

## THE PERIODIC TABLE

### A. Structure of the Periodic Table

The modern periodic table is a listing of elements in a grid like chart arrangement. The elements are placed in order of atomic number, and fall into certain positions in the table that reveal many of their properties and their relationships to each other.

Read Section 1.2 of the textbook to answer the following questions.

1. Define the following terms
  - a. Period \_\_\_\_\_
  - b. Group or Family \_\_\_\_\_
2. What does the staircase indicate? \_\_\_\_\_
3. Lightly shade the nonmetals on the periodic table below.
4. Define the Periodic Law. \_\_\_\_\_

△																	△
												△	△	△			△
															○		△
																	△
															○		△
																	△


5. The figure above represents a blank periodic table. Fill in the atomic numbers 1-118, one in each box, completing each row before moving to the next row.
6. Now fill in the group numbers for each of the 18 columns, moving left to right.
7. What do the circles - \_\_\_\_\_ and triangles - \_\_\_\_\_ represent?
8. By what other name are elements in Group 1 known? \_\_\_\_\_  
Properties: \_\_\_\_\_
9. By what other name are elements in Group 2 known? \_\_\_\_\_  
Properties: \_\_\_\_\_
10. By what other name are elements in Group 3-12 known? \_\_\_\_\_
11. By what other name are elements in Group 17 known? \_\_\_\_\_  
Properties: \_\_\_\_\_
12. By what other name are elements in Group 18 known? \_\_\_\_\_  
Properties: \_\_\_\_\_
13. What is true of the elements within any group? \_\_\_\_\_
14. Fill in the period number for each of the seven rows of the table, moving top to bottom.
15. How many elements are in each period? Period 1 \_\_\_\_ Period 2 \_\_\_\_ Period 3 \_\_\_\_ Period 4 \_\_\_\_ Period 5 \_\_\_\_ Period 6 \_\_\_\_ Period 7 \_\_\_\_
16. What period do the two rows at the bottom fit into? \_\_\_\_\_
17. What are these two rows called? \_\_\_\_\_

## B. Relating Valence Electrons to the Periodic Table

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1. Draw Lewis Dot Diagrams for the atoms that have the following atomic numbers:

4:

12:

20:

38:

What do these Lewis Dot Diagrams have in common?

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What would you expect about the relative properties of these elements?

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Where are these atom located in the periodic table? 

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2. Draw Lewis Dot Diagrams for the atoms that have the following atomic numbers:

9:

17:

35:

53:

What do these Lewis Dot Diagrams have in common?

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What would you expect about the relative properties of these elements?

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Where are these atom located in the periodic table? 

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## C. Ionic Charge and the Periodic Table

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Atoms become electrically charged by gaining or losing electrons. The typical number of electrons gained or lost is related to their Lewis Dot Diagrams and to position in the periodic table.

1. Draw the Lewis Dot Diagram for the following:

Ca:

Ca<sup>2+</sup>:

Explain why the 2<sup>+</sup> ion is the one that tends to typically form.

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In what group of the periodic table is Ca located? 

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What ions would the other elements in this group tend to form? Why?

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2. Draw the Lewis Dot Diagram for the following:

S:

S<sup>2-</sup>:

Explain why the 2<sup>-</sup> ion is the one that tends to typically form. 

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In what group of the periodic table is S located? 

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What ions would the other elements in this group tend to form? Why?

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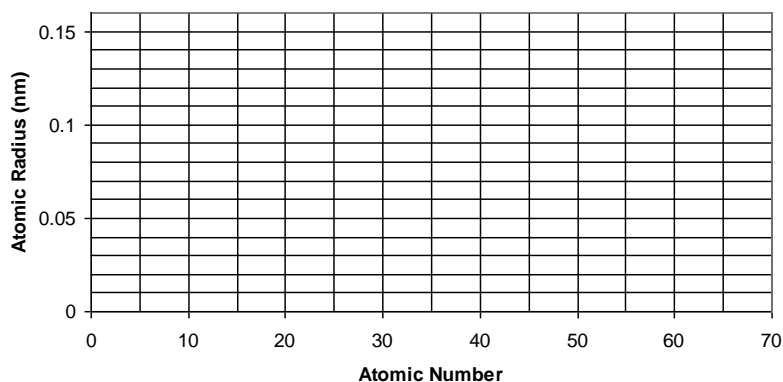
## D. Atomic Radius, Ionization Energy, and the Periodic Table

The size of atoms is measured in terms of atomic radius, in units such as nanometers ( $1\text{nm} = 1 \times 10^{-9}\text{m}$ ). The ionization energy, or energy needed to remove an electron from a gaseous atom, is typically measured in kilojoules per mole of atoms. These quantities are related to position in the periodic table.

1. The radius of the first few atoms in Group 17 have been estimated to have the following values:

F (element 9):	0.064 nm
Cl (17):	0.099 nm
Br (35):	0.114 nm
I (53):	0.133 nm

Graph these values versus atomic number in the grid.



Describe the relationship.

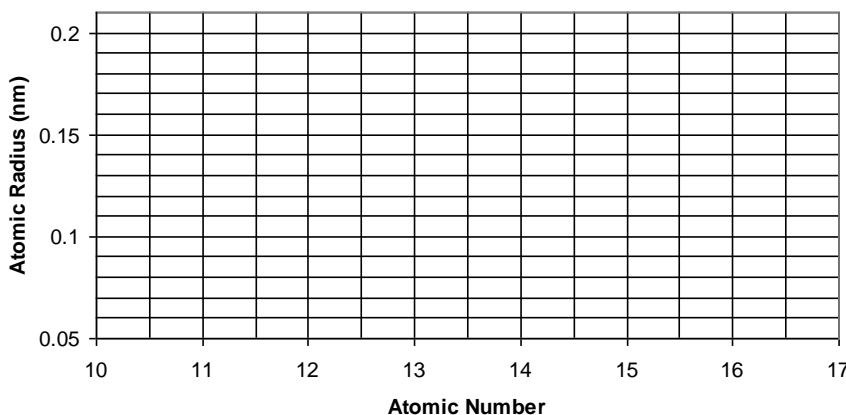
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2. The radii of the first seven elements in Period 3 have been estimated to have the following values:

Na (11):	0.186 nm
Mg (12):	0.160 nm
Al (13):	0.143 nm
Si (14):	0.117 nm
P (15):	0.110 nm
S(16):	0.104 nm
Cl (17):	0.099 nm

Graph these values versus atomic number in the grid.



Describe the relationship.

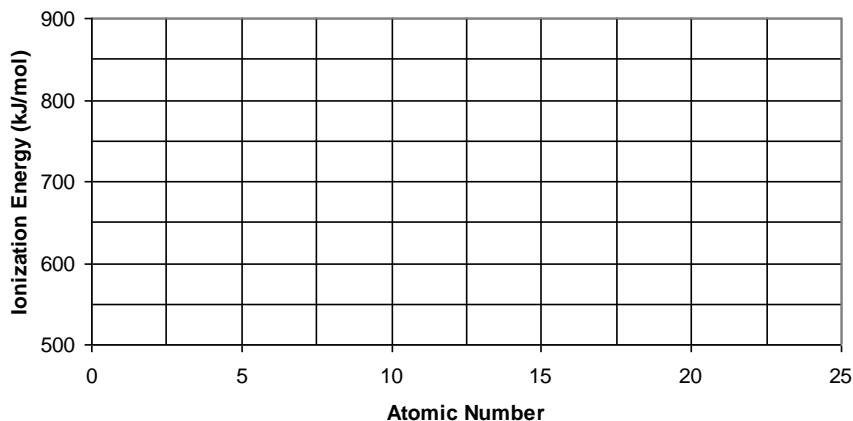
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3. The ionization energies of the first three atoms in Group 2 are as follows:

Be (4):	900 kJ/mol
Mg (12):	736 kJ/mol
Ca (20):	590 kJ/mol

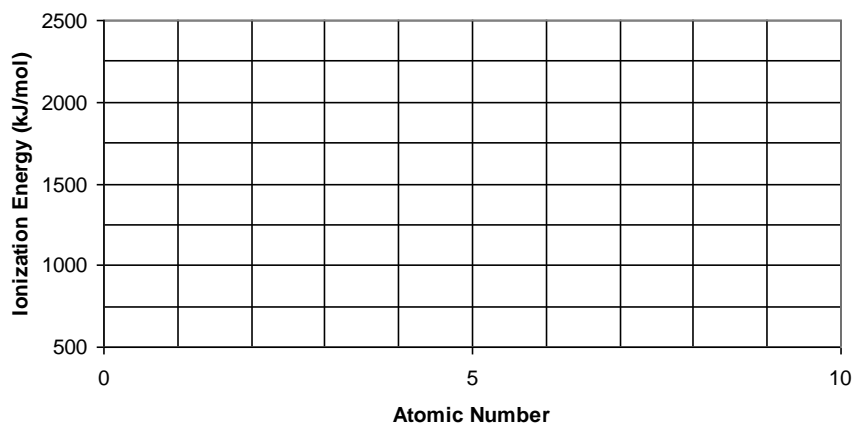
Graph these values versus atomic number in the grid.



Describe the relationship.

4. The ionization energies of the element in Period 2 are as follows:

Li (3)	519 kJ/mol
Be (4)	900 kJ/mol
B (5)	799 kJ/mol
C (6)	1088 kJ/mol
N (7)	1406 kJ/mol
O (8)	1314 kJ/mol
F (9)	1682 kJ/mol
Ne (10)	2080 kJ/mol



Graph these values versus atomic number in the grid.

Describe the relationship.

### E. Periodic Table Word Scramble

Use the clues provided to help you unscramble the letters below to form words related to this package. The letters in the circles will then spell out the name of a famous scientist.

Clues

- |                                  |  |
|----------------------------------|--|
| 1. Na, Mg, Ca and Fe for example | 6. A series                            |
| 2. Charged particle              | 7. Like neon                           |
| 3. An unreactive element         | 8. Rb <sup>+</sup> and Kr, for example |
| 4. K to Kr, for example          | 9. A transition metal                  |
| 5. Cl and I for example          |  |

1. S A L M T E

2. N C L R E T E O

3. N G O R A

4. E P O D I R

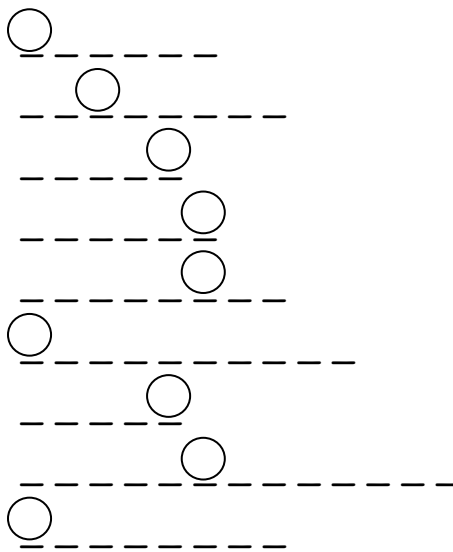
5. N H E L O A G S

6. A L A E N H N D T I

7. O L B E N

8. I N E E T L O S I C C R O

9. N A V I M A U D



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