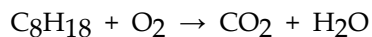


Practice Exam #2 Chapters 2 and 3

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



- 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) $\text{CH}_4(\text{g}) + \text{O}_2(\text{g}) \rightarrow \text{CO}_2(\text{g}) + \text{H}_2\text{O}(\text{l})$
- 2) $\text{CaO}(\text{s}) + \text{CO}_2(\text{g}) \rightarrow \text{CaCO}_3(\text{s})$
- 3) $\text{PbCO}_3(\text{s}) \rightarrow \text{PbO}(\text{s}) + \text{CO}_2(\text{g})$
- 4) $\text{CH}_3\text{OH}(\text{l}) + \text{O}_2(\text{g}) \rightarrow \text{CO}_2(\text{g}) + \text{H}_2\text{O}(\text{l})$

- 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 ($\text{CH}_3\text{CO}_2\text{H}$), rounded to the nearest integer, is _____ amu.

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

4) Calculate the percentage by mass of lead in $\text{Pb}(\text{NO}_3)_2$.

- 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}

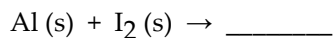
7) How many oxygen atoms are there in 52.06 g of carbon dioxide?

- 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) $\text{NH}_4\text{Cl} \rightarrow \text{NH}_3 + \text{HCl}$
- B) $2\text{Mg} + \text{O}_2 \rightarrow 2\text{MgO}$
- C) $2\text{N}_2 + 3\text{H}_2 \rightarrow 2\text{NH}_3$
- D) $2\text{CH}_4 + 4\text{O}_2 \rightarrow 2\text{CO}_2 + 4\text{H}_2\text{O}$
- E) $\text{Cd}(\text{NO}_3)_2 + \text{Na}_2\text{S} \rightarrow \text{CdS} + 2\text{NaNO}_3$

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



- A) AlI_2
- B) AlI
- C) AlI_3
- D) Al_2I_3
- E) Al_3I_2

10) The formula weight of lead nitrate ($\text{Pb}(\text{NO}_3)_2$) 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) NO₂
 - C) N₂O
 - D) N₂O₄
 - E) either NO₂ or N₂O₄
- 12) The balanced molecular equation for complete neutralization of H₂SO₄ by KOH in aqueous solution is _____.
- A) $2\text{H}^+(\text{aq}) + 2\text{OH}^-(\text{aq}) \rightarrow 2\text{H}_2\text{O}(\text{l})$
 - B) $2\text{H}^+(\text{aq}) + 2\text{KOH}(\text{aq}) \rightarrow 2\text{H}_2\text{O}(\text{l}) + 2\text{K}^+(\text{aq})$
 - C) $\text{H}_2\text{SO}_4(\text{aq}) + 2\text{OH}^-(\text{aq}) \rightarrow 2\text{H}_2\text{O}(\text{l}) + \text{SO}_4^{2-}(\text{aq})$
 - D) $\text{H}_2\text{SO}_4(\text{aq}) + 2\text{KOH}(\text{aq}) \rightarrow 2\text{H}_2\text{O}(\text{l}) + \text{K}_2\text{SO}_4(\text{s})$
 - E) $\text{H}_2\text{SO}_4(\text{aq}) + 2\text{KOH}(\text{aq}) \rightarrow 2\text{H}_2\text{O}(\text{l}) + \text{K}_2\text{SO}_4(\text{aq})$
- 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 NiI₂ accompanied by evolution of CO₂ gas via mixing solid NiCO₃ and aqueous hydriodic acid is _____.
- A) $2\text{NiCO}_3(\text{s}) + \text{HI}(\text{aq}) \rightarrow 2\text{H}_2\text{O}(\text{l}) + \text{CO}_2(\text{g}) + 2\text{Ni}^{2+}(\text{aq})$
 - B) $\text{NiCO}_3(\text{s}) + \text{I}^-(\text{aq}) \rightarrow 2\text{H}_2\text{O}(\text{l}) + \text{CO}_2(\text{g}) + \text{Ni}^{2+}(\text{aq}) + \text{HI}(\text{aq})$
 - C) $\text{NiCO}_3(\text{s}) + 2\text{H}^+(\text{aq}) \rightarrow \text{H}_2\text{O}(\text{l}) + \text{CO}_2(\text{g}) + \text{Ni}^{2+}(\text{aq})$
 - D) $\text{NiCO}_3(\text{s}) + 2\text{HI}(\text{aq}) \rightarrow 2\text{H}_2\text{O}(\text{l}) + \text{CO}_2(\text{g}) + \text{NiI}_2(\text{aq})$
 - E) $\text{NiCO}_3(\text{s}) + 2\text{HI}(\text{aq}) \rightarrow \text{H}_2\text{O}(\text{l}) + \text{CO}_2(\text{g}) + \text{Ni}^{2+}(\text{aq}) + 2\text{I}^-(\text{aq})$
- 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) $\text{HCl (aq)} + \text{NaOH (aq)} \rightarrow \text{NaCl (aq)} + \text{H}_2\text{O (l)}$
- B) $2\text{Na (s)} + 2\text{H}_2\text{O (l)} \rightarrow 2\text{NaOH (aq)} + \text{H}_2 \text{ (g)}$
- C) $\text{CaO (s)} + \text{H}_2\text{O (l)} \rightarrow \text{Ca(OH)}_2 \text{ (s)}$
- D) $2\text{HClO}_4 \text{ (aq)} + \text{CaCO}_3 \text{ (s)} \rightarrow \text{Ca(ClO}_4)_2 \text{ (aq)} + \text{H}_2\text{O (l)} + \text{CO}_2 \text{ (g)}$
- E) $\text{SO}_2 \text{ (g)} + \text{H}_2\text{O (l)} \rightarrow \text{H}_2\text{SO}_3 \text{ (aq)}$

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) $\text{Ba(NO}_3)_2 \text{ (aq)} + \text{K}_2\text{SO}_4 \text{ (aq)} \rightarrow \text{BaSO}_4 \text{ (s)} + 2\text{KNO}_3 \text{ (aq)}$
- B) $\text{HCl (aq)} + \text{NaOH (aq)} \rightarrow \text{NaCl (aq)} + \text{H}_2\text{O (l)}$
- C) $\text{MgO (s)} + \text{H}_2\text{O (l)} \rightarrow \text{Mg(OH)}_2 \text{ (s)}$
- D) $2\text{SO}_2 \text{ (g)} + \text{O}_2 \text{ (g)} \rightarrow 2\text{SO}_3 \text{ (g)}$
- E) $2\text{H}_2\text{O (l)} \rightarrow 2\text{H}_2 \text{ (g)} + \text{O}_2 \text{ (g)}$

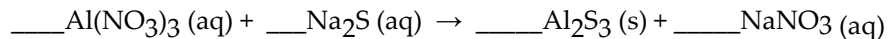
21) Which compound has the atom with the highest oxidation number?

- A) CaS
- B) Na_3N
- C) MgSO_3
- D) $\text{Al(NO}_2)_3$
- E) NH_4Cl

22) Which combination will produce a precipitate?

- A) $\text{NH}_4\text{OH (aq)}$ and HCl (aq)
- B) $\text{AgNO}_3 \text{ (aq)}$ and $\text{Ca(C}_2\text{H}_3\text{O}_2)_2 \text{ (aq)}$
- C) NaOH (aq) and HCl (aq)
- D) NaCl (aq) and $\text{HC}_2\text{H}_3\text{O}_2 \text{ (aq)}$
- E) NaOH (aq) and $\text{Fe(NO}_3)_2 \text{ (aq)}$

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

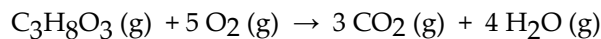


24) Calculate the percentage by mass of nitrogen in $\text{PtCl}_2(\text{NH}_3)_2$.

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 $\text{C}_3\text{H}_8\text{O}_3$ 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?



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 Na₂HPO₄ buffer, how many grams of Na₂HPO₄ (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 Na₂HPO₄?

Key Equations:

$$M_i V_i = M_f V_f$$

$$\text{Molarity} = \frac{\text{moles}}{\text{liter}}$$

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

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

Periodic Table of the Elements

Main Group Representative Elements										Main Group Representative Elements									
										8A 18									
										2 He 4.002602									
										3A 13 4A 14 5A 15 6A 16 7A 17									
										5 B 6 C 7 N 8 O 9 F 10 Ne									
										10.811 12.0107 14.0067 15.9994 18.998403 20.1797									
										13 Al 14 Si 15 P 16 S 17 Cl 18 Ar									
										26.981538 28.0855 30.973761 32.065 35.453 39.948									
										31 Ga 32 Ge 33 As 34 Se 35 Br 36 Kr									
										69.723 72.64 74.92160 78.96 79.904 83.80									
										49 In 50 Sn 51 Sb 52 Te 53 I 54 Xe									
										114.818 118.710 121.760 127.60 126.90447 131.293									
										85 Cs 86 Ba 87 La 88 Ce 89 Pr 90 Nd 91 Pm 92 Sm 93 Eu 94 Gd 95 Tb 96 Dy 97 Ho 98 Er 99 Tm 100 Yb 101 Lu 102 Hf 103 Ta 104 W 105 Re 106 Os 107 Ir 108 Pt 109 Au 110 Hg 111 Tl 112 Pb 113 Bi 114 Po 115 At 116 Rn 117 Fr 118 Ra 119 Ac 120 Th 121 Pa 122 U 123 Np 124 Pu 125 Am 126 Cm 127 Bk 128 Cf 129 Es 130 Fm 131 Md 132 No 133 Lr									
										132.90545 137.327 174.967 178.49 180.9479 183.84 186.207 190.23 192.217 195.078 196.96655 200.59 204.3833 207.2 208.98038 [208.98] [209.99] [222.02]									
										85 Cs 86 Ba 87 La 88 Ce 89 Pr 90 Nd 91 Pm 92 Sm 93 Eu 94 Gd 95 Tb 96 Dy 97 Ho 98 Er 99 Tm 100 Yb 101 Lu 102 Hf 103 Ta 104 W 105 Re 106 Os 107 Ir 108 Pt 109 Au 110 Hg 111 Tl 112 Pb 113 Bi 114 Po 115 At 116 Rn 117 Fr 118 Ra 119 Ac 120 Th 121 Pa 122 U 123 Np 124 Pu 125 Am 126 Cm 127 Bk 128 Cf 129 Es 130 Fm 131 Md 132 No 133 Lr									
										[223.02] [226.03] [262.11] [261.11] [262.11] [266.12] [264.12] [269.13] [268.14] [281.15] [272.15] [285] [284] [289] [288] [292] [294] [294]									

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]