

- ___ 16. The first member of the noble gas family, whose highest energy level consists of an octet of electrons, is
a. helium. b. argon. c. neon. d. krypton.
- ___ 17. The most characteristic property of the noble gases is that they
a. have low boiling points. c. are gases at ordinary temperatures.
b. are radioactive. d. are largely unreactive.
- ___ 18. Which represents a neutral atom acquiring an electron in a process where energy is released?
a. $A + e^- + \text{energy} \rightarrow A^-$ c. $A + e^- \rightarrow A^- + \text{energy}$
b. $A + e^- \rightarrow A^- - \text{energy}$ d. $A^- + \text{energy} \rightarrow A + e^-$
- ___ 19. The energy required to remove an electron from an atom is the atom's
a. electron affinity. c. electronegativity.
b. electron energy. d. ionization energy.
- ___ 20. A measure of the ability of an atom in a chemical compound to attract electrons from another atom in the compound is called
a. electron affinity. c. electronegativity.
b. electron configuration. d. ionization potential.
- ___ 21. What is removed when the ionization energy is supplied to an atom of an element?
a. the electron b. the nucleus c. an electron d. an ion cloud
- ___ 22. When an electron is acquired by a neutral atom, the energy change is called
a. electron affinity. c. ionization energy.
b. electronegativity. d. electron configuration.
- ___ 23. The element that has the greatest electronegativity is
a. oxygen. b. sodium. c. chlorine. d. fluorine.
- ___ 24. A positive ion is known as a(n)
a. ionic radius. b. valence electron. c. cation. d. anion
- ___ 25. Within a group of elements, as the atomic number increases, the atomic radius
a. increases. c. decreases regularly.
b. remains approximately constant. d. varies unpredictably.
- ___ 26. Across a period in the periodic table, atomic radii
a. gradually decrease. c. gradually increase.
b. gradually decrease, then sharply increase. d. gradually increase, then sharply decrease.
- ___ 27. For each successive electron removed from an atom, the ionization energy
a. increases. c. remains the same.
b. decreases. d. shows no pattern.
- ___ 28. As you move left to right in Period 4 from gallium through bromine, atomic radii
a. generally increase. c. do not change.
b. generally decrease. d. vary unpredictably.
- ___ 29. The number of valence electrons in Group 17 elements is
a. 7. c. 17.
b. 8. d. equal to the period number.
- ___ 30. Which of the following elements is in the same period as phosphorus?
a. carbon b. magnesium c. nitrogen d. oxygen
- ___ 31. The modern periodic table is arranged in order of increasing atomic _____.
a. mass b. charge c. number d. radius
- ___ 32. Of the elements Pt, V, Li, and Kr, which is a nonmetal?
a. Pt b. V c. Li d. Kr

- _____ 33. To what category of elements does an element belong if it is a poor conductor of electricity?
a. transition elements b. metalloids c. nonmetals d. metals
- _____ 34. The atomic number of an element is the total number of which particles in the nucleus?
a. neutrons b. protons c. electrons d. protons and electrons
- _____ 35. What element has the electron configuration $1s^2 2s^2 2p^6 3s^2 3p^2$?
a. nitrogen b. selenium c. silicon d. silver
- _____ 36. Which of the following is true about the electron configurations of the noble gases?
a. The highest occupied *s* and *p* sublevels are completely filled.
b. The highest occupied *s* and *p* sublevels are partially filled.
c. The electrons with the highest energy are in a *d* sublevel.
d. The electrons with the highest energy are in an *f* sublevel.
- _____ 37. Elements that are characterized by the filling of *p* orbitals are classified as _____.
a. p-block elements c. d-block elements
b. s-block elements d. f-block elements
- _____ 38. Which subatomic particle plays the greatest part in determining the properties of an element?
a. proton b. electron c. neutron d. none of the above
- _____ 39. Which of the following elements is a transition metal?
a. cesium b. copper c. tellurium d. tin
- _____ 40. Which of the following groupings contains only representative elements?
a. Cu, Co, Cd c. Al, Mg, Li
b. Ni, Fe, Zn d. Hg, Cr, Ag
- _____ 41. What are the Group 1A and Group 7A elements examples of?
a. representative elements c. noble gases
b. transition elements d. nonmetallic elements
- _____ 42. What element in the second period has the largest atomic radius?
a. carbon b. lithium c. potassium d. neon
- _____ 43. What is the charge of a cation?
a. a positive charge c. a negative charge
b. no charge d. The charge depends on the size of the nucleus.
- _____ 44. The metals in Groups 1A, 2A, and 3A _____.
a. gain electrons when they form ions c. all have ions with a 1^+ charge
b. all form ions with a negative charge d. lose electrons when they form ions
- _____ 45. Why is the second ionization energy greater than the first ionization energy?
a. It is more difficult to remove a second electron from an atom.
b. The size of atoms increases down a group.
c. The size of anions decreases across a period.
d. The nuclear attraction from protons in the nucleus decreases.
- _____ 46. In which of the following groups of ions are the charges all shown correctly?
a. Li^- , O^{2-} , S^{2+} c. K^{2-} , F^- , Mg^{2+}
b. Ca^{2+} , Al^{3+} , Br^- d. Na^+ , I^- , Rb^-

The Periodic Table

Multiple Choice

Identify the choice that best completes the statement or answers the question.

- _____ 1. Elements to the right side of the periodic table (*p*-block elements) have properties most associated with
a. metals. b. metalloids. c. gases. d. nonmetals.
- _____ 2. A horizontal row of blocks in the periodic table is called a(n)
a. family. b. octet. c. period. d. group.
- _____ 3. What are the Group 1A and Group 7A elements examples of?
a. noble gases c. representative elements
b. transition elements d. nonmetallic elements
- _____ 4. To what category of elements does an element belong if it is a poor conductor of electricity?
a. transition elements b. metalloids c. nonmetals d. metals
- _____ 5. The periodic law states that the physical and chemical properties of elements are periodic functions of their
atomic
a. radii. b. charges. c. masses. d. numbers.
- _____ 6. The electron configuration of cesium, atomic number 55, is [Xe] 6s¹. In what period is cesium?
a. Period 1 b. Period 6 c. Period 55 d. Period 8
- _____ 7. Which of the following groupings contains only representative elements?
a. Al, Mg, Li c. Ni, Fe, Zn
b. Cu, Co, Cd d. Hg, Cr, Ag
- _____ 8. Across a period in the periodic table, atomic radii
a. gradually decrease. c. gradually decrease, then sharply increase.
b. gradually increase, then sharply decrease. d. gradually increase.
- _____ 9. The group of 14 *f* block elements in the sixth period is the
a. actinides. b. metalloids. c. lanthanides. d. transition
elements.
- _____ 10. Which subatomic particle plays the greatest part in determining the properties of an element?
a. electron b. proton c. neutron d. none of the
above
- _____ 11. The elements in Group 1 are also known as the
a. Period 1 elements. c. rare-earth series.
b. actinide series. d. alkali metals.
- _____ 12. Argon, krypton, and xenon are
a. noble gases. c. actinides.
b. lanthanides. d. alkaline earth metals.
- _____ 13. Within a group of elements, as the atomic number increases, the atomic radius
a. increases. c. decreases regularly.
b. varies unpredictably. d. remains approximately constant.
- _____ 14. The element that has the greatest electronegativity is
a. oxygen. b. sodium. c. fluorine. d. chlorine.
- _____ 15. Which of the following elements is in the same period as phosphorus?
a. nitrogen b. magnesium c. carbon d. oxygen

- _____ 16. Elements in a group or column in the periodic table can be expected to have similar
a. atomic masses. c. numbers of neutrons.
b. atomic numbers. d. properties.
- _____ 17. The first member of the noble gas family, whose highest energy level consists of an octet of electrons, is
a. krypton. b. argon. c. helium. d. neon.
- _____ 18. The energy required to remove an electron from an atom is the atom's
a. electronegativity. c. electron energy.
b. ionization energy. d. electron affinity.
- _____ 19. A measure of the ability of an atom in a chemical compound to attract electrons from another atom in the compound is called
a. ionization potential. c. electron configuration.
b. electronegativity. d. electron affinity.
- _____ 20. The idea of arranging the elements in the periodic table according to their chemical and physical properties is attributed to
a. Ramsay. b. Mendeleev. c. Bohr. d. Moseley.
- _____ 21. The atomic number of lithium, the first element in Group 1, is 3. The atomic number of the second element in this group is
a. 4. b. 11. c. 18. d. 10.
- _____ 22. The most reactive group of the nonmetals is the
a. halogens. c. lanthanides.
b. transition elements. d. noble gases.
- _____ 23. Which of the following is true about the electron configurations of the noble gases?
a. The highest occupied *s* and *p* sublevels are completely filled.
b. The electrons with the highest energy are in a *d* sublevel.
c. The highest occupied *s* and *p* sublevels are partially filled.
d. The electrons with the highest energy are in an *f* sublevel.
- _____ 24. Each period in the periodic table corresponds to _____.
a. a suborbital c. a principal energy level
b. an energy sublevel d. an orbital
- _____ 25. Elements that are characterized by the filling of *p* orbitals are classified as _____.
a. f-block elements c. d-block elements
b. s-block elements d. p-block elements
- _____ 26. Which represents a neutral atom acquiring an electron in a process where energy is released?
a. $A + e^- \rightarrow A^- - \text{energy}$ c. $A + e^- + \text{energy} \rightarrow A^-$
b. $A^- + \text{energy} \rightarrow A + e^-$ d. $A + e^- \rightarrow A^- + \text{energy}$
- _____ 27. The atomic number of an element is the total number of which particles in the nucleus?
a. electrons b. protons and c. neutrons d. protons
electrons
- _____ 28. The modern periodic table is arranged in order of increasing atomic _____.
a. number b. charge c. radius d. mass
- _____ 29. Why is the second ionization energy greater than the first ionization energy?
a. It is more difficult to remove a second electron from an atom.
b. The size of atoms increases down a group.
c. The nuclear attraction from protons in the nucleus decreases.
d. The size of anions decreases across a period.

- ___ 30. What element has the electron configuration $1s^2 2s^2 2p^6 3s^2 3p^2$?
a. silver b. nitrogen c. silicon d. selenium
- ___ 31. Period 4 contains 18 elements. How many of these elements have electrons in the d sublevel?
a. 18 b. 10 c. 16 d. 8
- ___ 32. In which of the following groups of ions are the charges all shown correctly?
a. Li^- , O^{2-} , S^{2+} c. Ca^{2+} , Al^{3+} , Br^-
b. Na^+ , I^- , Rb^- d. K^{2-} , F^- , Mg^{2+}
- ___ 33. As you move left to right in Period 4 from gallium through bromine, atomic radii
a. generally increase. c. do not change.
b. vary unpredictably. d. generally decrease.
- ___ 34. Which statement is true about electronegativity?
a. Electronegativity generally increases as you move from top to bottom within a group.
b. Electronegativity generally is higher for metals than for nonmetals.
c. Electronegativity generally increases from left to right across a period.
d. Electronegativity is the ability of an anion to attract another anion.
- ___ 35. Which of the following elements is a transition metal?
a. cesium b. tin c. tellurium d. copper
- ___ 36. Bromine, atomic number 35, belongs to Group 17. How many electrons does bromine have in its outermost energy level?
a. 18 b. 17 c. 7 d. 35
- ___ 37. A positive ion is known as a(n)
a. anion b. ionic radius. c. valence electron. d. cation.
- ___ 38. The most characteristic property of the noble gases is that they
a. are largely unreactive. c. are radioactive.
b. have low boiling points. d. are gases at ordinary temperatures.
- ___ 39. What are the radioactive elements with atomic numbers from 90 to 103 called?
a. the noble gases c. the actinides
b. the rare-earth elements d. the lanthanides
- ___ 40. For each successive electron removed from an atom, the ionization energy
a. shows no pattern. c. increases.
b. remains the same. d. decreases.
- ___ 41. Of the elements Pt, V, Li, and Kr, which is a nonmetal?
a. Kr b. Pt c. V d. Li
- ___ 42. What is removed when the ionization energy is supplied to an atom of an element?
a. an ion b. an electron c. the electron d. the nucleus
cloud
- ___ 43. In Period 3 there are 8 elements. What sublevel(s) is (are) being filled?
a. d and f b. s and d c. s and p d. s
- ___ 44. Because the first energy level contains only the $1s$ sublevel, the number of elements in this period is
a. 4. b. 8. c. 1. d. 2.
- ___ 45. What are the elements with atomic numbers from 58 to 71 called?
a. the actinides c. the noble gases
b. the lanthanides d. the alkali metals
- ___ 46. Which of the following elements has the smallest atomic radius?
a. selenium b. bromine c. chlorine d. sulfur

- ___ 47. Krypton, atomic number 36, is the fourth element in Group 18. What is the atomic number of xenon, the fifth element in Group 18?
a. 68 b. 54 c. 90 d. 72
- ___ 48. Which block in the periodic table contains the alkali metals?
a. *d* b. *p* c. *f* d. *s*
- ___ 49. The number of valence electrons in Group 17 elements is
a. equal to the period number. c. 17.
b. 8. d. 7.
- ___ 50. What is the energy required to remove an electron from an atom in the gaseous state called?
a. shielding energy c. electronegative energy
b. nuclear energy d. ionization energy
- ___ 51. The metals in Groups 1A, 2A, and 3A _____.
a. lose electrons when they form ions c. gain electrons when they form ions
b. all have ions with a 1^+ charge d. all form ions with a negative charge
- ___ 52. When an electron is acquired by a neutral atom, the energy change is called
a. electron configuration. c. ionization energy.
b. electron affinity. d. electronegativity.
- ___ 53. What element in the second period has the largest atomic radius?
a. carbon b. lithium c. neon d. potassium
- ___ 54. The electron configuration of aluminum, atomic number 13, is $[\text{Ne}] 3s^2 3p^1$. Aluminum is in Period
a. 2. b. 3. c. 6. d. 13.
- ___ 55. What is the charge of a cation?
a. no charge c. a positive charge
b. The charge depends on the size of the nucleus. d. a negative charge

Essay

56. Explain how ions form. Compare and contrast the ions radii vs it's neutral atoms radii. Provide examples.