

Graphing Trends in the Periodic Table

Name: _____

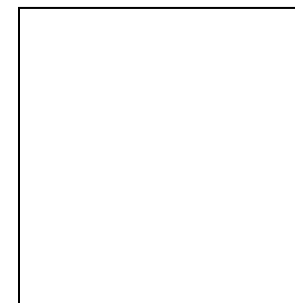
Objective: To understand trends of the periodic table and practice methods of graphing.

Background

The Periodic Table is arranged according to the Periodic Law. The Periodic Law states that when elements are arranged in order of increasing atomic number, their physical and chemical properties show a periodic pattern. Students can discover these patterns by examining the changes in properties of elements on the Periodic Table. The properties that will be examined in this lesson are: atomic radius AND first ionization energy

1. Make a prediction as to what will happen to the sizes of atoms as one progresses from left to right across a period on the periodic table. (Example: the sizes of atoms will (increase, decrease, remain constant) as one goes left to right across a period.)

2. According to your prediction, make a sketch of how you would EXPECT a graph to appear if you plotted atomic number on the X-axis and atomic radius (size of the atom) on the Y-axis.



Procedure:

Graph the following information according to the steps described

Graph 1: Atomic Radius vs Atomic Number: Elements 3-20

For elements 3-20 make a graph of atomic radius as a function of atomic number. Plot atomic number on the X axis and atomic radius on the Y axis. After creating the graph, use a colored pen or pencil to draw a vertical line that represents that beginning of each period (horizontal row on the periodic table).

Graph 2: Atomic Radius vs Atomic Number: Groups I and II

For elements in Group 1 (Alkali metals), make a graph of atomic radius as a function of atomic number. Make a second line on this same graph that will represent Group 2 (Alkaline Earth Metals). Use a periodic table to determine which elements are members of Group 1 and which elements are members of Group 2.

Graph 3: Ionization Energy vs Atomic Number: Elements 3-20

For elements 3-20, make a graph of the energy required to remove the easiest electron (first ionization energy) as a function of atomic number. Plot atomic number on the X axis and energy required on the Y axis. After creating the graph, use a colored pen or pencil to draw a vertical line that represents that beginning of each period (horizontal row on the periodic table).

Graph 4: Ionization Energy vs Atomic Number: Groups I and II

For elements of Group 1 (Alkali metals), make a graph of the energy required to remove the easiest electron (first ionization energy) as a function of atomic number. On the same graph make a second line to represent Group 2 (Alkaline Earth Metals). Use a periodic table to determine which elements are members of Group 1 and which elements are members of Group 2.

Symbol	Atomic Number	Atomic Radius	First Ionization Energy
Li	3	1.23	124
Be	4	0.89	215
B	5	0.8	191
C	6	0.77	260
N	7	0.7	335
O	8	0.66	314
F	9	0.64	402
Ne	10	0.67	497
Na	11	1.57	119
Mg	12	1.36	176
Al	13	1.25	138
Si	14	1.17	188
P	15	1.1	242
S	16	1.04	239
Cl	17	0.99	299
Ar	18	0.98	363
K	19	2.03	100
Ca	20	1.74	141
Rb	37	2.16	96
Sr	38	1.91	131
Cs	55	2.35	90
Ba	56	1.98	120

Analysis:

1. Record any similarities and differences between your predicted graph and the graph of actual data.

2. What does happen to the sizes of atoms as one goes left to right across a period?

3. What does happen to the sizes of atoms as one goes down a group?

4. Looking at the Bohr models of atoms, offer an explanation as to WHY the atomic size changes as it does for both periods and groups.

Periods:

Groups:

5. What happens to the ionization energy as one goes left to right across a period?

6. What happens to the ionization energy as one goes down a group?

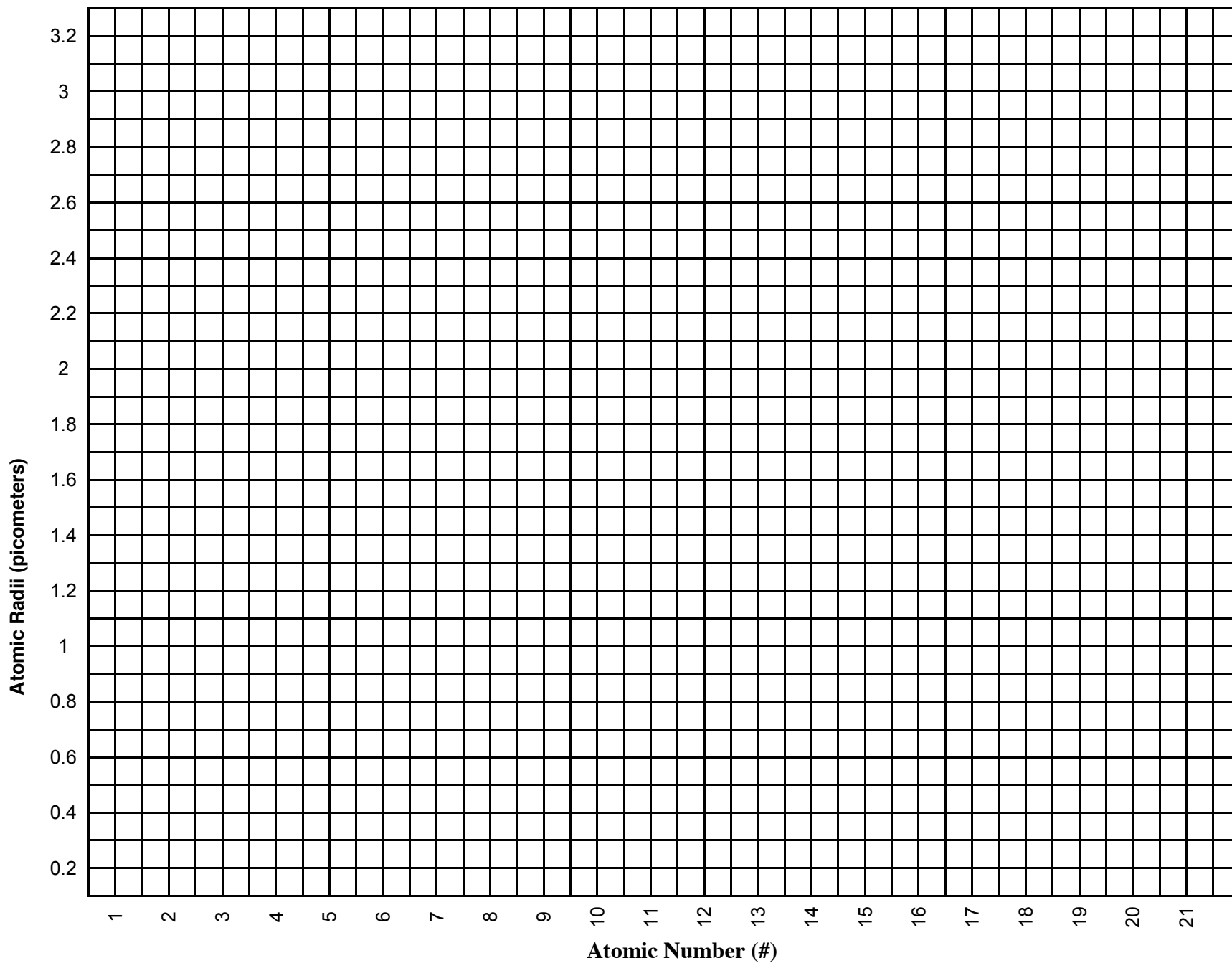
7. Offer an explanation as to WHY the ionization energy changes as it does for both periods and groups.

Period:

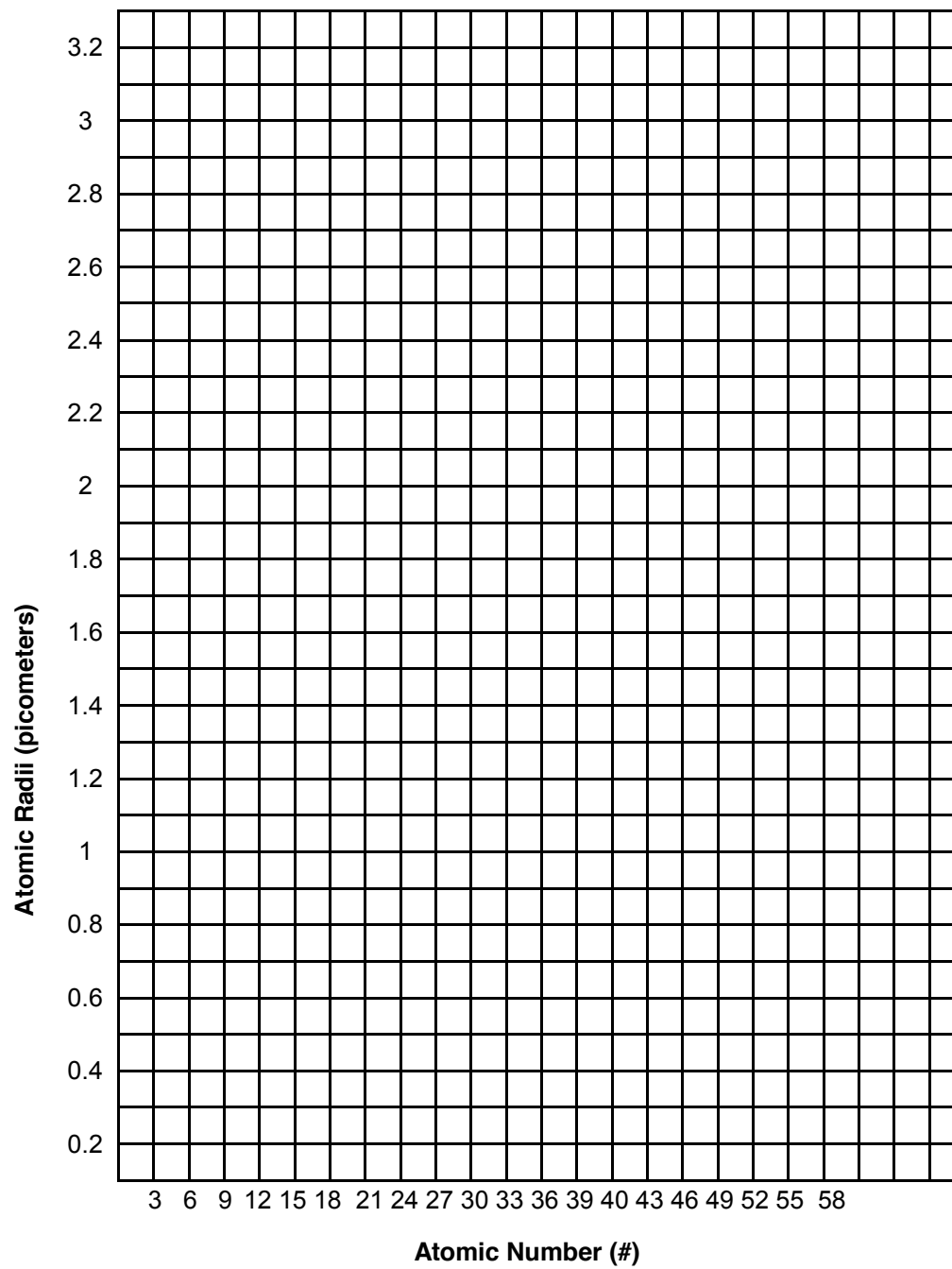
Group:

8. What PROPERTIES of elements visibly show periodic trends when their values are graphed?

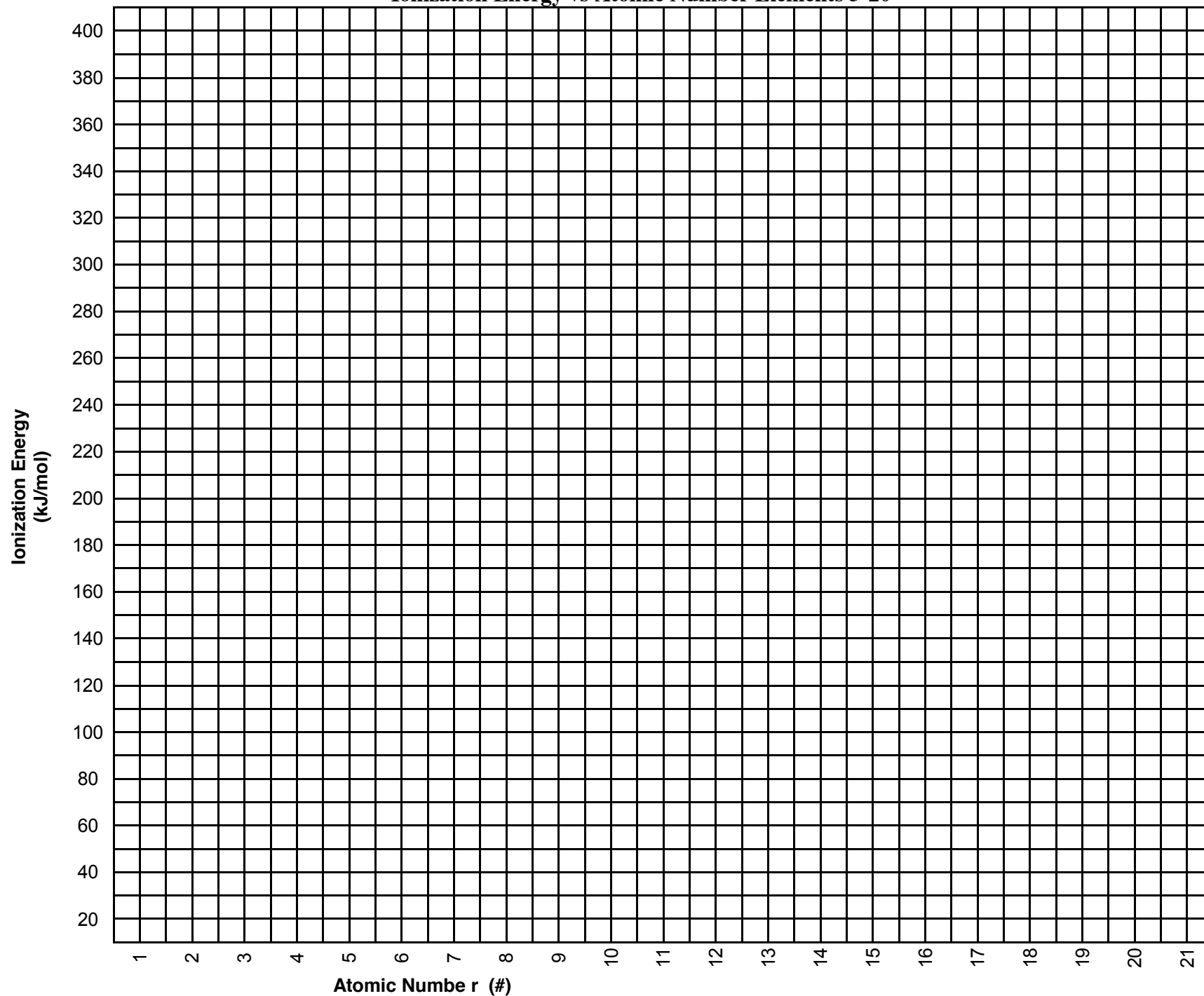
Atomic Radius vs Atomic Number: Elements 3 – 20



Atomic Radius vs Atomic Number: Group I and II



Ionization Energy vs Atomic Number Elements 3-20



Ionization Energy vs Atomic Number: Group I and II

