Ch16 • Equilibrium

1999 NChO Exam

$$P_4(s) + 5\ O_2(g) \rightleftharpoons P_4O_{10}(s)$$

33. What is the equilibrium expression for this reaction?

(A) $K_c = [P_4O_{10}] / [P_4]\ [O_2]^5$
(B) $K_c = [P_4O_{10}] / 5\ [P_4]\ [O_2]$
(C) $K_c = [O_2]^5$
(D) $K_c = 1 / [O_2]^5$

$$Fe_3O_4(s) + 4\ H_2(g) \rightleftharpoons 3\ Fe(s) + 4\ H_2O(g)$$
$$\Delta H > 0$$

34. For this reaction at equilibrium, which changes will increase the quantity of Fe(s)?

1. increasing temperature
2. decreasing temperature
3. adding $Fe_3O_4(s)$

(A) 1 only
(B) 1 and 2 only
(C) 2 and 3 only
(D) 1,2, and 3

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31.Which reaction characteristics are changing by the addition of a catalyst to a reaction to a reaction at constant temperature?

1. activation energy
2. equilibrium concentrations
3. reaction enthalpy

(A) 1 only
(B) 3 only
(C) 1 and 2 only
(D) 1, 2, and 3

32. Which reaction characteristics will be affected by a change in temperature?

1. value of equilibrium constant
2. equilibrium concentrations

(A) 1 only
(B) 2 only
(C) 1 and 2 only
(D) neither 1 nor 2

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32. What is the relationship between the equilibrium constant (K_c) of a reaction and the rate constants for the foward (k_f) and backward (k_b) steps?

(A) $K_c = k_f\ k_b$
(B) $K_c = k_b / k_f$
(C) $K_c = k_f / k_b$
(D) $K_c = 1 / (k_f k_b)$

33. Xenon tetrafluoride, XeF_4, can be prepared by heating Xe and F_2 together according to this equation.

$$Xe(g) + 2F_2(g) \rightleftharpoons XeF_4(g)$$

What is the equilibrium expression for this reaction?

(A) $K = [XeF_4] / (\ [Xe]\ [F_2]\ )$
(B) $K = [XeF_4] / (\ 2[Xe]\ [F_2]\ )$
(C) $K = [XeF_4] / (\ [Xe]\ [F_2]^2\ )$
(D) $K = (\ [Xe]\ [F_2]\ ) / [XeF_4]$

1996 NChO Exam

32. What is the equilibrium expression for the decomposition of ammonium carbamate, $NH_4CO_2NH_2$, that occurs according to this equation:

$$NH_4CO_2NH_2(s) \rightleftharpoons 2\ NH_3(g) + CO_2(g)$$

(A) $K = [NH_3][CO_2]$
(B) $K = [NH_3]^2[CO_2]$
(C) $K = [NH_3][CO_2] / [NH_4CO_2NH_2]$
(D) $K = [NH_3]^2[CO_2] / [NH_4CO_2NH_2]$

33. Which factors will affect both the position of equilibrium and the value of the equilibrium constant for this reaction? The $\Delta H = -92$ kJ

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

(A) increasing the volume of the container
(B) adding N_2
(C) removing NH_3
(D) lowering the temperature