"REVIEW QUESTIONS FOR CHAPTER 5"

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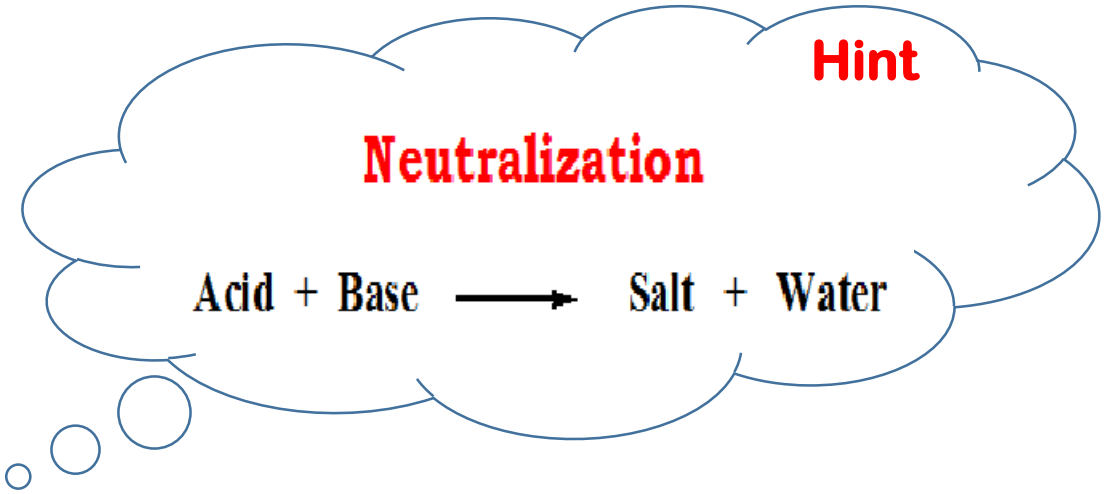
Q 1. The chemical reaction reaches the equilibrium state when :

A. Concentration of reactants are equal to that of products.
B. The rate of forward < rate of backward directions.
C. The rate of forward > rate of backward directions.
D. The rate of forward = rate of backward.

Q 2. When an acid reacts with a base the reaction is called ..... reaction.

A. Neutralization.
B. Precipitation.
C. Redox.
D. Single displacement.



Q 3. Given the following equation, the equilibrium expression will be:

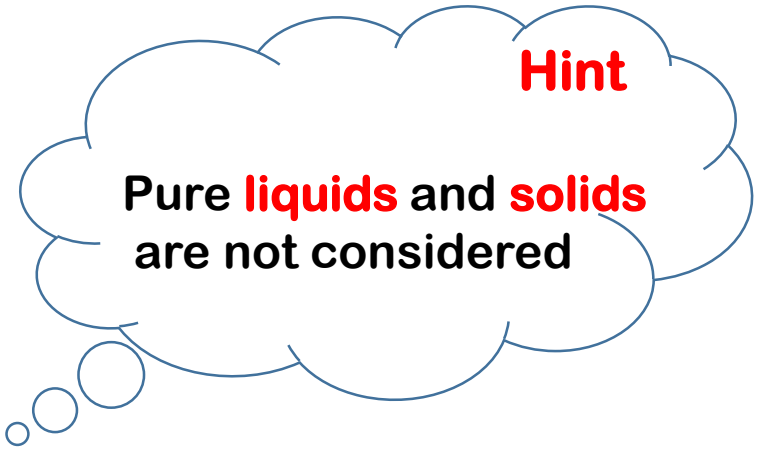
$$2\,CO_{(g)} \rightarrow C_{(s)} + CO_{2(g)}$$

A. $[CO]^2/[CO_2]$.

B. $[CO_2]\,/[CO]^2$.

C. $[CO]^2/\,[C][CO_2]$.

D. $[C]\,[\,CO_2]\,/[CO]^2$.



Q 4. For the equilibrium reactions, the equilibrium position favors the formation of products when:

A. $K_{eq.} > 1$.

B. $K_{eq.} < 1$.

C. $K_{eq.} = 1$.

D. None.

Hint

Keq. > 1	Equilibrium position favors right direction (to Products).
Keq. < 1	Equilibrium position favors left (back to Reactants).
Keq. = 1	Equilibrium position doesn't favor any direction.

Q 5. For the following reaction: $H_{2\,(g)} + I_{2\,(g)} \rightleftharpoons 2\,HI_{(g)}$

Knowing that: K = 50, thus the equilibrium constant for the following equation is: $2\,HI_{(g)} \rightleftharpoons H_{2\,(g)} + I_{2\,(g)}$

A. 0.2.
B. 0.02.
C. 0.002.
D. 20.

Hint

For any equilibrium reaction,

$A + B \rightleftharpoons C + D$ **with** K_1.

Keq. of the reverse direction

$(C + D \rightleftharpoons A + B);\ K_2 = \frac{1}{K_1}$

Q 6. Consider the following chemical system at equilibrium

$$\text{Heat} + O_{2\,(g)} + N_{2\,(g)} \rightleftharpoons 2\,NO_{(g)}$$

Which of the following effects would shift the equilibrium to the left?

A. increasing the concentration of O_2.
B. increasing the concentration of N_2.
C. decreasing the concentration of NO.
D. decreasing the reaction temperature.

Q 7. A Bronsted-Lowry acid is defined as a substance that _____ .

A. increases the [H+] concentration when placed in water.
B. decreases the [H+] concentration when placed in water.
C. acts as a proton donor.
D. acts as a proton acceptor.

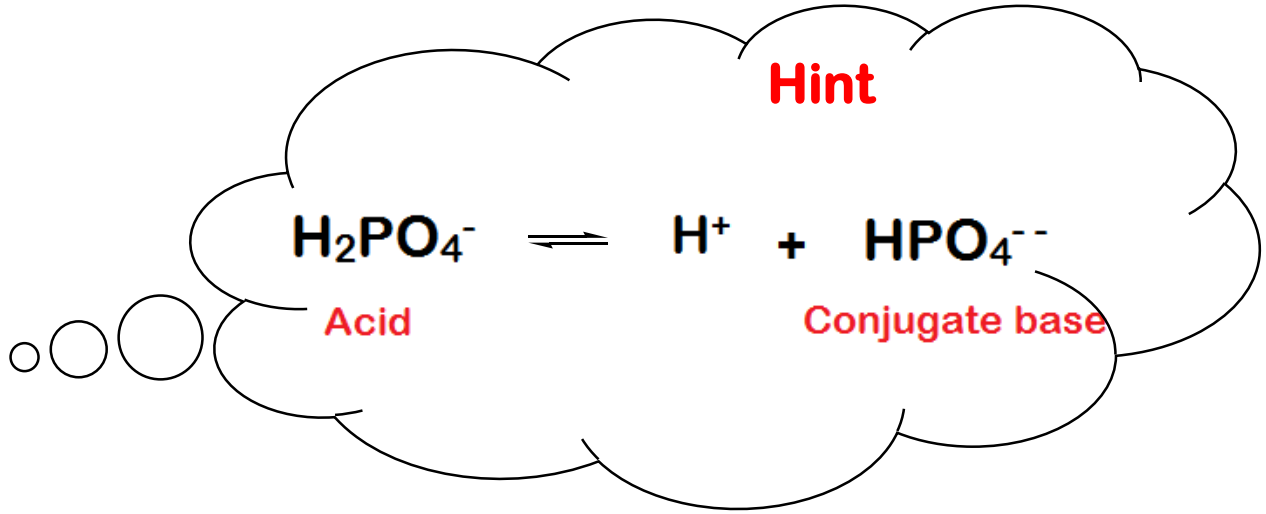
Q 8. What is the conjugate base of $H_2PO_4^-$?

A. HPO_4^{2-}.

B. PO_4^{3-}.

C. H_3PO_4.

D. H_3O^+.



Q 9. Calculate the pH for an aqueous solution of acetic acid that contains 2.15×10^{-3} M hydronium ion (H_3O^+).

A. 4.65×10^{-12} M.

B. 2.15×10^{-3} M.

C. 2.67 M.

D. 11.33

Hint

$$pH = -\log [H^+] = -\log (2.15 \times 10^{-3})$$

$$= 2.67$$

Q 10. CO_2 acts as a Lewis acid in the following reaction:

$$CaO_{(s)} + CO_2 \rightarrow CaCO_{3(s)}$$

because it _____ .

A. turns blue litmus to red.
B. reacts with a metal.
C. is a proton donor.
D. is an electron-pair acceptor.

Hint

Lewis acid = electron pair acceptor

Lewis base = electron pair donor

Q 11. Given the following equation, the equilibrium expression will be:

$$CO_{2(g)} + H_2O_{(l)} \rightarrow H^+_{(aq)} + HCO_3^-{}_{(aq)}$$

A. $[H^+][HCO_3^-]\ /[CO_2][H_2O]$.

B. $[H^+][HCO_3^-]\ /[CO_2]$.

C. $[CO_2][H_2O]/[HCO_3^-][H^+]$.

D. $[CO_2]/[HCO_3^-][H^+]$.

Hint

Pure **liquids** and **solids** are not considered

Q 12. At 700°C, Kc = 20.4 for the reaction shown below,

$$SO_{2\,(g)} + \tfrac{1}{2}\,O_{2(g)} \rightleftharpoons SO_{3(g)}$$

Thus, Kc for the following reaction is ..... .

$$2\,SO_{2\,(g)} + O_{2(g)} \rightleftharpoons 2\,SO_{3(g)}$$

A. - 20.4.

B. 20.4.

C. 40.8.

D. 416.2.

Hint

For any equilibrium reaction,

$A + B \rightleftharpoons C + D$ with K_1.

Keq. of the same reaction multiplied by n

$(nC + nD \rightleftharpoons nA + nB)$; $K_2 = K_1^{n}$

Q 13. ..... Stated that "when a chemical equilibrium is disturbed, the system shifts in a direction that minimizes that disturbance so, a system tends to maintain the equilibrium state".

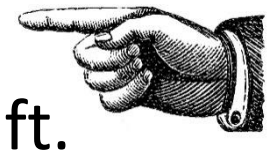
A. Avogadro.
B. Dalton.
C. Le Chatelier. 
D. Rutherford.

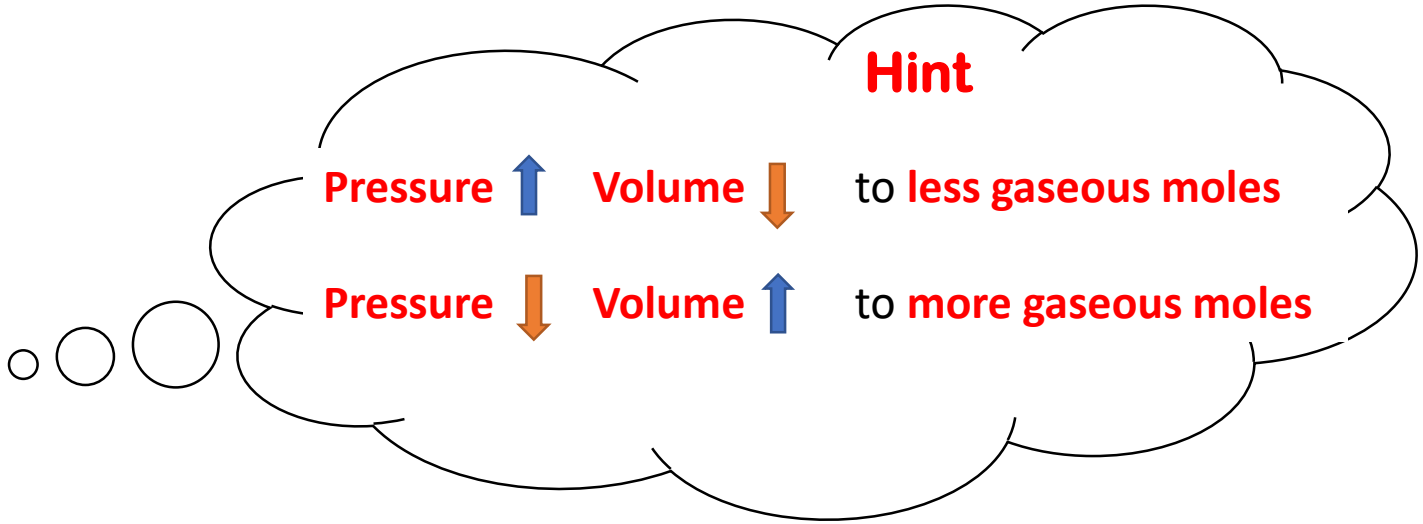
Q 14. Consider the following chemical system at equilibrium

$$C_{(s)} + 2H_{2(g)} \rightleftharpoons CH_{4(g)}$$

To which direction the reaction would shift if the volume is reduced?

A. left.
B. right.
C. No shift.
D. None.





Q 15. For the following equilibrium reaction:

$$2\,SO_{3(g)} \rightleftharpoons 2SO_{2(g)} + O_{2(g)},\quad Kp = 0.338 \text{ (at 1000 K)}$$

If the partial pressure of SO_3 is 0.10 atm and that of SO_2 is 0.15 atm. What is the partial pressure of O_2?

A. 0.10.
B. 0.15.
C. 0.20.
D. 0.25.

$$Kp = \frac{P_{SO2}^2 \cdot P_{O2}}{P_{SO3}^2}$$

$$0.338 = \frac{(0.15)^2 \cdot P_{O2}}{(0.10)^2} \Rightarrow P_{O2} = 0.15 \text{ atm}$$

With my best wishes
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