**Multiple Choice**

1. When 5.14 g of the hydrated magnesium sulfate MgSO4.xH2O are heated till all its water of crystallization is driven off 2.51 g of the anhydrous MgSO4 are obtained. Calculate the value of x (the number of the water molecules combined in the hydrated form).

A) 10 B) 7 C) 5 D) 3

1. For the manufacture of Freon-12 gas CCl2F2 according to:

3CCl4 + 2SbF3 → 3CCl2F2 + 2SbCl3

146.0 kg of SbF3 were allowed to react with 200.0 kg of CCl4. After the reaction was finished, 120.0 kg of CCl2F2 were obtained. Calculate the percentage yield of CCl2F2?

A) 77% B) 79% C) 81% D) 85%

1. Automotive air bags inflate when sodium azide NaN3 decomposes to its constituent elements:

2NaN3(s) → 2Na(s) + 3N2(g)

How many grams of NaN3 are required to inflate an air bag by 70.0 L of N2 at 35oC and 1.0 atm pressure?

A) 120 B) 110 C) 105 D) 100

1. Mass, in g, of water produced as a result of combusting 27.3 g of C8H18 is:

2C8H18 + 25O2 → 16CO2 + 18H2O

A) 29.32 B) 30.25 C) 32.17 D) 38.75

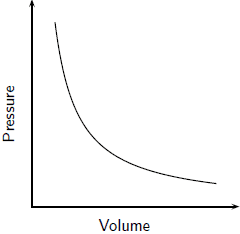
1. Mass, in g, of Mg(NO3)2 in 150 mL of 2.2 M aqueous solution of Mg(NO3)2 is:

A) 55.65 B) 48.95 C) 35.65 D) 25.65

1. The mole fraction of HCl in an aqueous solution that is 36.46% HCl by mass is?

A) 0.22 B) 0.25 C) 0.31 D) 0.35

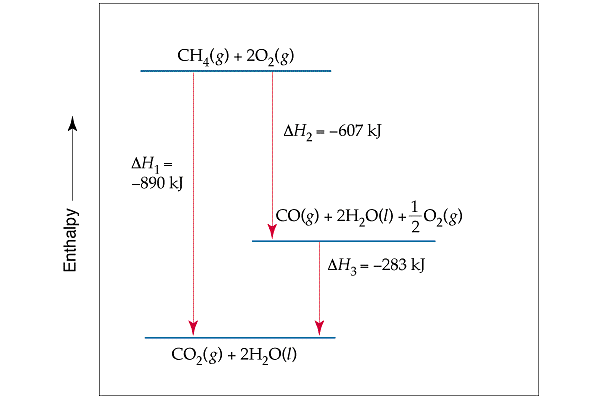
1. For a gas, if "P × V" does not equal "n × R × T" (deviation from the ideal gas law is pronounced), which of the following could be the reason:
2. volumes of the gas particles are very small.
3. attractions between the gas particles are very small.
4. temperature of the gas is very low.
5. pressure of the gas is very low.
6. The diagram on the right is a graphical presentation of which gas law?



1. Avogadro's law
2. Boyle's law
3. Charles law
4. Graham's law
5. Which of the following gases effuses about two times faster than SO2(g)?

A) CH4 B) O2 C) CO2 D) CO

1. The following diagram is a representation of:



1. van't Hoff's law
2. Le Châtelier's principle
3. Hess's law
4. Arrhenius equation
5. Which is the correct arrangement of **work done on** the system in the following reactions:

1st) H2(g) + Cl2(g) → 2HCl(g)

2nd) KClO3(s) → KCl(s) + 1.5O2(g)

3rd) 3H2(g) + N2(g) → 2NH3(g)

4th) CaO(s) + O2(g) → CaCO3(s)

1. 4th > 3rd > 2nd > 1st B) 1st > 2nd > 3rd > 4th

C) 2nd > 3rd > 1st > 4th D) 3rd > 4th > 1st > 2nd

1. Knowing that liquid chloroform boils at 76.8°C and its molal boiling-point-elevation constant (Kb) is 5.02°C m–1, the boiling point, in °C, of a solution of 34.7 g of solid naphthalene (C10H8) in 250 g of liquid chloroform is:

A) 5.44 B) 89.37 C) 82.24 D) 76.8

1. If the rate constant of a reaction is 4×10–3 mol–1 L s–1, the reaction order is:

A) 3 B) 2 C) 1 D) 0

1. Given that the rate constant of a reaction is:

|  |  |  |
| --- | --- | --- |
| T (K) | 600 | 800 |
| k (s–1) | 0.028 | 23 |

Ea, in kJ, is :

A) 121 B) 127 C) 131 D) 134

1. Nitrogen dioxide decomposes to nitric oxide and oxygen according to:

2NO2(g) → 2NO(g) + O2(g)

in a particular experiment at 300oC, [NO2] drops from 0.0100 M to 0.0065 M in 100 s. Calculate (in mol L–1 s–1) the rate of appearance of O2 for this same period.

A) 7.25×105 B) 3.62×10–5 C) 1.75×10–5 D) 7.25×10–3

1. Which of the followings **cannot** be correct for a chemical reaction:

**A) Its** rate constant = + 3.4 s–1.

B) **Its** equilibrium constant = – 3.4.

C) Its activation energy = + 3.4 kJ

D) Its enthalpy = – 3.4 kJ

1. Consider the following equilibrium reaction:

3O2(g) ⇌2O3(g) ΔH° = + 284.5 kJ

Which of the following applications will increase the O3 production?

1. Increasing temperature and pressure.
2. Decreasing temperature and pressure.
3. Increasing pressure and decreasing temperature.
4. Decreasing temperature and decreasing the amount of O2.
5. Knowing the equilibrium constants for the following reactions at 298K:

2NO(g) ⇌N2(g) + O2(g) KC1 = 2.4 × 1030

NO(g) + ½Br2(g) ⇌NOBr(g) KC2 = 1.4

Determine the equilibrium constants for the following reaction:

½N2(g) + ½O2(g) + ½Br2(g) ⇌NOBr(g) KC3 =?

A) 9×10–16 B) 8×1015 C) 8×10–15 D) 7×10–14

1. A flask contains a mixture of NOCl(g), NO(g), and Cl2(g) at equilibrium at 800°C?

NOCl(g) ⇌ NO(g) + 0.5Cl2(g)

If P*NOCl* = 0.657 atm, P*NO* = 0.065 atm, and Ptotal = 0.7545 atm, the value of Kp of the above reaction is:

A) 8.59×10–2 B) 8.59×102 C) 1.78×10–2 D) 3.25×10–3

1. If 0.50 mol of N2(g) gas is mixed with 0.5 mol of O2(g) in a 2.00 L tank at 2000 K. The two gasses react to form nitric oxide gas by the reaction:

N2(g) + O2(g) ⇌2NO(g) Kc = 4.1 x 10-4 (T = 2000 K)

the equilibrium concentration, (in mol L–1) of NO is:

A) 0.005 B) 0.004 C) 0.03 D) 0.3

1. Knowing that:

N2O4(g) ⇌ 2NO2(g) Kp = 11 (T = 100 K)

If 0.2 mol of N2O4(g) gas is mixed with 0.2 mol of NO2(g) in a 4.00 L flask at 100 K, which of the following is correct regarding this reaction mixture:

A) It is at equilibrium.

B) It will proceed from right to left to achieve equilibrium.

C) It will proceed from left to right to achieve equilibrium.

D) The given information are not enough.

1. From the table below for the following reaction:

H2(g) + I2(g) ⇌ 2HI(g)

|  |  |  |  |
| --- | --- | --- | --- |
|  | Temperature | Kp |  |
|  | 500 K | 160 |  |
|  | 700 K | 54 |  |

A) Increasing temperature increases HI production.

B) Increasing pressure increases HI production.

C) The reaction from left to right is endothermic.

D) The reaction from left to right is exothermic.

1. Which of the following is correct regarding a reaction at equilibrium?

A) Rate of forward and reverse reactions are equal.

B) Concentrations to the left and to the right of equation are equal.

C) Rate constant of forward and reverse reactions are equal.

D) Number of moles to the left and to the right of equation are equal.

1. According to the following equation:

(aq) + (aq) ⇌ H2CO3(aq) + (aq)

(aq) is:

1. a conjugate acid of (aq).
2. a conjugate acid of H2CO3(aq).
3. a conjugate base of (aq).
4. a conjugate base of H2CO3(aq).

1. The molarity of an aqueous HNO3 solution that has a pH of 3.42 is:

A) 1.6×10–2 B) 1.8×10–3 C) 2.4×10–3 D) 3.8×10–4

1. Knowing that = 4.5 × 10–4, the pH of an aqueous solution of 1.23 M HNO2 solution is:

A) 2.22 B) 1.92 C) 1.63 D) 1.4

1. A 1 L buffer solution of the weak acid HClO (Ka = 3.0×10–8) and its salt NaClO is 0.234 M HClO and 0.316 M NaClO. If 0.072 mol of HCl gas is introduced to the solution, the difference between the pH before and after the addition is:

A) 0.135 B) 0.185 C) 0.258 D) 0.229

1. If it is found that the concentration of an unknown monoprotic acid (HX) is 0.0995 M and its pH is 3.58, this acid is:

A) strong.

B) weak with Ka = 6.95 × 10–7.

C) weak with Ka = 4.95 × 10–7.

D) weak with Ka = 2.95 × 10–7.

1. Cola drink has a pH value = 3, while milk has a pH value = 7. How many times greater is the H3O+ concentration in cola drink than in milk?

A) 10000 times higher in cola drink than in milk.

B) 4000 times higher in cola drink than in milk.

C) 1000 times higher in cola drink than in milk.

D) 2.33 times higher in cola drink than in milk.

1. Which of the following is the most acidic solution:

A) 0.1 M CH3COOH and 0.1 M CH3COONa.

B) 0.1 M CH3COOH and 0.2 M CH3COONa.

C) 0.1 M CH3COOH.

D) All the three above solution have equal acidity.