

**Development of the Periodic Table**

*On the line at the left, write the letter of the contribution that each chemist made to the periodic table. Each letter will only be used once.*

- |                           |  |
|---------------------------|--|
| _____ 1. Dmitri Mendeleev | A. arranged elements by atomic number  |
| _____ 2. H.G.J. Moseley   | B. grouped elements into sets of three   |
| _____ 3. J.W. Dobereiner  | C. predicted the existence and properties of three undiscovered elements       |
| _____ 4. J.A.R Newlands   | D. organized elements into repeating groups of eight, which he termed octaves. |

*Answer each of the following questions in the space provided.*

5. Describe the features of Dobereiner's triads. Use the beryllium, magnesium and calcium triad to demonstrate his idea of average properties.

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6. What did the law of octaves state about the elements? \_\_\_\_\_

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7. Why was Mendeleev's decision to leave blank spaces on his table sometimes referred to as his most significant contribution to the periodic table?

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8. State the Periodic Law: \_\_\_\_\_

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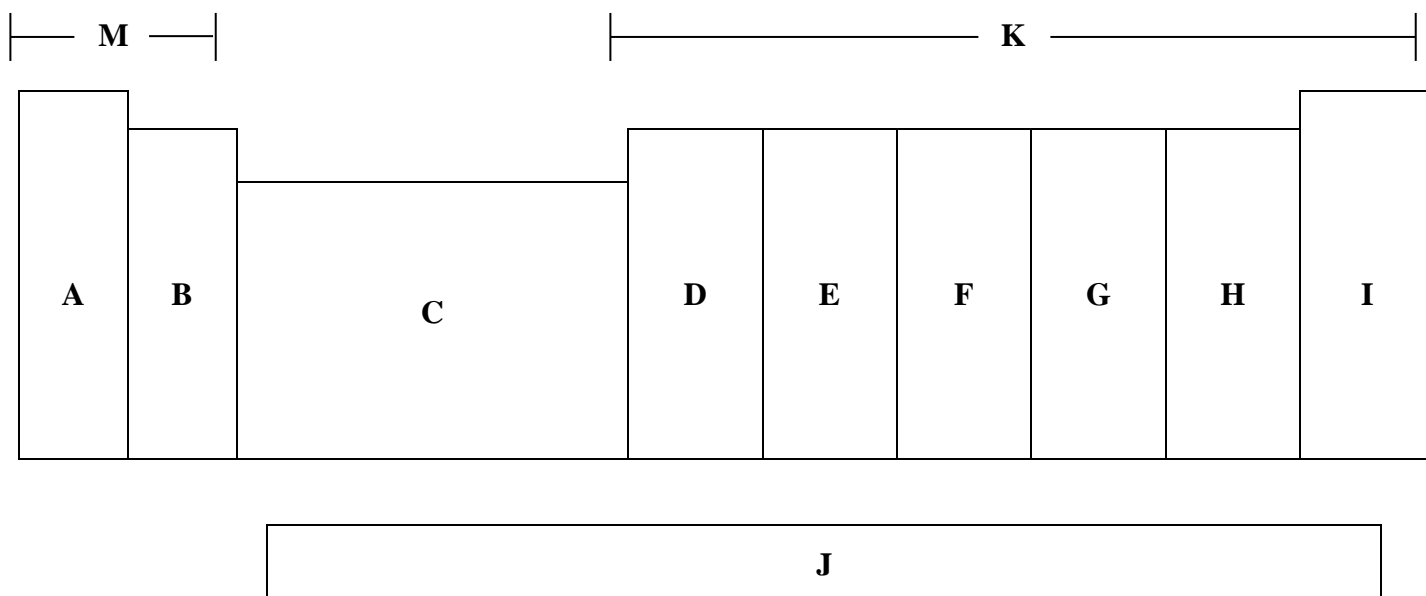
9. How does the above law differ from Mendeleev's arrangement of the periodic table? \_\_\_\_\_

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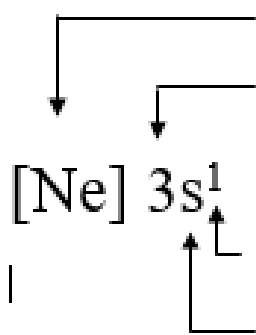
**Parts of the Periodic Table**

On the line at the left write the letter of the appropriate location of each group of elements on the periodic table below. Some letters will be used more than once.

- |                                   |  |
|-----------------------------------|--|
| _____ 1. carbon family            | _____ 8. <i>f</i> -block elements              |
| _____ 2. alkaline earth metals    | _____ 9. noble gases                           |
| _____ 3. inner transition metals  | _____ 10. <i>p</i> -block elements             |
| _____ 4. halogens                 | _____ 11. nitrogen family                      |
| _____ 5. <i>d</i> -block elements | _____ 12. <i>s</i> -block elements             |
| _____ 6. oxygen family            | _____ 13. transition metals                    |
| _____ 7. alkali metals            | _____ 14. group of one metalloid & four metals |



Explain the abbreviated electron configuration for sodium:



15. \_\_\_\_\_

16. \_\_\_\_\_

17. \_\_\_\_\_

18. \_\_\_\_\_

Write the abbreviated electron configuration for strontium:

19. \_\_\_\_\_

Write the abbreviated electron configuration for sulfur:

20. \_\_\_\_\_

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Identify each *of the* following elements as a metal (**M**), nonmetal, (**NM**), or semimetal (metalloid) (**SM**).

- \_\_\_\_\_ 21. sodium      \_\_\_\_\_ 22. silicon      \_\_\_\_\_ 23. neon  
\_\_\_\_\_ 24. calcium      \_\_\_\_\_ 25. nitrogen      \_\_\_\_\_ 26. hydrogen

Write the family names that have been given for each of the following groups:

27. Group IA (1) \_\_\_\_\_  
28. Group IIA (2) \_\_\_\_\_  
29. Group VIIA (17) \_\_\_\_\_  
30. Group VIIIA (18) \_\_\_\_\_

31. What information is usually found in the 100+ squares on the Periodic Table?

\_\_\_\_\_  
\_\_\_\_\_

32. What properties distinguish metal from nonmetals?

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

33. What does an electron configuration indicate? Why can abbreviated electron configurations be used?

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**4.3 Review***Periodic Trends*

*Use the periodic table to decide which atom in each pair has the larger atomic radius?*

\_\_\_\_\_ 1. Li or K

\_\_\_\_\_ 2. Ca or Ni

\_\_\_\_\_ 3. Ga or B

\_\_\_\_\_ 4. O or C

\_\_\_\_\_ 5. Cl or Br

\_\_\_\_\_ 6. Be or Ba

\_\_\_\_\_ 7. Si or S

\_\_\_\_\_ 8. Fe or Au

*Use the periodic table to decide which ion has the smaller atomic radius?*

\_\_\_\_\_ 9.  $K^+$  or  $O^{2-}$ \_\_\_\_\_ 10.  $Ba^{2+}$  or  $I^-$ \_\_\_\_\_ 11.  $Al^{3+}$  or  $P^{3-}$ \_\_\_\_\_ 12.  $K^+$  or  $Cs^+$ \_\_\_\_\_ 13.  $Fe^{2+}$  or  $Fe^{3+}$ \_\_\_\_\_ 14.  $F^-$  or  $S^{2-}$ 

*Use the periodic table to decide which atom or ion has the larger ionization energy?*

\_\_\_\_\_ 15. Na or O

\_\_\_\_\_ 16. Be or Ba

\_\_\_\_\_ 17. Ar or F

\_\_\_\_\_ 18. Cu or Ra

\_\_\_\_\_ 19. I or Ne

\_\_\_\_\_ 20. K or V

\_\_\_\_\_ 21. Ca or Fr

\_\_\_\_\_ 22. W or Se

*Write the charge that each atom will acquire when it has a complete set of valence electrons.*

\_\_\_\_\_ 23. O

\_\_\_\_\_ 24. Na

\_\_\_\_\_ 25. F

\_\_\_\_\_ 26. N

\_\_\_\_\_ 27. Ca

\_\_\_\_\_ 28. Ar

29. Define atomic radius: \_\_\_\_\_

\_\_\_\_\_

30. Why do atoms get smaller as you move across a period? \_\_\_\_\_

\_\_\_\_\_

31. Explain the relationship between the relative size of an ion to its atom and the charge on the ion.

\_\_\_\_\_

\_\_\_\_\_

32. Explain why noble gases are inert and do not form ions. \_\_\_\_\_

\_\_\_\_\_

**4.3 Practice**

1. Chlorine, selenium and bromine are located near each other on the periodic table. Which of these elements a) is the smallest? b) has the highest ionization energy?
2. Phosphorus, sulfur and selenium are located near each other on the periodic table. Which of these elements a) is larger? b) has the highest ionization energy?
3. Scandium, yttrium and lanthanum are located near each other on the periodic table. Which of these elements a) is larger? b) has the smaller ionization energy?
4. a) Which of the following atoms is smallest: vanadium, chromium or tungsten? b) Which has the highest ionization energy?
5. a) Which of the following atoms is smallest: nitrogen, phosphorus or arsenic? b) Which of these atoms has the smallest ionization energy?
6. Which of the following is the largest: a potassium atom, a potassium ion with a +1 charge, or a rubidium atom?
7. Circle the largest:    **Cl**    **Cl<sup>-1</sup>**    **Br**
8. Circle the smallest:    **Li**    **Li<sup>+1</sup>**    **Na**
9. Circle the largest:    **Te<sup>-2</sup>**    **I<sup>-1</sup>**    **Xe**
10. Aluminum, silicon and phosphorus are located near each other on the periodic table. Which of these elements a) is the largest? b) has the highest ionization energy?

**4.3 Apply****The Periodic Table**

1. What is the relationship between the number of a period in the periodic table and the distribution of electrons of elements of that period?
2. Would you expect strontium to be more similar to calcium or to rubidium? Explain.
3. How many valence electrons are in each of the following?
  - a) sulfur \_\_\_\_\_
  - b) calcium \_\_\_\_\_
  - c) nickel \_\_\_\_\_
  - d) arsenic \_\_\_\_\_
4. Which elements in period 4 have one valence electron? \_\_\_\_\_  
Which elements of period 4 have 2 valence electrons? \_\_\_\_\_
5. Which element in period 4 has a half-filled p sublevel? \_\_\_\_\_
6. Which elements in period 4 have:
  - a) filled 3d sublevels? \_\_\_\_\_
  - b) half-filled 3d sublevels? \_\_\_\_\_
7. What name is given to the group of elements that have the following valence shell electron configurations?
  - a)  $s^2$  \_\_\_\_\_
  - b)  $s^2p^5$  \_\_\_\_\_
8. How do the electron configurations within the same group of elements compare?
9. Tell why the charge on the kernel of any atom:
  - (a) can never be negative. \_\_\_\_\_
  - (b) can never be greater than +8. \_\_\_\_\_

10. What are the lightest alkali metal and the lightest halogen? \_\_\_\_\_  
What are the heaviest noble gas and the heaviest alkaline earth metal? \_\_\_\_\_
11. Which alkali metal belongs to the 6th period? \_\_\_\_\_  
Which halogen belongs to the fourth period? \_\_\_\_\_
12. Why are the noble gases relatively unreactive?
13. (a) In which block (s, p, d, or f) are the metalloids found? \_\_\_\_\_  
(b) ) In which block (s, p, or d) are the hardest, densest metals found? \_\_\_\_\_
14. How do the transition elements of the lanthanoid series differ from the other transition elements of period 6?
15. Arrange the following elements in order of increasing ionization energy.  
(a) Be, Mg, Sr \_\_\_\_\_  
(b) Bi, Cs, Ba \_\_\_\_\_  
(c) Na, Al, S \_\_\_\_\_
16. Explain why it would take more energy to remove a 4s electron from zinc than it would from calcium.
17. Which element in each pair is more electronegative?  
(a) Cl or F    (b) C or N    (c) Mg or Ne    (d) As or Ca
18. Describe the relationship between atomic radius and:  
(a) nuclear charge \_\_\_\_\_  
(b) number of occupied energy levels \_\_\_\_\_
19. Why are the ionic radii of metallic elements smaller than the atomic radii of the same elements?

Why are the ionic radii of nonmetallic elements larger than the atomic radii of those elements?

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20. Identify the atom or ion with the larger radius in each of the following pairs:

(a) S and O \_\_\_\_\_ (b)  $S^{2-}$  and  $O^{2-}$  \_\_\_\_\_ (c) Na and K \_\_\_\_\_

(d)  $Na^{+1}$  and  $K^{+1}$  \_\_\_\_\_ (e) Ca and  $Ca^{+2}$  \_\_\_\_\_ (f) F and  $F^{-1}$  \_\_\_\_\_

21. Classify the following as metals, nonmetals, or semimetals:

Sodium \_\_\_\_\_ silicon \_\_\_\_\_

Boron \_\_\_\_\_ bromine \_\_\_\_\_

Carbon \_\_\_\_\_ aluminum \_\_\_\_\_

Tin \_\_\_\_\_

22. Arrange the following elements in order of increasing metallic character: Cesium, Copper, Fluorine, Phosphorus, Potassium.

23. Would you expect the metals or nonmetals of the same period to have higher ionization energies?

24. What type of ions do metals tend to form? Explain your answer.

25. What type of ions do nonmetals tend to form. Explain.

26. For each group below, indicate whether electrons are more likely to be lost or gained during compound formation. Give the number of electrons that will be lost or gained.

(a) Group 1 elements: \_\_\_\_\_

(b) Group 2 elements: \_\_\_\_\_

(c) Group 13 elements: \_\_\_\_\_

(d) Group 16 elements: \_\_\_\_\_

(e) Group 17 elements: \_\_\_\_\_

(f) Group 18 elements: \_\_\_\_\_



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**Practice #1: The Periodic Table**

- \_\_\_\_\_ 1. The man who published the first periodic table.
- \_\_\_\_\_ 2. How did the man in question 1 arrange the elements on the periodic table?
- \_\_\_\_\_ 3. The man responsible for the modern periodic table.
- \_\_\_\_\_ 4. How did the man in question 3 arrange the elements on the periodic table?
- \_\_\_\_\_ 5. What name is given to a horizontal row on the periodic table?
- \_\_\_\_\_ 6. What name is given to a vertical column on the periodic table?
- \_\_\_\_\_ 7. How many elements belong to period 6?
- \_\_\_\_\_ 8. How many elements belong to group 2?
- \_\_\_\_\_ 9. The periods of the periodic table are numbered 1 - 7. What does this number tell us about the elements in that period?
- \_\_\_\_\_ 10. Which element(s) in period 4 have 1 valence electron?
- \_\_\_\_\_ 11. What groups make up the s block on the periodic table?
- \_\_\_\_\_ 12. What groups make up the p block on the periodic table?
- \_\_\_\_\_ 13. What name is given to all elements on the periodic table that are filling the d sublevel?
- \_\_\_\_\_ 14. What name is given to the transition elements of period 6 that are filling the f sublevels?
- \_\_\_\_\_ 15. What name is given to the transition elements of period 7 that are filling the f sublevels?
- \_\_\_\_\_ 16. What do you call the outermost energy level that includes at least one electron?
- \_\_\_\_\_ 17. What name is given to all the elements in group one except hydrogen?
- \_\_\_\_\_ 18. What is the maximum number of electrons that might be found in the valence shell?
- \_\_\_\_\_ 19. Which of the following elements would be least similar to Chlorine? (Fluorine, Iodine, Sulfur, or Bromine?)
- \_\_\_\_\_ 20. Which element is in period 5, group 11?
- \_\_\_\_\_ 21. How many valence electrons does Bromine have?
- \_\_\_\_\_ 22. How many valence electrons does Barium have?
- \_\_\_\_\_ 23. What element in period 3 has a half-filled s sublevel?

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- \_\_\_\_\_ 24. What is the valence shell of manganese?
- \_\_\_\_\_ 25. What name is given to all the elements in group 2?
- \_\_\_\_\_ 26. What name is given to all the elements in group 17?
- \_\_\_\_\_ 27. Which columns contain elements that are the most reactive of all the elements?
- \_\_\_\_\_ 28. What is the lightest member of the alkali metals?
- \_\_\_\_\_ 29. Which is the heaviest noble gas?
- \_\_\_\_\_ 30. Which halogen belongs to the fourth period?

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**Practice #2: The Periodic Table**

- \_\_\_\_\_ 1. The energy required to remove valence electrons from an atom.
- \_\_\_\_\_ 2. As you go from left to right across the periodic table, does this value increase or decrease?
- \_\_\_\_\_ 3. As you go down a family, does this value increase or decrease?
- \_\_\_\_\_ 4. The ability of an atom to attract or pull a shared electron to itself.
- \_\_\_\_\_ 5. As you go from left to right across the periodic table, does this value increase or decrease?
- \_\_\_\_\_ 6. As you go down a family, does this value increase or decrease?
- \_\_\_\_\_ 7. The distance between the nucleus and the electrons in the valence shell of an atom.
- \_\_\_\_\_ 8. As you go from left to right across the periodic table, does this value increase or decrease?
- \_\_\_\_\_ 9. As you go down a family, does this value increase or decrease?
- \_\_\_\_\_ 10. Why would fluorine have a smaller atomic radius than oxygen?
- \_\_\_\_\_ 11. Why would fluorine have a smaller atomic radius than chlorine?
- \_\_\_\_\_ 12. Which one of these elements has the greater ionization energy? (calcium, iron, arsenic)
- \_\_\_\_\_ 13. The process that occurs when two atoms share electrons in order to fill their valence shells.
- \_\_\_\_\_ 14. What two factors determine whether or not the ionization energy increases or decreases?
- \_\_\_\_\_ 15.
- \_\_\_\_\_ 16. Which one of the following elements has the smallest electronegativity? (tungsten, zinc, phosphorus, fluorine)
- \_\_\_\_\_ 17. Which two of these elements should have characteristics similar to each other? (fluorine, chlorine, oxygen, nitrogen)
- \_\_\_\_\_ 18. Which of the following has the highest ionization energy? (tin, arsenic, sulfur)
- \_\_\_\_\_ 19. Identify the atom or ion with the larger radius:  $\text{Na}^{+1}$  or  $\text{K}^{+1}$
- \_\_\_\_\_ 20. Identify the atom or ion with the smaller radius: F or  $\text{F}^{-1}$
- \_\_\_\_\_ 21. Which elements on the periodic table have no electronegativity?
- \_\_\_\_\_ 22. The distance from the nucleus of an ion to its outer energy level is called?
- \_\_\_\_\_ 23. Metals are more likely to (take on, give off) valence electrons?
- \_\_\_\_\_ 24. Do negative ions have a larger or smaller ionic radius than the parent atom?

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- \_\_\_\_\_ 25. Nonmetals are more likely to (take on, give off) valence electrons?
- \_\_\_\_\_ 26. Do positive ions have a larger or smaller ionic radius than the parent atom?
- \_\_\_\_\_ 27. Elements that have characteristics of both metals and nonmetals are called?
- \_\_\_\_\_ 28. List the seven elements that have characteristics of both metals and nonmetals.
- \_\_\_\_\_ 29. Where are the most metallic elements found on the periodic table?
- \_\_\_\_\_ 30. An element that can be hammered into a thin, flat sheet is said to be?
- \_\_\_\_\_ 31. The ability to be drawn into a long, thin wire.
- \_\_\_\_\_ 32. Do metals have a low or high ionization energy?
- \_\_\_\_\_ 33. Do nonmetals have a low or high electronegativity?
- \_\_\_\_\_ 34. Which element is more metallic: Mg, Sr, or Cs?
- \_\_\_\_\_ 35. Where on the periodic table would you find elements with the highest electronegativity?

- \_\_\_\_\_ 1. How many periods are on the periodic table?
- \_\_\_\_\_ 2. How many groups are on the periodic table?
- \_\_\_\_\_ 3. What three groups contain elements that are so reactive that they can only be found in the combined state in nature?
- \_\_\_\_\_ 4. What groups contain the transition elements?
- \_\_\_\_\_ 5. What group contains the halogens?
- \_\_\_\_\_ 6. What group contains the alkali metals?
- \_\_\_\_\_ 7. What period contains the actinoids?
- \_\_\_\_\_ 8. What two groups represent the s block of elements?
- \_\_\_\_\_ 9. What group are the noble gases?
- \_\_\_\_\_ 10. What period contains the lanthanoids?
- \_\_\_\_\_ 11. What groups make up the p block of elements?
- \_\_\_\_\_ 12. What groups make up the d block elements?
- \_\_\_\_\_ 13. What group contains the alkaline earth metals?
- \_\_\_\_\_ 14. What composes the f block of elements?
- \_\_\_\_\_ 15. In what group are the elements that will never react because their valence shells already have the maximum number of 8 electrons.
- \_\_\_\_\_ 16. Which element would have a larger atomic radius, potassium or sodium?

**Matching. Indicate the letter of the term on the right that most closely matches the phrase on the left.**

- |   |                      |
|---|----------------------|
| _____ 17. A measure of the force of attraction between an atom and a shared pair of electrons in a covalent bond. | 1) Atomic Radius     |
| _____ 18. The distance from the nucleus to the valence shell of an atom   | 2) Ionic Radius      |
| _____ 19. The distance from the nucleus of a charged atom to the outer shell of electrons.                        | 3) Ionization Energy |
| _____ 20. The energy required to remove the outermost electron from a neutral atom.                               | 4) Electronegativity |

**Multiple Choice**

- \_\_\_\_\_ 21. In early efforts to develop a table of elements, the elements were arranged by:  
(1) atomic numbers (2) atomic masses (3) atomic radii (4) ionization energies.
- \_\_\_\_\_ 22. The modern periodic table classifies elements according to:  
(1) atomic numbers (2) atomic weights (3) atomic masses (4) mass numbers.
- \_\_\_\_\_ 23. Most elements in the fourth period are:  
(1) nonmetals (2) metals (3) semimetals (4) gases.
- \_\_\_\_\_ 24. Roughly half of the elements in the fourth period are:  
(1) active metals (2) semimetals (3) transition elements (4) nonmetals
- \_\_\_\_\_ 25. Which one of the following is a transition element?  
(1) Calcium (2) Iodine (3) Arsenic (4) Scandium- Sc
- \_\_\_\_\_ 26. Which category of elements is found in the f block?  
(1) lanthanoids (2) transition elements (3) halogens (4) alkali metals.
- \_\_\_\_\_ 27. In the periodic table, the nonmetals with the highest electronegativities are found at or near the:  
(1) upper right (2) lower right (3) upper left (4) lower left.
- \_\_\_\_\_ 28. In the periodic table, the metals with the lowest ionization energies are found at or near the:  
(1) upper right (2) lower right (3) upper left (4) lower left.
- \_\_\_\_\_ 29. The number of the row of elements is the same as the number of:  
(1) the energy level of the valence electrons (2) electrons in an atom of that element  
(3) protons and neutrons in an atom of that element (4) elements in that particular row of the table.
- \_\_\_\_\_ 30. One property of most nonmetals in the solid state is that they are:  
(1) brittle (2) malleable (3) good conductors of electricity (4) good conductors of heat.
- \_\_\_\_\_ 31. Which of the atoms of period 3 attracts a shared pair of electrons more strongly than does phosphorus?  
(1) Sodium (2) Chlorine (3) Calcium (4) Arsenic.
- \_\_\_\_\_ 32. Which one of the following elements is chemically most similar to phosphorus?  
(1) Silicon (2) Sulfur (3) Carbon (4) Nitrogen.
- \_\_\_\_\_ 33. Which one of the following elements is most likely to form a positive ion?  
(1) Oxygen (2) Potassium (3) Phosphorus (4) Chlorine.
- \_\_\_\_\_ 34. The elements of period 3 are similar in that they all have the same number of:  
(1) occupied principal energy levels (2) protons in the nucleus (3) 3p electrons  
(4) valence electrons.
- \_\_\_\_\_ 35. Which one of the following elements is most likely to form a negative ion?  
(1) Chlorine (2) Beryllium (3) Carbon (4) Lithium.

- \_\_\_\_\_36. In the ground state, what is the number of valence electrons of the elements in Group 17?
- \_\_\_\_\_37. The alkali metals all have the same: (1) covalent atomic radius (2) ionization energy (3) electronegativity (4) number of valence electrons.
- \_\_\_\_\_38. The atoms of the most active nonmetals have:  
(1) small covalent atomic radii and high ionization energies.  
(2) small covalent atomic radii and low ionization energies.  
(3) large covalent atomic radii and low ionization energies.  
(4) large covalent atomic radii and high ionization energies.
- \_\_\_\_\_39. The alkaline earth metal that has the largest covalent atomic radius is found in Period:  
(1) 1 (2) 2 (3) 6 (4) 7.
- \_\_\_\_\_40. Which of the following ions has the smallest radius?  
(1)  $K^+$  (2)  $Li^+$  (3)  $Na^+$  (4)  $Rb^+$ .
- \_\_\_\_\_41. An element that has both a high ionization energy and a high electronegativity is most likely to be a:  
(1) metal (2) nonmetal (3) semimetal (4) noble gas.
- \_\_\_\_\_42. Within a family of elements, as atomic number increases, covalent atomic radius increases. Which of the following statements is the best explanation for this? (1) The number of occupied energy levels increases. (2) The number of occupied energy levels decreases. (3) The charge on the nucleus increases. (4) The charge on the nucleus decreases.
- \_\_\_\_\_43. Elements that have similar properties have: (1) nearly the same atomic mass (2) the same number of protons (3) the same number of valence electrons (4) the same number of total electrons.
- \_\_\_\_\_44. The ionic radius compared to the atomic radius of the parent atom is:  
(1) generally larger for all ions (2) generally smaller for all ions (3) larger for positive ions and smaller for negative ions (4) larger for negative ions and smaller for positive ions.
- \_\_\_\_\_45. In the same group of elements the ionization energy tends to decrease with increasing atomic number. This is due partially to the: (1) decreasing size of the atom itself (2) increasing forces of attraction (3) outer electrons being closer to the nucleus (4) outer electrons being farther from the nucleus.
- \_\_\_\_\_46. An element with the electron configuration of  $1s^2 2s^2 2p^6 3s^2$  would belong in which group?  
(1) nitrogen group (2) alkaline earth metals (3) noble gases (4) halogens.
- \_\_\_\_\_47. The characteristic properties of metals are associated with:  
(1) strongly held valence electrons (2) completely filled energy levels  
(3) partially filled orbitals (4) loosely held valence electrons.

**FILL IN THE BLANK**

- \_\_\_\_\_ 48. How many valence electrons does Silver have?
- \_\_\_\_\_ 49. What is the valence shell of Tungsten (W)?
- \_\_\_\_\_ 50. Which element (Y, Tc, Cd) has the least electronegativity?
- \_\_\_\_\_ 51. Which element ( Na, K, Fr, O) has the greater ionization energy?
- \_\_\_\_\_ 52. Which element (Fe, Zn, Ru, Ta, Fr) is the most metallic?
- \_\_\_\_\_ 53. What do you call a vertical column on the periodic table?
- \_\_\_\_\_ 54. What do you called a horizontal row on the periodic table?
- \_\_\_\_\_ 55. What scientist is responsible for the periodic table that we are using today?
- \_\_\_\_\_ 56. Within a group of elements in the periodic table, as the atomic number increases, the atomic radii (increases, decreases, remains the same)?
- \_\_\_\_\_ 57. Which family contains the most active (reactive) group of nonmetals?
- \_\_\_\_\_ 58. The most metallic of the elements are found where in the periodic table? (upper right, lower left, upper left, lower right?)
- \_\_\_\_\_ 59. As you go from left to right on the periodic table, does the ionization energy increase or decrease?
- \_\_\_\_\_ 60. As you go from left to right on the periodic table, does the electronegativity increase or decrease?
- \_\_\_\_\_ 61. As you go down the periodic table, does the ionization energy increase or decrease?
- \_\_\_\_\_ 62. What term means that an element can be hammered into flat sheets?

**Tell whether each of the following elements is a metal, a nonmetal, or a semimetal.**

- \_\_\_\_\_ 63. Cobalt
- \_\_\_\_\_ 64. Oxygen
- \_\_\_\_\_ 65. Carbon
- \_\_\_\_\_ 66. Boron
- \_\_\_\_\_ 67. Iodine
- \_\_\_\_\_ 68. Zinc
- \_\_\_\_\_ 69. Arsenic
- \_\_\_\_\_ 70. Mercury
- \_\_\_\_\_ 71. Antimony
- \_\_\_\_\_ 72. Aluminum



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**Three elements are represented by the letters A, B, and C. The three elements have the same number of valence electrons. Element C has electrons in three energy levels and element A is the lightest of the three. Element B has a total of twenty electrons.**

\_\_\_\_\_ 73. What is element A?

\_\_\_\_\_ 74. What is element B?

\_\_\_\_\_ 75. What is element C?

\_\_\_\_\_ 76. How many protons does chlorine have?

\_\_\_\_\_ 77. In which group does chlorine belong?

\_\_\_\_\_ 78. What is the name of this group?

\_\_\_\_\_ 79. How many valence electrons does chlorine have?

\_\_\_\_\_ 80. How does the atomic radius of chlorine compare to Fluorine?

\_\_\_\_\_ 81. What type of ion is chlorine most likely to form?

\_\_\_\_\_ 82. How does the electronegativity of chlorine compare to Sulfur?

\_\_\_\_\_ 83. How does the ionization energy of chlorine compare to Bromine?