Multiple Choice

1. What is the mass of 0.0250 mol of P$_2$O$_5$?
   
   A) 3.55 g  
   B) 2.25 g  
   C) 2.87 g  
   D) 4.25 g

2. How many S atoms are in 5.54 g of F$_2$?
   
   A) 3.52×10$^{22}$  
   B) 3.52×10$^{23}$  
   C) 1.76×10$^{23}$  
   D) 8.78×10$^{22}$

3. The percent composition by mass of a compound is 76.0% C, 12.8% H and 11.2% O. What is the empirical formula of the compound?
   
   A) C$_{10}$H$_6$O  
   B) C$_{12}$H$_6$O  
   C) C$_{4}$H$_7$O  
   D) C$_{9}$H$_{18}$O

4. What is the maximum number of grams of ammonia, NH$_3$, that can be obtained from the reaction of 10.0 g of H$_2$ and 80.0 g of N$_2$?
   
   3H$_2$ + N$_2$ → 2NH$_3$
   
   A) 28.4  
   B) 48.6  
   C) 56.3  
   D) 72.8

5. When octane (C$_8$H$_{18}$) is burned in a particular internal combustion engine, the yield of the products (carbon dioxide and water) is 93%. What mass of carbon dioxide will be produced in this engine when 15.0 g of octane is burned with 15.0 g of oxygen gas?
   
   2C$_8$H$_{18}$ + 25O$_2$ = 16CO$_2$ + 18H$_2$O
   
   A) 12.28 g  
   B) 10.56 g  
   C) 9.22 g  
   D) 14.75 g

6. Deviation from the ideal gas behavior becomes more evident at:
   
   A) High temperature and high pressure.  
   B) High temperature and low pressure.  
   C) Low temperature and low pressure.  
   D) Low temperature and high pressure.

7. A storage gas vessel with a volume of 60.0 L at 27°C contains a gas mixture of 0.3 moles N$_2$, 0.2 moles O$_2$, 0.5 moles He and 0.7 moles CO$_2$. Therefore, the partial pressure of N$_2$ (in torr unit) is:
   
   A) 218.4  
   B) 156.0  
   C) 93.6  
   D) 62.4

8. The volume of ethyne (acetylene) C$_2$H$_2$ produced at 25°C and 722 torr when 15 g of calcium carbide CaC$_2$ reacts completely with water in the following reaction:
   
   CaC$_2$ + 2H$_2$O → Ca(OH)$_2$ + C$_2$H$_2$
   
   (in L unit) is:
   
   A) 5.0  
   B) 6.0  
   C) 7.0  
   D) 8.0
9. A 2.00 L sample of O\textsubscript{2} gas was collected over water at a total pressure of 785 torr and 29^\circ\text{C}. When the O\textsubscript{2} gas was dried (water vapor removed) the gas has a volume of 1.96 L at 25^\circ\text{C} and a pressure of one atmosphere. Calculate the vapor pressure of water at 29^\circ\text{C}.

A) 32.6  B) 30.2  C) 28.8  D) 26.4

10. The molar mass of a gas (in g mol\textsuperscript{-1} units) that occupies 6.6 g of it 5.25 L at 558 torr and 41^\circ\text{C} is?

A) 26  B) 30  C) 44  D) 80

11. The root mean-square speed of molecular chlorine (Cl\textsubscript{2}) in m/s at 20^\circ\text{C} is:

A) 321  B) 382  C) 415  D) 429

12. A 13.50-g sample of mercury was heated to 48.72^\circ\text{C}. It was then added to 25.00-g of water at 20.11^\circ\text{C} in an insulated cup. The mixture temperature was found to be 20.62^\circ\text{C}. Calculate in (J mol\textsuperscript{-1} °C\textsuperscript{-1}) the molar heat capacity of mercury (the specific heat of water is 4.184 J g\textsuperscript{-1} °C\textsuperscript{-1}).

A) 32.7  B) 30.4  C) 28.2  D) 26.8

13. Which of the following reactions gives \Delta of NH\textsubscript{3}(g)?

A) \text{2N}_2(g) + 3\text{H}_2(g) \rightarrow 2\text{NH}_3(g)  B) \text{-N}_2(g) + \text{-H}_2(g) \rightarrow \text{NH}_3(g)
C) \text{N}(g) + 3\text{H}(g) \rightarrow \text{NH}_3(g)  D) \text{-N}_2(l) + \text{-H}_2(g) \rightarrow \text{NH}_3(g)

14. From the thermochemical equations:

i) \text{8Mg(s) + Mg(NO}_3)_2(s) \rightarrow \text{Mg}_3\text{N}_2(s) + 6\text{MgO(s)} \quad \Delta H^\circ = -3884 \text{ kJ}
ii) \text{Mg}_3\text{N}_2(s) \rightarrow 3\text{Mg(s)} + \text{N}_2(g) \quad \Delta H^\circ = +463 \text{ kJ}
iii) \text{2MgO(s) \rightarrow 2Mg(s) + O}_2(g) \quad \Delta H^\circ = +1203 \text{ kJ}

What is the standard heat of formation of Mg(NO\textsubscript{3})\textsubscript{2}, in (kJ/mol)?

A) +376  B) -376  C) +188  D) -188

15. Calculate \Delta H^\circ (in kJ) for the reaction:

\text{CO}_2(g) + 2\text{H}_2\text{S(g) \rightarrow CS}_2(l) + 2\text{H}_2\text{O(l) }

given the following data.

<table>
<thead>
<tr>
<th>Substance</th>
<th>CO\textsubscript{2}(g)</th>
<th>CS\textsubscript{2}(l)</th>
<th>H\textsubscript{2}S(g)</th>
<th>H\textsubscript{2}O(l)</th>
</tr>
</thead>
<tbody>
<tr>
<td>\Delta kJ/mol</td>
<td>-394</td>
<td>+89.5</td>
<td>-20.2</td>
<td>-286</td>
</tr>
</tbody>
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A) +109.6  B) -48.1  C) -109.6  D) +48.1