CHM 1045 Name:

Exam 2

Fall 2010

MC: Pick the best answer ( 2.5 pt each total 50 pts)

1. If I dissolve 10 g of NaCl(s) in 2 L of H2O(l) what is the solute?
   1. NaCl b. H2O
2. What is the molarity of a solution made by dissolving 2.42 g of NaOH in water to make a total of 500 mL of solution?
   1. 4.84 mol/L b. 4.84 x 10-3 mol/L c. 1.21 x 10-4 mol/L d. 0.121 mol/L
3. If I dilute 0.825 L of a 12.0 M HCl solution to 1.53 L with water, what is the resulting Molarity?
   1. 22.3 mol/L b. 6.47 mol/L c. 0.105 mol/L d. 12.0 mol/L
4. What is the oxidation number of titanium in Ti(CO3)2?
   1. 0 b. 2 c. 3 d. 4
5. Which of the following is a weak electrolyte?
   1. Hydrochloric acid
   2. Sodium hydroxide
   3. Hydrofluoric acid
6. What type of reaction is the following?

HCl(aq) + NaOH(aq) 🡪 H2O(l) + NaCl(aq)

* 1. Redox
  2. Acid-base neutralization
  3. Precipitation

1. What type of reaction is the following?

Fe(s) + CuSO4(aq) 🡪 FeSO4(aq) + Cu(s)

* 1. Redox
  2. Acid-base neutralization
  3. Precipitation

1. In general, what happens to the pressure of a gas when you increase the number of moles of gas? (keeping volume and temperature constant)
   1. Pressure increases
   2. Pressure decreases
   3. Pressure remain constant
2. In general, what happens to the pressure of a gas when you decrease the volume? (keeping temperature and moles constant)
   1. Pressure increases
   2. Pressure decreases
   3. Pressure remain constant
3. The density of a gaseous compound is 3.38 g/L at 40°C and 1.97 atm. What is its molar mass?
   1. 44.1 g/mol b. 5.63 g/mol c. 4465 g/mol d. 570.6 g/mol
4. If I have a mixture of gases (see figure) with the following partial pressures, what is the total pressure?

|  |  |
| --- | --- |
| Gas | Partial pressure (atm) |
| O2 | 3 |
| N2 | 5 |
| H2 | 3 |

* 1. 10 atm
  2. 11 atm
  3. 8 atm

1. What is the total pressure of a mixture of gases if I have 2 moles of CO2 and 3 moles of O2 that occupies a volume of 110 L at 35°C?
   1. 0.131 atm
   2. 1.15 atm
   3. 116 atm
2. Holding volume, temperature, and pressure constant which of the following gases should have the slowest rate (speed)
   1. O2
   2. N2
   3. CO2
3. Which of the following has the most kinetic energy?
   1. A ball moving down a hill
   2. A ball at the top of a hill (not moving)
   3. A ball at the bottom of a hill (not moving)
4. How much energy (in J) does it take to increase the temperature of 12.2 g of Iron from 65°C to 120°C? Specific heat of iron is 0.450 J/g°C
   1. 659 J
   2. 357J
   3. 302 J
5. Using what you know about Hess’s Law find the Standard enthalpy change for the reaction using the individual steps of the reaction

2A + B 🡪 2F + 3G ΔH° = ?

|  |  |
| --- | --- |
| Steps | ΔH° (kJ) |
| A + C 🡪 F + Q + G | -22 |
| G + 2C 🡪 B + 2Q | 38 |

* 1. 6 kJ b. -6 kJ c. -82 kJ d. 82 kJ

1. Which of the following is a Lewis base but not an Arrhenius base?
   1. NaOH b. Mg(OH)2 c. NH3 d. HCl
2. In the following reaction what species is being oxidized?

Fe(s) + CuSO4(aq) 🡪 FeSO4(aq) + Cu(s)

1. Fe(s)
2. Cu2+(aq)
3. Fe2+(aq)
4. Cu(s)
5. In the following reaction what species is the oxidizing agent?

Fe(s) + CuSO4(aq) 🡪 FeSO4(aq) + Cu(s)

1. Fe(s)
2. Cu2+(aq)
3. Fe2+(aq)
4. Cu(s)

1. In a disposable chemical cold pack from the pharmacy is the reaction that is taking place endothermic or exothermic?
   1. Endothermic b. Exothermic

LA 1 (10 pts)

Write the complete molecular equation, complete ionic equation, and the net ionic equation for the following reaction and state what type of reaction it is

**Cu(NO3)2(aq) + NaOH(aq) 🡪 Cu(OH)2(s) + NaNO3(aq)**

CME

CIE

NIE

LA 2 (10 pts)

Calculate the pressure for the following using the Ideal gas equation and the Van Der Waal’s equation

4.8 moles of NH3 occupy 7.13 L at 47°C, calculate the pressure of the gas using

* 1. Ideal gas equation
  2. Van Der Waals equation (a=4.17 b=0.0371)

LA 3 (10 pts)

Using the following table of heats of formation, calculate the standard state enthalpy change for the following reaction

4 NO(g) + 6 H2O(g) 🡪 4 NH3(g) + 5 O2(g)

|  |  |
| --- | --- |
| Compound | ΔH°f (kJ/mol) |
| NH3(g) | -45.90 |
| NO(g) | 90.29 |
| H2O(g) | -241.8 |

Is this reaction endo or exothermic? Why?

LA 4 (10 pts)

Balance the following redox reaction in an acidic solution

**Cr2O72-(aq) + Cl-(aq) 🡪 Cr3+(aq) + Cl2(aq)**

Answer:

LA 5: Potential Energy Diagram (10 pts)

In the following potential energy diagram label:

1. Reactants
2. Products
3. Transition state
4. ΔH
5. Energy of activation

Reaction pathway

Energy

Is this reaction endo or exothermic?

Is this reaction thermodynamically favorable or unfavorable? Why

**Extra Credit:** In the following reaction label the acid, base, conjugate acid and conjugate base

C5H5N + C6H5COOH 🡪 C5H5NH+ + C6H5COO-

**Equations:**

ΔH° = ΣΔH°f(products) - ΣΔH°f(reactants)

M = mol/L

D = PMM / RT

D = nMM / V

PV=nRT

M1V1 = M2V2

Ptot = RT/V Σn

(P + an2/v2) \* (V-nb) = nRT

P1V1 = P2V2

V1 / T1 = V2 / T2

V1 / n1 = V2 / n2

P1V1/T1 = P2V2/T2

Urms = √3RT/MM

Rate1/Rate2 = √MM2 / √MM1

q = s x m x Δt