Practice Exam #2 Chapters 2 and 3

1) When the following equation is balanced, the coefficients are _____.

$$C_8H_{18} + O_2 \rightarrow CO_2 + H_2O$$

A) 2, 3, 4, 4
B) 1, 4, 8, 9
C) 2, 12, 8, 9
D) 4, 4, 32, 36
E) 2, 25, 16, 18

2) Which of the following are combustion reactions?
1) CH_4 (g) + O_2 (g) → CO_2 (g) + H_2O (l)
2) CaO (s) + CO_2 (g) → $CaCO_3$ (s)
3) $PbCO_3$ (s) → PbO (s) + CO_2 (g)
4) CH_3OH (l) + O_2 (g) → CO_2 (g) + H_2O (l)

A) 1 and 4
B) 1, 2, 3, and 4
C) 1, 3, and 4
D) 2, 3, and 4
E) 3 and 4

3) The molecular weight of the acetic acid (CH_3CO_2H), rounded to the nearest integer, is _____ amu.

A) 60
B) 48
C) 44
D) 32

4) Calculate the percentage by mass of lead in $Pb(NO_3)_2$.

A) 38.6
B) 44.5
C) 62.6
D) 65.3
E) 71.2

5) How many molecules of CH_4 are in 48.2 g of this compound?

A) 5.00×10^{24}
B) 3.00
C) 2.90×10^{25}
D) 1.81×10^{24}
E) 4.00

6) How many sulfur dioxide molecules are there in 1.80 mol of sulfur dioxide?

A) 1.08×10^{23}

B) 6.02×10^{24}

C) 1.80×10^{24}

D) 1.08×10^{24}

E) 6.02×10^{23}

7) How many oxygen atoms are there in 52.06 g of carbon dioxide?

A) 1.424×10^{24}

B) 6.022×10^{23}

C) 1.204×10^{24}

D) 5.088×10^{23}

E) 1.018×10^{24}

8) Of the reactions below, which one is a decomposition reaction?

A) $NH_4Cl \rightarrow NH_3 + HCl$

B) $2Mg + O_2 \rightarrow 2MgO$

C) $2N_2 + 3H_2 \rightarrow 2NH_3$

D) $2CH_4 + 4O_2 \rightarrow 2CO_2 + 4H_2O$

E) $Cd(NO_3)_2 + Na_2S \rightarrow CdS + 2NaNO_3$

9) Which one of the following substances is the product of this combination reaction?

$Al\ (s) + I_2\ (s) \rightarrow$ _____

A) AlI_2

B) AlI

C) AlI_3

D) Al_2I_3

E) Al_3I_2

10) The formula weight of lead nitrate ($Pb(NO_3)_2$) is _____ amu.

A) 269.2

B) 285.2

C) 317.2

D) 331.2

E) 538.4

11) A nitrogen oxide is 63.65% by mass nitrogen. The molecular formula could be _____.
A) NO
B) NO_2
C) N_2O
D) N_2O_4
E) either NO_2 or N_2O_4

12) The balanced molecular equation for complete neutralization of H_2SO_4 by KOH in aqueous solution is _____.
A) $2H^+ (aq) + 2OH^- (aq) \rightarrow 2H_2O (l)$
B) $2H^+ (aq) + 2KOH (aq) \rightarrow 2H_2O (l) + 2K^+ (aq)$
C) $H_2SO_4 (aq) + 2OH^- (aq) \rightarrow 2H_2O (l) + SO_4^{2-} (aq)$
D) $H_2SO_4 (aq) + 2KOH (aq) \rightarrow 2H_2O (l) + K_2SO_4 (s)$
E) $H_2SO_4 (aq) + 2KOH (aq) \rightarrow 2H_2O (l) + K_2SO_4 (aq)$

13) Aqueous potassium chloride will react with which one of the following in an exchange (metathesis) reaction?
A) calcium nitrate
B) sodium bromide
C) lead nitrate
D) barium nitrate
E) sodium chloride

14) The net ionic equation for formation of an aqueous solution of NiI_2 accompanied by evolution of CO_2 gas via mixing solid $NiCO_3$ and aqueous hydriodic acid is _____.
A) $2NiCO_3 (s) + HI (aq) \rightarrow 2H_2O (l) + CO_2 (g) + 2Ni^{2+} (aq)$
B) $NiCO_3 (s) + I^- (aq) \rightarrow 2H_2O (l) + CO_2 (g) + Ni^{2+} (aq) + HI (aq)$
C) $NiCO_3 (s) + 2H^+ (aq) \rightarrow H_2O (l) + CO_2 (g) + Ni^{2+} (aq)$
D) $NiCO_3 (s) + 2HI (aq) \rightarrow 2H_2O (l) + CO_2 (g) + NiI_2 (aq)$
E) $NiCO_3 (s) + 2HI (aq) \rightarrow H_2O (l) + CO_2 (g) + Ni^{2+} (aq) + 2I^- (aq)$

15) With which of the following will the ammonium ion form an insoluble salt?
A) chloride
B) sulfate
C) carbonate
D) sulfate and carbonate
E) none of the above

16) Which one of the following is a diprotic acid?
A) nitric acid
B) chloric acid
C) phosphoric acid
D) hydrofluoric acid
E) sulfuric acid

17) In which reaction does the oxidation number of hydrogen change?
A) $HCl\ (aq) + NaOH\ (aq) \rightarrow NaCl\ (aq) + H_2O\ (l)$
B) $2Na\ (s) + 2H_2O\ (l) \rightarrow 2NaOH\ (aq) + H_2\ (g)$
C) $CaO\ (s) + H_2O\ (l) \rightarrow Ca(OH)_2\ (s)$
D) $2HClO_4\ (aq) + CaCO_3\ (s) \rightarrow Ca(ClO_4)_2\ (aq) + H_2O\ (l) + CO_2\ (g)$
E) $SO_2\ (g) + H_2O\ (l) \rightarrow H_2SO_3\ (aq)$

18) Sodium does not occur in nature as Na (s) because _____.
A) it is easily reduced to Na^-
B) it is easily oxidized to Na^+
C) it reacts with water with great difficulty
D) it is easily replaced by silver in its ores
E) it undergoes a disproportionation reaction to Na^- and Na^+

19) Oxidation is the _____ and reduction is the _____.
A) gain of oxygen, loss of electrons
B) loss of oxygen, gain of electrons
C) loss of electrons, gain of electrons
D) gain of oxygen, loss of mass
E) gain of electrons, loss of electrons

20) In which reaction does the oxidation number of oxygen increase?
A) $Ba(NO_3)_2\ (aq) + K_2SO_4\ (aq) \rightarrow BaSO_4\ (s) + 2KNO_3\ (aq)$
B) $HCl\ (aq) + NaOH\ (aq) \rightarrow NaCl\ (aq) + H_2O\ (l)$
C) $MgO\ (s) + H_2O\ (l) \rightarrow Mg(OH)_2\ (s)$
D) $2SO_2\ (g) + O_2\ (g) \rightarrow 2SO_3\ (g)$
E) $2H_2O\ (l) \rightarrow 2H_2\ (g) + O_2\ (g)$

21) Which compound has the atom with the highest oxidation number?
A) CaS
B) Na_3N
C) $MgSO_3$
D) $Al(NO_2)_3$
E) NH_4Cl

22) Which combination will produce a precipitate?
A) $NH_4OH\ (aq)$ and $HCl\ (aq)$
B) $AgNO_3\ (aq)$ and $Ca(C_2H_3O_2)_2\ (aq)$
C) $NaOH\ (aq)$ and $HCl\ (aq)$
D) $NaCl\ (aq)$ and $HC_2H_3O_2\ (aq)$
E) $NaOH\ (aq)$ and $Fe(NO_3)_2\ (aq)$

23) When the following equation is balanced, the coefficients are _____.

____$Al(NO_3)_3$ (aq) + ___Na_2S (aq) → _____Al_2S_3 (s) + _____$NaNO_3$ (aq)

24) Calculate the percentage by mass of nitrogen in $PtCl_2(NH_3)_2$.

25) Propane (C_3H_8) reacts with oxygen in the air to produce carbon dioxide and water. In a particular experiment, 38.0 grams of carbon dioxide are produced from the reaction of 22.05 grams of propane with excess oxygen. What is the percent yield in this reaction?

26a.) Given the following balanced chemical equation, if you consumed 0.642 moles of $C_3H_8O_3$ in the reaction, how many moles of CO_2 would be made?

26b.) If 42 grams of water were produced in this reaction, how many grams of O_2 were consumed?

$$C_3H_8O_3\ (g) + 5\ O_2\ (g) \rightarrow 3\ CO_2\ (g) + 4\ H_2O\ (g)$$

27) What is the molecular, ionic, and net ionic equation for the reaction between aqueous sulfuric acid and aqueous sodium hydroxide:

Molecular equation:

Ionic Equation:

Net Ionic Equation:

28a.) If you need to make a 1L solution of 1.25 M Na_2HPO_4 buffer, how many grams of Na_2HPO_4 (142 g/mol) would you have to add to make that 1L solution?

28b.) How many milliliters of that solution 1.25 M solution would you need if you then had to make a 2 L solution that was 0.16 M Na_2HPO_4?

Key Equations:

$M_i V_i = M_f V_f$ $\qquad$ $Molarity = \frac{moles}{liter}$

$$\%\ Mass\ composition = \frac{(number\ of\ atoms\ of\ element)(atomic\ weight\ of\ element)}{formula\ weight\ of\ the\ compound} x\ 100$$

$$\%\ Yield = \frac{actual\ yield}{theoretical\ yield}\ x\ 100$$

Periodic Table of the Elements

	Main Group Representative Elements												Main Group Representative Elements					
	1A[a] 1																	8A 18
1	1 **H** 1.00794	2A 2											3A 13	4A 14	5A 15	6A 16	7A 17	2 **He** 4.002602
2	3 **Li** 6.941	4 **Be** 9.012182											5 **B** 10.811	6 **C** 12.0107	7 **N** 14.0067	8 **O** 15.9994	9 **F** 18.998403	10 **Ne** 20.1797
3	11 **Na** 22.989770	12 **Mg** 24.3050	3B 3	4B 4	5B 5	6B 6	7B 7	8B 8	8B 9	8B 10	1B 11	2B 12	13 **Al** 26.981538	14 **Si** 28.0855	15 **P** 30.973761	16 **S** 32.065	17 **Cl** 35.453	18 **Ar** 39.948
4	19 **K** 39.0983	20 **Ca** 40.078	21 **Sc** 44.955910	22 **Ti** 47.867	23 **V** 50.9415	24 **Cr** 51.9961	25 **Mn** 54.938049	26 **Fe** 55.845	27 **Co** 58.933200	28 **Ni** 58.6934	29 **Cu** 63.546	30 **Zn** 65.39	31 **Ga** 69.723	32 **Ge** 72.64	33 **As** 74.92160	34 **Se** 78.96	35 **Br** 79.904	36 **Kr** 83.80
5	37 **Rb** 85.4678	38 **Sr** 87.62	39 **Y** 88.90585	40 **Zr** 91.224	41 **Nb** 92.90638	42 **Mo** 95.94	43 **Tc** [98]	44 **Ru** 101.07	45 **Rh** 102.90550	46 **Pd** 106.42	47 **Ag** 107.8682	48 **Cd** 112.411	49 **In** 114.818	50 **Sn** 118.710	51 **Sb** 121.760	52 **Te** 127.60	53 **I** 126.90447	54 **Xe** 131.293
6	55 **Cs** 132.90545	56 **Ba** 137.327	71 **Lu** 174.967	72 **Hf** 178.49	73 **Ta** 180.9479	74 **W** 183.84	75 **Re** 186.207	76 **Os** 190.23	77 **Ir** 192.217	78 **Pt** 195.078	79 **Au** 196.96655	80 **Hg** 200.59	81 **Tl** 204.3833	82 **Pb** 207.2	83 **Bi** 208.98038	84 **Po** [208.98]	85 **At** [209.99]	86 **Rn** [222.02]
7	87 **Fr** [223.02]	88 **Ra** [226.03]	103 **Lr** [262.11]	104 **Rf** [261.11]	105 **Db** [262.11]	106 **Sg** [266.12]	107 **Bh** [264.12]	108 **Hs** [269.13]	109 **Mt** [268.14]	110 **Ds** [281.15]	111 **Rg** [272.15]	112 **Cn** [285]	113 [284]	114 [289]	115 [288]	116 [292]	117 ** [294]	118 [294]

Metals Metalloids Nonmetals

Transition metals

Lanthanide series	57 **La** 138.9055	58 **Ce** 140.116	59 **Pr** 140.90765	60 **Nd** 144.24	61 **Pm** [145]	62 **Sm** 150.36	63 **Eu** 151.964	64 **Gd** 157.25	65 **Tb** 158.92534	66 **Dy** 162.50	67 **Ho** 164.93032	68 **Er** 167.259	69 **Tm** 168.93421	70 **Yb** 173.04
Actinide series	89 **Ac** [227.03]	90 **Th** 232.0381	91 **Pa** 231.03588	92 **U** 238.02891	93 **Np** [237.05]	94 **Pu** [244.06]	95 **Am** [243.06]	96 **Cm** [247.07]	97 **Bk** [247.07]	98 **Cf** [251.08]	99 **Es** [252.08]	100 **Fm** [257.10]	101 **Md** [258.10]	102 **No** [259.10]