

### Multiple Choice

1. What is the mass of 0.0250 mol of  $P_2O_5$ ?

- A) 3.55 g      B) 2.25 g      C) 2.87 g      D) 4.25 g

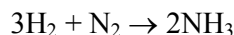
2. How many S atoms are in 5.54 g of  $F_2$ ?

- A)  $3.52 \times 10^{22}$       B)  $3.52 \times 10^{23}$   
C)  $1.76 \times 10^{23}$       D)  $8.78 \times 10^{22}$

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?

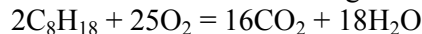
- A)  $C_{10}H_6O$       B)  $C_{12}H_6O$   
C)  $C_4H_7O$       D)  $C_9H_{18}O$

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  $N_2$ ?



- A) 28.4      B) 48.6      C) 56.3      D) 72.8

5. When octane ( $C_8H_{18}$ ) 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?



- A) 12.28 g      B) 10.56 g      C) 9.22 g      D) 14.75 g

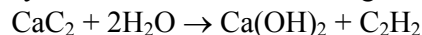
6. Deviation from the ideal gas behavior becomes more evident at:

- 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  $27^\circ C$  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)  $C_2H_2$  produced at  $25^\circ C$  and 722 torr when 15 g of calcium carbide  $CaC_2$  reacts completely with water in the following reaction:



(in L unit) is:

- A) 5.0      B) 6.0      C) 7.0      D) 8.0

9. A 2.00 L sample of O<sub>2</sub> gas was collected over water at a total pressure of 785 torr and 29°C. When the O<sub>2</sub> gas was dried (water vapor removed) the gas has a volume of 1.96 L at 25°C and a pressure of one atmosphere. Calculate the vapor pressure of water at 29°C.

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

10. The molar mass of a gas (in g mol<sup>-1</sup> units) that occupies 6.6 g of it 5.25 L at 558 torr and 41°C is?

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

11. The root mean-square speed of molecular chlorine (Cl<sub>2</sub>) in m/s at 20°C is:

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

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

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

13. Which of the following reactions gives Δ of NH<sub>3</sub>(g)?

A) 2N<sub>2</sub>(g) + 3H<sub>2</sub>(g) → 2NH<sub>3</sub>(g)      B) -N<sub>2</sub>(g) + -H<sub>2</sub>(g) → NH<sub>3</sub>(g)  
 C) N(g) + 3H(g) → NH<sub>3</sub>(g)      D) -N<sub>2</sub>(l) + -H<sub>2</sub>(g) → NH<sub>3</sub>(g)

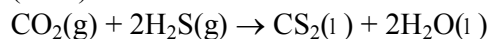
14. From the thermochemical equations:

i) 8Mg(s) + Mg(NO<sub>3</sub>)<sub>2</sub>(s) → Mg<sub>3</sub>N<sub>2</sub>(s) + 6MgO(s)      ΔH° = -3884 kJ  
 ii) Mg<sub>3</sub>N<sub>2</sub>(s) → 3Mg(s) + N<sub>2</sub>(g)      ΔH° = +463 kJ  
 iii) 2MgO(s) → 2Mg(s) + O<sub>2</sub>(g)      ΔH° = +1203 kJ

What is the standard heat of formation of Mg(NO<sub>3</sub>)<sub>2</sub>, in (kJ/mol)?

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

15. Calculate ΔH° (in kJ) for the reaction:



given the following data.

Substance	CO <sub>2</sub> (g)	CS <sub>2</sub> (l)	H <sub>2</sub> S(g)	H <sub>2</sub> O(l)
Δ kJ/mol)	-394	+89.5	-20.2	-286

A) +109.6      B) -48.1      C) -109.6      D) +48.1