1. What is the overall charge of an ion that has 12 protons, 10 electrons, and 14 neutrons?
   A) 2−  B) 2+  C) 4−  D) 4+
2. Which particles have approximately the same mass?
   A) an electron and an alpha particle  
   B) an electron and a proton  
   C) a neutron and an alpha particle  
   D) a neutron and a proton
3. Which phrase describes an atom?
   A) a negatively charged nucleus surrounded by positively charged protons  
   B) a negatively charged nucleus surrounded by positively charged electrons  
   C) a positively charged nucleus surrounded by negatively charged protons  
   D) a positively charged nucleus surrounded by negatively charged electrons
4. An atom in the ground state has two electrons in its first shell and six electrons in its second shell. What is the total number of protons in the nucleus of this atom?
   A) 5  B) 2  C) 7  D) 8
5. What is the number of electrons in a completely filled second shell of an atom?
   A) 32  B) 2  C) 18  D) 8
6. Which two particles have opposite charges?
   A) an electron and a neutron  
   B) an electron and a proton  
   C) a proton and a neutron  
   D) a proton and a positron
7. Which statement concerning elements is true?
   A) Different elements must have different numbers of isotopes.  
   B) Different elements must have different numbers of neutrons.  
   C) All atoms of a given element must have the same mass number.  
   D) All atoms of a given element must have the same atomic number.
8. What was concluded about the structure of the atom as the result of the gold foil experiment?
   A) A positively charged nucleus is surrounded by positively charged particles.  
   B) A positively charged nucleus is surrounded by mostly empty space.  
   C) A negatively charged nucleus is surrounded by positively charged particles.  
   D) A negatively charged nucleus is surrounded by mostly empty space.
9. Every chlorine atom has
   A) 7 electrons  
   B) 17 neutrons  
   C) a mass number of 35  
   D) an atomic number of 17
10. A sample composed only of atoms having the same atomic number is classified as
   A) a compound  
   B) a solution  
   C) a element  
   D) an isomer
11. As the number of neutrons in the nucleus of a given atom of an element increases, the atomic number of that element
   A) decreases  
   B) increases  
   C) remains the same
12. Which particle has the least mass?
   A) alpha particle  
   B) beta particle  
   C) neutron  
   D) proton
13. What is the total number of neutrons in the nucleus of a neutral atom that has 19 electrons and a mass number of 39?
   A) 19  
   B) 20  
   C) 39  
   D) 58
14. The table below shows the number of subatomic particles in atom X and in atom Z.

<table>
<thead>
<tr>
<th>Atom</th>
<th>Number of Protons</th>
<th>Number of Neutrons</th>
<th>Number of Electrons</th>
</tr>
</thead>
<tbody>
<tr>
<td>X</td>
<td>6</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>Z</td>
<td>6</td>
<td>7</td>
<td>6</td>
</tr>
</tbody>
</table>

Atom X and atom Z are isotopes of the element
A) aluminum  B) carbon  C) magnesium  D) nitrogen

15. Which isotopic notation represents an atom of carbon-14?
A) $^{6}_{8}C$  B) $^{8}_{6}C$  C) $^{6}_{14}C$  D) $^{14}_{6}C$

16. Which notation represents an atom of sodium with an atomic number of 11 and a mass number of 24?
A) $^{24}_{11}Na$  B) $^{11}_{24}Na$  C) $^{13}_{11}Na$  D) $^{35}_{11}Na$

17. The atomic mass of titanium is 47.88 atomic mass units. This atomic mass represents the
A) total mass of all the protons and neutrons in an atom of Ti
B) total mass of all the protons, neutrons, and electrons in an atom of Ti
C) weighted average mass of the most abundant isotope of Ti
D) weighted average mass of all the naturally occurring isotopes of Ti

18. What is the total number of valence electrons in an atom of germanium in the ground state?
A) 8  B) 2  C) 14  D) 4
19. Given the table below that shows student's examples of proposed models of the atom:

**Proposed Models of the Atom**

<table>
<thead>
<tr>
<th>Model</th>
<th>Location of Protons</th>
<th>Location of Electrons</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>in the nucleus</td>
<td>specific shells</td>
</tr>
<tr>
<td>B</td>
<td>in the nucleus</td>
<td>regions of most probable location</td>
</tr>
<tr>
<td>C</td>
<td>dispersed throughout the atom</td>
<td>specific shells</td>
</tr>
<tr>
<td>D</td>
<td>dispersed throughout the atom</td>
<td>regions of most probable location</td>
</tr>
</tbody>
</table>

Which model correctly describes the locations of protons and electrons in the wave-mechanical model of the atom?

A) A  B) B  C) C  D) D

20. Which electron configuration represents an excited state for a potassium atom?

A) 2-8-7-1  B) 2-8-7-2  C) 2-8-8-1  D) 2-8-8-2

21. Given the bright-line spectra of three elements and the spectrum of a mixture formed from at least two of these elements:

Which elements are present in this mixture?

A) E and D, only  B) E and G, only  C) D and G, only  D) D, E, and G

22. An orbital of an atom is defined as the most probable location of

A) an electron  B) a neutron  C) a positron  D) a proton

23. According to the wave-mechanical model of the atom, electrons in an atom

A) travel in defined circles  B) are most likely found in an excited state  C) have a positive charge  D) are located in orbitals outside the nucleus

24. In which group of elements do most atoms have completely filled s and p valence sublevels?

A) halogens  B) noble gases  C) alkali metals  D) alkaline earth metals

25. What is the maximum number of electrons in an orbital of any atom?

A) 1  B) 2  C) 6  D) 10

26. Which sublevel contains a total of 5 orbitals?

A) s  B) p  C) d  D) f

27. A maximum of 6 electrons can occupy

A) an s orbital  B) an s sublevel  C) a p orbital  D) a p sublevel
28. An electron will emit energy in quanta when its energy state changes from 4p to
   A) 5s    B) 5p    C) 3s    D) 6p
29. Which of the following sublevels has the highest energy?
   A) 2p    B) 2s    C) 3p    D) 3s
30. Which electron configuration represents an atom of lithium in an excited state?
   A) 1s\(^1\)2s\(^1\)    B) 1s\(^1\)2s\(^2\)
   C) 1s\(^2\)2s\(^1\)    D) 1s\(^2\)2s\(^2\)
31. Which orbital notation correctly represents a noble gas in the ground state?
   A) \(\text{S} \quad \text{P}\)
   B) \(\text{S} \quad \text{P}\)
   C) \(\text{S} \quad \text{P}\)
   D) \(\text{S} \quad \text{P}\)
32. Which list includes elements with the most similar chemical properties?
   A) Br, Ga, Hg    B) Cr, Pb, Xe
   C) O, S, Se    D) N, O, F
33. The elements in Group 2 are classified as
   A) metals    B) metalloids
   C) nonmetals    D) noble gases
34. The elements on the Periodic Table are arranged in order of increasing
   A) atomic number    B) mass number
   C) number of isotopes    D) number of moles
35. The chemical properties of calcium are most similar to the chemical properties of
   A) Ar    B) K
   C) Mg    D) Sc
36. 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
37. Which element is an alkali metal?
   A) hydrogen    B) calcium
   C) sodium    D) zinc
38. Which of the following Period 4 elements has the most metallic characteristics?
   A) Ca    B) Ge
   C) As    D) Br
39. A solid element that is malleable, a good conductor of electricity, and reacts with oxygen is classified as a
   A) metal    B) metalloid
   C) noble gas    D) nonmetal
40. Which element has chemical properties that are most similar to the chemical properties of fluorine?
   A) boron    B) chlorine
   C) neon    D) oxygen
41. Which property is characteristic of nonmetals?
   A) more protons than neutrons
   B) more neutrons than protons
   C) a total of two valence electrons
   D) a total of eight valence electrons
42. An atom of argon in the ground state tends not to bond with an atom of a different element because the argon atom has
   A) more protons than neutrons
   B) more neutrons than protons
   C) a total of two valence electrons
   D) a total of eight valence electrons
43. Which element is a noble gas?
   A) W    B) Ar
   C) N    D) Er
44. Which element has both metallic and nonmetallic properties?
   A) Rb    B) Rn
   C) Si    D) Sr
45. Which Lewis electron-dot diagram represents a boron atom in the ground state?
   A) \(\cdot\text{B}\)
   B) \(\cdot\text{B}\)
   C) \(\cdot\text{B}\)
   D) \(\cdot\text{B}\)
46. Which ion has no electrons?
   A) H\(^+\)    B) Li\(^+\)
   C) Na\(^+\)    D) Rb\(^+\)
47. Which element has an atom in the ground state with a total of three valence electrons?
   A) aluminum    B) lithium
   C) phosphorus    D) scandium
48. An element with a partially filled d sublevel in the ground state is classified as
   A) a halogen  
   B) a transition metal 
   C) an alkali metal 
   D) an alkaline earth metal

49. What is the net charge on an ion that has 9 protons, 11 neutrons, and 10 electrons?
   A) 1+  
   B) 2+  
   C) 1-  
   D) 2-

50. An atom of which element has the largest atomic radius?
   A) Fe  
   B) Mg  
   C) Si  
   D) Zn

51. 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

52. Which element forms an ion larger than its atom?
   A) Na  
   B) Ne  
   C) Ba  
   D) Br

53. An atom of which element has the greatest attraction for electrons in a chemical bond?
   A) As  
   B) Ga  
   C) Ge  
   D) Se

54. Atoms of which element have the greatest tendency to gain electrons?
   A) bromine  
   B) chlorine  
   C) fluorine  
   D) iodine

55. Which atom in the ground state requires the least amount of energy to remove its valence electron?
   A) lithium atom  
   B) potassium atom  
   C) rubidium atom  
   D) sodium atom

56. Two categories of compounds are
   A) covalent and molecular  
   B) covalent and metallic  
   C) ionic and molecular 
   D) ionic and metallic

57. Which substance can not be broken down by chemical means?
   A) ammonia  
   B) antimony  
   C) methane  
   D) water

58. Which formula represents strontium phosphate?
   A) SrPO₄  
   B) Sr₃PO₈  
   C) Sr₂(PO₄)₃  
   D) Sr₃(PO₄)₂

59. What is the chemical formula for iron(III) oxide?
   A) FeO  
   B) Fe₂O₃  
   C) Fe₃O₄  
   D) Fe₃O₂

60. What is the formula of titanium(II) oxide?
   A) TiO  
   B) TiO₂  
   C) Ti₂O  
   D) Ti₂O₃

61. The correct chemical formula for iron(II) sulfide is
   A) FeS  
   B) FeS₃  
   C) FeSO₄  
   D) Fe₂(SO₄)₃

62. In a bond between an atom of carbon and an atom of fluorine, the fluorine atom has a
   A) absorbed  
   B) destroyed  
   C) produced  
   D) released

63. To break a chemical bond, energy must be
   A) absorbed  
   B) destroyed  
   C) produced  
   D) released

64. Given the Lewis electron-dot diagram:
   \[
   \begin{array}{cc}
   H & \cdot \\
   C & \cdot \cdot \\
   H & \cdot \\
   \end{array}
   \]
   Which electrons are represented by all of the dots?
   A) the carbon valence electrons, only  
   B) the hydrogen valence electrons, only  
   C) the carbon and hydrogen valence electrons  
   D) all of the carbon and hydrogen electrons

65. Which element has an atom with the greatest tendency to attract electrons in a chemical bond?
   A) carbon  
   B) chlorine  
   C) silicon  
   D) sulfur

66. Which bond is least polar?
   A) As–Cl  
   B) Bi–Cl  
   C) P–Cl  
   D) N–Cl
67. Given the diagram representing a process being used to separate the colored dyes in food coloring:

Which process is represented by this diagram?
A) chromatography  B) electrolysis
C) distillation      D) titration

68. The diagram below shows the upper part of a laboratory burner.

Which letter represents the hottest part of the burner flame?
A) A  B) B  C) C  D) D

69. A student determined that the percent of H₂O in a hydrate was 39.0%. The percent of H₂O in this hydrate is 36.0% according to an accepted chemistry reference. What is the student's percent of error?
A) 9.1%  B) 8.3%  C) 3.0%  D) 11%

70. Given the equation:

H₂(g) + Cl(g) → 2 HCl(g)

What is the total number of moles of HCl(g) produced when 3 moles of H₂(g) is completely consumed?
A) 5 moles  B) 2 moles
C) 3 moles  D) 6 moles

71. Given the balanced equation representing a reaction:

Zn(s) + H₂SO₄(aq) → ZnSO₄(aq) + H₂(g)

Which type of reaction is represented by this equation?
A) decomposition  B) double replacement
C) single replacement  D) synthesis

72. All chemical reactions have a conservation of
A) mass, only  B) mass and charge, only
C) charge and energy, only  D) mass, charge, and energy
73. Given the unbalanced equation:

\[ \text{___ Al + ___ CuSO}_4 \rightarrow \text{___ Al}_2(\text{SO}_4)_3 + \text{___ Cu} \]

When the equation is balanced using the *smallest* whole-number coefficients, what is the coefficient of Al?

A) 1  B) 2  C) 3  D) 4

74. Given the balanced equation representing a reaction:

\[
\text{F}_2(\text{g}) + \text{H}_2(\text{g}) \rightarrow 2\text{HF}(\text{g})
\]

What is the mole ratio of \( \text{H}_2(\text{g}) \) to \( \text{HF}(\text{g}) \) in this reaction?

A) 1:1  B) 1:2  C) 2:1  D) 2:3

75. Which polyatomic ion has a charge of 3–?

A) chromate ion  B) oxalate ion  C) phosphate ion  D) thiocyanate ion

76. The oxidation numbers of all the atoms in \( \text{H}_2\text{SO}_4 \) must add up to

A) 0  B) +5  C) +9  D) +16

77. A student intended to make a salt solution with a concentration of 10.0 grams of solute per liter of solution. When the student’s solution was analyzed, it was found to contain 8.90 grams of solute per liter of solution. What was the percent error in the concentration of the solution?

A) 1.10%  B) 8.90%  C) 11.0%  D) 18.9%

78. A student calculates the density of an unknown solid. The mass is 10.04 grams, and the volume is 8.21 cubic centimeters. How many significant figures should appear in the final answer?

A) 1  B) 2  C) 3  D) 4

79. What is the sum of \( 0.0421 \text{ g} + 5.263 \text{ g} + 2.13 \text{ g} \) to the correct number of significant digits?

A) 7 g  B) 7.4 g  C) 7.44 g  D) 7.435 g

80. Which formulas represent one ionic compound and one molecular compound?

A) \( \text{N}_2 \text{ and SO}_2 \)  B) \( \text{Cl}_2 \text{ and H}_2\text{S} \)
C) \( \text{BaCl}_2 \text{ and N}_2\text{O}_4 \)  D) \( \text{NaOH} \text{ and BaSO}_4 \)

81. Which element forms an ionic compound when it reacts with lithium?

A) K  B) Fe  C) Kr  D) Br

82. The bonds in \( \text{BaO} \) are best described as

A) covalent, because valence electrons are shared  B) covalent, because valence electrons are transferred
C) ionic, because valence electrons are shared  D) ionic, because valence electrons are transferred

83. Which compound contains both ionic and covalent bonds?

A) ammonia  B) methane  C) sodium nitrate  D) potassium chloride

84. A solid substance was tested in the laboratory. The test results are listed below:

• dissolves in water
• is an electrolyte
• melts at a high temperature

Based on these results, the solid substance could be

A) \( \text{Cu} \)  B) \( \text{CuBr}_2 \)
C) \( \text{C} \)  D) \( \text{C}_6\text{H}_12\text{O}_6 \)

85. Which sample is composed of particles arranged in a regular geometric pattern?

A) a monatomic molecule  B) a diatomic molecule
C) a heterogeneous mixture  D) a homogeneous mixture

86. What is formed when two atoms of bromine bond together?

A) a monatomic molecule  B) a diatomic molecule
C) a heterogeneous mixture  D) a homogeneous mixture

87. What is the total number of electrons shared in a double covalent bond?

A) \( \text{CaCO}_3 \)  B) \( \text{CH}_2\text{Cl}_2 \)
C) \( \text{CH}_3\text{OH} \)  D) \( \text{C}_6\text{H}_12\text{O}_6 \)
89. Given a formula for oxygen:

\[ \text{O=O} \]

What is the total number of electrons shared between the atoms represented in this formula?
A) 1  B) 2  C) 8  D) 4

90. As a bond between a hydrogen atom and a sulfur atom is formed, electrons are
A) shared to form an ionic bond
B) shared to form a covalent bond
C) transferred to form an ionic bond
D) transferred to form a covalent bond

91. Which atoms are most likely to form covalent bonds?
A) metal atoms that share electrons
B) metal atoms that share protons
C) nonmetal atoms that share electrons
D) nonmetal atoms that share protons

92. Which formula represents a molecular compound?
A) Kr  B) LiOH  C) N₂O₄  D) NaI

93. Which characteristic is a property of molecular substances?
A) good heat conductivity
B) good electrical conductivity
C) low melting point
D) high melting point

94. What is the maximum number of covalent bonds that a carbon atom can form?
A) 1  B) 2  C) 3  D) 4

95. Which element consists of positive ions immersed in a "sea" of mobile electrons?
A) sulfur  B) nitrogen  C) calcium  D) chlorine

96. Which phrase describes a molecule of CH₄, in terms of molecular polarity and distribution of charge?
A) polar with an asymmetrical distribution of charge
B) polar with a symmetrical distribution of charge
C) nonpolar with an asymmetrical distribution of charge
D) nonpolar with a symmetrical distribution of charge

97. Which formula represents a polar molecule?
A) H₂  B) H₂O  C) CO₂  D) CCl₄

98. Which formula represents a polar molecule?
A) Br₂  B) CO₂  C) CH₄  D) NH₃

99. Which diagram best represents a polar molecule?
A)  B) 
C)  D) 

100. Which molecule is polar?
A) H-S  B)  C)  D) N≡N

101. What is the total number of nitrogen atoms in 0.25 mole of NO₂ gas?
A) 1.5 × 10²³  B) 6.0 × 10²³  C) 3.0 × 10²³  D) 1.2 × 10²⁴

102. The gram atomic mass of oxygen is 16.0 grams per mole. How many atoms of oxygen does this mass represent?
A) 16.0  B) 32.0  C) 6.02 × 10²³  D) 2(6.02 × 10²³)

103. The total number of molecules in 34.0 grams of NH₃ is equal to
A) 22.4 L  B) 33.6 L  C) 44.8 L  D) 67.2 L

104. What is the total volume occupied by 132 grams of CO₂(g) at STP?
A) 22.4 L  B) 33.6 L  C) 44.8 L  D) 67.2 L

105. Given the balanced equation representing a reaction:
2H₂ + O₂ → 2H₂O

What is the total mass of water formed when 8 grams of hydrogen reacts completely with 64 grams of oxygen?
A) 18 g  B) 36 g  C) 56 g  D) 72 g
106. Given the balanced equation representing a reaction:
\[ \text{C}_3\text{H}_8(\text{g}) + 5\text{O}_2(\text{g}) \rightarrow 3\text{CO}_2(\text{g}) + 4\text{H}_2\text{O}(\text{g}) \]
What is the total number of moles of \( \text{O}_2(\text{g}) \) required for the complete combustion of 1.5 moles of \( \text{C}_3\text{H}_8(\text{g}) \)?
A) .30 mol  B) 1.5 mol  
C) 4.5 mol  D) 7.5 mol

107. A balanced equation representing a chemical reaction can be written using
A) chemical formulas and mass numbers 
B) chemical formulas and coefficients 
C) first ionization energies and mass numbers 
D) first ionization energies and coefficients

108. Given the incomplete equation for the combustion of ethane:
\[ 2\text{C}_2\text{H}_6 + 7\text{O}_2 \rightarrow 4\text{CO}_2 + 6 \_ \_ \_ \_ \_ \_ \]
What is the formula of the missing product?
A) \text{CH}_3\text{OH}  B) \text{HCOOH}  
C) \text{H}_2\text{O}  D) \text{H}_2\text{O}_2

109. Given the unbalanced equation:
\[ \_ \_ \_ \text{Fe}_2\text{O}_3 \_ \_ \_ \_ \_ \text{CO} \rightarrow \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \text{Fe} + \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \text{CO}_2 \]
When the equation is correctly balanced using the smallest whole-number coefficients, what is the coefficient of CO?
A) 1  B) 2  C) 3  D) 4

110. Given the unbalanced equation:
\[ \_ \_ \_ \text{Al}(s) + \_ \_ \_ \text{O}_2(g) \rightarrow \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \text{Al}_2\text{O}_3(s) \]
When this equation is correctly balanced using smallest whole numbers, what is the coefficient of \( \text{O}_2(g) \)?
A) 6  B) 2  C) 3  D) 4

111. During all chemical reactions, mass, energy, and charge are
A) absorbed  B) conserved  
C) formed  D) released

112. Given the balanced equation representing a reaction:
\[ 4\text{NH}_3 + 5\text{O}_2 \rightarrow 4\text{NO} + 6\text{H}_2\text{O} \]
What is the minimum number of moles of \( \text{O}_2 \) that are needed to completely react with 16 moles of \( \text{NH}_3 \)?
A) 16 mol  B) 20 mol  
C) 64 mol  D) 80 mol

113. Which sample contains a mole of atoms?
A) 23 g Na  B) 24 g C  
C) 42 g Kr  D) 78 g K

114. What is the total mass in grams of 0.75 mole of \( \text{SO}_2 \)?
A) 16 g  B) 24 g  C) 32 g  D) 48 g

115. What is the percent composition by mass of sulfur in the compound \( \text{MgSO}_4 \) (molar mass = 120 grams per mole)?
A) 20%  B) 27%  C) 46%  D) 53%

116. A compound has a gram formula mass of 56 grams per mole. What is the molecular formula for this compound?
A) \text{CH}_2  B) \text{C}_2\text{H}_4  C) \text{C}_3\text{H}_6  D) \text{C}_4\text{H}_8

117. In which type of chemical reaction do two or more reactants combine to form one product, only?
A) synthesis  B) decomposition  
C) single replacement  D) double replacement

118. Given the balanced equation:
\[ 2\text{KClO}_3 \rightarrow 2\text{KCl} + 3\text{O}_2 \]
Which type of reaction is represented by this equation?
A) synthesis  B) decomposition  
C) single replacement  D) double replacement

119. \[ \text{Cu}(s) + 2\text{HCl(aq)} \leftrightarrow \text{CuCl}_2(\text{aq}) + \text{H}_2(\text{g}) \]
What type of reaction is shown above?
A) synthesis  B) decomposition  
C) single replacement  D) double replacement
120. \( \text{Ba(NO}_3\text{)}_2\text{(aq)} + \text{Na}_2\text{SO}_4\text{(aq)} \rightarrow 2 \text{NaNO}_3\text{(aq)} + \text{BaSO}_4\text{(s)} \)

What type of reaction is shown above?
A) synthesis  B) decomposition  C) single replacement  D) double replacement

121. Given the nuclear equation:
\( ^{253}_{99}\text{Es} + X \rightarrow ^{110}_{41}\text{Md} + ^{0}_{0}\text{n} + ^{256}_{101}\text{Md} \)
Which particle is represented by \( X \)?
A) \( \frac{1}{2}\text{He} \)  B) \( -1\text{e} \)  C) \( +1\text{n} \)  D) \( +1\text{e} \)

122. Which product of nuclear decay has mass but no charge?
A) alpha particles  B) neutrons  C) gamma rays  D) beta positrons

123. In the reaction:
\( ^{9}_{4}\text{Be} + X \rightarrow ^{6}_{3}\text{Li} + ^{4}_{2}\text{He} \)

The \( X \) represents
A) \( \frac{0}{1}\text{e} \)  B) \( \frac{1}{1}\text{H} \)  C) \( \frac{1}{0}\text{n} \)  D) \( +1\text{e} \)

124. In the equation:
\( ^{239}_{90}\text{Th} \rightarrow ^{239}_{91}\text{Pa} + X \)

The symbol \( X \) represents
A) \( \frac{0}{1}\text{e} \)  B) \( \frac{1}{0}\text{n} \)  C) \( \frac{1}{1}\text{H} \)  D) \( +1\text{H} \)

125. What is the oxidation number of iodine in KIO\(_4\)?
A) +1  B) −1  C) +7  D) −7

126. What is the oxidation number of chromium in the chromate ion, \( \text{CrO}_4^{2−} \)?
A) +6  B) +2  C) +3  D) +8

127. What is the total number of different elements present in \( \text{N}_2\text{H}_4\text{NO}_3 \)?
A) 7  B) 9  C) 3  D) 4

128. What is the chemical formula for copper(II) hydroxide?
A) \( \text{CuOH} \)  B) \( \text{CuOH}_2 \)  C) \( \text{Cu}_2\text{(OH)} \)  D) \( \text{Cu(OH)}_2 \)

129. Which formula correctly represents the composition of iron (III) oxide?
A) \( \text{FeO}_3 \)  B) \( \text{Fe}_2\text{O}_3 \)  C) \( \text{Fe}_3\text{O} \)  D) \( \text{Fe}_3\text{O}_2 \)

130. What is the IUPAC name for the compound ZnO?
A) zinc oxide  B) zinc oxalate  C) zinc peroxide  D) zinc hydroxide

131. What is the chemical formula of iron(III) sulfide?
A) \( \text{FeS} \)  B) \( \text{Fe}_2\text{S}_3 \)  C) \( \text{FeSO}_3 \)  D) \( \text{Fe}_2\text{(SO}_3\text{)}_3 \)

132. What is the name of the polyatomic ion in the compound Na\(_2\)O\(_2\)?
A) hydroxide  B) oxalate  C) oxide  D) peroxide

133. What is the IUPAC name for the compound FeS?
A) \( \text{Sr} \)  B) \( \text{Sb} \)  C) \( \text{Ag} \)  D) \( \text{Xe} \)

134. Which element in Period 5 of the Periodic Table is a transition element?
A) \([\text{Ar}]4\text{s}^1\)  B) \([\text{Ar}]3\text{d}^{10}\text{f}^1\)  C) \([\text{Ar}]3\text{d}^{10}\text{f}^2\text{g}^1\)  D) \([\text{Ar}]3\text{d}^{10}\text{f}^2\text{g}^3\)

135. Which is the electron configuration of a transition element in the ground state?
A) Be and Mg  B) Ca and Br  C) Cl and Ar  D) Na and P

136. Which two elements have the most similar chemical properties?
A) Be and Mg  B) Ca and Br  C) Cl and Ar  D) Na and P

137. Which Group 15 element exists as a diatomic molecule at STP?
A) \( \text{protons} \)  B) \( \text{neutrons} \)  C) \( \text{valence electrons} \)  D) \( \text{occupied energy levels (shells)} \)

138. All of the atoms of the elements in Period 2 have the same number of
A) protons  B) neutrons  C) valence electrons  D) occupied energy levels (shells)
139. Which three elements have the most similar chemical properties?
   A) Ar, Kr, Br  B) K, Rb, Cs
   C) B, C, N  D) O, N, Si

140. Which of the following Period 3 elements has the least metallic character?
   A) Na  B) Mg  C) Al  D) Si

141. Which element is a member of the halogen family?
   A) K  B) B  C) I  D) S

142. The elements of the Periodic Table are arranged in horizontal rows according to each successive element's greater
   A) atomic mass  B) atomic radius
   C) number of protons  D) number of neutrons

143. An atom of an element contains 20 protons, 20 neutrons, and 20 electrons. This element is in Group
   A) 1  B) 2  C) 4  D) 18

144. Alkali metals, alkaline earth metals, and halogens are elements found respectively in Groups
   A) 1, 2, and 18  B) 2, 13, and 17
   C) 1, 2, and 14  D) 1, 2, and 17

145. Which substance can be decomposed by chemical means?
   A) tungsten  B) antimony
   C) krypton  D) methane