**Name: Period: Seat#:**

**Review**

STATION 1 • MASS ACTION EXPRESSIONS

Write the mass action expression for the equilibrium: Fe3O4(s) + 4 H2(g) **** 3 Fe(s) + 4 H2O(g)

Write the mass action expression for the equilibrium: Ca(OH)2(s) **** Ca2+(aq) + 2 OH-(aq)

The equilibrium constant, Kc = 7.9 x 10-6, is this equilibrium system reactant or product-favored. \_\_\_\_\_\_\_\_\_

Chemical Equilibrium

STATION 2 • MANIPULATING K

Given:

H2O(l)  H+(aq) + OH(aq) Kc = 1 x 10-14

HCN(aq)  H+(aq) + CN (aq) Kc = 4.0 x 1010

Calculate Kc for this reaction:

HCN(aq) + OH(aq)  H2O(l) + CN(aq) Kc = ???

This reaction is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_-favored.

Chemical Equilibrium

STATION 3 • Kp & Kc

Consider the equilibrium: 2NO(g) + O2(g) **** 2NO2(g).

At 100°C, the equilibrium concentrations for this system are:

[NO] = 0.52 M; [O2] = 0.24 M; [NO2] = 0.18 M

Write the expression for Kc and calculate its value at this temperature?

What is Δn for this system? \_\_\_\_\_

Write the expression for Kp and calculate its value at this temperature.

Chemical Equilibrium

STATION 4 • LE CHÂTELIER’S PRINCIPLE

Consider the gaseous equilibrium: 2CCl4(g) + O2(g) **** 2COCl2(g) + 2Cl2(g) ΔH = +35 kJ

Predict the effect each change would have on the concentrations of the each substance.

Add CCl4 \_\_\_\_ \_\_\_\_ \_\_\_\_ \_\_\_\_

Remove Cl2 \_\_\_\_ \_\_\_\_ \_\_\_\_ \_\_\_\_

Add COCl2 \_\_\_\_ \_\_\_\_ \_\_\_\_ \_\_\_\_

Increase temperature \_\_\_\_ \_\_\_\_ \_\_\_\_ \_\_\_\_

Reduce container volume \_\_\_\_ \_\_\_\_ \_\_\_\_ \_\_\_\_

Add a catalyst \_\_\_\_ \_\_\_\_ \_\_\_\_ \_\_\_\_

Remove O2 \_\_\_\_ \_\_\_\_ \_\_\_\_ \_\_\_\_

Add He to increase pressure \_\_\_\_ \_\_\_\_ \_\_\_\_ \_\_\_\_

A different equilibrium shifts toward the reactants when the temperature is increased. From this observation, you know that the reaction is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (exothermic / endothermic).

Chemical Equilibrium

STATION 5 • ICE BOX PROBLEM

Consider the equilibrium: 2SO2(g) + O2(g) **** 2SO3(g)

If 0.200 mol SO3(g) is placed a 0.500 Liter container, it is found that 0.050 mole of O2(g) is in the container at equilibrium. Fill in the ICE box and determine the Kc for this reaction.

|  |  |  |  |
| --- | --- | --- | --- |
|  | SO2 | O2 | SO3 |
| *Initial* |  |  |  |
| *Change* |  |  |  |
| *Equilibrium* |  |  |  |

Chemical Equilibrium

STATION 6 • ANOTHER ICE BOX PROBLEM

At 985°C, the equilibrium constant, Kc, for the reaction, H2(g) + CO2(g)  H2O(g) + CO(g), is 1.63.

If 2.00 moles each of H2(g) and CO2(g) are placed in a 1.00-Liter container and allowed to come to equilibrium, determine the equilibrium concentrations of the four chemicals.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | H2 | CO2 | H2O | CO |
| *Initial* |  |  |  |  |
| *Change* |  |  |  |  |
| *Equilibrium* |  |  |  |  |

Chemical Equilibrium

STATION 7 • TEST QUOTIENT,Q

Consider the equilibrium: 2NO(g) + O2(g) **** 2NO2(g). Kc = 0.499

The system is set up with the following concentrations:

[NO] = 0.50 M; [O2] = 0.25 M; [NO2] = 0.25 M

This reaction will \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (shift right, shift left, remain unchanged).

Justify your prediction.

Chemical Equilibrium

STATION 8 • NChO PROBLEMS

|  |  |
| --- | --- |
|  |  |
|  |

Chemical Equilibrium – Not assessed. Challenge Problem

STATION 9 • PREDICTING REACTIONS

A solution of hydrochloric acid is added to a solution of potassium nitrite.

|  |
| --- |
| (i) Balanced equation: |

(ii) What are the oxidation states of the N atom before and after the reaction?

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_