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

3) How many moles of chloride ions are present in a 66.7 g sample of \(\text{AlCl}_3\)?
(A) 1.0 mol  
(B) 1.33 mol  
(C) 2.0 mol  
(D) 1.5 mol

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

5) The empirical formula for an oxide of nitrogen that is 30.4% by mass nitrogen is
(A) NO  
(B) NO\(_2\)  
(C) N\(_2\)O  
(D) NO\(_4\)

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) \(\text{C}_4\text{H}_6\text{O}_3\)  
(B) \(\text{C}_{10}\text{H}_{12}\)  
(C) \(\text{C}_7\text{O}_3\)  
(D) \(\text{C}_6\text{H}_{12}\text{O}_3\)

7) Consider the following reaction:
\[3\text{A} + 2\text{B} \rightarrow \text{A}_3\text{B}_2\]
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
8) When the following equation is balanced, the coefficients from left to right are 

\[ \text{C}_8\text{H}_{18} + \text{O}_2 \rightarrow \text{CO}_2 + \text{H}_2\text{O} \]

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

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

If you need 2.50 moles of SF₆, you will need to use 

(A) 0.313 moles of S₈ and 7.50 moles of F₂  
(B) 0.313 moles of S₈ and 3.00 moles of F₂  
(C) 0.125 moles of S₈ and 7.50 moles of F₂  
(D) 0.125 moles of S₈ and 3.00 moles of F₂

10) An element "X" combines with oxygen to form XO₂. If 13.4 g of this element combines with 7.8 g of O₂, 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 CO₂ at 6.54 atm and 75 °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 (C₄H₁₀) is shown in the equation below 

\[ 2\text{C}_4\text{H}_{10} + 13\text{O}_2 \rightarrow 8\text{CO}_2 + 10\text{H}_2\text{O} \]

What is the volume of O₂ required for the complete combustion of 12.9 L of C₄H₁₀ 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 N₂, CO₂, and O₂ is 150 kPa. If the partial pressures of N₂ are 100 kPa and CO₂ are 24 kPa, respectively, the partial pressure of O₂ in this gaseous mixes 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) H₂ gas generated when Ca metal reacts with water. If the volume of H₂ gas collected at 25 °C and pressure of 988 mmHg is 461 mL, what is the mass of the H₂ gas obtained? (The pressure of water vapor at 25 °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