Chemstiry.G11- Quarter 1 Smmary Qs. Bank

Topics:

- **The science of matter**
- **Matter is made up of atoms.**
- **Introduction to the periodic table.**
- **Formation of compounds**
- **Types of compounds.**
- **Chemical reactions and equations.**

Modified True/False
Indicate whether the statement is true or false. If false, change the identified word or phrase to make the statement true.

____ 1. Carbon dioxide is present at a <u>higher</u> concentration in air that is exhaled than in air that is inhaled.

____ 2. The most abundant element in the universe is <u>oxygen</u>.

____ 3. The two raw materials for the process of photosynthesis are water and <u>sugars</u>.

____ 4. The elements in column 18 of the periodic table are chemically <u>inactive</u>.

____ 5. All of the noble gas elements except <u>neon</u> have eight electrons in their outermost energy level. False,

____ 6. In covalent bonding, atoms can achieve a full octet of electrons by <u>sharing electrons</u>.

____ 7. A typical potassium ion has a positive charge because it has <u>lost</u> an electron.

____ 8. The following electron dot structure shows a bromine atom that has <u>lost</u> an electron to become an ion. _____

..
[:Br:]$^-$
..

____ 9. A crystal of the compound potassium fluoride consists of potassium and fluoride <u>molecules</u>.

____ 10. The formula for methane, CH_4, indicates that each methane molecule contains <u>one</u> carbon atom and <u>four</u> hydrogen atoms.

Completion
Complete each statement.

11. The neutral particle found within an atom is the _____.
12. The sum of the protons and neutrons in the nucleus of an atom is called the _____ of that atom.
13. The space around the nucleus of an atom where the atom's electrons are found is called the _____.
14. The _____ is the positively charged central core of an atom.
15. A system used to represent the valence electrons around the chemical symbol of an element is the _____.
16. The positively-charged, subatomic particle is a(n) _____.
17. According to the _____, the elements that make up a compound always occur in the same mass proportion.
18. A fact of nature that has been confirmed many times by observation is known as a(n) _____.
19. The range of all forms of radiant energy is given the name _____.
20. The smallest particle of which matter consists is a(n) _____.
21. A(n) _____ is found in the outermost energy level of an atom.
22. The number of protons in the nucleus of an atom of an element is the _____ of that element.
23. The _____ is the idea that matter is made up of fundamental particles called atoms.
24. Use the square from the periodic table shown in Figure 2-3 to complete the blanks.

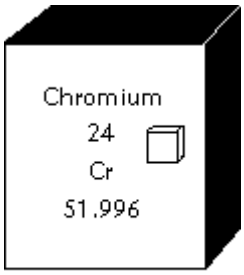

Figure 2-3

Atomic number _____
Symbol _____
Name of element _____
Atomic mass _____
State of element _____

25. A(n) _____ is an element that has properties of both metals and nonmetals.
26. A row of elements in the periodic table is called a(n) _____.
27. An element that has luster and conducts heat and electricity well is a(n) _____.
28. A(n) _____ is an element in which valence electrons are tightly held.
29. The repeating pattern of the properties of elements from row to row in the periodic table is an example of _____.
30. The inner transition elements with atomic numbers from 90 to 103 make up the _____.
31. Elements that are not found in nature but are produced artificially are _____ elements.
32. A(n) _____ is an atom or group of atoms that carries an electric charge because it has gained or lost electrons.
33. A(n) _____ is a substance that conducts an electric current when dissolved in water or when melted.
34. An arrangement of valence electrons like that found in helium, argon, neon, and similar elements is known as a(n) _____.
35. The bond formed when two atoms share one or more pairs of electrons with each other is called a(n) _____.
36. A(n) _____ is a regular, repeating arrangement of atoms, ions, or molecules of a solid.
37. A compound that consists of ions is called a(n) _____.
38. A(n) _____ shows in a shorthand way the numbers and kinds of elements present in a compound.
39. A compound, the atoms of which are held together by means of bonds that involve electron sharing, is called a(n) _____.
40. $CaSO_4 \cdot 2H_2O$ is a(n) _____ because it always contains a fixed ratio of water molecules to calcium and sulfate ions.
41. A chemist can often use the process of _____ to separate two liquids from each other.
42. The sodium ion (Na^+) is said to have a(n) _____ of 1+ because that is the charge on a sodium ion.
43. A compound such as methane that contains carbon is generally classified as a(n) _____.
44. Sodium carbonate is a(n) _____ substance because it takes on water molecules, to which it becomes chemically bonded.

45. When copper sulfate pentahydrate is heated, water is driven off, leaving behind _____ copper sulfate.

46. Methane and propane are examples of _____ because they contain only carbon and hydrogen.

47. If left outside on a table long enough, a(n) _____ substance, such as calcium chloride, will take on enough water to form a liquid solution.

48. In the compound Al_2O_3, the simplest ratio of atoms in the compound, called the _____, is two atoms of aluminum to three atoms of oxygen.

49. A(n) _____ is one in which atoms are held together by covalent rather than ionic bonds.

50. In general, compounds that do not contain carbon are classified as _____.

Matching

Match each item with the correct statement below.

a. alloy
b. aqueous solutions
c. chemical property
d. compound
e. energy
f. exothermic
g. formula
h. law of conservation of mass
i. mass
j. matter
k. physical change
l. properties
m. quantitative
n. solute

____ 51. The type of change in which the identity of substances does not change.
____ 52. A chemical combination of two or more elements joined together in a fixed proportion.
____ 53. The fact that matter can be neither created nor destroyed in a chemical change.
____ 54. Solutions in which water is the solvent.
____ 55. The behavior of matter and its characteristics.
____ 56. A solid solution usually consisting of two or more metals.
____ 57. Any chemical reaction that gives off energy.
____ 58. The combination of chemical symbols that describes the composition of a chemical compound.
____ 59. The measure of the amount of matter that an object contains.
____ 60. An observation that makes use of measurement.
____ 61. Can be observed only when there is a change in composition of a substance.
____ 62. Anything that takes up space and has mass.
____ 63. The material that is dissolved in a solution.
____ 64. The capacity to do work.

Match each item with the correct item below.

a. ionic
b. molecular

____ 65. potassium nitrite
____ 66. selenium dioxide
____ 67. pentane
____ 68. diphosphorus pentasulfide
____ 69. nickel(II) bromide

Match each item with the correct item below.

a. common
b. formal

____ 70. anhydrous gypsum
____ 71. nitric acid
____ 72. calcined magnesia
____ 73. lithium hydroxide

Match each item with the correct statement below.

a. activation energy
b. catalyst
c. chemical reaction
d. coefficient
e. combustion
f. concentration
g. decomposition
h. enzymes
i. equilibrium
j. inhibitor
k. insoluble
l. product
m. reactant
n. single-displacement
o. soluble
p. synthesis

____ 74. The replacement of hydrogen from water by sodium is an example of a(n) _____ reaction.
____ 75. In order for a chemical reaction to take place, the particles involved must collide with a sufficient amount of _____.
____ 76. In order to balance a chemical equation, it may be necessary to add a(n) _____ before one or more of the symbols or formulas.
____ 77. A precipitate forms in a chemical reaction when a(n) _____ substance is formed during the reaction.
____ 78. A chemical reaction is in a state of _____ when the rate of products being formed equals the rate of reactants being reformed.
____ 79. A(n) _____ is any substance that produces other substances in a chemical reaction.
____ 80. Chemists often add a(n) _____ to a reaction if they want to increase the rate at which the reaction is taking place.
____ 81. A(n) _____ reaction is one in which two or more substances combine to form a single product.
____ 82. The human body contains _____, which are catalysts that change the rates of biochemical reactions.
____ 83. Sugar is a(n) _____ substance because it dissolves in water.
____ 84. A chemical change is also known as a(n) _____.
____ 85. An example of a(n) _____ reaction is the electrolysis of water, in which an electric current breaks down water into two new substances.
____ 86. You can slow down a chemical reaction by adding a(n) _____ to the reaction.

Match each statement with the correct item below.

a. $2Na + Cl_2 \rightarrow 2NaCl$

b. burning of coal in oxygen
c. an amount of reactant present in a small enough amount to determine when the reaction will stop
d. NaCl in $2Na + Cl_2 \rightarrow 2NaCl$
e. substance that slows down a reaction
f. energy required to get a reaction started
g. $Cl_2 + 2NaBr \rightarrow Br_2 + 2NaCl$
h. the 2 in 2NaCl
i. substance that speeds up a reaction without being used up
j. any chemical change
k. $2KBr + Pb(NO_3)_2 \rightarrow 2KNO_3 + PbBr_2$
l. substance that appears as a precipitate
m. rate of $A + B \rightarrow AB$ equals rate of $AB \rightarrow A + B$
n. either Na or Cl_2 in $2Na + Cl_2 \rightarrow 2NaCl$
o. $Ca(OH)_2 \rightarrow CaO + 2H_2O$

____ 87. limiting reactant
____ 88. coefficient
____ 89. catalyst
____ 90. decomposition
____ 91. synthesis
____ 92. insoluble
____ 93. dynamic equilibrium
____ 94. product
____ 95. chemical reaction
____ 96. activation energy
____ 97. combustion
____ 98. reactant
____ 99. single displacement
____100. inhibitor

Short Answer

Explain how the two terms in the following pairs relate to one another.

101. matter and mass
102. pure substance and element
103. qualitative observation and quantitative observation
104. solution and aqueous solution
105. Na and NaCl
106. endothermic and exothermic

107. How did Thomson's discovery of neon's isotopes lead to the discovery of neutrons?

108. Why is it difficult to detect the presence of isotopes of an element during chemical studies?

109. How is the movement of electrons between energy levels like climbing a ladder?

110. Sequence the following parts of a scientific method: experiment, hypothesis, observation, revised hypothesis, theory.

111. An atom of tin has atomic number of 50 and mass number of 119. How many protons, neutrons, and electrons does this atom of tin contain?

112. What two factors determine the location of an electron around the nucleus?

113. How was Dobereiner's concept of triads an important step in the development of a periodic table?

114. Explain how to determine the number of valence electrons in Groups 1, 2, and 13-18.

115. Describe the composition of a molecule of the sugar sucrose, given that its formula is $C_{12}H_{22}O_{11}$.

116. Why are the noble gases no longer called inert gases?

117. Compare and contrast the properties of the elements oxygen and carbon.

118. When copper sulfate is used as a desiccant, it takes on five molecules of water of hydration. Write the formulas for the initial and final compounds in this change.
Initial: _____; Final: _____

119. Write the name and formula of any binary acid.
Acid: _____

The diagram, Figure 5-1, shows the way two colorless liquids with different boiling points can be separated from each other by means of distillation. Answer the following questions about this diagram.

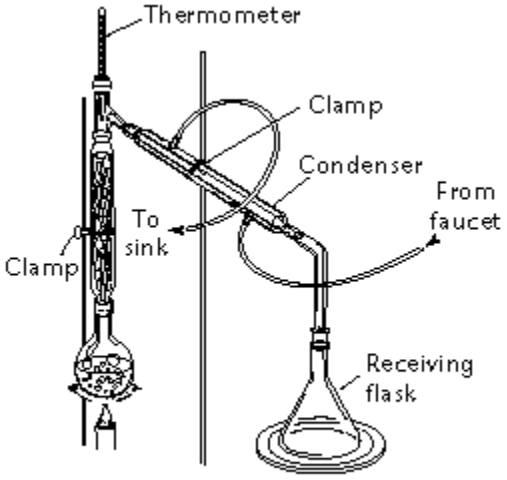

Figure 5-1

120. In the first few minutes after the burner is turned on, what change do you expect to see in the thermometer reading? Why?

121. Describe the movement of water as it flows through the condenser.

122. Which liquid first begins falling from the condenser into the receiving flask?

123. Under what circumstances might this procedure *not* be satisfactory for separating two liquids from each other?

124. Write the formula for each of the following binary ionic compounds: cesium iodide, potassium selenide, aluminum fluoride, calcium phosphide.

125. Name the ionic compound represented by each formula: K_2CO_3, $CaHPO_4$, $Na_2C_2O_4$, NH_4HSO_4, $Mg(MnO_4)_2$.

126. Write the formula for the compound made from each of the following pairs of ions: cesium and sulfate ions, aluminum and hydroxide ions, beryllium and nitrate ions, ammonium and dihydrogen phosphate ions.

127. Write the formula for each of the following compounds containing transition elements: chromium(II) sulfate, gold(III) selenide, iron(II) phosphate, copper(I) nitride.

128. The metals in the following compounds can have various oxidation numbers. Predict the charge on each metal ion, and write the name of each of the following compounds: $PbSO_4$, CuCN, SnS_2, $Bi_2(C_2O_4)_3$.

129. Vanadium is a transition element with multiple oxidation numbers. Write the names of the following compounds containing vanadium: V_2S_3, VF_4, $V_2(SO_4)_3$, V_2O_5.

130. Write the names of the following hydrates:
$Cu(NO_3)2 \cdot 3H_2O$,
$K_2C_2O_4 \cdot H_2O$,
$Ni(C_2H_3O_2)2 \cdot 4H_2O$,
$Na_2HPO_4 \cdot 7H_2O$.

131. How many atoms of each element are present in five formula units of ammonium sulfite monohydrate?

132. Name the following molecular compounds: P_2O_3, SiS_2, IBr_3, Se_2Cl_2.

133. Write the formulas for the following molecular compounds: nitrogen trifluoride, tellurium tetrabromide, tetraphosphorus trisulfide, chlorine monofluoride.

134. Name the following molecular compounds, all of which contain carbon: CI_4, C_8H_{18}, C_3O_2, $C_{10}H_{22}$.

135. Find the error in the equation and correct it so the equation is correctly balanced:
$2HI(aq) + 2Pb(NO_3)_2(aq) \rightarrow PbI_2(s) + 2HNO_3(aq)$.

136. What feature of a chemical equation is used to make sure the equation obeys the law of conservation of mass?

137. Over time, a piece of magnesium metal will react with oxygen to form magnesium oxides, as shown by the following chemical equation: $2Mg + O_2 \rightarrow 2MgO$. Explain why this is or is not an example of combustion.

138. What property do all products of a combustion reaction have in common with each other?

139. In the reaction $3O_2(g)$ + energy $\leftrightarrows$ $2O_3(g)$, name three ways of increasing the amount of ozone (O_3) that is produced.

140. Write a balanced chemical equation for the reaction described:
aluminum metal + hydrochloric acid $\rightarrow$ aluminum chloride solution + hydrogen.

141. Balance the equation $Sr(s) + H_2O(l) \rightarrow Sr(OH)_2(aq) + H_2(g)$.

142. Classify the reaction, $NH_4HS(s) \rightarrow NH_3(g) + H_2S(g)$, as either decomposition, single displacement, combustion, synthesis, or double displacement.

143. In which of the five general types of reactions would you not expect an element to be a reactant?

144. Use a word equation to describe the chemical equation given, and classify the reaction as one of the five major types: $4P(s) + 5O_2(g) \rightarrow 2P_2O_5(s)$.

145. Sodium metal will combine with oxygen in dry air to form solid sodium oxide. Write a balanced chemical equation for this reaction. If 90 trillion sodium atoms and 30 trillion oxygen molecules are available to react, which is the limiting reactant?

146. Will an endothermic reaction that is at equilibrium shift to the left or to the right to readjust after products are removed?

147. Will an endothermic reaction that is at equilibrium shift to the left or to the right to readjust after reactants are removed?

148. Carbon dioxide gas can be produced by reacting calcium carbonate and hydrochloric acid, as shown by the equation for the reaction:
$CaCO_3(s) + 2HCl(aq) \rightarrow CaCl_2(aq) + H_2O(l) + CO_2(g)$.
In a particular reaction, 1.0×10^{24} molecules of HCl were mixed with 7.5×10^{23} formula units of $CaCO_3$, which reactant is limiting?

149. Write a balanced equation for the combustion of cyclopentane liquid, C_5H_{10}. How many oxygen molecules will react with 35 trillion cyclopentane molecules?

150. The unbalanced equation for the reaction between aqueous solutions of aluminum nitrate and sodium phosphate is as follows:
$Al(NO_3)_3(aq) + Na_3PO_4(aq) \rightarrow NaNO_3(aq) + AlPO_4(s)$. Balance the chemical equation.

Problem

Below are listed changes that can be observed in everyday life. Tell whether it is a physical change or a chemical change. Then explain the basis on which you made your decision.

151. charcoal burning

152. magnetizing a piece of steel

153. rubbing alcohol evaporating from the skin

The lists give the density of selected substances. Answer the following questions.

Substance	Density (g/mL)
water (at 4.0ºC)	1.000
hydrogen	0.00090
carbon dioxide	XXX
gasoline	0.68
copper	8.89
silver	10.5
mercury	13.595
tungsten	19.3

154. Corks are used on fishing lines because they float. What can you say about the density of cork?

These three boxes shown in Figure 2-1 are taken from the periodic table. They represent elements that have no known isotopes. Use the information contained in these boxes to supply the information requested for the atoms of each element. For atomic structure, give the number of protons, neutrons, and electrons.

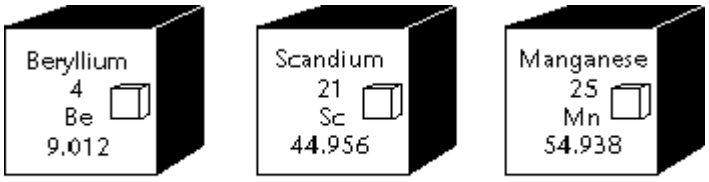

Figure 2-1

155.

Scandium: Mass number for this atom:
Atomic structure:

156.

Manganese: Mass number for this atom:
Atomic structure:

The diagram in Figure 2-2 represents a potassium atom. Answer the questions about the electron transitions that take place in this atom.

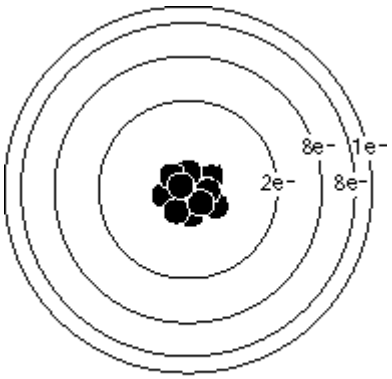

Figure 2-2

157. Draw a Lewis dot diagram for this atom.

158. Suppose you wanted to observe an emission spectrum for this atom. How would you produce such a spectrum? Explain how this action would produce a spectrum.

159. Suppose that a potassium atom absorbs energy that causes two electrons to move up to the fifth energy level: one from the fourth energy level and one from the third. In terms of emission spectra, what will happen when the electrons return to their original levels?

160. If enough energy was added to the atom to permit an electron to escape from the atom, which electron would it be?

This set of data is similar to those on which Joseph Louis Proust based his law of definite proportions in 1799. Answer these questions about these data and their interpretation.

Trial	Nitrogen Mass	Oxygen Mass
101	13.9 g	16.0 g
102	25.8 g	29.2 g
103	19.7 g	22.3 g
104	31.8 g	36.2 g

161. How do the results of these experiments lead to the law of definite proportions?

162. To the nearest whole number, the atomic masses of nitrogen and oxygen are 14 and 16, respectively. Calculate the percentage composition of a compound made by combining one atom of nitrogen with one atom of oxygen.

163. Assign a chemical formula to the compound formed between one atom of nitrogen and one atom of oxygen.

For each of the numbered elements (1-4) shown in the periodic table in Figure 3-1, give the information asked for in the tables.

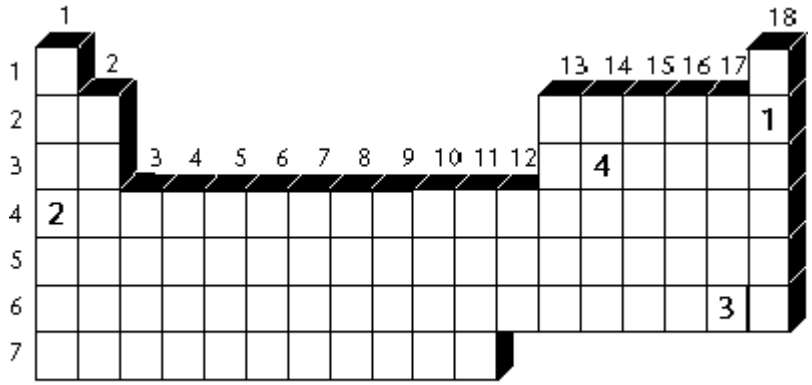

Figure 3-1

164.

	Group	Period	Class	Number of valence electrons	Outermost energy level	Properties
Element 1:						

165.

	Group	Period	Class	Number of valence electrons	Outermost energy level	Properties
Element 3:						

166.

	Group	Period	Class	Number of valence electrons	Outermost energy level	Properties
Element 4:						

Suppose that you were asked to select an element for each application listed in the following questions. All you have on which to base your decision is the element's position in the periodic table. Refer to the periodic table in your textbook. Name the element or type of element you would choose for each application and explain your choice.

167. An element for use in making photovoltaic cells that are constructed with semiconductors.
Choice: _____
Reason: _____

168. An element that can be used as a fuel.
Choice: _____
Reason: _____

169. An element other than silicon to use in the construction of a transistor.
Choice: _____
Reason: _____

Ionization energy is the term used to describe the energy needed to remove an electron from a gaseous atom of an element. Listed below, in alphabetical order, are the ionization energies of 18 elements. Reorder the elements according to their atomic number, using the periodic table in your textbook. Then graph the data.

Element	Ionization energy (Kilojoules per mole)
aluminum	577
argon	1520
beryllium	900
boron	800
calcium	589
carbon	1086
chlorine	1255
fluorine	1681
lithium	520
magnesium	738
neon	2080
nitrogen	1402
oxygen	1314
phosphorus	1012
potassium	419
silicon	786
sodium	496
sulfur	1000

170. What relationship does the graph you made have to the periodic law?

171. Do your data confirm or refute this hypothesis?

Look at each of the electron dot structures shown below. In each case, decide: how many valence electrons are present; whether or not the particle is reactive; and if it is reactive, what it could do to become part of a stable compound and what kind of bond it would form in the process.

172. .
·C·
.

173. Ba:

174. .
·N:
.

Listed below are some imaginary data for a series of compounds. Based on what you have learned, predict whether each compound is probably ionic (I) or covalent (C). If the information given might apply to either kind of compound, put a question mark (?).

175. Is a gas at room temperature.

176. Is found in Earth's crust.

177. Is highly soluble in water.

178. Is a white solid at -100ºC.

179. Has a boiling point of 13.2ºC.

180. Is composed of a metal and a nonmetal.

181. When dissolved in water, does not conduct an electric current.

182. Is a hard, rough crystal.

Write the formula and the name for the compound formed when the following atoms or groups of atoms combine with each other.

183. sodium and oxygen

184. calcium and sulfate

185. aluminum and carbonate

186. copper (2+) and acetate

187. iron (3+) and sulfate

188. sulfur (6+) and oxygen

189. silicon and phosphorus

The compounds listed below are all somewhat different from the kinds of compounds you have studied. Explain how each compound is different and write the formula for the compound.

190. sodium hydride
    a. Difference:
    b. Formula:

191. xenon hexafluoride
    a. Difference:
    b. Formula:

192. bromine heptafluoride
    a. Difference:
    b. Formula:

A series of eight test tubes is lined up on top of a laboratory bench. The contents of these test tubes are listed. The contents are exposed to O_2 in the air. Water or energy may be added to the contents, if necessary, for reaction to occur. Predict the type of chemical reaction that is most likely to take place in each of the eight test tubes. If no reaction will take place, explain why. Give a balanced chemical equation for each reaction that takes place.

193. calcium hydroxide:

194. magnesium metal and iron(III) chloride:

195. mercury(II) oxide:

196. neon gas:

197. barium chloride and potassium sulfate:

Sulfur dioxide gas (SO_2) reacts with oxygen to form sulfur trioxide gas (SO_3). The graph in Figure 6-1 shows how the concentration of these three gases changes over time in an experiment in which first the concentration of only the sulfur dioxide is increased, and then the concentration of only the oxygen is increased. Answer the following questions relating to this graph.

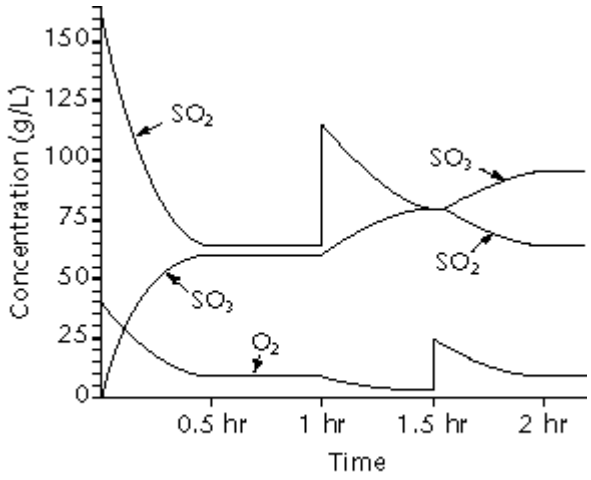

Figure 6-1

198. At about what time did this reaction reach equilibrium?

199. At approximately what time was the concentration of sulfur dioxide increased?

200. At approximately what time was the concentration of oxygen increased?

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Answer Section

MODIFIED TRUE/FALSE

1. ANS: T
2. ANS: F, hydrogen
3. ANS: F, carbon dioxide
4. ANS: T
5. ANS: F, helium
6. ANS: T
7. ANS: T
8. ANS: F, gained
9. ANS: F, ions
10. ANS: T

COMPLETION

11. ANS: neutron
12. ANS: mass number
13. ANS: electron cloud
14. ANS: nucleus
15. ANS: Lewis dot diagram
16. ANS: proton
17. ANS: law of definite proportions
18. ANS: scientific law
19. ANS: electromagnetic spectrum
20. ANS: atom
21. ANS: valence electron
22. ANS: atomic number
23. ANS: atomic theory
24. ANS: 24, Cr, chromium, 51.9961, solid
25. ANS: metalloid
26. ANS: period
27. ANS: metal
28. ANS: nonmetal
29. ANS: periodicity
30. ANS: actinides
31. ANS: synthetic
32. ANS: ion
33. ANS: electrolyte
34. ANS: noble gas configuration
35. ANS: covalent bond
36. ANS: crystal
37. ANS: ionic compound
38. ANS: formula

39. ANS: covalent compound
40. ANS: hydrate
41. ANS: distillation
42. ANS: oxidation number
43. ANS: organic compound
44. ANS: hygroscopic
45. ANS: anhydrous
46. ANS: hydrocarbons
47. ANS: deliquescent
48. ANS: formula unit
49. ANS: molecular substance
50. ANS: inorganic compounds

MATCHING

51. ANS: K
52. ANS: D
53. ANS: H
54. ANS: B
55. ANS: L
56. ANS: A
57. ANS: F
58. ANS: G
59. ANS: I
60. ANS: M
61. ANS: C
62. ANS: J
63. ANS: N
64. ANS: E

65. ANS: A
66. ANS: B
67. ANS: B
68. ANS: B
69. ANS: A

70. ANS: A
71. ANS: A
72. ANS: A
73. ANS: B

74. ANS: N
75. ANS: A
76. ANS: D
77. ANS: K
78. ANS: I

79. ANS: M
80. ANS: B
81. ANS: P
82. ANS: H
83. ANS: O
84. ANS: C
85. ANS: G
86. ANS: J

87. ANS: C
88. ANS: H
89. ANS: I
90. ANS: O
91. ANS: A
92. ANS: L
93. ANS: M
94. ANS: D
95. ANS: J
96. ANS: F
97. ANS: B
98. ANS: N
99. ANS: G
100. ANS: E

SHORT ANSWER

101. ANS:
Mass is a measure of the amount of matter in something.

102. ANS:
An element is one class of pure substance.

103. ANS:
A quantitative observation uses measurement, whereas a qualitative observation can be made without measurement.

104. ANS:
An aqueous solution always has water as the solvent, but solutions do not have to contain water.

105. ANS:
Na is a chemical symbol, and NaCl is a chemical formula.

106. ANS:
Endothermic refers to chemical reactions in which energy is absorbed, and exothermic to ones in which energy is given off.

107. ANS:

Scientists hypothesized that atoms must contain a third type of particle to account for the difference in the masses of the neon atoms.

108. ANS:
Isotopes of an element all have the same chemical properties and would behave in the same way during a chemical study.

109. ANS:
When you climb a ladder, you must step on the rungs; you can't step between them. Electrons must move from one energy level to another; they can't exist between them. When you climb a ladder, you can skip over some rungs; electrons can jump over energy levels to get to other energy levels.

110. ANS:
observation, hypothesis, experiment, revised hypothesis, theory

111. ANS:
50 protons, 69 neutrons, 50 electrons

112. ANS:
the speed (energy) of the electron, the attraction of the nucleus

113. ANS:
The triad concept showed that the elements could be grouped according to their properties in an orderly way.

114. ANS:
In Groups 1 and 2, the group number tells the number of valence electrons. For groups 13-18, the last digit of the group number is used.

115. ANS:
One sucrose molecule consists of 12 atoms of carbon, 22 atoms of hydrogen, and 11 atoms of oxygen.

116. ANS:
A few compounds of the noble gases, which have full octets as free elements, have been produced in the laboratory.

117. ANS:
Oxygen is a colorless gas at ordinary temperatures, is highly reactive, and supports combustion. Carbon is a solid and is not very reactive at ordinary temperatures. Both are nonmetals.

118. ANS:
$CuSO_4$; $CuSO_4 \cdot 5H_2O$

119. ANS:
Answers may vary; e.g. HCl, hydrochloric acid

120. ANS:
The temperature should begin to rise because the liquids in the flask are being heated.

121. ANS:

Water flows from the faucet into the lower part of the condenser, through the condenser, and out of the upper part of the condenser into the sink.

122. ANS:
the liquid with the lower boiling point

123. ANS:
Answers may vary. Possible answers: when the two liquids have similar boiling points or when the two liquids react with each other

124. ANS:
CsI, K_2Se, AlF_3, Ca_3P_2

125. ANS:
potassium carbonate, calcium monohydrogen phosphate, sodium oxalate, ammonium hydrogen sulfate, magnesium permanganate

126. ANS:
Cs_2SO_4, $Al(OH)_3$, $Be(NO_3)_2$, $NH_4H_2PO_4$

127. ANS:
$CrSO_4$, Au_2Se_3, $Fe_3(PO_4)_2$, Cu_3N

128. ANS:
2+ charge, lead(II) sulfate; 1+ charge, copper(I) cyanide; 4+ charge, tin(IV) sulfide; 3+ charge, bismuth(III) oxalate

129. ANS:
vanadium(III) sulfide, vanadium(IV) fluoride, vanadium(III) sulfate, vanadium(V) oxide

130. ANS:
copper(II) nitrate trihydrate, potassium oxalate monohydrate, nickel(II) acetate tetrahydrate, sodium monohydrogen phosphate heptahydrate

131. ANS:
In $5(NH_4)2SO_3 \cdot H_2O$, there are 10 nitrogen atoms, 50 hydrogen atoms, 5 sulfur atoms, and 20 oxygen atoms.

132. ANS:
diphosphorus trioxide, silicon disulfide, iodine tribromide, diselenium dichloride

133. ANS:
NF_3, $TeBr_4$, P_4S_3, ClF

134. ANS:
carbon tetraiodide, octane, tricarbon dioxide, decane

135. ANS:
$2HI(aq) + Pb(NO_3)_2(aq) \rightarrow PbI_2(s) + 2HNO_3(aq)$

136. ANS:
Coefficients are used to make sure the same number of atoms are present on both sides of the equation.

137. ANS:
The term *combustion* is reserved for oxidation reactions that occur rapidly, with the evolution of heat and light.

138. ANS:
They are all oxides.

139. ANS:
Answers may include: increase the temperature, increase the concentration of diatomic oxygen, or remove the ozone as it is formed.

140. ANS:
$2Al(s) + 6HCl(aq) \rightarrow 2AlCl_3(aq) + 3H_2(g)$

141. ANS:
$Sr(s) + 2H_2O(l) \rightarrow Sr(OH)_2(aq) + H_2(g)$

142. ANS:
decomposition

143. ANS:
decomposition, double displacement

144. ANS:
phosphorus + oxygen $\rightarrow$ diphosphorus pentoxide; synthesis or combustion

145. ANS:
$4Na(s) + O_2(g) \rightarrow 2Na_2O(s)$
Sodium is limiting, since 120 trillion sodium atoms are needed to react with all the oxygen.

146. ANS:
to the right

147. ANS:
to the left

148. ANS:
HCl, because only 5.0×10^{23} $CaCO_3$ formula units will react with all of the HCl.

149. ANS:
$2C_5H_{10}(l) + 15O_2(g) \rightarrow 10CO_2(g) + 10H_2O(g)$
(35 trillion) $\times$ 15/2 = 260 trillion O_2 molecules

150. ANS:
$Al(NO_3)_3(aq) + Na_3PO_4(aq) \rightarrow 3NaNO_3(aq) + AlPO_4(s)$

PROBLEM

151. ANS:
chemical change; Charcoal (carbon) reacts to form gases (carbon dioxide and water vapor).

152. ANS:
physical change; The steel does not change its composition during magnetization.

153. ANS:
physical change; Liquid alcohol changes to a vapor.

154. ANS:
The density of cork must be less than 1.000 g/mL.

155. ANS:
45; (21 p^+ + 24 n^0) and 21e^-

156. ANS:
55; (25 p^+ + 30 n^0) and 25e^-

157. ANS:
The Lewis dot diagram is $K^{\cdot}$

158. ANS:
Supply high-voltage electricity or radiation to the atom. Electrons will be raised to higher energy levels. Then they fall back to lower energy levels, giving off radiation that forms line spectra.

159. ANS:
Each electron will release energy, but the one that falls back to the third level will release more energy. Two spectral lines of differing energy will therefore result.

160. ANS:
The first electron to leave the atom would be one in the highest energy level. It is least attracted to the nucleus because that electron is the most distant.

161. ANS:
The compound formed between nitrogen and oxygen always has the same proportion.

162. ANS:
The compound would have a composition of 46.7 percent nitrogen and 53.3 percent oxygen.

163. ANS:
The formula is NO.

164. ANS:
18, 2, nonmetal, 8, 2, unreactive

165. ANS:
17, 6, nonmetal, 7, 6, poor conductor and nonlustrous

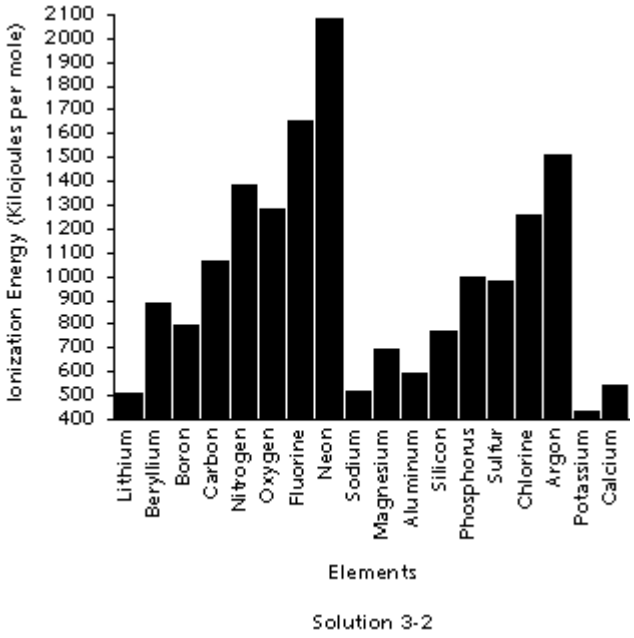
166. ANS:
14, 3, metalloid, 4, 3, semiconductor and lustrous

167. ANS:
a metalloid; Metalloids are commonly used in the manufacture of semiconductors.

168. ANS:
carbon; Carbon burns easily.

169. ANS:
phosphorus, arsenic, antimony, or boron; All are commonly used to dope semiconductors.

170. ANS:
The ionization energies of the elements repeat in a regular pattern when the elements are arranged in order of increasing atomic number. The pattern is repeated for each period of elements. See Solution 3-2.



Solution 3-2

171. ANS:
In general, the data confirm this hypothesis, although there are variations in the pattern.

172. ANS:
4, reactive, It would probably share electrons with other atoms to form four covalent bonds.

173. ANS:
2, reactive, It would lose two electrons to form an ionic bond.

174. ANS:
5, reactive, It would usually share three of its five electrons to form three covalent bonds and achieve a stable octet.

175. ANS:

C

176. ANS:
?

177. ANS:
I

178. ANS:
?

179. ANS:
C

180. ANS:
I

181. ANS:
C

182. ANS:
I

183. ANS:
Na_2O; sodium oxide

184. ANS:
$CaSO_4$; calcium sulfate

185. ANS:
$Al_2(CO_3)_3$; aluminum carbonate

186. ANS:
$Cu(C_2H_3O_2)_2$; copper(II) acetate

PTS: 1 DIF: B OBJ: 5-2

187. ANS:
$Fe_2(SO_4)_3$; iron(III) sulfate

188. ANS:
SO_3; sulfur trioxide

189. ANS:
Si_3P_4; trisilicon tetraphosphide

190. ANS:
Hydrogen usually does not have a charge of 1- in a compound.
NaH

191. ANS:
Noble gases usually do not form compounds.
XeF_6

192. ANS:
Elements in Group 17 would all be expected to gain electrons and, therefore, not to react with each other.
BrF_7

193. ANS:
Decomposition will occur with heating. $Ca(OH)_2$ + energy $\rightarrow$ CaO + H_2O

194. ANS:
Single displacement will occur if the iron(III) chloride is in solution. $3Mg + 2FeCl_3 \rightarrow 3MgCl_2 + 2Fe$

195. ANS:
Decomposition will occur if sufficient heat is available. $2HgO \rightarrow 2Hg + O_2$

196. ANS:
Neon is an inert gas that will not take part in a chemical reaction.

197. ANS:
Double displacement will occur if both compounds are in solution. $BaCl_2 + K_2SO_4 \rightarrow BaSO_4 + 2KCl$

198. ANS:
30 minutes

199. ANS:
about 1 hour

200. ANS:
about 1 hour 30 minutes

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