

**Name:****Score:** 0 / 25 points (0%) [2 open-ended questions not graded]

## Chapters3&4

### True/False

Indicate whether the statement is true or false.



- \_\_\_ 1. The quantity of product that is calculated to form when all of the limiting reagent reacts is called the actual yield.

**ANSWER:** F**POINTS:** 0 / 1

- \_\_\_ 2. The molecular weight is ALWAYS a whole-number multiple of the empirical formula weight.

**ANSWER:** T**POINTS:** 0 / 1

### Multiple Choice

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



- \_\_\_ 3. When the following equation is balanced, the coefficients are \_\_\_\_\_.




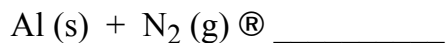
- a. 1, 1, 1, 1
- b. 4, 7, 4, 6
- c. 2, 3, 2, 3
- d. 1, 3, 1, 2
- e. 4, 3, 4, 3

**ANSWER:** B**POINTS:** 0 / 1

- \_\_\_ 4. Write the balanced equation for the reaction that occurs when methanol,  $\text{CH}_3\text{OH} (\text{l})$ , is burned in air. What is the coefficient of oxygen in the balanced equation?

- a. 1
- b. 2
- c. 3
- d. 4
- e. 3/2


**ANSWER:** C

**POINTS: 0 / 1** \_\_\_\_\_ 5. Predict the product in the combination reaction below.


- a. AlN
- b. Al<sub>3</sub>N
- c. AlN<sub>2</sub>
- d. Al<sub>3</sub>N<sub>2</sub>
- e. AlN<sub>3</sub>

**ANSWER: A****POINTS: 0 / 1** \_\_\_\_\_ 6. There are \_\_\_\_\_ mol of carbon atoms in 4 mol of dimethylsulfoxide (C<sub>2</sub>H<sub>6</sub>SO).

- a. 2
- b. 6
- c. 8
- d. 4
- e. 3

**ANSWER: C****POINTS: 0 / 1** \_\_\_\_\_ 7. There are \_\_\_\_\_ sulfur atoms in 25 molecules of C<sub>4</sub>H<sub>4</sub>S<sub>2</sub>.

- a.  $1.5 \times 10^{25}$
- b.  $4.8 \times 10^{25}$
- c.  $3.0 \times 10^{25}$
- d. 50
- e.  $6.02 \times 10^{23}$

**ANSWER: D****POINTS: 0 / 1** \_\_\_\_\_ 8. How many grams of hydrogen are in 46 g of CH<sub>4</sub>O?

- a. 5.8
- b. 1.5
- c. 2.8
- d. 0.36
- e. 184


**ANSWER: A****POINTS: 0 / 1** \_\_\_\_\_ 9. A 22.5-g sample of ammonium carbonate contains \_\_\_\_\_ mol of ammonium ions.

- a. 0.468

- b. 0.288
- c. 0.234
- d. 2.14
- e. 3.47


**ANSWER: A**

**POINTS: 0 / 1**

-  10. What is the empirical formula of a compound that contains 27.0% S, 13.4% O, and 59.6% Cl by mass?
- a. SOCl
  - b. SOCl<sub>2</sub>
  - c. S<sub>2</sub>OCl
  - d. SO<sub>2</sub>Cl
  - e. ClSO<sub>4</sub>


**ANSWER: B**

**POINTS: 0 / 1**

-  11. A compound contains 40.0% C, 6.71% H, and 53.29% O by mass. The molecular weight of the compound is 60.05 amu. The molecular formula of this compound is \_\_\_\_\_.
- a. C<sub>2</sub>H<sub>4</sub>O<sub>2</sub>
  - b. CH<sub>2</sub>O
  - c. C<sub>2</sub>H<sub>3</sub>O<sub>4</sub>
  - d. C<sub>2</sub>H<sub>2</sub>O<sub>4</sub>
  - e. CHO<sub>2</sub>


**ANSWER: A**

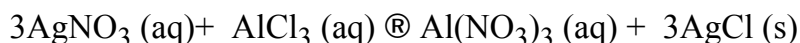
**POINTS: 0 / 1**

-  12. Combustion of a 1.031-g sample of a compound containing only carbon, hydrogen, and oxygen produced 2.265 g of CO<sub>2</sub> and 1.236 g of H<sub>2</sub>O. What is the empirical formula of the compound?
- a. C<sub>3</sub>H<sub>8</sub>O
  - b. C<sub>3</sub>H<sub>5</sub>O
  - c. C<sub>6</sub>H<sub>16</sub>O<sub>2</sub>
  - d. C<sub>3</sub>H<sub>9</sub>O<sub>3</sub>
  - e. C<sub>3</sub>H<sub>6</sub>O<sub>3</sub>

**ANSWER: A**

**POINTS: 0 / 1**

-  13. Silver nitrate and aluminum chloride react with each other by exchanging anions:



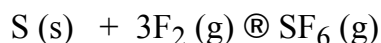
What mass in grams of AgCl is produced when 4.22 g of AgNO<sub>3</sub> react with 7.73 g of AlCl<sub>3</sub>?

- a. 17.6
- b. 4.22
- c. 24.9
- d. 3.56
- e. 11.9

**ANSWER: D**

**POINTS: 0 / 1**

 14. Sulfur and fluorine react in a combination reaction to produce sulfur hexafluoride:




In a particular experiment, the percent yield is 79.0%. This means that in this experiment, a 7.90-g sample of fluorine yields \_\_\_\_\_ g of SF<sub>6</sub>.

- a. 30.3
- b. 10.1
- c. 7.99
- d. 24.0
- e. 0.110

**ANSWER: C**


**POINTS: 0 / 1**

 15. When a hydrocarbon burns in air, what component of air reacts?

- a. oxygen
- b. nitrogen
- c. carbon dioxide
- d. water
- e. argon

**ANSWER: A**


**POINTS: 0 / 1**

 16. 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.  $\text{Cd}(\text{NO}_3)_2 + \text{Na}_2\text{S} \rightarrow \text{CdS} + 2\text{NaNO}_3$


**ANSWER: A**

**POINTS: 0 / 1**

-  \_\_\_\_\_ 17. Which one of the following is not true concerning automotive air bags?
- They are inflated as a result of a decomposition reaction
  - They are loaded with sodium azide initially
  - The gas used for inflating them is oxygen
  - The two products of the decomposition reaction are sodium and nitrogen
  - A gas is produced when the air bag activates.


**ANSWER: C**

**POINTS: 0 / 1**

-  \_\_\_\_\_ 18. The formula of nitrobenzene is  $C_6H_5NO_2$ . The molecular weight of this compound is \_\_\_\_\_ amu.
- 107.11
  - 43.03
  - 109.10
  - 123.11
  - 3.06


**ANSWER: D**

**POINTS: 0 / 1**

-  \_\_\_\_\_ 19. One mole of \_\_\_\_\_ contains the largest number of atoms.
- $S_8$
  - $C_{10}H_8$
  - $Al_2(SO_4)_3$
  - $Na_3PO_4$
  - $Cl_2$


**ANSWER: B**

**POINTS: 0 / 1**

-  \_\_\_\_\_ 20. One million argon atoms is \_\_\_\_\_ mol (rounded to two significant figures) of argon atoms.
- 3.0
  - $1.7 \times 10^{-18}$
  - $6.0 \times 10^{23}$
  - $1.0 \times 10^{-6}$
  - $1.0 \times 10^{+6}$

**ANSWER: B**


**POINTS: 0 / 1**

-  \_\_\_\_\_ 21. Gaseous argon has a density of 1.40 g/L at standard conditions. How many argon atoms are in 1.00 L of argon gas at standard conditions?
- $4.76 \times 10^{22}$
  - $3.43 \times 10^{25}$

- c.  $2.11 \times 10^{22}$
- d.  $1.59 \times 10^{25}$
- e.  $6.02 \times 10^{23}$


**ANSWER: C**

**POINTS: 0 / 1**

-  22. A nitrogen oxide is 63.65% by mass nitrogen. The molecular formula could be \_\_\_\_\_.
- a. NO
  - b. NO<sub>2</sub>
  - c. N<sub>2</sub>O
  - d. N<sub>2</sub>O<sub>4</sub>
  - e. either NO<sub>2</sub> or N<sub>2</sub>O<sub>4</sub>


**ANSWER: C**

**POINTS: 0 / 1**

-  23. Which hydrocarbon pair below have identical mass percentage of C?
- a. C<sub>3</sub>H<sub>4</sub> and C<sub>3</sub>H<sub>6</sub>
  - b. C<sub>2</sub>H<sub>4</sub> and C<sub>3</sub>H<sub>4</sub>
  - c. C<sub>2</sub>H<sub>4</sub> and C<sub>4</sub>H<sub>2</sub>
  - d. C<sub>2</sub>H<sub>4</sub> and C<sub>3</sub>H<sub>6</sub>
  - e. none of the above


**ANSWER: D**

**POINTS: 0 / 1**

-  24. Propane (C<sub>3</sub>H<sub>8</sub>) 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 % yield in this reaction?
- a. 38.0
  - b. 57.6
  - c. 66.0
  - d. 86.4
  - e. 94.5

**ANSWER: B**

**POINTS: 0 / 1**

-  25. Automotive air bags inflate when sodium azide decomposes explosively to its constituent elements:



How many moles of N<sub>2</sub> are produced by the decomposition of 2.88 mol of sodium azide?

- a. 1.92
- b. 8.64
- c. 4.32
- d. 0.960
- e. 1.44

**ANSWER: C**

**POINTS: 0 / 1**

### Problem



26. Show all work on the following problem: 6.8360g of aqueous calcium hydroxide are combined in a beaker with 5.0999g of aqueous sodium sulfate. (29 pts.)
- a. Write the balanced molecular equation.
  - b. Determine the limiting reagent.
  - c. Determine which product is the precipitate.
  - d. Calculate the theoretical mass of the precipitate produced.
  - e. Calculate the percent yield if 3.0575g of the precipitate are actually produced.

**RESPONSE:**

**ANSWER:**

- a.  $\text{Ca}(\text{OH})_2(\text{aq}) + \text{Na}_2\text{SO}_4(\text{aq}) \rightarrow \text{CaSO}_4(\text{s}) + 2\text{NaOH}(\text{aq})$
- b.  $\text{Na}_2\text{SO}_4$
- c.  $\text{CaSO}_4$
- d. 4.89g of  $\text{CaSO}_4$
- e. 62.6% yield

**POINTS: -- / 29**



27. Show all work on the following problem: Potassium dichromate is used to titrate a sample containing an unknown percentage of iron. The sample is dissolved in  $\text{H}_3\text{PO}_4/\text{H}_2\text{SO}_4$  mixture to reduce all of the iron to  $\text{Fe}^{2+}$  ions. The solution is then titrated with 0.01625M  $\text{K}_2\text{Cr}_2\text{O}_7$ , producing  $\text{Fe}^{3+}$  and  $\text{Cr}^{3+}$  ions in acidic solution. The titration requires 32.26mL of  $\text{K}_2\text{Cr}_2\text{O}_7$  for 1.2765g of the sample. (46 pts.)
- a. Balance the net ionic equation using the half-reaction method.
  - b. Determine the percent iron in the sample.
  - c. Is the sample ferrous iodate, ferrous phosphate, or ferrous acetate?

**RESPONSE:**

**ANSWER:**

- a.  $6\text{Fe}^{2+} + \text{Cr}_2\text{O}_7^{2-} + 14\text{H}^{1+} \rightarrow 6\text{Fe}^{3+} + 2\text{Cr}^{3+} + 7\text{H}_2\text{O}$
- b. 13.8% Fe
- c. ferrous iodate

**POINTS: -- / 46**

