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QUESTION 1

Select the CORRECT answer.

Consider the following equilibrium:

$$aA + bB \rightleftharpoons cC + dD$$

Which of the following represents the general form of the equilibrium constant expression?

- $K_{eq} = \frac{[C][D]}{[A][B]}$
- $K_{eq} = \frac{[A][B]}{[C][D]}$
- $K_{eq} = \frac{[A]^a[B]^b}{[C]^c[D]^d}$
- $K_{eq} = \frac{[C]^c[D]^d}{[A]^a[B]^b}$ ✓

QUESTION 2

Select the CORRECT answer about the equilibrium constant.

- K_{eq} varies with the initial concentrations.
- K_{eq} is constant at any temperature.
- K_{eq} is expressed in molarity (M).

K_{eq} is unitless (with no units). ✓

QUESTION 3

Select the CORRECT answer.

Consider the following equilibrium:

$$2NO(g) + O_2(g) \rightleftharpoons 2NO_2(g) \quad K_{eq} = 2.25 \times 10^{12}$$

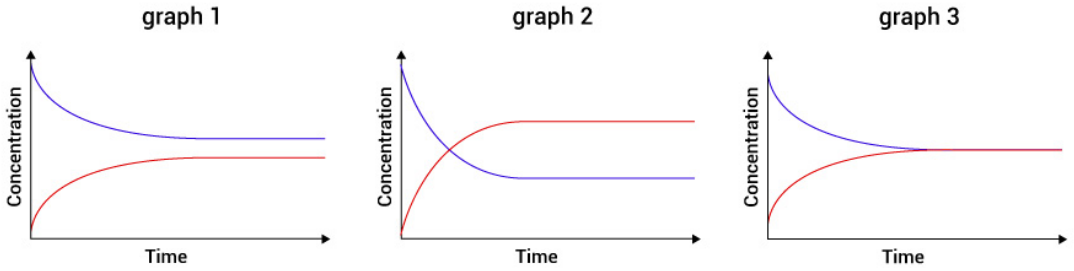
Which of the following is *correct* about the above equilibrium?

- ○ The equilibrium constant is very low.
- ○ The equilibrium favors the reactants.
- ○ The reaction mixture contains more reactants.
- ✓ The equilibrium favors the products.

QUESTION 4

Drag and drop the CORRECT answers.

The graphs below show the concentration changes with time.



$K_{eq} < 1$ ✓ $K_{eq} > 1$ ✓ $K_{eq} = 1$ ✓

$K_{eq} = 0$ $K_{eq} < 0$

QUESTION 5

Select the CORRECT representation.

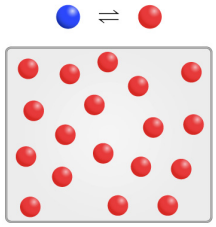
Consider the following equilibrium: A ⇌ B

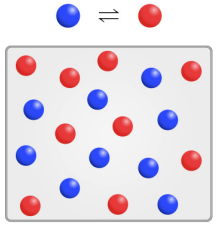
Given the concentrations at equilibrium:

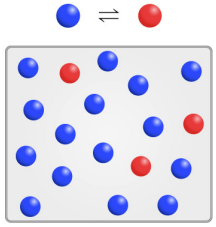
[A] = 0.04*M*

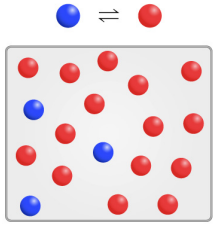
[B] = 0.2*M*

Which of the following best represents the reaction mixture at equilibrium?







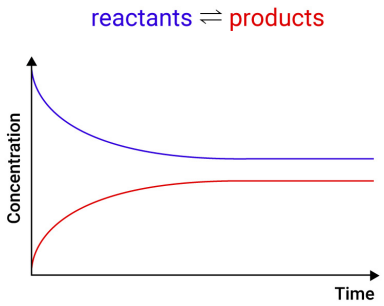


QUESTION 6

Select the CORRECT answer.

Consider the adjacent graph showing the variation of the concentrations in a reaction mixture with time.

Which of the following is *CORRECT* about the equilibrium represented in the graph?



- At equilibrium, [products] > [reactants].
- At equilibrium, the constant $K_{eq} = 1$.
- ✓ At equilibrium, the constant $K_{eq} < 1$.
- At equilibrium, [reactants] = [products].

QUESTION 7

Select the CORRECT answer.

Calcium carbonate ($CaCO_3$) is found naturally in limestones.

When this compound is heated in a furnace at 1200 K the following decomposition takes place:

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

The calcium oxide (CaO) produced is then used in many industries.

The reaction above does not reach a state of equilibrium. What is the reason behind this situation?



- ✓ The furance is an open system.
- The reaction is irreversible.

- The initial concentrations are not accurate.
- The temperature is high.

QUESTION 8

Select the CORRECT answer from the drop-down menu.

A 0.1*M* sample of nitrosyl chloride (NOCl) was placed in a closed flask until the system reached equilibrium.

$$2NOCl(g) \rightleftharpoons 2NO(g) + Cl_2(g)$$

At equilibrium, the mixture contains:

[NOCl] = 0.44*M*

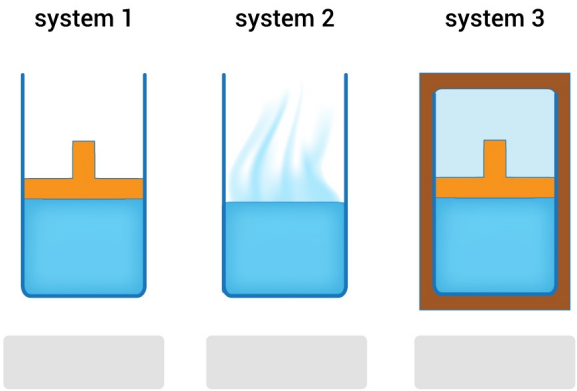
$[Cl_2]$ = 0.056*M*

[NO] = 0.028*M*

The equilibrium constant for the above reaction is 2.26×10^{-4} .

QUESTION 9

Drag and drop the CORRECT answers to label the diagram below.



complex system | chemical system | simple system

closed syste... | opened syst... | isolated system

QUESTION 10

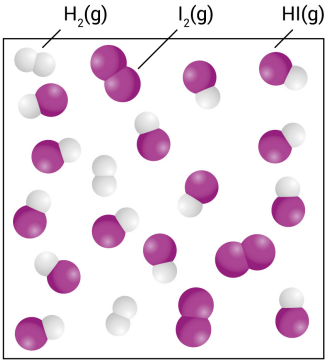
QUESTION 10

Select the CORRECT answers.

Consider the following reversible reaction:

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

The adjacent figure represents the reaction mixture at equilibrium.



The equilibrium constant is greater than 1 because the reaction mixture contains more products at equilibrium.

QUESTION 11

Select the CORRECT answer.

The Haber Process for converting hydrogen (H_2) and nitrogen (N_2) gases to ammonia (NH_3) is a reversible reaction that is exothermic in the forward direction.

$$N_2(g) + 3H_2(g) \rightleftharpoons 2NH_3(g)$$

The equilibrium constant for the above reaction, at 450°C, is $K_{eq} = 0.05 \times 10^{-3}$.

The equilibrium constant at 300°C will be $K_{eq} = 4.34 \times 10^{-3}$.



QUESTION 12

Select the CORRECT answer from the drop-down menu.

Consider the decomposition reaction of 0.3 *M* sulfuryl chloride gas (SO_2Cl_2) when performed at 100 °C:

$$SO_2Cl_2(g) \rightleftharpoons SO_2(g) + Cl_2(g) \quad (K_{eq} = 0.078)$$

The experiment was repeated starting with 0.9 *M* of SO_2Cl_2 gas. The value of the equilibrium constant in the second equilibrium will be $K_{eq} = 0.078$.

QUESTION 13

Select the CORRECT answer.

Which of the following equilibrium constants refers to a reaction mixture containing almost equal amounts of products and reactants at equilibrium?

- $K_{eq} = 1.5 \times 10^{-1}$
- $K_{eq} = 9.9 \times 10^{-1}$ ✓
- $K_{eq} = 8.6 \times 10^{6}$
- $K_{eq} = 1 \times 10^{-3}$

QUESTION 14

Select the CORRECT answer.

Consider the following equilibrium constant:

$$K_{eq} = \frac{[B_2][C_2]}{[A]^2}$$

Which of the following is the equation whose equilibrium constant is expressed above?

- $A_2 \rightleftharpoons 2B + 2C$
- $2A \rightleftharpoons B_2 + C_2$ ✓
- $B_2 + C_2 \rightleftharpoons 2A$
- $2B + 2C \rightleftharpoons A_2$

QUESTION 15

Select the CORRECT answer to complete the definition.

The _____ is the mathematical ratio of the concentrations of the products to the concentrations of the reactants at equilibrium; each concentration is raised to its coefficient in the balanced chemical reaction.

- [x] equilibrium constant
- [ ] chemical equilibrium
- [ ] dynamic equilibrium
- [ ] equilibrium state