.0381	91 Pa Protactinium 231.03688	92 U Uranium 238.02891	93 Np Neptunium (237)	94 Pu Plutonium (244)	95 Am Americium (243)	96 Cm Curium (247)	97 Bk Berkelium (247)	98 Cf Californium (251)	99 Es Einsteinium (252)	100 Fm Fermium (257)	101 Md Mendelevium (258)	102 No Nobelium (259)	103 Lr Lawrencium (262)	

1995 IUPAC masses and Approved Names from <http://www.chem.guvc.ac.uk/iupac/1995/>
 masses for 107-111 from C&EN, March 13, 1995, p. 35
 112 from <http://www.gsi.de/z112e.html>

Model Fluorine - atomic number 9
Atomic mass - 18.99



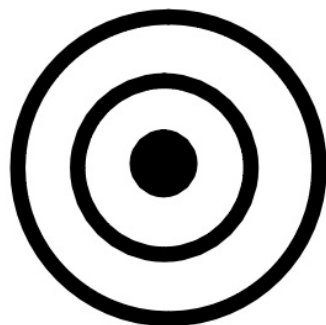
**Model Beryllium- atomic number 4
atomic mass 9.01**



Exit Ticket

Use your periodic table to answer the questions





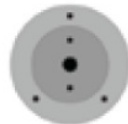

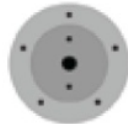
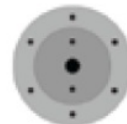
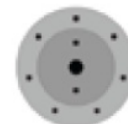
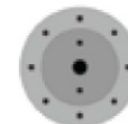

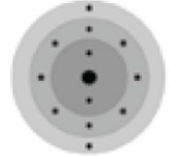
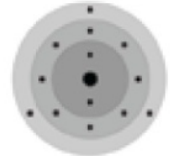

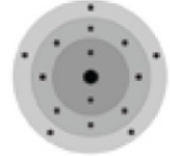


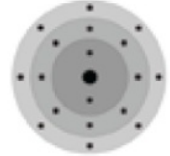
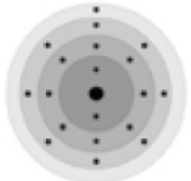
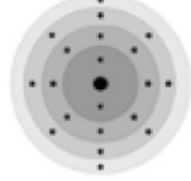
1. Draw the Bohr model for Sodium (Na)



2. How many electrons do you predict are in the outer shell of Krypton. HINT: Use the patterns

3. How many valence electrons are there for Carbon?

ENERGY LEVELS ELEMENTS 1-20

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<p>POTASSIUM 19</p>  <p>39.10</p>	<p>CALCIUM 20</p>  <p>40.08</p>						

Write the number of electrons in the OUTER Shell for every element.