

The Periodic Table Review

1. Identify the following elements as a metal, metalloid or nonmetal, and as a solid, liquid, or gas at room temperature.

Element	Symbol	Metal, metalloid, or nonmetal?	Solid, liquid or gas?
Fluorine	F	Nonmetal	Gas
Germanium	Ge	Metalloid	Solid
Zinc	Zn	Metal	Solid
Phosphorus	P	Nonmetal	Solid
Lithium	Li	Metal	Solid

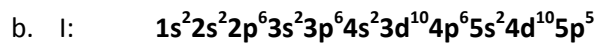
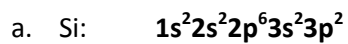
2. Name two elements that have properties similar to those of the element potassium. Why did you pick these two?

Li, Na, Rb, Cs, or Fr; because they are in the same group and have the same number of valence electrons

3. List at least 2 properties of each: metals, nonmetals and metalloids.

Check your textbook for examples.

4. Use the periodic table to write the electron configuration for silicon and iodine. (Shorthand or Longhand)



5. Complete the following table with the appropriate electron configurations, number of valence electrons, and electron dot notation.

Element	Electron Configuration	# of electrons	# of valence electrons	Electron dot structure
Si	$[\text{Ne}]3s^2 3p^2$	14	4	
Se	$[\text{Ar}]4s^2 3d^{10} 4p^3$	34	5	
Nb	$[\text{Kr}]5s^2 4d^3$	41	2	
Eu	$[\text{Xe}]6s^2 4f^7$	63	2	

6. For the following elements, predict what ion will form and write the electron configuration for the ion.



7. Name the element that matches the following description.

- | | |
|---|-----------|
| a. one that has 5 electrons in the third energy level | P |
| b. one with an electron configuration that ends in $4s^24p^5$ | Br |
| c. the Group 6A element in period 4 | Se |
| d. the alkaline earth metal in period 6 | Ba |
| e. The noble gas with the smallest atomic radius | He |
| f. The alkali metal with the greatest ionization energy | Li |
| g. The halogen with the lowest electronegativity | At |

8. What is the common characteristic of the electron configurations of the elements Ne and Ar? In which group would you find them?

Neon and argon each have a filled p energy orbital. This means they each hold 8 valence electrons. They are in group 18 known as the noble gases.

9. Is a magnesium atom smaller or larger than the atoms of both sodium and calcium? Explain.

Magnesium is smaller than sodium and calcium. Atomic size decreases across the periods due to increasing positive charge and unchanging electron energy levels. This means magnesium must be smaller than sodium. Magnesium is smaller than calcium because calcium has gained an additional electron energy level.

10. What is ionization energy? Which of the following has the lowest ionization energy: sodium or potassium?

Ionization energy is the energy needed to remove the electron from an atom of an element. Potassium would have the lower ionization energy.

11. Describe electroegativity. Is the electronegativity of barium larger or smaller than that of strontium?

Electronegativity is the attraction an atom has for electrons, particularly when participating in a chemical bond with another atom. The electronegativity of barium is smaller than that of strontium.

12. Tell whether each of the following elements is an *inner transition metal*, a *noble gas*, an *alkali metal*, an *alkaline earth metal*, or a *halogen*. The give its period and group numbers (ex. 18 & 8A.)

Element	Symbol	Type	Period #	Group #'s
Calcium	Ca	Alkaline earth metal	4	2
Cesium	Cs	Alkali metal	6	1
Fluorine	F	Halogen	2	17
Chromium	Cr	Transition metal	4	6
Neon	Ne	Noble gas	2	18
Silver	Ag	Transition metal	5	11

13. Among the following parts of atoms and ions, identify the larger of the two:

Atom, Ion	Larger Atomic Radius
Li, Li ⁺	Li
Cl, Cl ⁻	Cl ⁻
Mg, Mg ²⁺	Mg

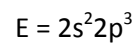
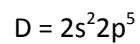
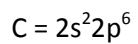
14. Given the outermost energy level configurations below, complete the table by providing the period number, group number, group name (if appropriate), and symbol for each element identified.

Element	Period #	Group #	Group Name	Symbol
[He]2s ²	2	2	Alkaline earth metals	Be
[Ne]3s ² 3p ³	3	15	N/A	P
[Ne]3s ² 3p ⁶	3	18	Noble Gases	Ar
[Ar]4s ¹	4	1	Alkali metals	K
[Ar]4s ² 3d ¹	4	3	Transition metals	Sc
[Ar]4s ² 3d ¹⁰ 4p ⁵	4	17	Halogens	Br

15. Among the following pairs of atoms, identify the larger of the two, the one with the greater first ionization energy, and the one with the lower electronegativity.

Element	Larger Atomic Radius	Greater Ionization Energy	Lower Electronegativity
Li, K	K	Li	K
C, F	C	F	C
Mg, Ca	Ca	Mg	Ca
O, S	S	O	S

16. The outermost energy level configurations for the theoretical elements A-E are listed below. Use the symbols A through E to answer each of the questions that follow.



- a. Which has the lowest first ionization energy? **B**
- b. Which is a noble gas? **C**
- c. Which has the highest electronegativity? **D**
- d. Which has the highest second ionization energy? **(We didn't talk about this)** **E**
- e. Which is the largest atom? **B**

17. How are the values of both ionization energy and electronegativity related to atomic size?

Think about the impact of increasing positive nuclear charge on all three of these properties.