Chemistry 1411
General Chemistry I
Chapter 1 Review

1. The term that is related to the reproducibility (repeatability) of
    a measurement is
    a. qualitative.
    b. property.
    c. quantitative.
    d. precision.
    e. accuracy.

2. The number of significant figures in the mass measured as 0.05010
    g is
    a. 1.
    b. 2.
    c. 4.
    d. 5.
    e. 3.

3. The volume of a 10.0% glucose solution is 8.25 mL. Its density is
    1.039 g/mL. What mass does the solution have?
    a. 8.25 g
    b. 0.00825 kg
    c. 8.57 g
    d. 0.0857 kg
    e. 825 mg

4. Liquid propane boils at -42øC. What is its boiling point on the
    Kelvin scale?
    a. 273 K
    b. 231 K
    c. 315 K
    d. 256 K
    e. 345 K

5. Which is the smallest mass?
    a. 1000 ng
    b. 1000 mg
    c. 1000 g
    d. 1000 æg
    e. 1000 kg

6. How many joules are there in 7.72 kcal? (1.000 calorie = 4.184 joules.)
   a. 32.3
   b. 12,900
   c. 1.78
   d. 32,300
   e. 1780

7. A 5.00 Á 10^2 g sample of ethyleneglycol has a density of 1.114 g/cm^3. Calculate its volume.
   a. 7.24 cm^3
   b. 8.98 cm^3
   c. 449 cm^3
   d. 0.00223 cm^3
   e. 557 cm^3

8. How many liters are in 12 ounces of soft drink? (1.00 ounce = 28.3 mL)
   a. 3.40 Á 10^2 L
   b. 3.4 Á 10^{-1} L
   c. 3.4 Á 10^{-4} L
   d. 3.40 Á 10^{-1} L
   e. 3.40 Á 10^{-4} L

9. What volume of alcohol (density 0.800 g/mL) is needed to obtain 320. g of alcohol?
   a. 100. mL
   b. 400. mL
   c. 256 mL
   d. 80.0 mL
   e. 320. mL

10. Two types of pure substances are
    a. compounds and heterogeneous solutions.
    b. compounds and elements.
    c. elements and homogeneous solutions.
    d. compounds and homogeneous solutions.
    e. elements and heterogeneous solutions.

Chemistry 1411
General Chemistry I
Chapter 2 Review

1. Dalton's atomic theory consisted of all the following postulates **EXCEPT**
   a. with gases, the volumes consumed and produced are in ratios of small whole numbers.
   b. atoms combine in fixed ratios of whole numbers.
   c. atoms of different elements have different properties.
   d. elements are composed of indivisible particles called atoms.

e. in chemical changes, atoms are not destroyed, created, or changed.

2. How many neutrons are there in the chloride ion, $_{17}^{37}Cl^-$?
   a. 20
   b. 18
   c. 17
   d. 21
   e. 38

3. What is the symbol of the species that has 16 protons and 18 electrons?
   a. $_{14}Si^{4-}$
   b. $_{16}S^{2+}$
   c. $_{16}S$
   d. $_{16}S^{2-}$
   e. $_{18}Ar$

4. An atom that has the same number of neutrons as ^{59}Co is
   a. ^{58}Fe.
   b. ^{60}Cu.
   c. ^{57}Co.
   d. ^{59}Ni.
   e. ^{58}Ni.

5. Which of the following represents a pair of isotopes?

		Atomic Number	Mass Number
a.	I	17	34
	II	18	36
b.	I	7	14
	II	8	16
c.	I	7	16
	II	8	16
d.	I	17	35
	II	17	37
e.	I	17	37
	II	18	37

6. One gram of washing soda, Na_2CO_3 ú $10H_2O$, has 2.1×10^{21} carbon atoms. How many oxygen atoms are present in 1.0 g of washing soda?
   a. 2.1×10^{21}
   b. 8.4×10^{21}
   c. 6.3×10^{21}
   d. 2.7×10^{22}
   e. 3.2×10^{22}

7. The formulas of the hydroxide ion, the nitrate ion, and the phosphate ion are represented, respectively, as
   a. OH^-, NO_2^-, PO_3^{3-}.

b. OH^-, NO_2^-, PO_4^{3-}.
c. H^-, NO_3^-, P^{3-}.
d. H^-, NO_2^-, P^{3-}.
e. OH^-, NO_3^-, PO_4^{3-}.

8. The formula for aluminum sulfate is
    a. Al_2S_3.
    b. Al_3S_2.
    c. AlS.
    d. $Al_3(SO_4)_2$.
    e. $Al_2(SO_4)_3$.

9. All the following oxoacids and names

    1. H_2SO_3 sulfurous acid
    2. $HClO_2$ chlorous acid
    3. H_2CO_3 carbonic acid

    is (are) correct **EXCEPT**
    a. 1 and 2 only.
    b. 3 only.
    c. 2 only.
    d. All are correct.
    e. 1 only.

10. Which one of the following equations is properly balanced?
    a. $NH_4NO_3 \square 2H_2O + N_2$
    b. $Na_2CO_3 + 2H_2SO_4 \square Na_2SO_4 + 2H_2O + CO_2$
    c. $CH_3CHO + 3O_2 \square 2CO_2 + 2H_2O$
    d. $Sn + 4HNO_3 \square SnO_2 + 4NO_2 + 2H_2O$
    e. $2Na_2SO_4 + 3Bi(NO_3)_3 \square Bi_2(SO_4)_3 + 9NaNO_3$

Chemistry 1411
General Chemistry I
Chapter 3 - Review Set

1. What is the molar mass of ammonium sulfate, $(NH_4)_2SO_4$, an important synthetic fertilizer?
    a. 70. g/mol
    b. 92 g/mol
    c. 114 g/mol
    d. 132 g/mol
    e. 146 g/mol

2. A sample of 124 g of white phosphorus, P_4, contains the same number of atoms as
    a. 23.0 g of sodium.
    b. 32.0 g of oxygen (O_2).
    c. 48.0 g of ozone (O_3).
    d. 30.0 g of formaldehyde (CH_2O).
    e. 14.0 g of nitrogen.

3. Which of the following samples contains the largest number of atoms?
   a. 1 g Li
   b. 1 g F_2
   c. 1 g C
   d. 1 g P_4
   e. 1 g N_2

4. What is the weight in grams of **ONE** acetylsalicylic acid (aspirin) molecule, $C_9H_8O_4$?
   a. $3.34 \text{ Á } 10^{21}$
   b. 180.
   c. $2.99 \text{ Á } 10^{-22}$
   d. $3.45 \text{ Á } 10^{-22}$
   e. $6.90 \text{ Á } 10^{-22}$

5. What is the percentage of nitrogen in ammonium phosphate, $(NH_4)_3PO_4$?
   a. 11.6%
   b. 16.0%
   c. 28.2%
   d. 31.9%
   e. 34.3%

6. Cubane is a compound composed of only C and H. It contains 92.26% C. What is its empirical formula?
   a. CH
   b. CH_2
   c. C_2H_3
   d. C_2H_5
   e. C_3H_4

7. Complete combustion of a 0.20-mol sample of a hydrocarbon, C_xH_y, gives 0.80 mol of CO_2 and 1.0 mol of H_2O. The molecular formula of the original hydrocarbon is
   a. C_3H_8.
   b. C_4H_5.
   c. C_4H_8.
   d. C_4H_{10}.
   e. C_8H_{20}.

8. Elemental sulfur can be converted to sulfur trioxide by reaction with oxygen in the presence of a catalyst. Upon addition of water, sulfuric acid is produced as represented by the equation:

   $S_8(s) + 12O_2(g) + 8H_2O \ \square \ 8H_2SO_4(l)$
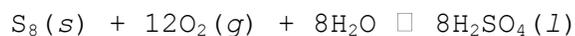
   What minimum mass of sulfur is needed to prepare 175 g of H_2SO_4?
   a. 39.6 g

b. 57.2 g
c. 71.8 g
d. 75.3 g
e. 81.9 g

9. $2Al(s) + 6HCl(aq) \square 2AlCl_3(aq) + 3H_2(g)$
    According to the equation above, how many grams of aluminum are
    needed to react with 1.16 mol of hydrochloric acid?
    a. 1.16
    b. 10.4
    c. 15.7
    d. 18.2
    e. 23.6

10. Which of the following compounds contains the largest number of
    atoms?
    a. 1.0 mole of CH_3COOH
    b. 2.0 moles of H_2SO_4
    c. 3.0 moles of NH_3
    d. 4.0 moles of H_2S
    e. 5.0 moles of HBr

Chemistry 1411
General Chemistry I
Chapter 4 Review

1. The complete combustion of phenylhydrazine, $C_6H_5NHNH_2$, with the
    oxidizer dinitrogen tetraoxide is shown in the equation

    ___ $C_6H_5NHNH_2$ + ___ N_2O_4 $\square$ ___ CO_2 + ___ H_2O + ___ N_2

    When balanced, the sum of all the coefficients (using smallest
    whole numbers) is
    a. 25.
    b. 15.
    c. 10.
    d. 20.
    e. 30.

2. All the following reactions are described as decomposition
    reactions **EXCEPT**
    a. $(NH_4)_2Cr_2O_7(s) \square N_2(g) + 4H_2O(g) + Cr_2O_3(s)$.
    b. $2CO_2(g) \square 2CO(g) + O_2(g)$.
    c. $2CH_3OH(l) + 3O_2(g) \square 2CO_2(g) + 4H_2O(g)$.
    d. $NH_4HS(s) \square NH_3(g) + H_2S(g)$.
    e. $PCl_5(l) \square PCl_3(g) + Cl_2(g)$.

3. All the following are weak acids **EXCEPT**
    a. HNO_2.
    b. H_3PO_2.
    c. H_3PO_4.

d. H_3PO_3.
e. HNO_3.

4. All the following are strong electrolytes in aqueous solution **EXCEPT**
   a. $NaHCO_3$.
   b. NH_4HCO_3.
   c. $(NH_4)_2CO_3$.
   d. Na_2CO_3.
   e. H_2CO_3.

5. Which of the following is (are) a weak base(s)?

   1. $Al(OH)_3$
   2. NH_3
   3. $LiOH$
   a. 2 only
   b. 3 only
   c. 1 only
   d. 1, 2, and 3
   e. 1 and 2 only

6. What products result from the addition of aqueous solutions of $Cu(NO_3)_2$ and $(NH_4)_2S$?
   a. $CuS(s)$, $NH_3(g)$, and $H_2S(g)$
   b. $CuS(s)$ and $NH_4NO_3(aq)$
   c. $Cu_2S(s)$ and $NH_4NO_3(aq)$
   d. $CuS(aq)$ and $NH_4NO_3(s)$
   e. $CuS(s)$ and $NH_4NO_3(s)$

7. All the following are oxidation-reduction reactions **EXCEPT**
   a. $2Al(s) + Fe_2O_3(s) \ \square\ Al_2O_3(s) + 2Fe(s)$.
   b. $Hg(NO_3)_2 + 4KI \ \square\ K_2HgI_4(aq) + 2KNO_3(aq)$.
   c. $(NH_4)_2Cr_2O_7(s) \ \square\ Cr_2O_3(s) + N_2(g) + 4H_2O(l)$.
   d. $Cu(s) + 2H_2SO_4(aq) \ \square\ CuSO_4(aq) + SO_2(g) + 2H_2O(l)$.
   e. $2Na(s) + 2H_2O(l) \ \square\ 2NaOH(aq) + H_2(g)$.

8. Which net ionic equation best represents the reaction that occurs when an aqueous solution of barium chloride is mixed with an aqueous solution of sulfuric acid?
   a. No net reaction occurs.
   b. $Ba^{2+}(aq) + 2Cl^-(aq) + 2H^+(aq) + SO_4{}^{2-}(aq) \ \square\ BaSO_4(s) + 2HCl(g)$
   c. $2H^+(aq) + 2Cl^-(aq) \ \square\ HCl(g)$
   d. $BaCl_2 + H_2SO_4 \ \square\ BaSO_4 + 2HCl$
   e. $Ba^{2+}(aq) + SO_4{}^{2-}(aq) \ \square\ BaSO_4(s)$

9. In the balanced equation

 $$3Na^+ + 3OH^- + P_4 + 3H_2O \ \square\ 3Na^+ + 3H_2PO_2{}^- + PH_3$$

   the reducing agent is

a. OH^-.
b. Na^+.
c. H_2O.
d. PH_3.
e. P_4.

10. How many grams of lithium nitrate, $LiNO_3$, are required to prepare 3.00×10^2 mL of 2.00×10^{-1} M solution?
a. 6.32 g
b. 4.14 g
c. 3.62 g
d. 1.04 g
e. 2.08 g

Chemistry 1411
General Chemistry I
Chapter 5 Review

1. A gas occupies a volume of 2.75 L at 350 mmHg and 200øC. Which mathematical expression gives the correct volume at 600 mmHg and 300øC?

a.
$$2.75 \times \frac{600}{350} \times \frac{473}{573}$$

b.
$$2.75 \times \frac{350}{600} \times \frac{473}{573}$$

c.
$$2.75 \times \frac{600}{350} \times \frac{573}{473}$$

d.
$$2.75 \times \frac{350}{600} \times \frac{300}{200}$$

e.
$$2.75 \times \frac{350}{600} \times \frac{573}{473}$$

2. When ammonium nitrite undergoes decomposition, only gases are produced, according to the equation

$$NH_4NO_2(s) \; \square \; N_2(g) + 2H_2O(g)$$
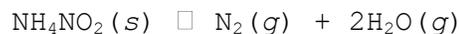
What is the total volume of gases produced at 1092 K and 1.00 atm pressure when 192 g of ammonium nitrite undergoes the foregoing decomposition reaction?
a. 18×22.4 L
b. 36×22.4 L
c. 6×22.4 L
d. 9×22.4 L

e. 12 Á 22.4 L

3. How many moles of gas are in a gas sample occupying 1.23 L at 760. mmHg and 300. K?
    a. 0.100
    b. 0.0250
    c. 0.0500
    d. 0.200
    e. 0.400

4. At standard conditions, 2.75 L of a gas weighed 5.39 g. The gas is
    a. F_2.
    b. N_2O.
    c. NF_3.
    d. N_2.
    e. NO.

5. The density of a gas is 3.48 g/L at STP. What is its molecular weight?
    a. 32.0 g/mol
    b. 78.0 g/mol
    c. 44.6 g/mol
    d. 147 g/mol
    e. 224 g/mol

6. At 23øC and 325 mmHg, an unknown pure gas has a density of 0.493 g/L. Which of the following gases could be the unknown gas?
    a. Ne
    b. CO
    c. C_2H_6
    d. F_2
    e. N_2O

7. A mixture consisting of 0.100 mol N_2, 0.050 mol O_2, 0.200 mol CH_4, and an unknown amount of CO_2 occupied a volume of 9.60 L at 27øC and 1.00 atm pressure. How many moles of CO_2 are there in this sample?
    a. Answer cannot be determined because it is a mixture.
    b. 0.050 mol
    c. 0.100 mol
    d. 0.390 mol
    e. 0.040 mol

8. A given mass of gas in a rigid container is heated from 100 to 500øC. Which of the following responses best describes what will happen to the pressure of the gas?
    a. The pressure will increase by a factor less than five.
    b. The pressure will decrease by a factor of five.
    c. The pressure will increase by a factor greater than five.
    d. The pressure will remain the same.
    e. The pressure will increase by a factor of five.

9. The volume of one mole of nitrogen
    a. is lower than that of ammonia at high pressures.
    b. is decreased by increasing its kinetic energy.
    c. is decreased by decreasing the pressure of the gas.
    d. is increased by decreasing the temperature.
    e. has the value of 22.4 L at 0øC and 1.00 atm.

10. All the following are postulates of the kinetic-molecular theory
    of gases except
    a. at a constant temperature, each molecule has the same kinetic
       energy.
    b. the gas molecules are in constant motion.
    c. the collisions between molecules are elastic.
    d. the volumes of the molecules are negligible compared with the
       volume of the container.
    e. the gas molecules are in rapid motion.

CHEM 1411
General Chemistry
Chapter 6 Review

1. If çU = +32 kJ for a certain process, that process
    a. occurs rapidly.
    b. cannot occur.
    c. requires a catalyst.
    d. is exothermic.
    e. is endothermic.

2. The sign of çH for the process $H_2O(g) \square H_2O(l)$ is
    a.   negative, and the process is exothermic.
    b.   positive, and the process is exothermic.
    c.   ø
          impossible to predict with confidence because $çH_f$ for $H_2O(g)$
       and
             ø
          $çH_f$ for $H_2O(l)$ are not given.
    d.   positive, and the process is endothermic.
    e.   negative, and the process is endothermic.

3. Which answer lists all the following responses that are exothermic
    and none that are endothermic?

       1. boiling water
       2. freezing water
       3. condensation of steam
       4. melting ice
    a. 2 and 4 only
    b. 2 and 3 only
    c. 1 and 2 only
    d. 1 and 4 only

e. 2, 3, and 4 only

4. ςH_{fus} for sulfur is 17.7 kJ/mol. How many grams of sulfur can be melted by 29.0 kJ of energy?
a. 9.8 g
b. 52.5 g
c. 19.5 g
d. 26.2 g
e. 40.7 g

5. H_2 and F_2 react according to the following equation, forming HF.

   $H_2 + F_2 \rightarrow 2HF$ $\varsigma H\emptyset = -271$ kJ/mol

   If $H_2(g)$ and $F_2(g)$ were mixed in a thermally insulated vessel, the reaction that occurred would be
   a. We could not tell unless the original and final temperatures were given.
   b. exothermic, and the temperature of the reaction system would fall.
   c. endothermic, and the temperature of the reaction system would fall.
   d. exothermic, and the temperature of the reaction system would rise.
   e. endothermic, and the temperature of the reaction system would rise.

6. In one of the following processes, ςH and ςU are nearly the same. Select the process.
   a. $H_2O(g) \rightarrow H_2(g) + \frac{1}{2}O_2(g)$
   b. $BaO(s) + CO_2(g) \rightarrow BaCO_3(s)$
   c. $I_2(s) \rightarrow I_2(g)$
   d. $2NH_3(g) \rightarrow N_2(g) + 3H_2(g)$
   e. $Hg(s) \rightarrow Hg(l)$

7. Calculate the change in enthalpy when 55.8 g of Fe at 25∅C and 1 atm
   pressure is oxidized. ($\varsigma H_f^{\emptyset}$ for $Fe_2O_3(s)$ is -824 kJ/mol.)

   $4Fe(s) + 3O_2(g) \rightarrow 2Fe_2O_3(s)$
   a. +824 kJ
   b. +208 kJ
   c. +412 kJ
   d. -412 kJ
   e. -824 kJ

8. The equation for the standard enthalpy of formation of potassium bromate, $KBrO_3$, corresponds to which reaction?
   a. $\frac{1}{3}$

$$K(g) + \ddot{A}Br_2(g) + \ddot{A}O_2(g) \ \Box \ KBrO_3(s)$$
$$\qquad\qquad 2 \qquad\qquad 2$$

b. $K(g) + Br(g) + 3O(g) \ \Box \ KBrO_3(s)$
c. $K(s) + Br(g) + 3O(g) \ \Box \ KBrO_3(s)$
d. $\qquad\qquad 1 \qquad\quad 3$
$$K(s) + \ddot{A}Br_2(g) + \ddot{A}O_2(g) \ \Box \ KBrO_3(s)$$
$$\qquad\qquad 2 \qquad\qquad 2$$

e. $\qquad\qquad 1 \qquad\quad 3$
$$K(s) + \ddot{A}Br_2(l) + \ddot{A}O_2(g) \ \Box \ KBrO_3(s)$$
$$\qquad\qquad 2 \qquad\qquad 2$$
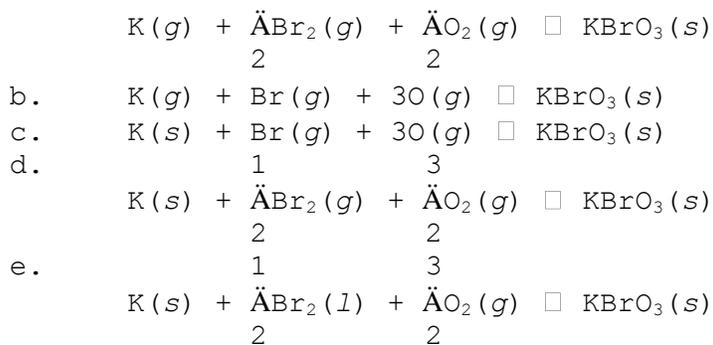
9. Given the following data:

$N_2(g) + 3/2\ O_2(g) \rightarrow N_2O_3(s)$ $\qquad\qquad\qquad$ çH = 83.7 kJ

$N_2(g) + O_2(g) \ \Box \ 2NO(g)$ $\qquad\qquad\qquad$ çH = 180.4 kJ

$1/2\ N_2(g) + O_2(g) \ \Box \ NO_2(g)$ $\qquad\qquad\qquad$ çH = 33.2 kJ

what is çH for the reaction

$N_2O_3(g) \ \Box \ NO(g) + NO_2(g)$
a. 207.1 kJ
b. 24.3 kJ
c. 39.7 kJ
d. -207.1 kJ
e. -39.7 kJ
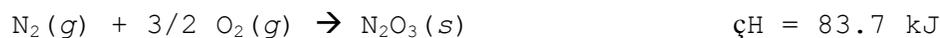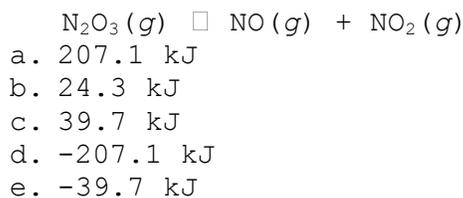
10. The following two reactions are known:

$Fe_2O_3(s) + 3CO(g) \ \Box \ 2Fe(s) + 3CO_2(g)$ $\qquad$ çH = -26.8 kJ
$FeO(s) + CO(g) \ \Box \ Fe(s) + CO_2(g)$ $\qquad\qquad$ çH = -16.5 kJ
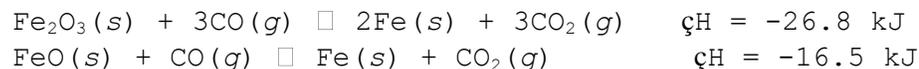
Determine the çH value for the reaction below.

$Fe_2O_3(s) + CO(g) \ \Box \ 2\ FeO(s) + CO_2(g)$
a. -43.3 kJ
b. 22.7 kJ
c. -10.3 kJ
d. 6.2 kJ
e. 10.3 kJ

Chemistry 1411
General Chemistry I
Chapter 7 Review

1. The relationship between the speed, wavelength, and frequency of
    electromagnetic radiation is
    a. $¡ = c + é$.

b.
$$\mathtext{¡} = \frac{é + c}{é}\ \text{ÄÄÄÄ}.$$

c.
$$\mathtext{¡} = \frac{é}{c}\ \text{Ä}.$$

d.
$$\mathtext{¡} = 1 + \frac{é}{c}\ \text{Ä}.$$

e.
$$\mathtext{¡} = \frac{c}{é}\ \text{Ä}.$$

2. Which radiation has the shortest wavelength?
    a. blue light
    b. gamma rays
    c. microwaves
    d. x rays
    e. red light

3. What is the wavelength of light associated with the radiation of
    7.26 Á 10^{-19} J/photon? (h = 6.63 Á 10^{-34} J ú s.)
    a. 548 nm
    b. 274 nm
    c. 231 nm
    d. 684 nm
    e. 137 nm

4. What is the wavelength of light in centimeters having a frequency
    of 1.5 Á 10^{18} s^{-1}? (The speed of light is 3.00 Á 10^8 m/s.)
    a. 4.5 Á 10^{28}
    b. 2.0 Á 10^{-8}
    c. 2.0 Á 10^{-10}
    d. 5.0 Á 10^{11}
    e. 5.0 Á 10^9

5. Which quantum number describes the orientation in space of an
    orbital?
    a. any of these
    b. n
    c. m_s
    d. m_l
    e. l

6. Which of the following sets of quantum numbers is **NOT** permissible?
    a.
        $$n = 2,\ l = 0,\ m_l = 0,\ m_s = +\frac{1}{2}\ \text{Ä}$$
    b.
        $$n = 2,\ l = 1,\ m_l = 1,\ m_s = -\frac{1}{2}\ \text{Ä}$$

c.

$$n = 3, \; l = 3, \; m_l = -3, \; m_s = -\ddot{A}\frac{1}{2}$$

d.

$$n = 4, \; l = 0, \; m_l = 0, \; m_s = +\ddot{A}\frac{1}{2}$$

e.

$$n = 1, \; l = 0, \; m_l = 0, \; m_s = +\ddot{A}\frac{1}{2}$$

7. All the following statements are true **EXCEPT**
    a. the n = 3 energy level has no f orbitals.
    b. the s orbital has a spherical shape.
    c. there are 5 d orbitals in a set.
    d. the third major energy level has one set of f orbitals.
    e. the 2p orbitals can have a maximum of 6 electrons.

8. The value of l for a 4f electron is
    a. 2.
    b. 1.
    c. 0.
    d. 3.
    e. 4.

9. What is the maximum number of electrons in **n** = 3?
    a. 9
    b. 18
    c. 3
    d. 7
    e. 5

10. The maximum number of electrons in a 4d subshell is
    a. 8.
    b. 10.
    c. 1.
    d. 5.
    e. 3.

Chemistry 1411
General Chemistry I
Chapter 8 Review

1. The maximum number of electrons that can be accommodated in a p
    subshell is
    a. 2.
    b. 4.
    c. 6.
    d. 10.
    e. 8.

2. The Pauli exclusion principle requires that
   a. no two electrons in the same atom can have the same set of four quantum numbers.
   b. the wavelength of a photon of light times its frequency is equal to the speed of light.
   c. an electron can have either particle character or wave character.
   d. the wavelength and mass of a subatomic particle are related by é = h/mv.
   e. both the position of an electron and its momentum cannot be known simultaneously very accurately.

3. Which of the following electron configurations is **NOT** possible?
   a. $1s^2\ 2s^2\ 2p^6$
   b. $1s^2\ 2s^2\ 2p^3$
   c. $1s^2\ 1p^2$
   d. $1s^2\ 2s^2\ 2p^2$
   e. $1s^2\ 2s^2\ 2p^6\ 3s^1$

4. What is the valence-shell electron configuration for the fourth-period element in Group VA?
   a. $4s^2\ 4p^3$
   b. $5s^2\ 5p^2$
   c. $4s^2\ 5p^3$
   d. $4s^2\ 3d^3$
   e. $5s^2\ 4p^3$

5. Arsenic is an element in the same family as phosphorus. Which of the following would be the formula of arsenic acid?
   a. H_3AsO_3
   b. H_3As
   c. H_3AsO_4
   d. H_2AsO_2
   e. H_3AsO_2

6. Which of the following atoms has the **LARGEST** atomic radius?
   a. Cl
   b. O
   c. P
   d. B
   e. Na

7. Which of the following elements has the highest third ionization energy?
   a. S
   b. Al
   c. Ga
   d. Mg
   e. As

8. Which of the following elements has the **LARGEST** first ionization energy?
    a. O
    b. Ca
    c. S
    d. Cs
    e. Si

9. All the following are periodic functions of atomic number **EXCEPT**
    a. atomic radius.
    b. density.
    c. the mass number.
    d. boiling point.
    e. electron affinity.

10. Which of the following equations represents the first ionization energy of calcium?
    a. $Ca(g) \rightarrow Ca^{2+}(g) + 2e^-$
    b. $Ca(s) \rightarrow Ca^+(s) + e^-$
    c. $Ca(g) \rightarrow Ca^+(g) + e^-$
    d. $Ca(s) \rightarrow Ca^+(g) + e^-$
    e. $Ca(s) + e^- \rightarrow Ca^-(s)$

Chemistry 1411
General Chemistry I
Ch. 9 Review

1. How many electrons does a stable barium **ION** have?
    a. 2
    b. 54
    c. 56
    d. 18
    e. 58

2. The empirical formula of a salt consisting of Mg^{2+} and N^{3-} ions is
    a. MgN.
    b. Mg_2N_3.
    c. Mg_3N_2.
    d. $Mg^{2+}N^{3-}$.
    e. Mg_2N.

3. Which of the following species would you expect to have the largest radius?
    a. Br^-
    b. Kr
    c. K^+
    d. Al^{3+}
    e. Cl^-

4. The electronic configuration of the Al^{3+} ion is
   a. $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^4$.

b. $1s^2\ 2s^2\ 2p^6$.
c. $1s^2\ 2s^2\ 2p^3$.
d. $1s^2\ 2s^2\ 2p^1$.
e. $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^1$.

5. All the following species are isoelectronic **EXCEPT**
    a. Na^+.
    b. S^{2-}.
    c. K^+.
    d. Cl^-.
    e. Ar.

6. The number of valence electrons in the acetate ion, CH_3COO^-, is
    a. 22.
    b. 36.
    c. 38.
    d. 23.
    e. 24.

7. Which atom would be expected to be the most electronegative?
    a. N
    b. Na
    c. B
    d. Cs
    e. Al

8. The central atom in the bromate ion, BrO_3^-, is surrounded by
    a. four bonding pairs and four lone pairs of electrons.
    b. two double bonds and no unshared pairs of electrons.
    c. three bonding pairs and one unshared pair of electrons.
    d. one bonding pair and three unshared pairs of electrons.
    e. two bonding pairs and two unshared pairs of electrons.

9. Which of the following species does **NOT** have the proper electron-
    dot formula?
    a.   ì
              ïFï
           ì ³ ì
           ïFÄÄSÄÄFï
            ì ³ ì
              ïFï
               ì
    b.   íîëí
                O
           íî õ ô ëí
              F   F
           êîëê êîëê
    c.   ì
           HÄÄFï
               ì
    d.   ì

ïFï
                     3

                    ïXeï
                     3

                    ïFï
                     ì
    e.   îîëí îîëí
               F   F
             êîô õ   ëê
                  B
                  3
                ïFï
                 ì

10. çH of sublimation
    a. $Cl_2(g) \square 2Cl(g)$
    b. $Na^+(g) + Cl^-(g) \square NaCl(s)$
    c. $Na(s) \square Na(g)$
    d. $Na(s) \square Na^+(g) + e$
    e. $Na(g) \square Na^+(g) + e$

Chapter 10 Review

1. In ClF_3, the electron pairs are arranged about the chlorine atom
    in
    a. a trigonal pyramid.
    b. a square plane.
    c. a tetrahedron.
    d. a trigonal bipyramid.
    e. an octahedron.

2. In the ICl_2^- ion, how many valence electrons are there about the
    central iodine atom?
    a. 4
    b. 8
    c. 12
    d. 10
    e. 6

3. The molecular shape of the PH_3 molecule is
    a. pyramidal.
    b. tetrahedral.
    c. square planar.
    d. trigonal planar.
    e. square pyramidal.

4. The shape of the thiosulfate ion, $S_2O_3^{2-}$, would best be described
    as
    a. bent.
    b. square planar.

c. tetrahedral.
d. trigonal bipyramidal.
e. pyramidal.

5. The approximate H–C–C bond angle in ethane, C_2H_6, is
    a. 90ø.
    b. 109ø.
    c. 60ø.
    d. 180ø.
    e. 120ø.

6. A nitrogen atom is the central atom in laughing gas, N_2O,
    dinitrogen oxide, which has the following characteristics:
    a. trigonal planar, nonpolar.
    b. linear, nonpolar.
    c. linear, polar.
    d. bent, nonpolar.
    e. bent, polar.

7. The H–N–H bond angle in ammonia
    a. slightly less than 120ø
    b. 120ø
    c. 180ø
    d. 109ø
    e. slightly less than 109ø

8. The tetrahedral bond angle is
    a. 180ø.
    b. 90ø.
    c. 120ø.
    d. 72ø.
    e. 109.5ø.

9. The bonding in ketene, H_2CCO, is best described as
    a. five ã bonds.
    b. four â bonds and one ã bond.
    c. three â bonds and two ã bonds.
    d. four â bonds and two ã bonds.
    e. five â bonds.

10. The carbon-carbon-carbon bond angle in H_2CCCH_2 is
    a. 120ø.
    b. 150ø.
    c. 90ø.
    d. 180ø.
    e. 109ø.

Chemistry 1411
General Chemistry I

Chapter 11 Review

1. Which of the following compounds is expected to have the **HIGHEST**
    boiling point?
    a. CH_3OCH_3
    b. $CH_3CH_2CH_3$
    c. $CH_3CH_2CH_2CH_3$
    d. CH_3CH_2OH
    e. CH_3Cl

2. Which of the following compounds is expected to have the **HIGHEST**
    vapor pressure?
    a. CH_3CH_2OH
    b. $CH_3CH_2CH_2Cl$
    c. $CH_3CH_2CH_2CH_3$
    d. CH_3OCH_3
    e. $CH_3CH_2CH_3$

3. Which of the following would be expected to have the highest heat
    of vaporization?
    a. SbH_3
    b. H_2O
    c. PH_3
    d. AsH_3
    e. NH_3

4. The **STRONGEST** intermolecular forces between molecules of NH_3 are
    a. London forces.
    b. ionÄdipole attractions.
    c. hydrogen bonds.
    d. covalent bonds.
    e. ionic bonds.

5. How many atoms are there in a body-centered cubic unit cell of
    tungsten?
    a. 6
    b. 4
    c. 8
    d. 1
    e. 2

6. Which of the following phase changes are exothermic?

        1. vaporization
        2. sublimation
        3. condensation
    a. 2 and 3 only
    b. 2 only
    c. 3 only
    d. 1 and 2 only
    e. 1 only

7. The normal boiling point of a liquid is
    a. the temperature at which there can be equilibrium between the liquid and gas states which the substance cannot exist as a liquid regardless of the pressure.
    b. none of these.
    c. the only temperature at which there can be equilibrium between the liquid and gas states.
    d. the temperature at which the vapor pressure equals 760 mmHg.
    e. the temperature at which gas molecules have more kinetic energy than molecules in the liquid.

8. From a consideration of the phase diagram below, a change from point M to point N corresponds to
    a. freezing.
    b. liquefaction.
    c. condensation.
    d. evaporation.
    e. sublimation.
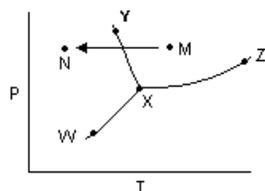
9. The melting point of benzene at 1 atm is 5.5øC. The density of liquid benzene is 0.90 g/mL, and that of the solid is 1.0 g cm^3. At an applied pressure of 10 atm, the melting point of benzene is
    a. slightly less than 5.5øC.
    b. slightly greater than 5.5øC.
    c. much greater than 5.5øC.
    d. equal to 5.5øC.
    e. much less than 5.5øC.