Question 1

Which is true for a system at equilibrium?

    A. Forward reaction rate is faster than the reverse and concentrations are equal
    B. Forward and reverse reaction rates are equal and concentrations are constant
    C. Forward and reverse reaction rates are equal and concentrations are equal
    D. Forward reaction rate is faster than the reverse and concentrations are constant

Question 2

Equilibrium for $2CrO_4^{2-} + 2H^+ \rightarrow Cr_2O_7^{2-} + H_2O$. What happens when OH^- ions are added to the system?

    A. Position of equilibrium will shift to right
    B. Color of system will turn from orange to yellow
    C. K_c will decrease
    D. OH^- ions will not react, and thus no change is seen.

Question 3

Given the K_c for a forward reaction, how can you find K_c for the reverse reaction?

    A. Divide K_c by 1
    B. Divide 1 by K_c
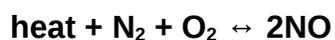   **C.** Square K_c
    D. Square K_c

Question 4

When the rate of the forward reaction is equal to the rate of backward reaction, the system is said to be in

  A. Chemical Equilibrium
  B. Chemical Balance
  C. Stoichiometry
  D. Chemical Reaction

Question 5

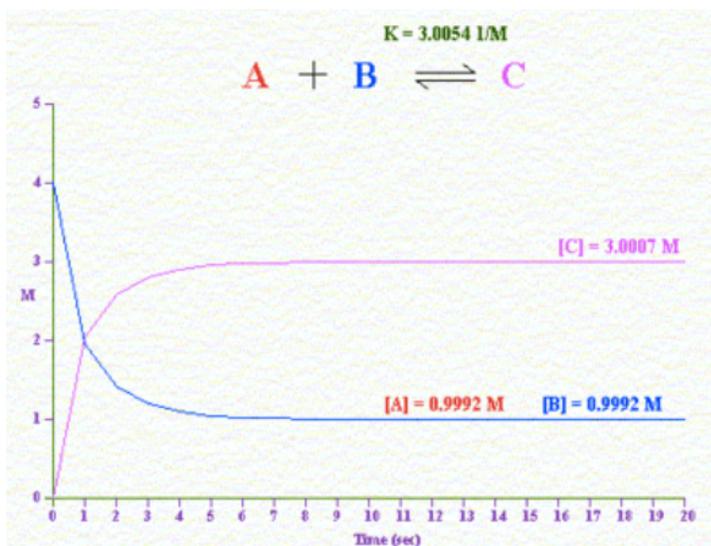**For the reaction**

heat + N_2 + O_2 ↔ 2NO

If heat is added to the chemical system, the system will shift _____.
  A. left
  B. right
  C. left and right
  D. neither left nor right

Question 6

At what time (in seconds) is equilibrium established?

$$K = 3.0054 \ 1/M$$
$$A + B \rightleftharpoons C$$

$[C] = 3.0007 \ M$

$[A] = 0.9992 \ M$ $[B] = 0.9992 \ M$

Time (sec)

  A. 0 seconds
  B. 1 second
  C. 5 seconds
  D. 10 seconds

Question 7

Why is equilibrium called a dynamic state?

    A. Chemists try to convert as much reactants as possible into products.
    B. The reactions at equilibrium continue to take place once equilibrium is established.
    C. The products of a forward reaction are favored, so equilibrium lies to the right.
    D. All chemical reactions are considered to be reversible under suitable conditions.
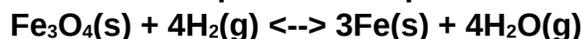
Question 8

What is the K_c expression for this reaction?
  $2\ NO_{(g)}\ +\ O_{2(g)} \rightleftharpoons\ 2\ NO_{2(g)}$

    A. $K_c = [NO_2]^2 / [NO]^2\,[O_2]$
    B. $K_c = [NO]^2\,[O_2] / [NO_2]^2$
    C. $K_c = [NO]^2\,[O_2]\,[NO_2]^2$
    D. $K_c = [NO_2]^2 / [NO]^2 +\ [O_2]$

Question 9

What is the equilibrium expression for:
$Fe_3O_4(s) + 4H_2(g) <--> 3Fe(s) + 4H_2O(g)$

    A. $([Fe]^3[H_2O]^4\ ) / ([Fe_3O_4][H_2]^4)$
    B. $([Fe_3O_4][H_2]^4) / ([Fe]^3[H_2O]^4)$
    C. $[H_2O]^4 / [H_2]^4$
    D. $([Fe][H_2O]) / ([Fe_3O_4][H_2])$

Question 10

Consider the following equation: $CO_{(g)} + 2H_{2(g)} \rightleftharpoons CH_3OH_{(g)} +$ Heat

Which of the factors below would decrease the concentration of CH_3OH at equilibrium?

    A. adding CO
    B. increasing H_2
    C. decrease in the temperature
    D. increasing the temperature

Question 11

The following reaction is allowed to reach equilibrium.

$$2O_3(g) \rightleftharpoons 3O_2(g)$$

What happens to the reaction when the volume of the reaction vessel is increased?
    A. Favors forward reaction
    B. Favors reverse reaction
    C. The reaction is still at equilibrium

Question 12

The following endothermic reaction is allowed to reach equilibrium.
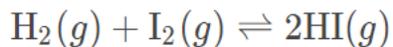
$$NH_4HS(s) \rightleftharpoons NH_3(g) + H_2S(g)$$

What happens to the reaction when the temperature is increased?

    A. Favors forward reaction
    B. Favors reverse reaction
    C. The reaction is still at equilibrium

Question 13
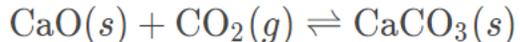
The following reaction is allowed to reach equilibrium.

$$H_2(g) + I_2(g) \rightleftharpoons 2HI(g)$$

What happens to the reaction when more H_2 (g) is added?

    A. Favors forward reaction
    B. Favors reverse reaction
    C. The reaction is still at equilibrium

Question 14

The following reaction is allowed to reach equilibrium.

$$CaO(s) + CO_2(g) \rightleftharpoons CaCO_3(s)$$

What happens to the reaction when some CaCO$_3$ (s) is removed?

    A. Favors forward reaction
    B. Favors reverse reaction
    C. The reaction is still at equilibrium

Question 15

What is the equilibrium constant expression K$_c$ for the following balanced equation? $I_2(aq) + I^-(aq) \rightleftharpoons I_3^-(aq)$

    A. $\dfrac{[I_2][I^-]}{[I_3^-]}$

    B. $\dfrac{[I_2]^2[I^-]}{[I_3^-]^3}$

    C. $\dfrac{[I_3^-]^3}{[I_2]^2[I^-]}$

    D. $\dfrac{[I_3^-]}{[I_2][I^-]}$

Answer: D

Question 16

What is the equilibrium constant expression K$_c$ for the following balanced equation?

$$Cu(s) + 2Ag^+(aq) \rightleftharpoons Cu^{2+}(aq) + 2Ag(s)$$

    A. $\dfrac{[Cu^{2+}][Ag]^2}{[Cu][Ag^+]^2}$

    B. $\dfrac{[Cu][Ag^+]^2}{[Cu^{2+}][Ag]^2}$
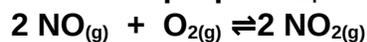
C. $\dfrac{[Cu^{2+}]}{[Ag^+]^2}$

D. $\dfrac{[Ag^+]^2}{[Cu^{2+}]}$

Answer: C

Question 17

What is the proper K_{eq} for the following reaction?
$2\ NO_{(g)}\ +\ O_{2(g)} \rightleftharpoons 2\ NO_{2(g)}$

A. $K_{eq} = [NO_2]^2 / [NO]^2[O_2]$
B. $K_{eq} = [NO]^2[O_2] / [NO_2]^2$
C. $K_{eq} = [NO]^2[O_2][NO_2]^2$
D. $K_{eq} = 2[NO][O_2] / 2[NO_2]$

Question 18

(Calculator Allowed) What is $[H_2O]$ if K = 1.2,
$[CO_2]$ = 0.846M, & $[CH_4]$= 0.0713M?
$4CuO_{(s)}+CH_{4(g)} \leftrightarrow CO_{2(g)}+4Cu_{(s)} +2H_2O_{(g)}$

A. 0.101 M
B. 0.318 M
C. 0.0102 M
D. 3.77 M

Answer Key

1. B
2. B
3. B
4. A
5. B
6. C
7. B
8. A
9. C
10. D
11. A
12. A
13. A
14. C
15. D
16. C
17. A
18. B