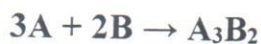


# Second - Midterm Exam

Name:	Student ID No:
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**Choose the correct choice and write your answer in the table below**

- 1) How many phosphate ions are present in  $3.01 \times 10^{23}$  formula units of  $\text{Cu}_3(\text{PO}_4)_2$ ?  
 (A) 2 ions      (B) 3 ions      (C)  $6.02 \times 10^{23}$  ions      (D)  $1.2 \times 10^{24}$  ions
- 
- 2) A gas sample contains 16.0 g of  $\text{CH}_4$  and 16.0 g of  $\text{O}_2$ . What is the total number of moles of the gas in the sample?  
 (A) 0.500 mol      (B) 15.0 mol      (C) 1.50 mol      (D) 1.00 mol  
*Handwritten:  $\text{CH}_4 \frac{16\text{g}}{16} = 1 \text{ mol}$ ,  $\text{O}_2 \frac{16\text{g}}{32} = 0.5 \text{ mol}$*
- 
- 3) How many moles of chloride ions are present in a 66.7g sample of  $\text{AlCl}_3$ ?  
 (A) 1.0 mol      (B) 1.33 mol      (C) 2.0 mol      (D) 1.5 mol  
*Handwritten:  $66.7 \text{g AlCl}_3 \times \frac{1 \text{ mol AlCl}_3}{133.35 \text{g}} = 3 \text{ mol AlCl}_3 = 3 \text{ mol Cl} = 1.5 \text{ mol AlCl}_3$*
- 
- 4) How many oxygen atoms are there in 22.0 g of  $\text{CO}_2$ ?  
 (A)  $1.42 \times 10^{24}$  atoms  
 (B)  $6.02 \times 10^{23}$  atoms  
 (C)  $1.20 \times 10^{24}$  atoms  
 (D)  $5.09 \times 10^{23}$  atoms  
*Handwritten:  $22 \text{g CO}_2 \times \frac{1 \text{ mol CO}_2}{44 \text{g CO}_2} \times \frac{2 \text{ mol O}}{1 \text{ mol CO}_2} \times \frac{6.022 \times 10^{23} \text{ atoms O}}{1 \text{ mol O}} =$*
- 
- 5) The empirical formula for an oxide of nitrogen that is 30.4% by mass nitrogen is  
 (A) NO      (B)  $\text{NO}_2$       (C)  $\text{N}_2\text{O}$       (D)  $\text{NO}_4$   
*Handwritten:  $\frac{30.4\% \text{ N}}{14} = 2.17$ ,  $\frac{69.6\% \text{ O}}{16} = 4.35 \text{ mol}$ ,  $\frac{2.17}{2.17} = 1$ ,  $\frac{4.35}{2.17} = 2$*
- 
- 6) A compound has an empirical formula of  $\text{C}_2\text{H}_4\text{O}$ . An independent analysis gave a value of 132 g for its molar mass. What is the molecular formula of the compound?  
 (A)  $\text{C}_4\text{H}_4\text{O}_5$       (B)  $\text{C}_{10}\text{H}_{12}$       (C)  $\text{C}_7\text{O}_3$       (D)  $\text{C}_6\text{H}_{12}\text{O}_3$   
*Handwritten: empirical molar mass = 44  $\Rightarrow \frac{132}{44} = 3$*
- 
- 7) Consider the following reaction:



Which of the following is a correct interpretation of this equation?

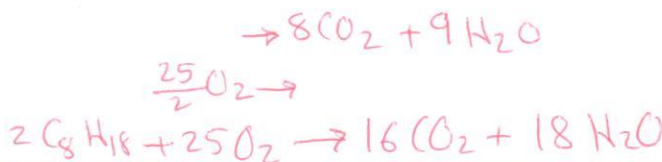
- I. 3 grams of A react with 2 grams of B to form 1 gram of  $\text{A}_3\text{B}_2$ .
  - II. 3 atoms of A react with 2 atoms of B to form 1 molecule of  $\text{A}_3\text{B}_2$ .
  - III. 3 moles of A react with 2 moles of B to form 1 mole of  $\text{A}_3\text{B}_2$ .
- (A) I only  
 (B) II only  
 (C) III only  
 (D) II and III

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8) When the following equation is balanced, the coefficients from left to right are \_\_\_\_\_



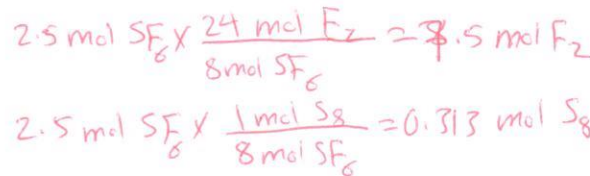
- (A) 2, 3, 4, 4  
 (B) 1, 4, 8, 9  
 (C) 4, 4, 32, 36  
 (D) 2, 25, 16, 18



9)  $\text{S}_8(\text{s}) + 24\text{F}_2(\text{g}) \rightarrow 8\text{SF}_6(\text{g})$

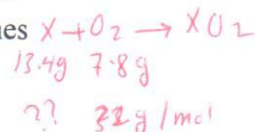
If you need 2.50 moles of  $\text{SF}_6$ , you will need to use \_\_\_\_\_

- (A) 0.313 moles of  $\text{S}_8$  and 7.50 moles of  $\text{F}_2$   
 (B) 0.313 moles of  $\text{S}_8$  and 3.00 moles of  $\text{F}_2$   
 (C) 0.125 moles of  $\text{S}_8$  and 7.50 moles of  $\text{F}_2$   
 (D) 0.125 moles of  $\text{S}_8$  and 3.00 moles of  $\text{F}_2$



10) An element "X" combines with oxygen to form  $\text{XO}_2$ . If 13.4 g of this element combines with 7.8 g of  $\text{O}_2$ , therefore the molar mass of X is \_\_\_\_\_

- (A) 83.5 g/mol (B) 54.9 g/mol (C) 47.2 g/mol (D) 37.5 g/mol

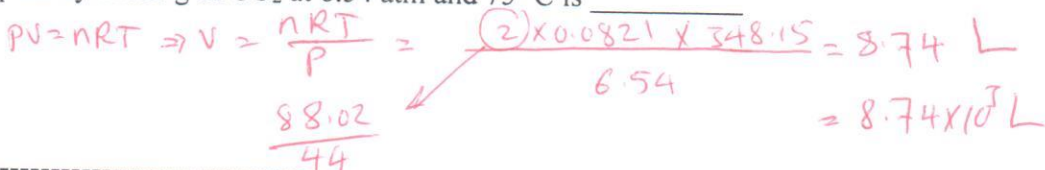


11) The molar volume of a gas at STP is \_\_\_\_\_

- (A) 22.4 L (B) 22.4 mL (C) 2.24 L (D) 44.8 L

12) The volume occupied by 88.02 g of  $\text{CO}_2$  at 6.54 atm and  $75^\circ\text{C}$  is \_\_\_\_\_

- (A)  $8.74 \times 10^3$  mL  
 (B)  $1.88 \times 10^3$  mL  
 (C)  $8.74 \times 10^{-3}$  mL  
 (D) 8.74 mL

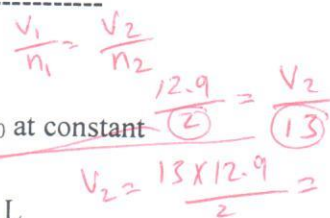


13) The combustion of butane ( $\text{C}_4\text{H}_{10}$ ) is shown in the equation below



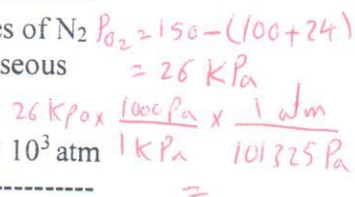
What is the volume of  $\text{O}_2$  required for the complete combustion of 12.9 L of  $\text{C}_4\text{H}_{10}$  at constant temperature and pressure?

- (A) 0.99 L (B) 1.01 L (C) 1.98 L (D) 83.85 L



14) The pressure of a mixture of  $\text{N}_2$ ,  $\text{CO}_2$ , and  $\text{O}_2$  is 150 kPa. If the partial pressures of  $\text{N}_2$  and  $\text{CO}_2$  are 100 kPa and 24 kPa, respectively, the partial pressure of  $\text{O}_2$  in this gaseous mixture is \_\_\_\_\_

- (A) 26.0 atm (B)  $2.60 \times 10^{-1}$  atm (C)  $2.74 \times 10^2$  atm (D)  $2.63 \times 10^3$  atm



15)  $\text{H}_2$  gas generated when Ca metal reacts with water. If the volume of  $\text{H}_2$  gas collected at  $25^\circ\text{C}$  and pressure of 988 mmHg is 461 mL, what is the mass of the  $\text{H}_2$  gas obtained? (The pressure of water vapor at  $25^\circ\text{C}$  is 23.76 mmHg)?

- (A)  $9.6 \times 10^2$  g (B)  $3.3 \times 10^{-2}$  g (C)  $6.7 \times 10^{-2}$  g (D)  $4.78 \times 10^{-2}$  g

