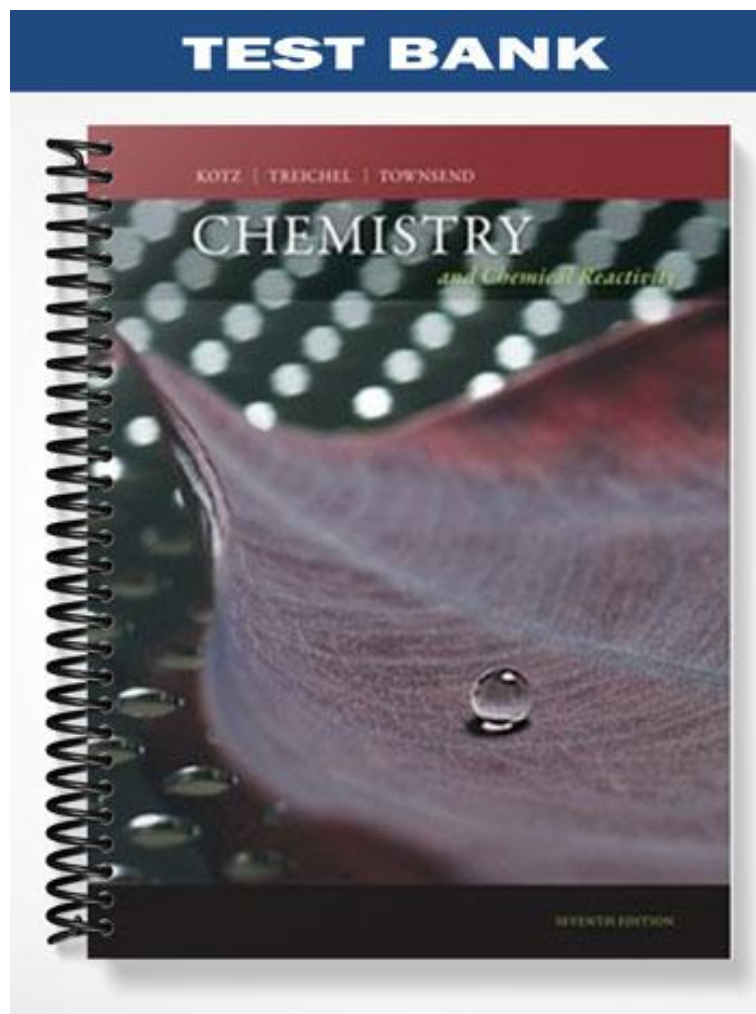


TEST BANK



KOTZ | TREICHEL | TOWNSEND

CHEMISTRY
and Chemical Reactivity

SEVENTH EDITION

Chapter 2--Atoms, Molecules, and Ions

Student: _____

- Which of the following statements concerning atomic structure is/are correct?
 - The nucleus contains most of an atom's mass.
 - The nucleus contains all the positive charge of an atom.
 - Electrons surround the nucleus and account for the majority of an atom's volume.

A. 1 only
B. 2 only
C. 3 only
D. 2 and 3
E. 1, 2, and 3
- Rank the subatomic particles from least to greatest mass.

A. electron mass = proton mass = neutron mass
B. electron mass = neutron mass < proton mass
C. electron mass = proton mass < neutron mass
D. electron mass < proton mass < neutron mass
E. electron mass < proton mass = neutron mass
- Atomic number is the number of _____ in the nucleus of an atom.

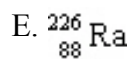
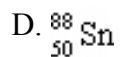
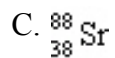
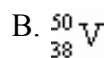
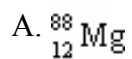
A. electrons
B. protons
C. neutrons
D. electrons and neutrons
E. neutrons and protons
- The atomic number of chromium is _____.

A. 6
B. 24
C. 28
D. 48
E. 52
- An atomic mass unit (u) is defined as

A. the mass of one hydrogen-1 atom.
B. the mass of one carbon-12 atom.
C. 1/12 the mass of one carbon-12 atom.
D. 1/8 the mass of one oxygen-16 atom.
E. the sum of the masses of one proton, one neutron, and one electron.

6. What is the mass number of a nickel atom with 31 neutrons?
- A. 3
 - B. 28
 - C. 31
 - D. 58
 - E. 59
7. How many protons, neutrons, and electrons are in a yttrium-89 atom?
- A. 39 protons, 50 neutrons, 39 electrons
 - B. 39 protons, 89 neutrons, 39 electrons
 - C. 39 protons, 50 neutrons, 50 electrons
 - D. 50 protons, 39 neutrons, 50 electrons
 - E. 39 protons, 11 neutrons, 39 electrons
8. How many protons, neutrons, and electrons are in a hydrogen-3 atom?
- A. 1 proton, 1 neutron, 1 electron
 - B. 1 proton, 2 neutrons, 1 electron
 - C. 1 proton, 3 neutrons, 1 electron
 - D. 2 protons, 1 neutron, 2 electrons
 - E. 2 protons, 1 neutron, 1 electron
9. What is the mass of sulfur-32 relative to carbon-12?
- A. 0.375
 - B. 0.600
 - C. 1.67
 - D. 2.67
 - E. 20
10. Which of the following atoms contains the fewest protons?
- A. ^{128}Te
 - B. ^{127}I
 - C. ^{131}Xe
 - D. ^{133}Cs
 - E. ^{209}Bi
11. Which of the following atoms contains the largest number of protons?
- A. ^{231}Pa
 - B. ^{238}U
 - C. ^{232}Th
 - D. ^{244}Pu
 - E. ^{251}Cf

12. What is the atomic symbol for an element with 38 protons and 50 neutrons?



13. What is the identity of ${}^{54}_{24}\text{X}$?

A. Cr

B. Xe

C. Pt

D. Zn

E. Mn

14. What is the atomic symbol for an element that has 24 neutrons and a mass number of 45?

A. Tm

B. Cr

C. Rh

D. Sc

E. Dy

15. How many neutrons are in an atom of arsenic-75?

A. 33

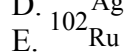
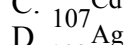
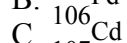
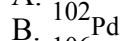
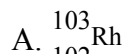
B. 42

C. 75

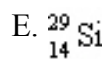
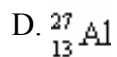
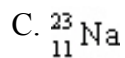
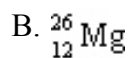
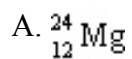
D. 108

E. 117

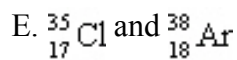
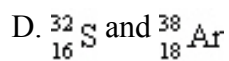
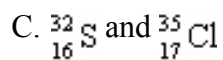
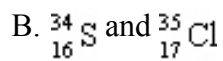
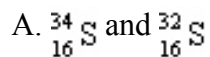
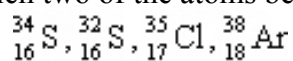
16. Which of the following atoms contains the fewest protons?



17. Which of the following atoms contains the largest number of neutrons?



18. Which two of the atoms below have the same number of neutrons?



19. Two isotopes of a given element will have the same number of _____, but a different number of _____ in their nucleus.

A. protons, electrons

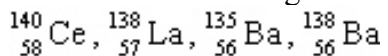
B. electrons, protons

C. protons, neutrons

D. neutrons, protons

E. electrons, neutrons

20. Which two of the following atoms are isotopes?



- A. ${}_{58}^{140}\text{Ce}$ and ${}_{57}^{138}\text{La}$
- B. ${}_{58}^{140}\text{Ce}$ and ${}_{56}^{135}\text{Ba}$
- C. ${}_{57}^{138}\text{La}$ and ${}_{56}^{135}\text{Ba}$
- D. ${}_{57}^{138}\text{La}$ and ${}_{56}^{138}\text{Ba}$
- E. ${}_{56}^{135}\text{Ba}$ and ${}_{56}^{138}\text{Ba}$
21. Europium has two naturally occurring isotopes. The average mass of Eu is 151.965 u. If 47.8% of Eu is found as Eu-151 (150.919847 u), what is the mass of the other isotope?
- A. 1.04 u
- B. 144.8 u
- C. 152.9 u
- D. 153.1 u
- E. 158.1u
22. An element consists of two isotopes. The abundance of one isotope is 60.1% and its atomic mass is 68.9256 u. The atomic mass of the second isotope is 70.9247 u. What is the average atomic mass of the element?
- A. 69.7 u
- B. 69.9 u
- C. 70.1 u
- D. 84.1 u
- E. 139.9 u
23. Copper has an average atomic mass of 63.55 u. If 69.17% of Cu exists as Cu-63 (62.93960 u), what is the identity and the atomic mass of the other isotope?
- A. Cu-64; 63.82 u
- B. Cu-64; 64.16 u
- C. Cu-65; 64.16 u
- D. Cu-65; 64.92 u
- E. Cu-66; 65.91 u

24. Boron has two stable isotopes with masses of 10.01294 u and 11.00931 u. The average molar mass of boron is 10.81 u. What is the percent abundance of each isotope?
- A. 18.9% B-10 and 81.1% B-11
 - B. 20.0% B-10 and 80.0% B-11
 - C. 48.6% B-10 and 51.4% B-11
 - D. 80.0% B-10 and 20.0% B-11
 - E. 81.1% B-10 and 18.9% B-11
25. How many elements are in the second period of the periodic table?
- A. 6
 - B. 8
 - C. 18
 - D. 32
 - E. 40
26. How many elements are in the sixth period of the periodic table?
- A. 5
 - B. 6
 - C. 8
 - D. 18
 - E. 32
27. What element is in the fifth period in Group 3A?
- A. Si
 - B. Ga
 - C. In
 - D. Sb
 - E. Tl
28. What alkaline earth metal is in the fifth period?
- A. Rb
 - B. Sr
 - C. Zr
 - D. In
 - E. Bi
29. What halogen is in the second period?
- A. N
 - B. O
 - C. F
 - D. Ne
 - E. Ar

30. Which three elements are likely to have similar chemical and physical properties?
- A. boron, silicon, and germanium
 - B. sodium, magnesium, and aluminum
 - C. magnesium, calcium, and strontium
 - D. uranium, plutonium, and americium
 - E. carbon, nitrogen, and oxygen
31. In which group of the periodic table do the elements all consist of diatomic molecules?
- A. 2A
 - B. 5A
 - C. 6A
 - D. 7A
 - E. 8A
32. Which of the following elements is not a metalloid?
- A. boron
 - B. gallium
 - C. germanium
 - D. arsenic
 - E. tellurium
33. The formula for acetic acid, $\text{CH}_3\text{CO}_2\text{H}$, is an example of a(n)
- A. condensed formula.
 - B. empirical formula.
 - C. structural formula.
 - D. ionic compound formula.
 - E. mass spectrum.
34. $\text{C}_2\text{H}_2\text{F}_4$ is the formula for two possible molecules. $\text{C}_2\text{H}_2\text{F}_4$ is an example of a(n)
- A. structural formula.
 - B. empirical formula.
 - C. condensed formula.
 - D. space-filling model.
 - E. molecular formula.
35. A sulfide ion has _____ electrons.
- A. 14
 - B. 15
 - C. 16
 - D. 17
 - E. 18

36. A magnesium ion has ____ electrons.
- 10
 - 11
 - 12
 - 13
 - 14
37. Which atom is most likely to form a 1- ion?
- K
 - Mg
 - P
 - Br
 - Ar
38. Which atom is most likely to form a 2+ ion?
- Sc
 - Sr
 - Ga
 - S
 - F
39. Identify the ions present in KClO_4 .
- K^+ , Cl^- , and O^{2-}
 - KCl^+ and O^-
 - K^+ and ClO_4^-
 - KCl^{2+} and O^{2-}
 - K^{2+} and ClO_4^{4-}
40. Identify the ions in CaHPO_4 .
- Ca^{2+} and PO_4^{3-}
 - Ca^{2+} and HPO_4^{2-}
 - Ca^+ and HPO_4^-
 - Ca^{3+} and HPO_4^{3-}
 - Ca^{2+} , H^+ , P^{3-} , and O^{2-}
41. What charge is likely on a monatomic silver cation?
- 2-
 - 1-
 - 1+
 - 2+
 - 3+

42. For a nonmetal in Group 6A of the periodic table, the most common monatomic ion will have a charge of ____.
- 3-
 - 2-
 - 1-
 - 1+
 - 2+
43. What is the correct formula for an ionic compound that contains aluminum ions and sulfide ions?
- AlS
 - AlS₂
 - Al₂S₃
 - Al²⁺S₃
 - Al₃S³⁻
44. Which of the following formulas is not correct?
- Al₃(CO₃)₂
 - KClO₄
 - BaO₄
 - Ca(NO₃)₂
 - Na₂HPO₄²⁻
45. What is the correct formula for an ionic compound that contains barium ions and phosphate ions?
- BaPO₄
 - Ba₃P₄
 - Ba₃(PO₄)₂
 - Ba₂(PO₄)₃
 - Ba₃(PO₄)₂
46. Sodium sulfate has the chemical formula Na₂SO₄. Based on this information, the formula for titanium(IV) sulfate is ____.
- TiSO₄
 - Ti(SO₄)₄
 - Ti(SO₄)₄
 - Ti₂SO₄²⁻
 - Ti₃(SO₄)₂
47. What is the charge on the copper ion in Cu₃P?
- 3-
 - 1-
 - 0
 - 1+
 - 3+

48. What is the correct formula for calcium nitrate?

- A. CaN
- B. Ca N₂
- C. Ca³NO₂
- D. Ca₃(NO₃)₂
- E. Ca(NO₃)₂

49. What is the correct formula for potassium hydrogen carbonate?

- A. KCO₃
- B. K₂CO₃
- C. KHCO₃
- D. K₂HCO₃
- E. KH₂CO₃

50. What is the correct formula for ammonium fluoride?

- A. NH F
- B. (NH₄)₂F
- C. NH₄F₂
- D. NH₃F
- E. NH₂F₂

51. What is the correct formula for iron(III) bromide?

- A. FeBr
- B. FeBr₃
- C. Fe₃Br
- D. Fe₂Br₃
- E. Fe₃Br₂

52. What is the correct formula for cobalt(III) carbonate?

- A. CoCO₃
- B. Co₃(CO₃)₂
- C. Co₃(CO₃)₂
- D. Co₂(CO₃)₃
- E. Co₃CO₃₃

53. What is the correct name for NH₄NO₃?

- A. ammonia hydrogen nitrate
- B. ammonia hydrogen nitride
- C. ammonium nitric acid
- D. ammonium nitrate
- E. ammonium nitride

54. What is the correct name for CaI_2 ?
- A. calcium diiodide
 - B. calcium diiodine
 - C. calcium(II) iodide
 - D. calcium iodide
 - E. iodine calcide
55. What is the correct name for Co_2S_3 ?
- A. cobalt sulfide
 - B. dicobalt trisulfate
 - C. dicobalt trisulfide
 - D. cobalt(II) sulfate
 - E. cobalt(III) sulfide
56. Which of the following statements concerning ionic compounds is/are correct?
1. As ion charges increase, the attraction between oppositely charged ions increases.
 2. Although not electrically conductive like metals, ionic compounds are malleable.
 3. Positive and negative ions are attracted to each other by electrostatic forces.
- A. 1 only
 - B. 2 only
 - C. 3 only
 - D. 1 and 3
 - E. 1, 2, and 3
57. Predict which ionic compound has the highest melting point.
- A. KBr
 - B. MgO
 - C. RbI
 - D. CaBr_2
 - E. CsCl^2
58. What is the correct name for SF_2 ?
- A. sulfur fluoride
 - B. sulfur difluoride
 - C. disulfur fluoride
 - D. disulfur difluoride
 - E. sulfide difluoride

59. What is the correct name for N_2O_3 ?
- A. nitrogen oxide
 - B. oxygen nitride
 - C. dinitrogen trioxide
 - D. nitrogen trioxide
 - E. trioxygen dinitride
60. What is the common name for PH_3 ?
- A. laughing gas
 - B. hydrazine
 - C. nitroglycerin
 - D. ammonia
 - E. phosphine
61. You have 0.575 mole of each of the following elements: C, Cl, Ca, Cr, and Cd. Which sample has the greatest mass?
- A. C
 - B. Cl
 - C. Ca
 - D. Cr
 - E. Cd
62. You have 7.57 g of each of the following elements: Si, S, Se, Sr, and Sn. Which sample contains the largest number of atoms?
- A. Si
 - B. S
 - C. Se
 - D. Sr
 - E. Sn
63. Calculate the number of moles in 0.093 g Zn.
- A. 0.0014 mol
 - B. 0.16 mol
 - C. 6.1 mol
 - D. 7.0×10^2 mol
 - E. 8.6×10^{20} mol
64. What is the mass of 0.018 mol Mg?
- A. 4.0×10^{-23} g
 - B. 7.4×10^{-4} g
 - C. 0.44 g
 - D. 2.3 g
 - E. 1.4×10^3 g

65. A 0.10 g sample of silicon contains ____ Si atoms.
- A. 5.9×10^{-27}
 - B. 0.0036
 - C. 2.1×10^{21}
 - D. 1.7×10^{24}
 - E. 1.7×10^{26}
66. The molar mass of platinum is 195.08 g/mol. What is the mass of 1.00×10^2 Pt atoms?
- A. 8.51×10^{-25} g
 - B. 3.24×10^{-24} g
 - C. 1.67×10^{-22} g
 - D. 3.24×10^{-22} g
 - E. 3.24×10^{-20} g
67. What mass of Ba contains the same number of atoms as 3.0 g Li?
- A. 0.0031 g
 - B. 0.15 g
 - C. 3.0 g
 - D. 59 g
 - E. 2.9×10^3 g
68. A nail is coated with a 0.053 cm thick layer of zinc. The surface area of the nail is 8.59 cm^2 . The density of zinc is 7.13 g/cm^3 . How many zinc atoms are used in the coating?
- A. 5.9×10^{20} atoms
 - B. 3.0×10^{22} atoms
 - C. 3.8×10^{22} atoms
 - D. 2.0×10^{24} atoms
 - E. 1.3×10^{26} atoms
69. What is the molar mass of calcium chloride hexahydrate?
- A. 75.53 g/mol
 - B. 111.0 g/mol
 - C. 117.0 g/mol
 - D. 183.6 g/mol
 - E. 219.1 g/mol
70. What is the molar mass of potassium nitrate?
- A. 39.10 g/mol
 - B. 53.11 g/mol
 - C. 85.11g/mol
 - D. 101.1 g/mol
 - E. 163.1 g/mol

71. Calculate the number of moles in 0.197 g As_2O_3 .
- A. 9.96×10^{-4} mol
 - B. 5.05×10^{-3} mol
 - C. 39.0 mol
 - D. 198 mol
 - E. 1.00×10^3 mol
72. What is the mass of 8.04×10^{-3} mol I_2 ?
- A. 3.17×10^{-5} g
 - B. 0.490 g
 - C. 0.980 g
 - D. 1.02 g
 - E. 2.04 g
73. What is the mass of 0.50 mol chromium(III) sulfide?
- A. 2.5×10^{-3} g
 - B. 5.9×10^{-3} g
 - C. 42 g
 - D. 1.0×10^2 g
 - E. 110 g
74. How many hydrogen atoms are in 1.0 g of CH_4 ?
- A. 6.2×10^{-2} atoms
 - B. 2.5×10^{-1} atoms
 - C. 3.8×10^{22} atoms
 - D. 1.5×10^{23} atoms
 - E. 3.9×10^{25} atoms
75. How many bromide ions are in 0.55 g of iron(III) bromide?
- A. 1.1×10^{21} ions
 - B. 3.4×10^{21} ions
 - C. 3.3×10^{23} ions
 - D. 9.9×10^{23} ions
 - E. 2.9×10^{26} ions
76. If 1.00 g of an unknown molecular compound contains 8.35×10^{21} molecules, what is its molar mass?
- A. 44.0 g/mol
 - B. 66.4 g/mol
 - C. 72.1 g/mol
 - D. 98.1 g/mol
 - E. 132 g/mol

77. What is the mass percent of iodine in calcium iodide?
- 13.64%
 - 24.00%
 - 66.67%
 - 76.00%
 - 86.36%
78. What is the mass percent of each element in sulfuric acid, H_2SO_4 ?
- 2.055% H, 32.69% S, 65.25% O
 - 1.028% H, 32.69% S, 66.28% O
 - 28.57% H, 14.29% S, 57.17% O
 - 1.028% H, 33.72% S, 65.25% O
 - 2.016% H, 32.07% S, 65.91% O
79. Nitrogen and oxygen form an extensive series of oxides with the general formula N_xO_y . What is the empirical formula for an oxide that contains 36.85% by mass nitrogen?
- N_2O
 - NO
 - NO_2
 - N_2O_3
 - N_2O_5
80. A molecule is found to contain 64.27% by mass C, 7.191% by mass H, and 28.54% by mass O. What is the empirical formula for this molecule?
- $\text{C}_3\text{H}_4\text{O}$
 - $\text{C}_2\text{H}_6\text{O}$
 - $\text{C}_3\text{H}_4\text{O}$
 - $\text{C}_3\text{H}_8\text{O}_2$
 - $\text{C}_4\text{H}_6\text{O}_3$
81. An ionic compound has the formula MCl_2 . The mass of 0.3011 mol of the compound is 62.69 grams. What is the identity of the metal?
- Ni
 - Cu
 - Sn
 - Hg
 - Ba

82. A 3.592 g sample of hydrated magnesium bromide, $\text{MgBr}_2 \cdot x\text{H}_2\text{O}$, is dried in an oven. When the anhydrous salt is removed from the oven, its mass is 2.263 g. What is the value of x ?
- A. 1
 - B. 3
 - C. 6
 - D. 8
 - E. 12
83. A 2.000 g sample of $\text{FeF}_2 \cdot x\text{H}_2\text{O}$ is dried in an oven. When the anhydrous salt is removed from the oven, its mass is 0.789 g. What is the value of x ?
- A. 1
 - B. 3
 - C. 6
 - D. 8
 - E. 12
84. Buckminsterfullerene is a molecule composed of sixty _____ atoms.
85. Pure oxygen can exist as O_2 or O_3 . Elements that exist in more than one distinct form are called _____.

86. The group _____ elements are nonmetals and all exist as diatomic molecules.

87. What are the names of four metalloids?

88. In reactions, metals generally lose electrons to become cations, and nonmetals gain electrons to become _____.

89. In which ionic compound, NaBr or KBr, is the force of attraction between anions and cations stronger?

90. The numerical quantity of a mole, 6.022×10^{23} , is defined as the number of atoms in a specific mass of an element. What is the mass and the identity of the element used to define one mole?

Chapter 2--Atoms, Molecules, and Ions **Key**

- Which of the following statements concerning atomic structure is/are correct?
 - The nucleus contains most of an atom's mass.
 - The nucleus contains all the positive charge of an atom.
 - Electrons surround the nucleus and account for the majority of an atom's volume.

A. 1 only
B. 2 only
C. 3 only
D. 2 and 3
E. 1, 2, and 3
- Rank the subatomic particles from least to greatest mass.

A. electron mass = proton mass = neutron mass
B. electron mass = neutron mass < proton mass
C. electron mass = proton mass < neutron mass
D. electron mass < proton mass < neutron mass
E. electron mass < proton mass = neutron mass
- Atomic number is the number of _____ in the nucleus of an atom.

A. electrons
B. protons
C. neutrons
D. electrons and neutrons
E. neutrons and protons
- The atomic number of chromium is _____.

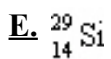
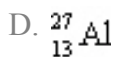
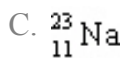
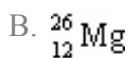
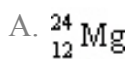
A. 6
B. 24
C. 28
D. 48
E. 52
- An atomic mass unit (u) is defined as

A. the mass of one hydrogen-1 atom.
B. the mass of one carbon-12 atom.
C. 1/12 the mass of one carbon-12 atom.
D. 1/8 the mass of one oxygen-16 atom.
E. the sum of the masses of one proton, one neutron, and one electron.

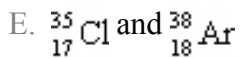
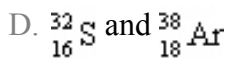
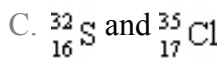
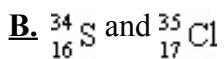
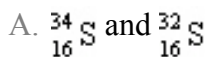
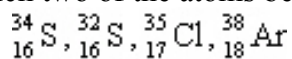
6. What is the mass number of a nickel atom with 31 neutrons?
- 3
 - 28
 - 31
 - 58
 - E.** 59
7. How many protons, neutrons, and electrons are in a yttrium-89 atom?
- A.** 39 protons, 50 neutrons, 39 electrons
 - 39 protons, 89 neutrons, 39 electrons
 - 39 protons, 50 neutrons, 50 electrons
 - 50 protons, 39 neutrons, 50 electrons
 - 39 protons, 11 neutrons, 39 electrons
8. How many protons, neutrons, and electrons are in a hydrogen-3 atom?
- 1 proton, 1 neutron, 1 electron
 - B.** 1 proton, 2 neutrons, 1 electron
 - 1 proton, 3 neutrons, 1 electron
 - 2 protons, 1 neutron, 2 electrons
 - 2 protons, 1 neutron, 1 electron
9. What is the mass of sulfur-32 relative to carbon-12?
- 0.375
 - 0.600
 - 1.67
 - D.** 2.67
 - 20
10. Which of the following atoms contains the fewest protons?
- A.** $^{128}_{52}\text{Te}$
 - $^{127}_{53}\text{I}$
 - $^{131}_{54}\text{Xe}$
 - $^{133}_{55}\text{Cs}$
 - $^{209}_{83}\text{Bi}$
11. Which of the following atoms contains the largest number of protons?
- $^{231}_{91}\text{Pa}$
 - $^{238}_{92}\text{U}$
 - $^{232}_{90}\text{Th}$
 - $^{244}_{94}\text{Pu}$
 - E.** $^{251}_{98}\text{Cf}$

12. What is the atomic symbol for an element with 38 protons and 50 neutrons?
- A. ${}^{88}_{12}\text{Mg}$
- B. ${}^{50}_{38}\text{V}$
- C. ${}^{88}_{38}\text{Sr}$**
- D. ${}^{88}_{50}\text{Sn}$
- E. ${}^{226}_{88}\text{Ra}$
13. What is the identity of ${}^{54}_{24}\text{X}$?
- A. Cr**
- B. Xe
- C. Pt
- D. Zn
- E. Mn
14. What is the atomic symbol for an element that has 24 neutrons and a mass number of 45?
- A. Tm
- B. Cr
- C. Rh
- D. Sc**
- E. Dy
15. How many neutrons are in an atom of arsenic-75?
- A. 33
- B. 42**
- C. 75
- D. 108
- E. 117
16. Which of the following atoms contains the fewest protons?
- A. ${}^{103}\text{Rh}$
- B. ${}^{102}\text{Pd}$
- C. ${}^{106}\text{Cd}$
- D. ${}^{107}\text{Ag}$
- E. ${}^{102}\text{Ru}$**

17. Which of the following atoms contains the largest number of neutrons?



18. Which two of the atoms below have the same number of neutrons?



19. Two isotopes of a given element will have the same number of _____, but a different number of _____ in their nucleus.

A. protons, electrons

B. electrons, protons

C. protons, neutrons

D. neutrons, protons

E. electrons, neutrons

20. Which two of the following atoms are isotopes?
 ${}_{58}^{140}\text{Ce}$, ${}_{57}^{138}\text{La}$, ${}_{56}^{135}\text{Ba}$, ${}_{56}^{138}\text{Ba}$
- A. ${}_{58}^{140}\text{Ce}$ and ${}_{57}^{138}\text{La}$
B. ${}_{58}^{140}\text{Ce}$ and ${}_{56}^{135}\text{Ba}$
C. ${}_{57}^{138}\text{La}$ and ${}_{56}^{135}\text{Ba}$
D. ${}_{57}^{138}\text{La}$ and ${}_{56}^{138}\text{Ba}$
E. ${}_{56}^{135}\text{Ba}$ and ${}_{56}^{138}\text{Ba}$
21. Europium has two naturally occurring isotopes. The average mass of Eu is 151.965 u. If 47.8% of Eu is found as Eu-151 (150.919847 u), what is the mass of the other isotope?
- A. 1.04 u
B. 144.8 u
C. 152.9 u
D. 153.1 u
E. 158.1u
22. An element consists of two isotopes. The abundance of one isotope is 60.1% and its atomic mass is 68.9256 u. The atomic mass of the second isotope is 70.9247 u. What is the average atomic mass of the element?
- A.** 69.7 u
B. 69.9 u
C. 70.1 u
D. 84.1 u
E. 139.9 u
23. Copper has an average atomic mass of 63.55 u. If 69.17% of Cu exists as Cu-63 (62.93960 u), what is the identity and the atomic mass of the other isotope?
- A. Cu-64; 63.82 u
B. Cu-64; 64.16 u
C. Cu-65; 64.16 u
D. Cu-65; 64.92 u
E. Cu-66; 65.91 u

24. Boron has two stable isotopes with masses of 10.01294 u and 11.00931 u. The average molar mass of boron is 10.81 u. What is the percent abundance of each isotope?
- A. 18.9% B-10 and 81.1% B-11
 - B.** 20.0% B-10 and 80.0% B-11
 - C. 48.6% B-10 and 51.4% B-11
 - D. 80.0% B-10 and 20.0% B-11
 - E. 81.1% B-10 and 18.9% B-11
25. How many elements are in the second period of the periodic table?
- A. 6
 - B.** 8
 - C. 18
 - D. 32
 - E. 40
26. How many elements are in the sixth period of the periodic table?
- A. 5
 - B. 6
 - C. 8
 - D. 18
 - E.** 32
27. What element is in the fifth period in Group 3A?
- A. Si
 - B. Ga
 - C.** In
 - D. Sb
 - E. Tl
28. What alkaline earth metal is in the fifth period?
- A. Rb
 - B.** Sr
 - C. Zr
 - D. In
 - E. Bi
29. What halogen is in the second period?
- A. N
 - B. O
 - C.** F
 - D. Ne
 - E. Ar

30. Which three elements are likely to have similar chemical and physical properties?
- A. boron, silicon, and germanium
 - B. sodium, magnesium, and aluminum
 - C.** magnesium, calcium, and strontium
 - D. uranium, plutonium, and americium
 - E. carbon, nitrogen, and oxygen
31. In which group of the periodic table do the elements all consist of diatomic molecules?
- A. 2A
 - B. 5A
 - C. 6A
 - D.** 7A
 - E. 8A
32. Which of the following elements is not a metalloid?
- A. boron
 - B.** gallium
 - C. germanium
 - D. arsenic
 - E. tellurium
33. The formula for acetic acid, $\text{CH}_3\text{CO}_2\text{H}$, is an example of a(n)
- A.** condensed formula.
 - B. empirical formula.
 - C. structural formula.
 - D. ionic compound formula.
 - E. mass spectrum.
34. $\text{C}_2\text{H}_2\text{F}_4$ is the formula for two possible molecules. $\text{C}_2\text{H}_2\text{F}_4$ is an example of a(n)
- A. structural formula.
 - B. empirical formula.
 - C. condensed formula.
 - D. space-filling model.
 - E.** molecular formula.
35. A sulfide ion has _____ electrons.
- A. 14
 - B. 15
 - C. 16
 - D. 17
 - E.** 18

36. A magnesium ion has _____ electrons.
- A.** 10
 B. 11
 C. 12
 D. 13
 E. 14
37. Which atom is most likely to form a 1- ion?
- A. K
 B. Mg
 C. P
D. Br
 E. Ar
38. Which atom is most likely to form a 2+ ion?
- A. Sc
B. Sr
 C. Ga
 D. S
 E. F
39. Identify the ions present in KClO_4 .
- A. K^+ , Cl^- , and O^{2-}
 B. KCl^+ and O^-
C. K^+ and ClO_4^-
 D. KCl^{2+} and O^{2-}
 E. K^{2+} and ClO_4^{42-}
40. Identify the ions in CaHPO_4 .
- A. Ca^{2+} and PO_4^{3-}
B. Ca^{2+} and HPO_4^{2-}
 C. Ca^+ and HPO_4^-
 D. Ca^{3+} and HPO_4^{3-}
 E. Ca^{2+} , H^+ , P^{3-} , and O^{2-}
41. What charge is likely on a monatomic silver cation?
- A. 2-
 B. 1-
C. 1+
 D. 2+
 E. 3+

42. For a nonmetal in Group 6A of the periodic table, the most common monatomic ion will have a charge of ____.
- A. 3-
B. 2-
 C. 1-
 D. 1+
 E. 2+
43. What is the correct formula for an ionic compound that contains aluminum ions and sulfide ions?
- A. AlS
 B. AlS₂
 C. Al₂S₃
D. Al₂S₃
 E. Al₃S₂
44. Which of the following formulas is not correct?
- A. Al₂(CO₃)₂**
 B. KClO₄
 C. BaO₄
 D. Ca(NO₃)₂
 E. Na₂HPO₄
45. What is the correct formula for an ionic compound that contains barium ions and phosphate ions?
- A. BaPO
 B. Ba₃P₄
 C. Ba₃(PO₄)₂
 D. Ba₂(PO₄)₃
E. Ba₃(PO₄)₂
46. Sodium sulfate has the chemical formula Na₂SO₄. Based on this information, the formula for titanium(IV) sulfate is ____.
- A. TiSO
 B. Ti(SO₄)
C. Ti(SO₄)₂
 D. Ti₂SO₄
 E. Ti₃(SO₄)₂
47. What is the charge on the copper ion in Cu₃P?
- A. 3-
 B. 1-
 C. 0
D. 1+
 E. 3+

48. What is the correct formula for calcium nitrate?
- A. CaN
 B. Ca₃N
 C. Ca³NO₂
 D. Ca₃(NO₂)
E. Ca(NO₃)₂
49. What is the correct formula for potassium hydrogen carbonate?
- A. KCO
 B. K₂CO₃
C. KHCO₃
 D. K₂HCO₃
 E. KH₂CO₃
50. What is the correct formula for ammonium fluoride?
- A. NH₄F**
 B. (NH₄)₂F
 C. NH₄F₂
 D. NH₃F
 E. NH₂F₂
51. What is the correct formula for iron(III) bromide?
- A. FeBr
B. FeBr₃
 C. Fe₃Br
 D. Fe₂Br₃
 E. Fe₃Br₂
52. What is the correct formula for cobalt(III) carbonate?
- A. CoCO
 B. Co₃(CO₃)
C. Co³⁺(CO₃)₂
 D. Co²⁺(CO₃)₃
 E. Co₃CO₃³
53. What is the correct name for NH₄NO₃?
- A. ammonia hydrogen nitrate
 B. ammonia hydrogen nitride
 C. ammonium nitric acid
D. ammonium nitrate
 E. ammonium nitride

54. What is the correct name for CaI_2 ?
- A. calcium diiodide
 - B. calcium diiodine
 - C. calcium(II) iodide
 - D.** calcium iodide
 - E. iodine calcide
55. What is the correct name for Co_2S_3 ?
- A. cobalt sulfide
 - B. dicobalt trisulfate
 - C. dicobalt trisulfide
 - D. cobalt(II) sulfate
 - E.** cobalt(III) sulfide
56. Which of the following statements concerning ionic compounds is/are correct?
1. As ion charges increase, the attraction between oppositely charged ions increases.
 2. Although not electrically conductive like metals, ionic compounds are malleable.
 3. Positive and negative ions are attracted to each other by electrostatic forces.
- A. 1 only
 - B. 2 only
 - C. 3 only
 - D.** 1 and 3
 - E. 1, 2, and 3
57. Predict which ionic compound has the highest melting point.
- A. KBr
 - B.** MgO
 - C. RbI
 - D. CaBr_2
 - E. CsCl^2
58. What is the correct name for SF_2 ?
- A. sulfur fluoride
 - B.** sulfur difluoride
 - C. disulfur fluoride
 - D. disulfur difluoride
 - E. sulfide difluoride

59. What is the correct name for N_2O_3 ?
- A. nitrogen oxide
 - B. oxygen nitride
 - C. dinitrogen trioxide**
 - D. nitrogen trioxide
 - E. trioxygen dinitride
60. What is the common name for PH_3 ?
- A. laughing gas
 - B. hydrazine
 - C. nitroglycerin
 - D. ammonia
 - E. phosphine**
61. You have 0.575 mole of each of the following elements: C, Cl, Ca, Cr, and Cd. Which sample has the greatest mass?
- A. C
 - B. Cl
 - C. Ca
 - D. Cr
 - E. Cd**
62. You have 7.57 g of each of the following elements: Si, S, Se, Sr, and Sn. Which sample contains the largest number of atoms?
- A. Si**
 - B. S
 - C. Se
 - D. Sr
 - E. Sn
63. Calculate the number of moles in 0.093 g Zn.
- A. 0.0014 mol**
 - B. 0.16 mol
 - C. 6.1 mol
 - D. 7.0×10^2 mol
 - E. 8.6×10^{20} mol
64. What is the mass of 0.018 mol Mg?
- A. 4.0×10^{-23} g
 - B. 7.4×10^{-4} g
 - C. 0.44 g**
 - D. 2.3 g
 - E. 1.4×10^3 g

65. A 0.10 g sample of silicon contains ____ Si atoms.
- A. 5.9×10^{-27}
 - B. 0.0036
 - C.** 2.1×10^{21}
 - D. 1.7×10^{24}
 - E. 1.7×10^{26}
66. The molar mass of platinum is 195.08 g/mol. What is the mass of 1.00×10^2 Pt atoms?
- A. 8.51×10^{-25} g
 - B. 3.24×10^{-24} g
 - C. 1.67×10^{-22} g
 - D. 3.24×10^{-22} g
 - E.** 3.24×10^{-20} g
67. What mass of Ba contains the same number of atoms as 3.0 g Li?
- A. 0.0031 g
 - B. 0.15 g
 - C. 3.0 g
 - D.** 59 g
 - E. 2.9×10^3 g
68. A nail is coated with a 0.053 cm thick layer of zinc. The surface area of the nail is 8.59 cm^2 . The density of zinc is 7.13 g/cm^3 . How many zinc atoms are used in the coating?
- A. 5.9×10^{20} atoms
 - B.** 3.0×10^{22} atoms
 - C. 3.8×10^{22} atoms
 - D. 2.0×10^{24} atoms
 - E. 1.3×10^{26} atoms
69. What is the molar mass of calcium chloride hexahydrate?
- A. 75.53 g/mol
 - B. 111.0 g/mol
 - C. 117.0 g/mol
 - D. 183.6 g/mol
 - E.** 219.1 g/mol
70. What is the molar mass of potassium nitrate?
- A. 39.10 g/mol
 - B. 53.11 g/mol
 - C. 85.11 g/mol
 - D.** 101.1 g/mol
 - E. 163.1 g/mol

71. Calculate the number of moles in 0.197 g As_2O_3 .
- A.** 9.96×10^{-4} mol
 - B. 5.05×10^{-3} mol
 - C. 39.0 mol
 - D. 198 mol
 - E. 1.00×10^3 mol
72. What is the mass of 8.04×10^{-3} mol I_2 ?
- A. 3.17×10^{-5} g
 - B. 0.490 g
 - C. 0.980 g
 - D. 1.02 g
 - E.** 2.04 g
73. What is the mass of 0.50 mol chromium(III) sulfide?
- A. 2.5×10^{-3} g
 - B. 5.9×10^{-3} g
 - C. 42 g
 - D.** 1.0×10^2 g
 - E. 110 g
74. How many hydrogen atoms are in 1.0 g of CH_4 ?
- A. 6.2×10^{-2} atoms
 - B. 2.5×10^{-1} atoms
 - C. 3.8×10^{22} atoms
 - D.** 1.5×10^{23} atoms
 - E. 3.9×10^{25} atoms
75. How many bromide ions are in 0.55 g of iron(III) bromide?
- A. 1.1×10^{21} ions
 - B.** 3.4×10^{23} ions
 - C. 3.3×10^{23} ions
 - D. 9.9×10^{23} ions
 - E. 2.9×10^{26} ions
76. If 1.00 g of an unknown molecular compound contains 8.35×10^{21} molecules, what is its molar mass?
- A. 44.0 g/mol
 - B. 66.4 g/mol
 - C.** 72.1 g/mol
 - D. 98.1 g/mol
 - E. 132 g/mol

77. What is the mass percent of iodine in calcium iodide?
- A. 13.64%
 B. 24.00%
 C. 66.67%
 D. 76.00%
E. 86.36%
78. What is the mass percent of each element in sulfuric acid, H_2SO_4 ?
- A.** 2.055% H, 32.69% S, 65.25% O
 B. 1.028% H, 32.69% S, 66.28% O
 C. 28.57% H, 14.29% S, 57.17% O
 D. 1.028% H, 33.72% S, 65.25% O
 E. 2.016% H, 32.07% S, 65.91% O
79. Nitrogen and oxygen form an extensive series of oxides with the general formula N_xO_y . What is the empirical formula for an oxide that contains 36.85% by mass nitrogen?
- A. N_2O
 B. NO
 C. NO_2
D. N_2O_3
 E. N_2O_5
80. A molecule is found to contain 64.27% by mass C, 7.191% by mass H, and 28.54% by mass O. What is the empirical formula for this molecule?
- A. $\text{C}_2\text{H}_6\text{O}$
B. $\text{C}_3\text{H}_8\text{O}_2$
 C. $\text{C}_3\text{H}_4\text{O}$
 D. $\text{C}_3\text{H}_8\text{O}_2$
 E. $\text{C}_4\text{H}_8\text{O}_3$
81. An ionic compound has the formula MCl_2 . The mass of 0.3011 mol of the compound is 62.69 grams. What is the identity of the metal?
- A. Ni
 B. Cu
 C. Sn
 D. Hg
E. Ba

82. A 3.592 g sample of hydrated magnesium bromide, $\text{MgBr}_2 \cdot x\text{H}_2\text{O}$, is dried in an oven. When the anhydrous salt is removed from the oven, its mass is 2.263 g. What is the value of x ?
- A. 1
B. 3
C. 6
D. 8
E. 12

83. A 2.000 g sample of $\text{FeF}_2 \cdot x\text{H}_2\text{O}$ is dried in an oven. When the anhydrous salt is removed from the oven, its mass is 0.789 g. What is the value of x ?
- A. 1
B. 3
C. 6
D. 8
E. 12

84. Buckminsterfullerene is a molecule composed of sixty _____ atoms.

carbon

85. Pure oxygen can exist as O_2 or O_3 . Elements that exist in more than one distinct form are called _____.

allotropes

86. The group _____ elements are nonmetals and all exist as diatomic molecules.

7A or 17

87. What are the names of four metalloids?

boron, silicon, germanium, arsenic, (antimony, and tellurium)

88. In reactions, metals generally lose electrons to become cations, and nonmetals gain electrons to become _____.

anions

89. In which ionic compound, NaBr or KBr, is the force of attraction between anions and cations stronger?

The force of attraction is stronger for NaBr. The electrostatic attraction between anions and cations decreases as the separation of the ions increases. The potassium ion will be farther from the bromide ion than the sodium ion due to its larger ionic radius.

90. The numerical quantity of a mole, 6.022×10^{23} , is defined as the number of atoms in a specific mass of an element. What is the mass and the identity of the element used to define one mole?

A mole is equal to the number of atoms in 12.00 grams of carbon-12.