

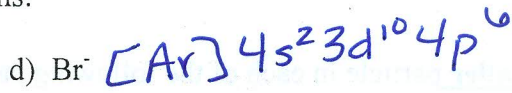
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### Chapter 5 Review Practice: Periodic Law and Periodic Trends

1) Write electron configurations of the following ions:



2) Define the phrase **isoelectronic atoms or ions**. Are any of the ions in question #1 considered isoelectronic? If so, which ones?   
  $\rightarrow$  atoms/ions with the same electron configuration

Yes -  $K^+$ ,  $V^{+5}$ ,  $Ti^{+4}$   
f, e, a

3) Define the following terms: **atomic radius** and **ionic radius**. Discuss why radius increases down a group.

$\frac{1}{2}$  the distance btwn 2 nuclei of bonded, identical atoms

$\rightarrow$  Moving down a group you add energy levels making atoms/ions larger

4) What is the **shielding effect** and how does this affect the radius of an atom or ion? How does this affect ionization energy?   
 Shielding is when inner electrons "shield" outer electrons from the nucleus

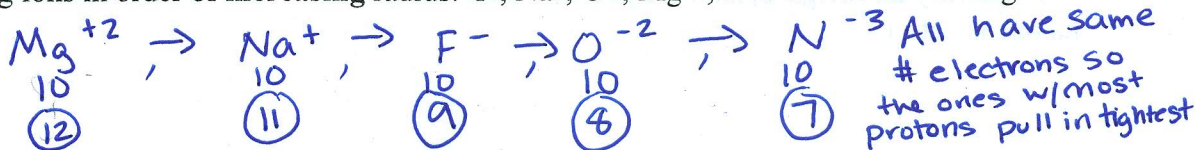
- It makes the radius of the atom/ion increase b/c nucleus doesn't hold as tightly. It makes IE decrease because the electrons are easier to remove further from the nucleus

5) Arrange the following atoms in order of **increasing** radius: N, Sb, P, Bi, As. Include reasoning for your order.

N, P, As, Sb, Bi

Each successive element adds an energy level

6) Arrange the following ions in order of **increasing** radius:  $F^-$ ,  $Na^+$ ,  $O^{2-}$ ,  $Mg^{2+}$ ,  $N^{3-}$ . Include reasoning for your order



7) Define: **ionization energy** and **electron affinity**. Explain how these two properties are related to the radius of the atom

Energy to remove an electron      energy to add an electron

The larger the atom the lower the IE + lower EA

8) Arrange the following atoms in order of **increasing** first ionization energy: Ba, Ca, Be, Sr, Mg. Explain your order

Ba  $\rightarrow$  Sr  $\rightarrow$  Ca  $\rightarrow$  Mg  $\rightarrow$  Be

$\downarrow$   
e- are furthest from the nucleus + have the most shielding

$\downarrow$   
e- are closest to the nucleus + have the least shielding

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9) Arrange the following atoms in order of **decreasing** electron affinity: Br, Sb, I, Te, Cl. Explain your order.

Cl → Br → I → Te → Sb

↓  
7 valence e<sup>-</sup>  
so really wants 1  
more → least energy levels + shielding

↓  
5 valence electrons  
+ most energy levels  
+ most shielding

10) Circle the **smaller** particle in each of the following pairs. Explain your choice.

Na, Li (less energy levels)

Br, I (less energy levels)

F, F<sup>-</sup> (same pt w/ less e<sup>-</sup>)

Cs, Ba (more pt hold in tighter)

K, K<sup>+</sup> (same pt less e<sup>-</sup>)

Ne, Ar (less energy levels)

11). Given the electron configurations for the following neutral atoms, predict the charge on the cation or anion and the number of valence electrons.

Element	Configuration	charge of cation or anion	valence electrons
A	1s <sup>2</sup> 2s <sup>2</sup> 2p <sup>6</sup> 3s <sup>2</sup>	+2	2
B	1s <sup>2</sup> 2s <sup>2</sup> 2p <sup>6</sup> 3s <sup>1</sup>	+1	1
C	1s <sup>2</sup> 2s <sup>2</sup> 2p <sup>6</sup>	0	8
D	1s <sup>2</sup> 2s <sup>2</sup> 2p <sup>5</sup>	-1	7
E	1s <sup>2</sup> 2s <sup>2</sup> 2p <sup>1</sup>	+3	3
F	1s <sup>2</sup> 2s <sup>2</sup> 2p <sup>6</sup> 3s <sup>2</sup> 3p <sup>5</sup>	-1	7

12.) Compare metals and nonmetals in terms of (a) position on the periodic table and (b) the way in which they form ions (do they gain or lose electrons).

a - metals - left nonmetals - right of zigzagline  
b - metals tend to lose e<sup>-</sup> nonmetals tend to gain e<sup>-</sup>

13). Which atom in each of the following pairs of atoms would have the **lower** electronegativity? Explain your choice.

a. Al, B (more energy levels + shielding)

b. B, Tl (more energy levels + shielding)

c. F, N (larger + further from valence e<sup>-</sup>)

d. Mg, Na (larger + further from valence e<sup>-</sup>)

e. K, Ca (larger + further from valence e<sup>-</sup>)

14). Identify all the groups on the periodic table using their correct family name (alkali metals, halogens, etc.)

1 - Alkali metal  
2 - Alkaline Earth metals  
3 - 12 transition metals  
17 - halogens  
18 - noble gases

15) Discuss the organization of Dmitri Mendeleev's early periodic table.

He arranged the periodic table based on atomic masses

16). Discuss Henry Moseley's Periodic table and the modern periodic table.

He arranged the periodic table based on atomic # (# of protons) because the properties aligned better

17). What is the periodic law? - the physical + chemical properties of the elements are periodic functions of their atomic numbers

18). Write the electron configurations for Mo and Au. Why are these different from what is predicted?

Mo - [Kr] 5s<sup>1</sup> 4d<sup>5</sup>  
Au - [Xe] 6s<sup>1</sup> 4f<sup>14</sup> 5d<sup>10</sup>

the d block is more stable when it is 1/2 or completely filled so it will take an electron from the s block and move it to the d block in the chromium + copper families