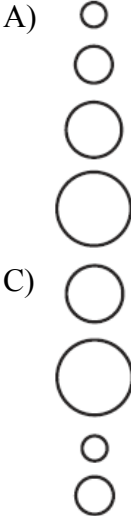
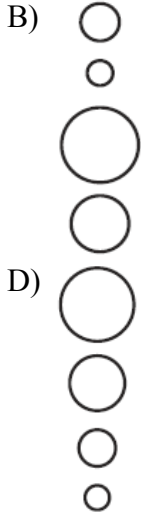

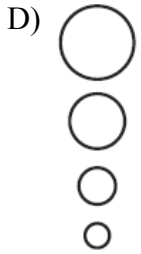


1. Which element is a solid at STP and a good conductor of electricity?
- A) iodine B) mercury
C) nickel D) sulfur
2. Which element has both metallic and nonmetallic properties?
- A) Rb B) Rn C) Si D) Sr
3. The carbon atoms in graphite and the carbon atoms in diamond have different
- A) atomic numbers
B) atomic masses
C) electronegativities
D) structural arrangements
4. Atoms of which element have the greatest tendency to gain electrons?
- A) bromine B) chlorine
C) fluorine D) iodine
5. Which statement describes a chemical property of the element magnesium?
- A) Magnesium is malleable.
B) Magnesium conducts electricity.
C) Magnesium reacts with an acid.
D) Magnesium has a high boiling point.
6. An ion of which element has a larger radius than an atom of the same element?
- A) aluminum B) chlorine
C) magnesium D) sodium
7. Which statement explains why sulfur is classified as a Group 16 element?
- A) A sulfur atom has 6 valence electrons.
B) A sulfur atom has 16 neutrons.
C) Sulfur is a yellow solid at STP.
D) Sulfur reacts with most metals.
8. Which group on the Periodic Table of the Elements contains elements that react with oxygen to form compounds with the general formula X_2O ?
- A) Group 1 B) Group 2
C) Group 14 D) Group 18
9. How do the atomic radius and metallic properties of sodium compare to the atomic radius and metallic properties of phosphorus?
- A) Sodium has a larger atomic radius and is more metallic.
B) Sodium has a larger atomic radius and is less metallic.
C) Sodium has a smaller atomic radius and is more metallic.
D) Sodium has a smaller atomic radius and is less metallic.
10. Which two characteristics are associated with metals?
- A) low first ionization energy and low electronegativity
B) low first ionization energy and high electronegativity
C) high first ionization energy and low electronegativity
D) high first ionization energy and high electronegativity
11. Which element is most chemically similar to chlorine?
- A) Ar B) F C) Fr D) S
12. Which grouping of circles, when considered in order from the top to the bottom, best represents the relative size of the atoms of Li, Na, K, and Rb, respectively?
- A)  B) 
- C)  D) 

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13. At STP, which element is brittle and *not* a conductor of electricity?
A) S B) K C) Na D) Ar
14. At which Celsius temperature does lead change from a solid to a liquid?
A) 874°C B) 601°C
C) 328°C D) 0°C
15. An atom of argon rarely bonds to an atom of another element because an argon atom has
A) 8 valence electrons
B) 2 electrons in the first shell
C) 3 electron shells
D) 22 neutrons
16. The elements on the Periodic Table are arranged in order of increasing
A) boiling point B) electronegativity
C) atomic number D) atomic mass
17. Which element is classified as a nonmetal?
A) Be B) Al C) Si D) Cl
18. Solid samples of the element phosphorus can be white, black, or red in color. The variations in color are due to different
A) atomic masses
B) molecular structures
C) ionization energies
D) nuclear charges
19. Lithium and potassium have similar chemical properties because the atoms of both elements have the same
A) mass number
B) atomic number
C) number of electron shells
D) number of valence electrons
20. When the elements in Group 1 are considered in order from top to bottom, each successive element at standard pressure has
A) a higher melting point and a higher boiling point
B) a higher melting point and a lower boiling point
C) a lower melting point and a higher boiling point
D) a lower melting point and a lower boiling point
21. At STP, which list of elements contains a solid, a liquid, and a gas?
A) Hf, Hg, He B) Cr, Cl₂, C
C) Ba, Br₂, B D) Se, Sn, Sr
22. Which Period 4 element has the most metallic properties?
A) As B) Br C) Ge D) Sc
23. Based on electronegativity values, which type of elements tends to have the greatest attraction for electrons in a bond?
A) metals B) metalloids
C) nonmetals D) noble gases
24. Which list of elements from Group 2 on the Periodic Table is arranged in order of increasing atomic radius?
A) Be, Mg, Ca B) Ca, Mg, Be
C) Ba, Ra, Sr D) Sr, Ra, Ba
25. The element in Group 14, Period 3 on the Periodic Table is classified as a
A) metal B) noble gas
C) metalloid D) nonmetal
26. Which trends are observed when the elements in Period 3 on the Periodic Table are considered in order of increasing atomic number?
A) The atomic radius decreases, and the first ionization energy generally increases.
B) The atomic radius decreases, and the first ionization energy generally decreases.
C) The atomic radius increases, and the first ionization energy generally increases.
D) The atomic radius increases, and the first ionization energy generally decreases.
27. Elements *Q*, *X*, and *Z* are in the same group on the Periodic Table and are listed in order of increasing atomic number. The melting point of element *Q* is -219°C and the melting point of element *Z* is -7°C . Which temperature is closest to the melting point of element *X*?
A) -7°C B) -101°C
C) -219°C D) -226°C
28. Which element is a solid at STP?
A) H₂ B) I₂ C) N₂ D) O₂

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29. Which element has chemical properties that are most similar to those of calcium?
A) Co B) K C) N D) Sr
30. Which element is malleable and can conduct electricity in the solid phase?
A) iodine B) phosphorus
C) sulfur D) tin
31. Which element has atoms with the greatest attraction for electrons in a chemical bond?
A) beryllium B) fluorine
C) lithium D) oxygen
32. Which trends are observed as each of the elements within Group 15 on the Periodic Table is considered in order from top to bottom?
A) Their metallic properties decrease and their atomic radii decrease.
B) Their metallic properties decrease and their atomic radii increase.
C) Their metallic properties increase and their atomic radii decrease.
D) Their metallic properties increase and their atomic radii increase.
33. The elements located in the lower left corner of the Periodic Table are classified as
A) metals B) nonmetals
C) metalloids D) noble gases
34. Which of these elements has the *lowest* melting point?
A) Li B) Na C) K D) Rb
35. Which list consists of elements that have the most similar chemical properties?
A) Mg, Al, and Si B) Mg, Ca, and Ba
C) K, Al, and Ni D) K, Ca, and Ga
36. At STP, an element that is a brittle solid and a poor conductor of heat and electricity could have an atomic number of
A) 12 B) 13 C) 16 D) 17
37. Based on Reference Table S, atoms of which of these elements have the strongest attraction for the electrons in a chemical bond?
A) Al B) Si C) P D) S
38. The elements in Period 5 on the Periodic Table are arranged from left to right in order of
A) decreasing atomic mass
B) decreasing atomic number
C) increasing atomic mass
D) increasing atomic number
39. Which list of elements contains a metal, a metalloid, and a nonmetal?
A) Zn, Ga, Ge B) Si, Ge, Sn
C) Cd, Sb, I D) F, Cl, Br
40. Based on your Reference Tables, the atoms of which of these elements have the strongest attraction for electrons in a chemical bond?
A) N B) Na C) P D) Pt
41. Which element has chemical properties that are most similar to the chemical properties of sodium?
A) Mg B) K C) Se D) Cl
42. Germanium is classified as a
A) metal B) metalloid
C) nonmetal D) noble gas
43. Which statement correctly describes diamond and graphite, which are different forms of solid carbon?
A) They differ in their molecular structure, only.
B) They differ in their properties, only.
C) They differ in their molecular structure and properties.
D) They do not differ in their molecular structure or properties.
44. As the elements in Group 17 on the Periodic Table are considered from top to bottom, what happens to the atomic radius and the metallic character of each successive element?
A) The atomic radius and the metallic character both increase.
B) The atomic radius increases and the metallic character decreases.
C) The atomic radius decreases and the metallic character increases.
D) The atomic radius and the metallic character both decrease.

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45. The data table below shows elements X_x , Y_y , and Z_z from the same group on the Periodic Table.

Element	Atomic Mass (atomic mass unit)	Atomic Radius (pm)
X_x	69.7	141
Y_y	114.8	?
Z_z	204.4	171

What is the most likely atomic radius of element Y_y ?

- A) 103 pm B) 127 pm C) 166 pm D) 185 pm

46. What determines the order of placement of the elements on the modern Periodic Table?

- A) atomic number
B) atomic mass
C) the number of neutrons, only
D) the number of neutrons and protons

47. At 298 K, oxygen (O_2) and ozone (O_3) have different properties because their

- A) atoms have different atomic numbers
B) atoms have different atomic masses
C) molecules have different molecular structures
D) molecules have different average kinetic energies

48. Which set of symbols represents atoms with valence electrons in the same electron shell?

- A) Ba, Br, Bi B) Sr, Sn, I
C) O, S, Te D) Mn, Hg, Cu

49. Which pair of symbols represents a metalloid and a noble gas?

- A) Si and Bi B) As and Ar
C) Ge and Te D) Ne and Xe

50. Which of these elements has the *least* attraction for electrons in a chemical bond?

- A) oxygen B) fluorine
C) nitrogen D) chlorine

51. Which statement describes a chemical property of iron?

- A) Iron can be flattened into sheets.
B) Iron conducts electricity and heat.
C) Iron combines with oxygen to form rust.
D) Iron can be drawn into a wire.

52. As the elements of Group 1 on the Periodic Table are considered in order of increasing atomic radius, the ionization energy of each successive element generally

- A) decreases B) increases
C) remains the same

53. Which element is a noble gas?

- A) krypton B) chlorine
C) antimony D) manganese

54. On the present Periodic Table of the Elements, the elements are arranged according to increasing

- A) number of oxidation states
B) number of neutrons
C) atomic mass
D) atomic number

55. Which of these elements is the best conductor of electricity?

- A) S B) N C) Br D) Ni

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56. What is a property of most metals?
- A) They tend to gain electrons easily when bonding.
 - B) They tend to lose electrons easily when bonding.
 - C) They are poor conductors of heat.
 - D) They are poor conductors of electricity.
57. The amount of energy required to remove the outermost electron from a gaseous atom in the ground state is known as
- A) first ionization energy
 - B) activation energy
 - C) conductivity
 - D) electronegativity
58. When an atom of phosphorus becomes a phosphide ion (P^{3-}), the radius
- A) decreases
 - B) increases
 - C) remains the same
59. As the atoms of the Group 17 elements in the ground state are considered from top to bottom, each successive element has
- A) the same number of valence electrons and similar chemical properties
 - B) the same number of valence electrons and identical chemical properties
 - C) an increasing number of valence electrons and similar chemical properties
 - D) an increasing number of valence electrons and identical chemical properties
60. As each successive element in Group 15 of the Periodic Table is considered in order of increasing atomic number, the atomic radius
- A) decreases
 - B) increases
 - C) remains the same
61. The elements in the Periodic Table are arranged in order of increasing
- A) atomic number
 - B) atomic radius
 - C) mass number
 - D) neutron number
62. The element in Period 4 and Group 1 of the Periodic Table would be classified as a
- A) metal
 - B) metalloid
 - C) nonmetal
 - D) noble gas
63. As the elements in Period 2 of the Periodic Table are considered in succession from left to right, there is a decrease in atomic radius with increasing atomic number. This may best be explained by the fact that the
- A) number of protons increases, and the number of shells of electrons remains the same
 - B) number of protons increases, and the number of shells of electrons increases
 - C) number of protons decreases, and the number of shells of electrons remains the same
 - D) number of protons decreases, and the number of shells of electrons increases
64. Which is a property of most nonmetallic solids?
- A) high thermal conductivity
 - B) high electrical conductivity
 - C) brittleness
 - D) malleability
65. In which list are the elements arranged in order of increasing atomic mass?
- A) Cl, K, Ar
 - B) Fe, Co, Ni
 - C) Te, I, Xe
 - D) Ne, F, Na
66. Which Group of the Periodic Table contains atoms with a stable outer electron configuration?
- A) 1
 - B) 8
 - C) 16
 - D) 18
67. From which of these atoms in the ground state can a valence electron be removed using the *least* amount of energy?
- A) nitrogen
 - B) carbon
 - C) oxygen
 - D) chlorine
68. The strength of an atom's attraction for the electrons in a chemical bond is the atom's
- A) electronegativity
 - B) ionization energy
 - C) heat of reaction
 - D) heat of formation
69. The high electrical conductivity of metals is primarily due to
- A) high ionization energies
 - B) filled energy levels
 - C) mobile electrons
 - D) high electronegativities

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Base your answers to questions **70** and **71** on the information below.

Elements with atomic numbers 112 and 114 have been produced and their IUPAC names are pending approval. However, an element that would be put between these two elements on the Periodic Table has not yet been produced. If produced, this element will be identified by the symbol Uut until an IUPAC name is approved.

70. Determine the charge of an Uut nucleus. Your response must include both the numerical value and the sign of the charge.
71. Identify one element that would be chemically similar to Uut.
-

72. Which list of elements contains *two* metalloids?

- A) Si, Ge, Po, Pb B) As, Bi, Br, Kr
C) Si, P, S, Cl D) Po, Sb, I, Xe

73. Explain, in terms of atomic structure, why germanium is chemically similar to silicon.

Base your answers to questions **74** and **75** on the information below.

Given: Samples of Na, Ar, As, Rb

74. Explain your answer in terms of the Periodic Table of the Elements.
75. Which *two* of the given elements have the most similar chemical properties?

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Base your answers to questions 76 through 79 on the information below.

The table below lists physical and chemical properties of six elements at standard pressure that correspond to known elements on the Periodic Table. The elements are identified by the code letters, D, E, G, J, L, and Q.

Properties of Six Elements at Standard Pressure

<u>Element D</u> Density 0.00018 g/cm ³ Melting point -272°C Boiling point -269°C Oxide formula (none)	<u>Element E</u> Density 1.82 g/cm ³ Melting point 44°C Boiling point 280°C Oxide formula E ₂ O ₅	<u>Element G</u> Density 0.53 g/cm ³ Melting point 181°C Boiling point 1347°C Oxide formula G ₂ O
<u>Element J</u> Density 0.0013 g/cm ³ Melting point -210°C Boiling point -196°C Oxide formula J ₂ O ₅	<u>Element L</u> Density 0.86 g/cm ³ Melting point 64°C Boiling point 774°C Oxide formula L ₂ O	<u>Element Q</u> Density 0.97 g/cm ³ Melting point 98°C Boiling point 883°C Oxide formula Q ₂ O

76. What is the total number of elements in the "Properties of Six Elements at Standard Pressure" table that are solids at STP?
77. An atom of element G is in the ground state. What is the total number of valence electrons in this atom?
78. Letter Z corresponds to an element on the Periodic Table other than the six listed elements. Elements G, Q, L, and Z are in the same group on the Periodic Table, as shown in the diagram below.

G
Q
L
Z

Based on the trend in the melting points for elements G, Q, and L listed in the "Properties of Six Elements at Standard Pressure" table, estimate the melting point of element Z, in degrees Celsius.

79. Identify, by code letter, the element that is a noble gas in the "Properties of Six Elements at Standard Pressure" table.
-
80. Explain, in terms of electron configuration, why selenium and sulfur have similar chemical properties.

Base your answers to questions 81 through 84 on the information below.

A metal, M, was obtained from a compound in a rock sample. Experiments have determined that the element is a member of Group 2 on the Periodic Table of the Elements.

81. Explain, in terms of electrons, why element M is a good conductor of electricity.

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82. Explain why the radius of a positive ion of element M is *smaller* than the radius of an atom of element M .
83. Using the symbol M for the element, write the chemical formula for the compound that forms when element M reacts with iodine.
84. What is the phase of element M at STP?
-

Base your answers to questions **85** and **86** on the table below.

First Ionization Energy of Selected Elements

Element	Atomic Number	First Ionization Energy (kJ/mol)
lithium	3	520
sodium	11	496
potassium	19	419
rubidium	37	403
cesium	55	376

85. State the trend in first ionization energy for the elements in the table as the atomic number increases.
86. Explain, in terms of atomic structure, why cesium has a *lower* first ionization energy than rubidium.
-
87. Based on the Periodic Table, explain why Na and K have similar chemical properties.

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