Chemistry Final Review

1) The difference between a scientific theory and a scientific law is that _____ .
   A) a law only summarizes observations; a theory attempts to explain observations
   B) a theory only summarizes observations; a law attempts to explain observations
   C) There is no difference.

2) An important characteristic of an accepted scientific theory is that _____ .
   A) it is agreed upon by all scientists.
   B) it can be proven true.
   C) it cannot be modified.
   D) it can be disproved at any time.

3) Matter is defined as anything that _____ .
   A) has a fixed volume and weight
   B) has mass and takes up space
   C) can be weighed on a balance
   D) has a definite volume

4) A vapor is which state of matter?
   A) plasma B) gas
   C) liquid D) solid

5) Which state of matter is characterized by having an indefinite shape, but a definite volume?
   A) plasma B) gas C) solid D) liquid

6) Which of the following materials is a pure substance?
   A) diamond B) air
   C) brass D) tea
   E) gasoline

7) All of the following are physical properties of matter EXCEPT
   A) color B) explosiveness
   C) hardness D) mass
   E) melting point

8) All of the following are physical properties of a substance in the liquid state EXCEPT _____.
   A) definite mass
   B) indefinite shape
   C) virtual incompressibility
   D) indefinite volume

9) Which of the following does NOT involve a physical change?
   A) melting B) grinding
   C) mixing D) tarnishing

10) Which of the following is a homogeneous mixture?
   A) beef stew B) raisin bread
   C) soil D) sand and water
   E) brine

11) Which of the following is a true statement about compounds?
   A) They are pure substances.
   B) They can be physically separated into their constituent elements.
   C) They have properties similar to those of their constituent elements.
   D) They have variable compositions.

12) One difference between a mixture and a compound is that
   A) a compound is made up of more than one phase.
   B) a mixture must be uniform in composition.
   C) a mixture can only be separated into its components by chemical means.
   D) a compound can only be separated into its components by chemical means.

13) The chemical formula of a compound indicates the _____.
   A) three-dimensional structure of the compound
   B) relative proportions of the elements in the compound
   C) type and arrangement of the bonds in the compound
   D) identity of the elements in the compound only

14) Consider the chemical reaction in which carbon reacts with oxygen to produce carbon dioxide. What mass of carbon dioxide would be produced if 24 grams of carbon reacted completely with 64 grams of oxygen?
   A) 64 g B) 48 g C) 40 g
   D)130 g E) 88 g

15) Which of the following is a chemical property of an antacid tablet?
   A) tart taste B) lack of color
   C) ability to neutralize acid D) white color

16) The diameter of a carbon atom is 0.000 000 000 154 m. What is this number expressed in scientific notation?
   A) 1.54×10^{10} m B) 1.54×10^{-12} m
   C) 1.54×10^{12} m D) 1.54×10^{-10} m

17) What is 5928 km expressed in scientific notation?
   A) 5.928×10^{-3} B) 5.928×10^{2}
   C) 5.928×10^{0} D) 5.928×10^{3}

18) How many significant figures are there in the measurement 40 500 mg?
   A) four B) five C) three
   D) two E) This cannot be determined.

19) What is the quantity 7896 millimeters expressed in meters?
A) 7.896 m B) 789 600 m C) 78.96 m
D) 789.6 m E) 7 896 000 m

20) Which of the following equalities is NOT correct?
A) 1 cm^3 = 1 mL B) 1000 kg = 1 g
C) 1000 mm = 1 m D) 100 cg = 1 g

21) What is the density of an object having a mass of 8.0 g and a volume of 25 cm^3?
A) 2.0 g/cm^3 B) 3.1 g/cm^3 C) 200 g/cm^3
D) 0.32 g/cm^3 E) none of the above

22) What is the volume of 45.6 g of silver if the density of silver is 10.5 g/mL?
A) 4.34 mL B) 0.23 mL C) 479 mL
D) none of the above

23) How are the numerator and denominator in a conversion factor related?
A) They each have the same units.
B) One is greater than or less than the other.
C) Both equal the value 1.
D) They are equal.

24) Which of the following conversion can be used to change centimeters to kilometers?
A) (1 m/100 cm) x (1000 m/1 km)
B) (100 cm/1 m) x (1 km/1000 m)
C) (100 cm/1 m) x (1000 m/1 km)
D) (1 m/100 cm) x (1 km/1000 m)

25) If 20 gits equal 1 erb, and 1 futz equals 2 hews, and 10 erbs equal 1 futz, how many gits equal 5 hews?
A) 500 gits B) 50 gits
C) 100 gits D) 1000 gits

26) What is the smallest particle of an element that retains the properties of that element?
A) an atom B) a proton C) an electron
D) a molecule E) a neutron

27) Dalton's atomic theory included which idea?
A) Atoms of different elements always combine in one-to-one ratios.
B) When an atom of an element changes into another element, a chemical reaction takes place.
C) Individual atoms can be seen with a microscope.
D) Atoms of the same element are always identical.
E) All atoms of all elements are the same size.

28) Why did J. J. Thomson reason that electrons must be a part of the atoms of all elements?
A) Cathode rays were always accompanied by anode rays.
B) Cathode rays can be deflected by magnets.
C) Cathode rays are always made of electrons, regardless of the gas used.
D) Cathode rays are negatively-charged particles.
E) An electron is 2000 times lighter than a hydrogen atom.

29) As a consequence of the discovery of the nucleus by Rutherford, which model of the atoms is believed to be true?
A) A model in which the nucleus is made of protons, electrons, and neutrons
B) A model in which the nucleus is made of neutrons only
C) A model in which the nucleus is made of electrons and protons.
D) A model in which the protons, electrons, and neutrons are evenly distributed throughout the volume of the atom
E) A model in which the region outside the nucleus is largely empty space in which the electrons are situated

30) In which of the following sets are the symbol of the element, the number of protons, and the number of electrons given correctly?
A) In, 49 protons, 49 electrons
B) Cs, 55 protons, 132.9 electrons
C) Zn, 30 protons, 60 electrons
D) He, 4 protons, 4 electrons
E) F, 19 protons, 19 electrons

31) Consider an element Z that has two naturally occurring isotopes with the following percent abundances: the isotope with a mass number of 20 is 25% abundant; the isotope with a mass number of 22 is 75% abundant. What is the average atomic mass for element Z?
A) 42.0 g B) 2.0 g C) 21.0 g
D) 21.5 g E) 20.5 g

32) Which subatomic particle plays the greatest part in determining the physical and chemical properties of an element?
A) electron B) neutron C) proton
D) quark E) muon

33) In which of the following is the symbol for the ion and the number of electrons it contains correct?
A) Br^- has 34 electrons. B) Al^{3+} has 16 electrons.
C) Ca^{2+} has 18 electrons. D) S^{2-} has 2 electrons.
E) H^+ has 1 electron.

34) Which of the following statements is true concerning the composition of ionic compounds?
A) They are formed from two or more nonmetallic elements.
B) They are formed from two or more metallic elements.
C) They are composed of anions only.
D) They are composed of cations only.
E) They are composed of anions and cations.

35) Which of the following formulas represents an ionic compound?
A) Kr B) BaI_2 C) PCl_3
D) N_2O_4 E) CS_2

36) In which of the following groups of ions are the charges all shown correctly?
A) Ca^{2+}, Al^{3+}, Br^- B) Be^{2+}, Cl^{2-}, Sr^{2+}
C) Li^-, O^{2-}, S^{2+} D) Na^+, I^-, Rb^-
E) K^{2-}, F^-, Mg^{2+}

37) In which of the following are the symbol and name for the ion given correctly?
A) PO_3^{3-} phosphate; PO_3^{4-}phosphite
B) NH_4^+ ammonia; H^+: hydride
C) $C_2H_3O_2^-$ acetate; CO_3^{2-} carbonite
D) OH^- : hydroxide; O^{2-}: oxide
E) HSO_4^- hydrogen sulfate; HSO_3^{2-} hydrogen sulfite

38) What is the ionic charge on the zirconium ion in the ionic compound zirconium oxide, ZrO_2?
A) 2- B) 4+ C) 2+ D) 0 E) 4-

39) Which of the following compounds contains the Mn^{3+} ion?
A) MnO B) MnS C) Mn_3O_2
D) $MnBr_2$ E) Mn_2O_3

40) What is the maximum number of electrons in the second principal energy level?
A) 32 B) 8 C)18 D) 2

41) In Bohr's model of the atom, where are the electrons and protons located?
A) The electrons orbit the protons, which are at the center of the atom.
B) The electrons and protons are located throughout the atom, but they are not free to move.
C) The electrons occupy fixed positions around the protons, which are at the center of the atom.
D) The electrons and protons move throughout the atom.

42) What did Rutherford's experiment demonstrate?
A) that most of an atom's mass is concentrated in a relatively small portion of the atom's entire volume
B) that all neutrons are located in the nucleus
C) that electrons orbit the nucleus
D) that atoms are made of positively and negatively charged particles

43) What is the electron configuration of potassium?
A) $1s^22s^23s^23p^63d^1$
B) $1s^22s^22p^23s^23p^24s^1$
C) $1s^22s^22p^{10}3s^23p^3$
D) $1s^22s^22p^63s^23p^64s^1$

44) The atomic emission spectra of a sodium atom on earth and of a sodium atom in the sun would be _____.
A) different from each other
B) the same as each other only in the ultraviolet range
C) the same as those of several other elements
D) the same

82) What is the approximate frequency of a photon having an energy 5 x 10-24 J? (h = 6.6 x 10-34 J s)
A) 1 x 10^{-11} Hz B) 1 x 10^{-10} Hz
C) 7 x 10^9 Hz D) 3 x 10^{-58} Hz
E) 3 x 10^{-57} Hz

45) Emission of light from an atom occurs when the electron
A) jumps from a lower to a higher energy level
B) moves within its atomic orbital
C) falls into the nucleus
D) drops from a higher to a lower energy level

46) What element has the electron configuration $1s^22s^22p^63s^23p^2$?
A) silver B) selenium
C) silicon D) nitrogen

47) Which of the following groupings contains only representative elements?
A) Hg, Cr, Ag B) Ni, Fe, Zn
C) Cu, Co, Cd D) Al, Mg, Li

48) Which group of the periodic table has the highest electronegativity?
A) 3A B) 6A C) 1A D) 2A E) 7A

49) Atomic size generally _____.
A) increases as you move from left to right across a period
B) remains constant within a period
C) decreases as you move down a group
D) decreases as you move from left to right across a period

50) As you move from left to right across the second period of the periodic table _____.
A) the atomic mass decreases

B) the atomic radii increase
C) the ionization energy increases
D) the electron affinity decreases

51) Which of the following increases with increasing atomic number in Group 2A?
A) electron affinity
B) first ionization energy
C) atomic radius
D) number of outermost electrons

52) How many valence electrons are there in an atom of magnesium?
A) 4 B) 6 C) 5 D) 3 E) 2

53) What is the electron configuration of the gallium ion?
A) $1s^2 2s^2 2p^6 3s^2 3p^5 4s^1$ B) $1s^2 2s^2 2p^6 3s^2 3p^3$
C) $1s^2 2s^2 2p^6 3s^2 3p^6$
D) $1s^2 2s^2 2p^6 3s^2 3p^6 3d^{10}$
E) $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 4p^6$

54) What is the formula of the ion formed when phosphorus achieves a noble-gas electron configuration?
A) P^- B) P^{3+} C) P^{3-} D) P^{2+} E) P^{2-}

55) How does oxygen obey the octet rule when reacting to form compounds?
A) It gives up electrons.
B) It does not change its number of electrons.
C) It gains electrons.

56) What is the name of the ionic compound formed from strontium and phosphorus?
A) strontium phosphorus
B) strontium phosphate
C) strontide phosphate
D) strontium phosphoride
E) strontium phosphide

57) Under what conditions can potassium bromide conduct electricity?
A) only when melted, or dissolved in water
B) only when melted
C) only when dissolved
D) only when it is in crystal form
E) all of the above

58) Which of the following particles are free to drift in metals?
A) protons B) neutrons C) electrons
D) cations E) pions

59) How many unshared pairs of electrons does the nitrogen atom in ammonia possess?
A) 4 B) 5 C) 2 D) 1 E) 3

60) How many electrons does carbon need to gain to obtain a noble-gas electron configuration?
A) 4 B) 8 C) 2 D) 1 E) 3

61) Which of the following diatomic molecules is joined by a double covalent bond?
A) O_2 B) Cl_2 C) N_2 D) H_2

Problems

142) What is the density of an object having a mass of 4.0 g and a volume of 39.0 cubic centimeters?

143) What is the temperature 198 K expressed in degrees Celsius?

144) What is the volume of 500.0 g of ice if the density of ice is 0.92 g/mL?

145) Convert 0.0349 mm to meters.

146) List the number of protons, neutrons, and electrons in each of the following atoms.

	Protons	Neutrons	Electrons
$^{13}_{6}C$	_____	_____	_____
$^{15}_{7}N$	_____	_____	_____
$^{20}_{10}Ne$	_____	_____	_____
$^{11}_{5}B$	_____	_____	_____
$^{9}_{4}Be$	_____	_____	_____

165) How many electrons are in the highest occupied energy level of a neutral strontium atom?

166) What is the wavelength of light with a frequency of 1.0×10^{20} Hz? ($c = 3.0 \times 10^8$ m/s)

167) What is the energy of a photon of light with frequency 1.0×10^{12} Hz? ($h = 6.6 \times 10^{-34}$ J s)

168) What is the electron configuration of oxygen?

169) Which element in the second principal energy level has the greatest atomic radius?

170) Give the electron configurations for sulfur and its 2- ion.

171) Give the electron configurations for iodine and its 1- ion.

172) How many electrons does a gallium atom give up when it becomes an ion?

173) Give the electron configuration for the lithium ion.

174) Write the formula for the compound, aluminum iodide.

Answers

1) A
2) D
3) B
4) B
5) D
6) A
7) B
8) D
9) D
10) E
11) A
12) D
13) B
14) E
15) C
16) D
17) D
18) C
19) A
20) B
21) D
22) A
23) D
24) D
25) A
26) A
27) D
28) C
29) E
30) A
31) D
32) A
33) C
34) E
35) B
36) A
37) D
38) B
39) E
40) B
41) A
42) A
43) D
44) D
45) C
46) D
47) C
48) D
49) E
50) D
51) C
52) C
53) E
54) D
55) C
56) C
57) E
58) A
59) C
60) D
61) A

142) 0.10 g/cm^3
143) -75°C
144) 540 mL
145) 0.0000349 m
146) Protons: 6, 7, 10, 5, 4
Neutrons: 7, 8, 10, 6, 5
Electrons: 6, 7, 10, 5, 4
165) 2
166) 3.0×10^{-12} m
167) 6.6×10^{-22} J
168) $1s^2 2s^2 2p^4$
169) lithium
170) S $1s^2 2s^2 2p^6 3s^2 3p^4$
S^{2-} $1s^2 2s^2 2p^6 3s^2 3p^6$
171) I
$1s^2 2s^2 2p^6 3s^2 3p^6 3d^{10} 4s^2 4p^6 4d^{10} 4f^{14} 5s^2 5p^5$
I^-
$1s^2 2s^2 2p^6 3s^2 3p^6 3d^{10} 4s^2 4p^6 4d^{10} 4f^{14} 5s^2 5p^6$
172) 3
173) $1s^2$
174) AlI_3
175) 2.4×10^4 cal
176) 8.1×10^3 cal