Name: _____ **Class:** _____ **Date:** _____

Chemistry Final Exam 2018-2019

Multiple Choice
Identify the choice that best completes the statement or answers the question.

_____ 1. **Ch. 5d**

What is primarily responsible for the high surface tension, specific heat capacity, boiling point and melting point of water?

    a.   ionic bonds
    b.   covalent bonds
    c.   dispersion forces
    d.   hydrogen bonds

_____ 2. **Ch. 1i**

Using the scientific method, information obtained through one's senses is called a(n)

    a.   theory
    b.   experiment
    c.   hypothesis
    d.   obsevation

_____ 3. **Ch. 3b**

Which coefficients correctly balance the formula equation $CaO + H_2O \rightarrow Ca(OH)_2$?

    a.   2, 1, 2
    b.   1, 2, 1
    c.   1, 1, 1
    d.   1, 2, 3

$$NaHCO_3(s) + HCl(aq) \rightarrow NaCl(aq) + CO_2(g) + H_2O(g)$$

Data Table

evaporating dish + watch glass	42.70 g
evaporating dish + watch glass + NaHCO₃	45.20 g
evaporating dish + watch glass + NaCl	44.45 g

_____ 4. **Chem. 1a**

A student conducted an experiment and was interested in the mass of the product of the chemical reaction. Some results of the experiment are shown above. What is the mass of the NaCl?

a. 0.75 g
b. 2.25 g
c. 1.75 g
d. 2.50 g

_____ 5. **Ch. 2a**

The element chlorine exists as two naturally occurring isotopes. Cl-35 occurs 75% of the time and Cl-37 occurs 25% of the time. Which of the following calculations should be used to calculate the correct average atomic mass of chlorine?

a. $$\frac{(35 \text{ amu} \times 3) + 37 \text{ amu}}{2}$$

b. $(35 \text{ amu} \times .75) + (37 \text{ amu} \times .25)$
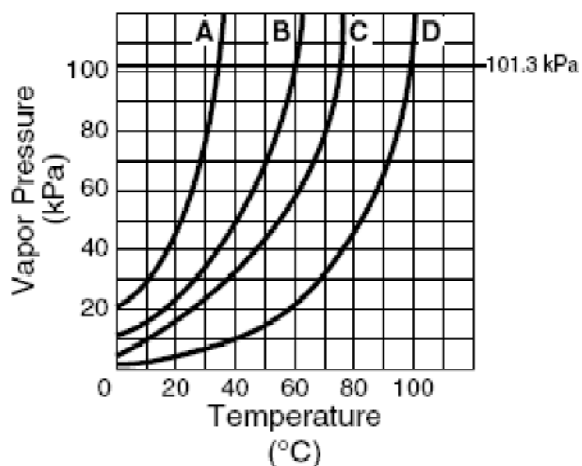
c. $$\frac{35 \text{ amu} + 37 \text{ amu}}{2}$$

d. $$\frac{(35 \text{ amu} \times 3) + 37 \text{ amu}}{3}$$

_____ 6. **Ch. 1g**

Line D represents water. If the
atmospheric pressure in a flask is
lowered to 70 kPa, water would boil at
what temperature?

a. 92°C

b. 32°C

c. 100°C

d. 70°C

_____ 7. **Ch. 2g**

In HNO_3 the oxidation state of hydrogen is +1 and the oxidation state of
oxygen is -2. Therefore, the oxidation state of nitrogen is —
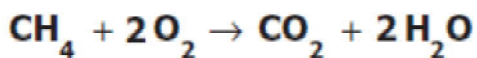
a. +3
b. +4
c. +5
d. -1

_____ 8. **Ch. 3c**

A compound is composed of 85.64% carbon and 14.36% hydrogen. The compound has a formula
mass of 42.08 grams. What is the molecular formula?

a. C_2H_{18}
b. C_3H_6
c. C_2H_4
d. CH_2

_____ 9. **Ch. 4b**

$$CH_4 + 2O_2 \rightarrow CO_2 + 2H_2O$$

If 3.0 moles of methane react with oxygen to produce carbon dioxide and water, what mass of water is produced?

   a. 72 grams
   b. 54 grams
   c. 108 grams
   d. 18 grams

_____ 10. **Ch. 1g**

Why should the rules of significant figures be utilized when rounding answers to lab calculations?

   a. to decrease the precision of the lab instruments
   b. to increase the precision of the student's measurements
   c. to increase the accuracy of the lab instruments
   d. to match the accuracy of the lab instruments

_____ 11. **Ch. 6a**

Which substance below is organic?

   a. NaOH
   b. C_3H_8O
   c. HCl
   d. Fe_2O_3

_____ 12. **Ch. 4b**

Consider the reaction : $2\ Al\ +\ 3\ CuCl_2 \rightarrow 3\ Cu + 2\ AlCl_3$
A chemist reacts 5g of aluminum with 37g of copper (II) chloride. If the reaction produces 17 g of copper, what mass of aluminum chloride is produced?

   a. 15 g
   b. 8 g
   c. 25 g
   d. 10 g

____ 13. **Ch. 5d**

If substance X is a liquid, substance Y is a gas, and substance Z is a solid, and all are at the same temperature and pressure, then the order of increasing strength of their intermolecular forces would be —

   a.   Y < X < Z
   b.   X < Y < Z
   c.   Z < Y < X
   d.   Y < Z < X

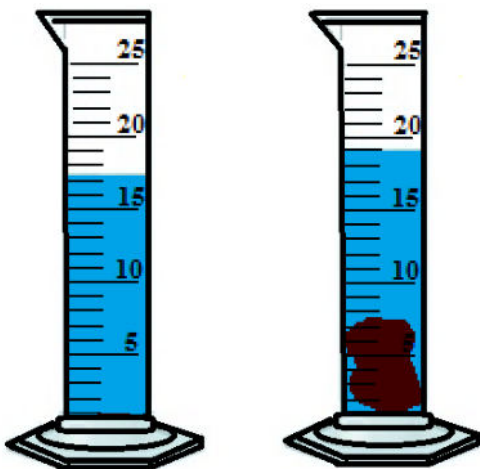____ 14. **Ch. 4a**

What is the density of oxygen gas at STP?

   a.   1.43 g/L
   b. 7.17×10^2 g/L
   c.   22.4 g/L
   d.   32.0 g/L

____ 15. **Ch. 2h**

Which of the following terms best describes a bowl of sugar?

   a.   element
   b.   compound
   c.   heterogeneous mixture
   d.   homogeneous mixture

_____ 16. **Chem. 1a**

The volume of the object in the graduated cylinder is
a. 17 mL
b. 2 mL
c. 8 mL
d. 19 mL

_____ 17. **Chem. 1a**

A piece of glassware has a narrow neck and wide base. It is used for heating and mixing so that the contents do not spill out easily. What is the name of this glassware?

a. evaporating dish
b. Erlenmeyer flask
c. buret
d. beaker

_____ 18. **Ch. 3e**

$$HCl + NaOH \rightarrow NaCl + H_2O$$

The reaction is which type of chemical reaction?

a. Single replacement
b. Neutralization
c. Decomposition
d. Double replacement

Name: _____

_____ 19. **Ch. 1g**

The temperature of 40°C is ___ in Kelvins.

    a. -173
    b. -233
    c. 298
    d. 313

_____ 20. **Ch. 2f**

At room temperature, chlorine exists as a gas, bromine exists as a liquid, and iodine exists as a solid. The physical states of these elements indicate that melting point —

    a. is constant within group 17 elements
    b. increases from top to bottom within group 17 elements
    c. is independent of periodic position
    d. decreases from top to bottom with group 17 elements

_____ 21. **Ch. 4a**

A 1.0 mole sample of H_2O_2 weighs?

    a. 17 g
    b. 1.0 g
    c. 34 g
    d. 18 g

_____ 22. **Ch. 4b**

In the reaction $2\,Al + 3\,CuSO_4 \rightarrow Al_2(SO_4)_3 + 3\,Cu$, how many moles of aluminum are required to produce 12 moles of copper?

    a. 12
    b. 6
    c. 4
    d. 8

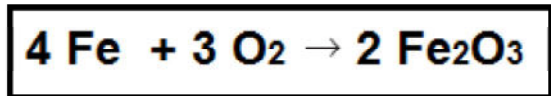_____ 23. **Ch. 1g**

A compound has a mass of $4.875 x 10^2$ g/mol. The number of significant figures in this mass is —

    a. 4
    b. 5
    c. 7
    d. 2

____ 24. **Ch. 3e**

$$4\ Fe\ +\ 3\ O_2\ \rightarrow\ 2\ Fe_2O_3$$

Which type of reaction is represent above?

a. single replacement
b. synthesis
c. decomposition
d. double replacement

____ 25. **Ch. 2i**

Neils Bohr's contribution to modern atomic theory was the proposition that-

a. each atom has a specific number of positive charges
b. electrons have a definite mass that can be computed
c. an atom has electrons in discrete energy levels
d. atomic mass is determined by the number of protons and neutrons in an atom

____ 26. **Ch. 3f**

Which of the following occurs when a reaction in a solution is at equilibrium and more product is added to the solution?

a. Equilibrium shifts to produce more reactant
b. No change will occur
c. The reaction will stop
d. Equilibrium shifts to produce more product

____ 27. **Ch. 4a**

One mole of carbon dioxide weighs?

a. 22 g
b. 44 g
c. 16 g
d. 38 g

_____ 28. **Ch. 1e**

A student measured the density of a liqud three times and recorded the following data.

Trial   Density, g/ml
1   1.37 g/ml
2   1.46 g/ml
3   1.55 g/ml

If the actual density of the liquid is 1.45 g, what can be said about the data?

a. High precision, high accuracy
b. High precision, low accuracy
c. Low precision, high accuracy
d. Low precision, low accuracy

_____ 29. **Ch. 1g**

A student massed a peice of iron on a balance. The most sensitive beam was marked off in 0.1 g intervals. The student reported the iron's mass as 12.34 g . Which of the digits in the measurement is estimated?

a. 2
b. 1
c. 3
d. 4

_____ 30. **Ch. 5b**

According to Charles' law, the volume of a fixed amount of gas is directly proportional to —

a. kelvin temperature
b. vapor concentration
c. isoelectric mixture
d. barometric pressure

_____ 31. **Ch. 5e**

The energy required to melt a solid into a liquid is called —

a. heat of vaporization
b. heat of fusion
c. triple point
d. cooling curve

_____ 32. **Ch. 2h**

All of the following are physical properties of matter EXCEPT:

    a.   odor
    b.   flammability
    c.   specific heat
    d.   density

_____ 33. **Ch. 3c**

The formula for calcium bromide is —

    a. Ca_2Br_3
    b. CB_2
    c. $CaBr_2$
    d.   CaBr

_____ 34. **Ch. 3e**

Which of these represents a single replacement reaction?

    a. $Zn + 2HCl \rightarrow ZnCl_2 + H_2$
    b. $2KClO_3 \rightarrow 2KCl + 3O_2$
    c. $N_2 + 3H_2 \rightarrow 2NH_3$
    d. $AgNO_3 + HCl \rightarrow AgCl + HNO_3$

_____ 35. **Ch. 3c**

A compound has 30% nitrogen and 70% oxygen. What is its empirical formula?

    a. N_2O_4
    b. NO_4
    c. NO_2
    d. NO_3

_____ 36. Ch. 2h

A form of matter is found to have a variable proportion of its components and 3 sets of properties. It is uniform throughout. It is most likely a/an:

    a.   element
    b.   homogeneous mixture
    c.   compound
    d.   heterogeneous mixture

____ 37. **Ch. 2c**

Elements	Protons	Neutrons	Electrons
1	11	12	10
2	1	0	2
3	15	16	15
4	20	20	18

Which of the above elements is a positive
ion with a charge of one?

a.   2
b.   1
c.   4
d.   3

____ 38. **Ch. 5e**

If the heat of fusion of water is 80 cal/g, the amount of heat energy required to change 15.0
grams of ice at 0°C to 15.0 grams of water at 0°C is—

a.   80 cal
b.   2400 cal
c.   560 cal
d.   1200 cal

____ 39. **Ch. 1f**

A student measured the temperature of a boiling solution and found it to be 56.0°C at standard
pressure. The theoretical temperature of that boiling solution is 55.0°C. What is the percent
error in the student's measurement?

a.   1.8%
b.   0.018%
c.   0.18%
d.   18%

____ 40. **Ch. 3f**

Le Chatelier's principle describes what happens to a system in equilibrium when a stress occurs.
All of the following could shift an equilibrium EXCEPT—

a.   changing the identity of the catalyst
b.   changing the temperature of the system
c.   changing the pressure on the system
d.   changing the concentration of one of the components

____ 41. **Ch. 3d**

Sulfur is represented by the following Lewis dot structure:
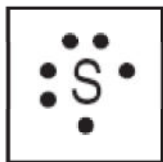
Which of the elements has the same Lewis structure?

a. Phosphorus
b. Chlorine
c. Oxygen
d. Magnesium

____ 42. **Ch. 4a**

What is the molar mass of Na_3PO_4?

a. 118 g/mol
b. 164 g/mol
c. 58 g/mol
d. 148 g/mol

____ 43. **Ch. 3d**

Phosphorus trichloride is a covalent compound. Which is a correct Lewis dot structure for PCl_3?

a.
$$Cl-P-Cl$$
$$|$$
$$Cl$$

b.
$$P-\ddot{C}l-P$$
$$|$$
$$P$$

c.
$$:\ddot{C}l-\ddot{P}-\ddot{C}l:$$
$$|$$
$$:\ddot{C}l:$$

d.
$$:Cl:$$
$$||$$
$$P$$
$$:\ddot{C}l \diagup \diagdown \ddot{C}l:$$

_____ 44. **Ch. 5f**

Solid copper has a specific heat of 0.385 J/g°C. How much heat is given off by a 25.0 gram sample of copper when it cools from 37.0°C to 22.0°C.

    a.   -974 J
    b.   -1440 J
    c.   -144 J
    d.   -375 J

_____ 45. **Ch. 4c**

How many grams of sodium chloride are required to prepare 500.0 mL of a 0.100 M solution?

    a.   58.5 g
    b.   29.3 g
    c.   1.46 g
    d.   2.93 g

_____ 46. **Ch. 3a**

What is the name of the compound whose formula is $FeCO_3$?

    a.   iron (III) carbon trioxide
    b.   iron (I) carbonate
    c.   iron (II) carbonate
    d.   iron carbonate

_____ 47. **Ch. 4c**

What volume of water must be added to 72.0 g HCl to prepare a 0.15 M solution?

    a.   0.30 L
    b.   480 L
    c.   13 L
    d.   10.8 L

_____ 48. **Ch. 2h**

Which of the following does NOT involve a physical change?

    a.   mixing
    b.   decomposing
    c.   melting
    d.   grinding

_____ 49. **Ch. 5b**

A gas has a volume of 50.0 cm³ at a temperature of -73°C. What volume would the gas occupy at a temperature of -123°C if the pressure stays constant?

    a. 50.0 cm³
    b. 3.75 cm³
    c. 5.0 cm³
    d. 37.5 cm³

_____ 50. **Ch. 1g**

X	Y
2	4
4	8
6	12
8	16

Using the above data to plot a graph, the graph would...

    a. increase going left to right
    b. decrease then increase going left to right
    c. increase then decrease going left to right
    d. decrease going left to right

_____ 51. **Ch. 5a**

One of the main assumptions of the kinetic molecular theory of gases is that the particles of an ideal gas —

    a. are in rapid, random, constant motion
    b. must be single atoms instead of molecules
    c. must be highly chemically reactive
    d. must be maintained at very high pressures

_____ 52. **Ch. 3d**

Which of the following is the correct molecular shape of NH_3?

    a. Linear
    b. Pyramidal
    c. Tetrahedral
    d. Bent

_____ 53. **Ch. 2a**

An increase in atomic number is related to an increase in atomic mass because —

  a.   more protons are orbiting the atomic nucleus
  b.   more electrons are present in the atomic nucleus
  c.   more electrons are orbiting the atomic nucleus
  d.   more protons are present in the atomic nucleus

_____ 54. **Ch. 4a**

What is the mass of a mole of $Mg(NO_3)_2$?

  a.   118 grams
  b.   148 grams
  c.   124 grams
  d.   86 grams

_____ 55. **Ch. 3d**

When carbon and hydrogen combine to form a molecular compound -

  a.   C and H keep the same number of electrons
  b.   C gains 4 electrons and H loses 1 electron
  c.   H gains 1 electron and C loses 4 electrons
  d.   C and H share electrons

_____ 56. **Ch. 5a**

The average kinetic energy of a sample of water molecules is —

  a.   unaffected by temperature changes
  b.   always equal to zero
  c.   increased as the temperature is increased
  d.   increased as the temperature is decreased

_____ 57. **Chem. 1a**

For an experiment, 13.2 mL of HCl are needed. What is the best instrument to use for measuring this volume?

  a.   Graduated cylinder
  b.   Erlenmeyer flask
  c.   Beaker
  d.   Test tube

_____ 58. **Ch. 3c**

The type of formula that shows the arrangements of atoms and bonds is called —

    a.   molecular
    b.   chemical
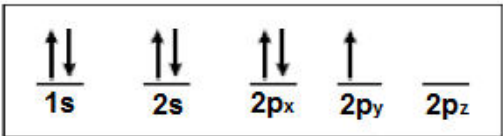   c.   structural
    d.   empirical

_____ 59. **Ch. 2d**

The elements that are characterized by the presence of an incomplete *d* sublevel are called —

    a.   alkali earth metals
    b.   transition elements
    c.   halogens
    d.   lanthanoids

_____ 60. **Ch. 2g**

Which of the following orbital diagrams is *incorrect* because it violates Hund's rule?

a.

$\uparrow\downarrow$	$\uparrow\downarrow$	$\uparrow$	—	—
1s	2s	2px	2py	2pz

b.

$\uparrow\downarrow$	$\uparrow\downarrow$	$\uparrow\downarrow$	$\uparrow$	—
1s	2s	2px	2py	2pz

c.

$\uparrow\downarrow$	$\uparrow$	—	—	—
1s	2s	2px	2py	2pz

d.

$\uparrow\downarrow$	$\uparrow\downarrow$	$\uparrow$	$\uparrow$	$\uparrow$
1s	2s	2px	2py	2pz

Chemistry Final Exam 2018-2019
Answer Section

MULTIPLE CHOICE

1. ANS: D   PTS: 1   DIF: k   REF: ncook
   OBJ: Phases of Matter and Kinetic Molecular Theory   STA: Ch. 5d
2. ANS: D   PTS: 1   DIF: k   REF: tjones
   OBJ: Scientific Investigation   STA: ch.1i
3. ANS: C   PTS: 1   DIF: c   REF: 2005 SOL
   OBJ: Chemical Formulas and Reactions   STA: Ch. 3b
4. ANS: C   PTS: 1   DIF: a   OBJ: Scientific Investigation
   STA: Ch. 1a
5. ANS: B   PTS: 1   DIF: c   REF: 2001 SOL
   OBJ: Atomic Structure and Periodic Relationships   STA: Ch. 2a
6. ANS: A   PTS: 1   DIF: k   REF: 2004 SOL
   OBJ: Scientific Investigation   STA: Ch. 1g
7. ANS: C   PTS: 1   DIF: c   REF: 2007 SOL
   OBJ: Atomic Structure and Periodic Relationships   STA: Ch. 2g
8. ANS: B   PTS: 1   DIF: a   REF: 2003 SOL
   OBJ: Chemical Formulas and Reactions   STA: Ch. 3c
9. ANS: C   PTS: 1   DIF: a   REF: 2009 SOL
   OBJ: Molar Relationships   STA: Ch. 4b
10. ANS: D   PTS: 1   DIF: k   OBJ: Scientific Investigation
    STA: Ch. 1g
11. ANS: B   PTS: 1   DIF: k
    OBJ: Atomic Structure and Periodic Relationships   STA: Ch. 6a
12. ANS: C   PTS: 1   DIF: c   REF: ncook
    OBJ: Molar Relationships   STA: Ch. 4b   MSC: made it up
13. ANS: A   PTS: 1   DIF: a   REF: 2009 SOL
    OBJ: Phases of Matter and Kinetic Molecular Theory   STA: Ch. 5d
14. ANS: A   PTS: 1   DIF: a   REF: 2003 SOL
    OBJ: Molar Relationships   STA: Ch. 4a
15. ANS: B   PTS: 1   DIF: k
    OBJ: Atomic Structure and Periodic Relationships   STA: Ch. 2h
16. ANS: B   PTS: 1   DIF: c   OBJ: Scientific Investigation
    STA: ch.1a
17. ANS: B   PTS: 1   DIF: k   OBJ: Scientific Investigation
    STA: Ch. 1a
18. ANS: B   PTS: 1   DIF: k   REF: 2007 SOL
    OBJ: Chemical Formulas and Reactions   STA: Ch. 3e
19. ANS: D   PTS: 1   DIF: k   OBJ: Scientific Investigation
    STA: Ch. 1g
20. ANS: B   PTS: 1   DIF: c   REF: 2005 SOL
    OBJ: Atomic Structure and Periodic Relationships   STA: Ch. 2f
21. ANS: C   PTS: 1   DIF: c   REF: dbutler
    OBJ: Molar Relationships   STA: Ch. 4a   MSC: Zumdahl 3rd Edition

22. ANS: D PTS: 1 DIF: a REF: 2001 SOL
    OBJ: Molar Relationships STA: Ch. 4b
23. ANS: A PTS: 1 DIF: k REF: 2007 SOL
    OBJ: Scientific Investigation STA: Ch. 1g
24. ANS: B PTS: 1 DIF: k REF: 2005 SOL
    OBJ: Chemical Formulas and Reactions STA: Ch. 3e
25. ANS: C PTS: 1 DIF: c REF: 2000 SOL
    OBJ: Atomic Structure and Periodic Relationships STA: Ch. 2i
26. ANS: A PTS: 1 DIF: a REF: 2004 SOL
    OBJ: Chemical Formulas and Reactions STA: Ch. 3f
27. ANS: B PTS: 1 DIF: c REF: dbutler
    OBJ: Molar Relationships STA: Ch. 4a MSC: Zumdahl 3rd Edition
28. ANS: C PTS: 1 DIF: c REF: tjones
    OBJ: Scientific Investigation STA: Ch.1e MSC: Made up
29. ANS: D PTS: 1 DIF: c REF: 2000 SOL
    OBJ: Scientific Investigation STA: Ch. 1g
30. ANS: A PTS: 1 DIF: k REF: 2004 SOL
    OBJ: Phases of Matter and Kinetic Molecular Theory STA: Ch. 5b
31. ANS: B PTS: 1 DIF: k REF: 2004 SOL
    OBJ: Phases of Matter and Kinetic Molecular Theory STA: Ch. 5e
32. ANS: B PTS: 1 DIF: k
    OBJ: Atomic Structure and Periodic Relationships STA: Ch. 2h
33. ANS: C PTS: 1 DIF: c REF: 2007 SOL
    OBJ: Chemical Formulas and Reactions STA: Ch. 3c
34. ANS: A PTS: 1 DIF: k REF: 2007 SOL
    OBJ: Chemical Formulas and Reactions STA: Ch. 3e
35. ANS: C PTS: 1 DIF: a REF: 2001 SOL
    OBJ: Chemical Formulas and Reactions STA: Ch. 3c
36. ANS: B PTS: 1 DIF: c
    OBJ: Atomic Structure and Periodic Relationships STA: Ch. 2h
37. ANS: B PTS: 1 DIF: k REF: 2004 SOL
    OBJ: Atomic Structure and Periodic Relationships STA: Ch. 2c
38. ANS: D PTS: 1 DIF: c REF: 2003 SOL
    OBJ: Phases of Matter and Kinetic Molecular Theory STA: Ch. 5e
39. ANS: A PTS: 1 DIF: c REF: 2000 SOL
    OBJ: Scientific Investigation STA: Ch. 1f
40. ANS: A PTS: 1 DIF: c REF: 2009 SOL
    OBJ: Chemical Formulas and Reactions STA: Ch. 3f
41. ANS: C PTS: 1 DIF: c REF: 2007 SOL
    OBJ: Chemical Formulas and Reactions STA: Ch. 3d
42. ANS: B PTS: 1 DIF: a REF: dbutler
    OBJ: Molar Relationhips STA: Ch. 4a MSC: Zumdahl 3rd Edition
43. ANS: C PTS: 1 DIF: c REF: 2009 SOL
    OBJ: Chemical Formulas and Reactions STA: Ch. 3d
44. ANS: C PTS: 1 DIF: a
    OBJ: Phases of Matter and Kinetic Molecular Theory STA: Ch. 5f
45. ANS: D PTS: 1 DIF: c REF: 2004 SOL
    OBJ: Molar Relationships STA: Ch. 4c

46. ANS: C   PTS: 1   DIF: c   OBJ: Chemical Formulas and Reactions
STA: Ch. 3a
47. ANS: C   PTS: 1   DIF: c   OBJ: Molar Relationships
STA: Ch. 4c
48. ANS: B   PTS: 1   DIF: c
OBJ: Atomic Structure and Periodic Relationships   STA: Ch. 2h
49. ANS: D   PTS: 1   DIF: a   REF: 2000 SOL
OBJ: Phases of Matter and Kinetic Molecular Theory   STA: Ch. 5b
50. ANS: A   PTS: 1   DIF: c   REF: tjones
OBJ: Scientific Investigation   STA: Ch. 1g
51. ANS: A   PTS: 1   DIF: k   REF: 2001 SOL
OBJ: Phases of Matter and Kinetic Molecular Theory   STA: Ch. 5a
52. ANS: B   PTS: 1   DIF: c   REF: 2003 SOL
OBJ: Chemical Formulas and Reactions   STA: Ch. 3d
53. ANS: D   PTS: 1   DIF: c   REF: 2003 SOL
OBJ: Atomic Structure and Periodic Relationships   STA: Ch. 2a
54. ANS: B   PTS: 1   DIF: c   REF: 2007 SOL
OBJ: Molar Relationships   STA: Ch. 4a
55. ANS: D   PTS: 1   DIF: k   REF: ncook
OBJ: Chemical Formulas and Reactions   STA: Ch. 3d   MSC: made it up
56. ANS: C   PTS: 1   DIF: k   REF: 2001 SOL
OBJ: Phases of Matter and Kinetic Molecular Theory   STA: Ch. 5a
57. ANS: A   PTS: 1   DIF: c   OBJ: Scientific Investigation
STA: Ch. 1a
58. ANS: C   PTS: 1   DIF: k   REF: 2005 SOL
OBJ: Chemical Formulas and Reactions   STA: Ch. 3c
59. ANS: B   PTS: 1   DIF: k   REF: 2005 SOL
OBJ: Atomic Structure and Periodic Relationships   STA: Ch. 2d
60. ANS: B   PTS: 1   DIF: c   REF: 2004 SOL
OBJ: Atomic Structure and Periodic Relationships   STA: Ch. 2g