DPP SOLUTION

- Subject – Physical Chemistry
- Chapter – Ionic Equilibrium

DPP No.- 01

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Question-

H^+ H^+

The concept that acid is proton donor and base is proton acceptor was given by

1. Arrhenius
2. Lowry-Bronsted
3. Lewis
4. Faraday

$HA + H_2O \rightleftharpoons H^+ + A^-$

$A^- + H_2O \rightleftharpoons HA + OH^-$

Ans. (2)

Question-

Conjugate base of HCO_3^- is

1. H_2CO_3
2. CO_2
3. H_2O
4. CO_3^{2-}

$$C.A. \underset{+H^+}{\overset{-H^+}{\rightleftharpoons}} C.B.$$

$$HCO_3^- \overset{-H^+}{\rightleftharpoons} CO_3^{2-}$$

Ans. (4)

Question-

The conjugate acid of NH_2^- is

1. NH_3
2. NH_4^+
3. N_2H_4
4. NH_2OH

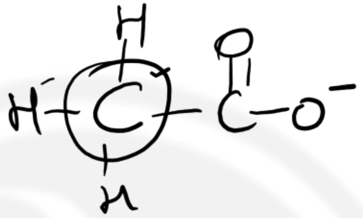
$$\underset{C.B.}{NH_2^-} + H^+ \rightleftharpoons \underset{C.A.}{NH_3}$$

Ans. (1)

Question-

Which one of the following can act as Bronsted acid as well as Bronsted base?

(1) CH_3COO^- $+ H^+ \rightleftharpoons CH_3COOH$



(2) CO_3^{2-} $+ H^+ \rightleftharpoons HCO_3^-$

(3) HPO_4^{2-} $+ H^+ \rightleftharpoons H_2PO_4^-$

$HPO_4^{2-} \xrightarrow{-H^+} PO_4^{3-}$

(4) SO_4^{2-} $+ H^+$

$\rightleftharpoons$

HSO_4^-

Ans. (3)

Question-

Which of the following can act both as Bronsted acid and Bronsted Base?

(1) Cl^- $+ H^+ \rightarrow HCl$

(2) $\overset{C.B.}{\underset{C.A.}{HSO_4^-}} + H^+ \rightleftharpoons \overset{C.A.}{H_2SO_4}$

$HSO_4^- \xrightarrow{-H^+} \underset{C.B.}{SO_4^{2-}}$

(3) $H_3O^+ \underset{}{\xrightarrow{-H^+}} H_2O$

(4) OH^- $+ H^+ \rightleftharpoons H_2O$

H_3O^+ $\cancel{+H^+}$

Ans. (2)

Question-

In the following reaction

$$HC_2O_4^{-} + PO_4^{-3} \leftrightharpoons HPO_4^{-2} + C_2O_4^{-2}$$

Which are the two Bronsted bases?

which ~~give~~ accept H^+

PO_4^{3-} & $C_2O_4^{2-}$

1. $HC_2O_4^{-}$ and PO_4^{-3}
2. HPO_4^{-2} and $C_2O_4^{-2}$
3. PO_4^{-3} and $C_2O_4^{-2}$
4. $HC_2O_4^{-}$ and HPO_4^{-2}

Ans. (3)

Question-

Observe the following equilibrium and choose the correct statement.

$$HClO_4 + H_2O \leftrightharpoons H_3O^+ + ClO_4^-$$

1. $HClO_4$ is conjugate acid of H_2O
2. H_3O^+ is conjugate base of H_2O
3. H_2O is conjugate acid of H_3O^+
4. ClO_4^- is conjugate base of $HClO_4$

$$H_2O \xrightleftharpoons{-H^+} OH^-$$

$$\underset{C \cdot B \cdot}{H_2O} + H^+ \rightleftharpoons \underset{C \cdot A \cdot}{H_3O^+}$$

$$HClO_4 \xrightleftharpoons{-H^+} ClO_4^-$$

Ans. (4)

Question-

Dissociation constant for a weak acid HA may be given as

1. $K_a = \dfrac{\alpha . c}{(1-\alpha)c}$

2. $K_a = \left(\dfrac{\alpha^2}{(1-\alpha)} . c\right)^2$

3. $K_a = \dfrac{\alpha^2 . c}{(1-\alpha)}$

4. $K_a = \dfrac{\alpha^2 . c}{1-\alpha^2}$

$K_a = \dfrac{c\alpha^2}{1-\alpha}$

if $\alpha <<< 1$

$\alpha \leq 0.05$

$1-\alpha \approx 1$

$K_a = c\alpha^2$

Ans. (2)

Question-

A monoprotic acid in a 0.1 M solution ionizes to 0.001 %. Its ionization constant is

(1) 1.0×10^{-3}

(2) 1.0×10^{-6}

(3) 1.0×10^{-8}

(4) 1.0×10^{-11}

it can loose only 1 H^+ ion

$C = 0.1\,M$

%age ionisation $= 0.001\% = \alpha \times 100$

$\alpha = \frac{0.001}{100} = 0.00001 = 10^{-5}$

$K_a = \cancel{\frac{C\alpha^2}{1-\alpha}}$ or $K_a = C\alpha^2$

$\cancel{\alpha > 0.05}$ $\alpha \le 0.05$

$K_a = C\alpha^2$

$= 10^{-1}(10^{-5})^2$

$= 10^{-1} \times 10^{-10} = 10^{-11}$

Ans. (4)

Thank You...