

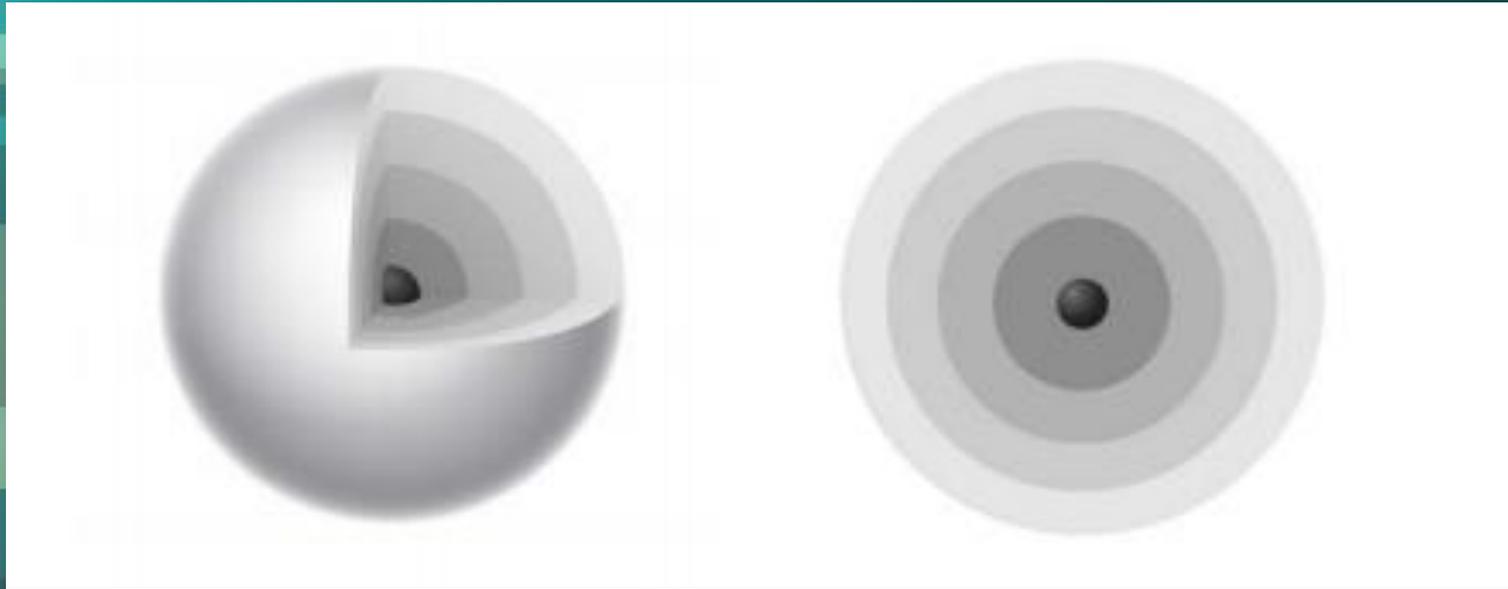
The Periodic Table and Energy Level Models

<https://www.youtube.com/watch?v=1cqauZq4uYM>

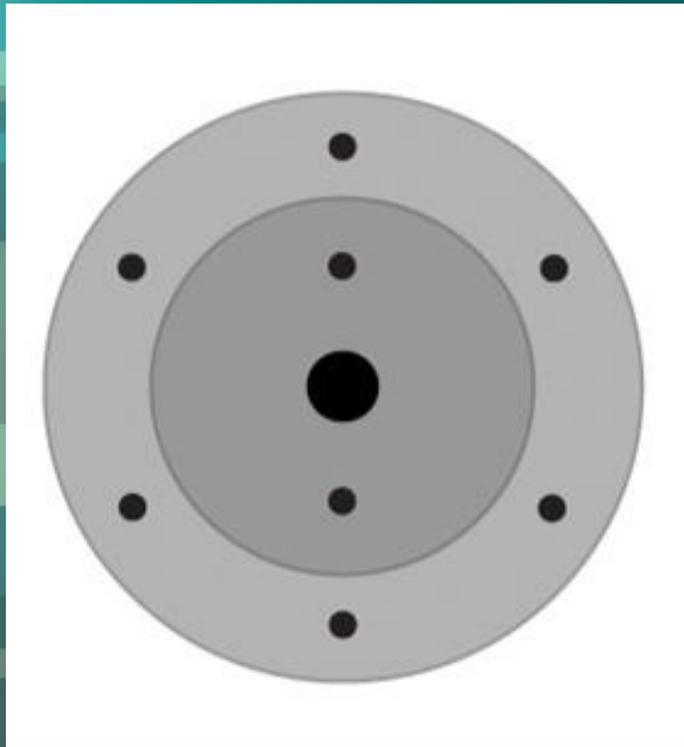
Objective:

- To be able to interpret the information given in the periodic table to describe the arrangement of electrons on the energy levels around an atom.

Electrons are in regions around the nucleus that are different distances away from the nucleus.



Can you identify which atom this model represents?



The large circle in the middle represents the nucleus where the protons and neutrons are. The smaller dots represent electrons.

Because neutral atoms in the periodic table have the same number of electrons as protons, the atom must have 8 protons. The number of protons is the same as the atomic number, so the atom is oxygen.

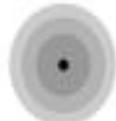
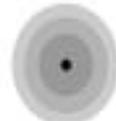
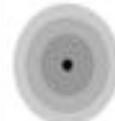
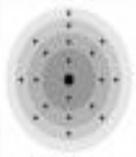
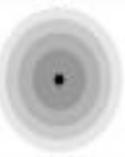
ACTIVITY:

- Your teacher will distribute some of the 80 cards to each group.
- Each card contains information about electrons and energy levels for each of the first 20 elements in the periodic table.
- Your job is to work as a group, read the card carefully, figure out which element the card is describing, and put the card at the spot in the room for that element.
- You will need to count the electrons in order to identify the atom.

PERIODIC TABLE OF ENERGY LEVELS

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>28.08</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>						

Each energy level holds a certain number of electrons before electrons go into the next level.

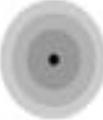
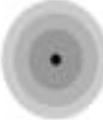
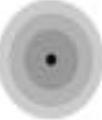
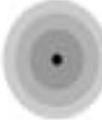
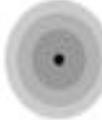
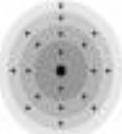
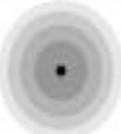
← These rows are called periods

←

←

ENERGY LEVELS ELEMENTS 1-20

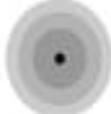
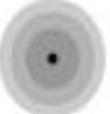
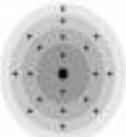
Complete each energy level model by drawing the correct number of electrons in their corresponding energy levels.

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

1st period:
Hydrogen and helium- electrons go into the first energy level. After the first level has two electrons, the next electron goes into the second level.

ENERGY LEVELS ELEMENTS 1-20

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

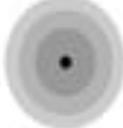
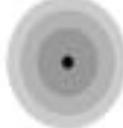
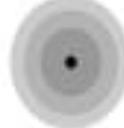
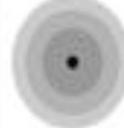
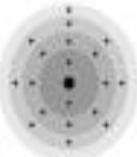
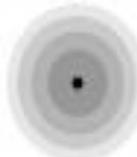
HYDROGEN 1  1.01								HELIUM 2  4.00
LITHIUM 3  6.94	BERYLLIUM 4  9.01	BORON 5  10.81	CARBON 6  12.01	NITROGEN 7  14.01	OXYGEN 8  16.00	FLUORINE 9  19.00	NEON 10  20.18	
SODIUM 11  22.99	MAGNESIUM 12  24.31	ALUMINUM 13  26.98	SILICON 14  28.09	PHOSPHORUS 15  30.97	SULFUR 16  32.07	CHLORINE 17  35.45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

2nd Period: Lithium to Neon- Electrons go into the second level. After the second level has 8 electrons, the next electron goes into the third level.



ENERGY LEVELS ELEMENTS 1-20

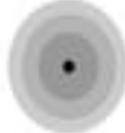
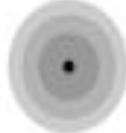
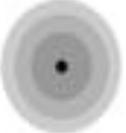
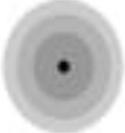
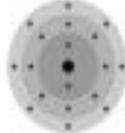
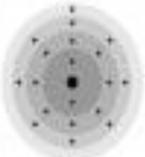
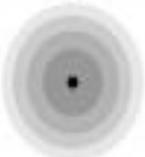
Complete each energy level model by drawing the correct number of electrons in their corresponding energy levels.

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

3rd period:
Sodium to
Argon- Electrons
go into the third
energy level.
After the third
energy level has
8 electrons, the
next electron
goes into the 4th
level.

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>
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<p>POTASSIUM 19</p>  <p>39.10</p>	<p>CALCIUM 20</p>  <p>40.08</p>	<p>← 4th period: Potassium and Calcium- electrons go into the fourth energy level.</p>					

ENERGY LEVELS ELEMENTS 1-20

HYDROGEN

1



1.01

HELIUM

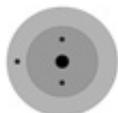
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4.00

LITHIUM

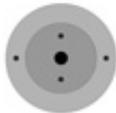
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6.94

BERYLLIUM

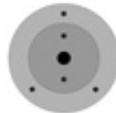
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9.01

BORON

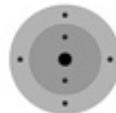
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10.81

CARBON

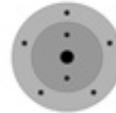
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12.01

NITROGEN

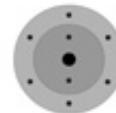
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14.01

OXYGEN

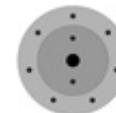
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16.00

FLUORINE

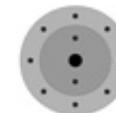
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19.00

NEON

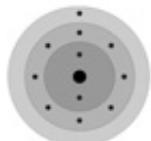
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20.18

SODIUM

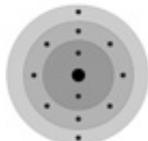
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22.99

MAGNESIUM

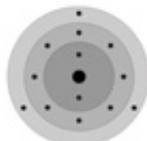
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24.31

ALUMINUM

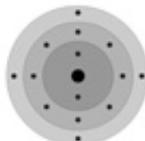
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26.98

SILICON

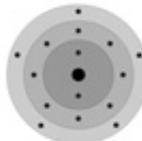
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28.09

PHOSPHORUS

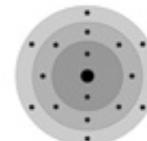
15



30.97

SULFUR

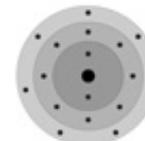
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32.07

CHLORINE

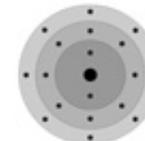
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35.45

ARGON

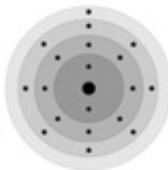
18



39.95

POTASSIUM

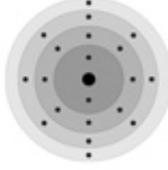
19



39.10

CALCIUM

20



40.08

Look for patterns in rows and columns of the first 20 elements in the periodic table.

Look at the periods (rows going across)

- *Period number gives the number of energy levels in each period:*
- The atoms in the first period have electrons in 1 energy level.
- The atoms in the second period have electrons in 2 energy levels.
- The atoms in the third period have electrons in 3 energy levels.
- The atoms in the fourth period have electrons in 4 energy levels.

Look at the columns going down: (these are called families)

- Compare the number of electrons in the outermost energy level for the atoms in a family (group)
- The outermost electrons are called valence electrons.
- These are the electrons responsible for bonding, which we will learn about in an upcoming lesson.

THE WAY DIFFERENT ELEMENTS REACT CHEMICALLY RELATE TO THEIR LOCATION ON THE PERIODIC TABLE.

[sodium in water](#)

[potassium in water](#)

[calcium in water](#)

Sodium and potassium react similarly because they are in the same group.
Calcium is not in the same group.

Key Concepts:

1. Electrons surrounding an atom are located in regions around the nucleus called “**energy levels**”
2. An energy level represents the 3-dimensional space surrounding the nucleus where electrons are **most likely to be**.
3. The **first energy** level is **closest to the nucleus**. The second energy level **is a little farther away** than the rest. The third is a little farther away than the second, and so on.
4. Each energy level can accommodate or “**hold**” a different **number of electrons** before additional electrons begin to go into the **next level**.

Key Concepts continued on next slide

Key Concepts, continued....

5. When the **first energy** level has **2** electrons, the next electrons go into the second energy level until the **second level** has **8** electrons.
6. When the **second energy level** has **8** electrons, the next electrons go into the third energy level until the **third level** has **8** electrons.
7. When the **third energy level** has **8** electrons, the next **two** electrons go into the **fourth energy level**.
8. The electrons in the energy level furthest from the nucleus are called **valence electrons**.
9. Atoms in the same **column** (group) in the periodic table have the same number of **valence electrons**.