

(1) ✓

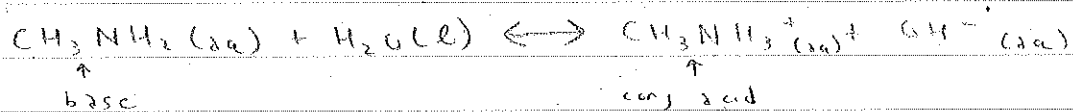
(2) ✓

(3) ✓

Acid = proton donor $\rightarrow [H_3O^+]$ Base = proton acceptor $\rightarrow [OH^-]$

(4) X

(5) X

To identify acids

Hydroacids

Ex) HCl, HCN

Oxyacids

Ex) nitrous acid, nitric acid

carboxylic acid

Ex) benzoic, acetic, formic

To identify bases

Metal hydroxide

Ex) KOH, NaOH, $\text{Bi}(\text{OH})_3$

Deriv of ammonia

(6) + 10 points (pull)

Part II



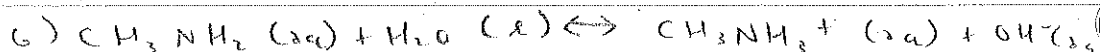
3)
$$K_a = \frac{[\text{H}_3\text{O}^+][\text{ClO}_2^-]}{[\text{HClO}_2]} = 1.2 \times 10^{-2}$$

4) Acid strength depends on the K_a (equilibrium constant) and the hydronium ion conc.

larger K_a , greater hydronium conc, stronger acid.

5) the acids listed in decreasing acid strength

6) +10 points (pull)



7)
$$K_b = \frac{[\text{OH}^-][\text{CH}_3\text{NH}_3^+]}{[\text{CH}_3\text{NH}_2]} = 4.38 \times 10^{-4}$$

8) larger K_b , more OH^- ions, stronger base

9) decreasing base strength

10) yes, K_a & K_b is decreasing \therefore acids / bases decreasing in strength

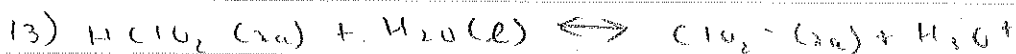
11) conj acid-base are indirectly proportional
- stronger the acid, weaker conjugate base partner

8) +10 points (pull)

12) equilibrium constant exp for water

$$K_w = [H_3O^+] \cdot [OH^-]$$

(9) + 10 points (poll)



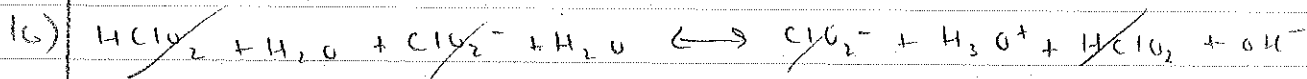
$$K_a = \frac{[ClO_2^-][H_3O^+]}{[HClO_2]} = 1.2 \times 10^{-2}$$



$$K_b = \frac{[HClO_2][OH^-]}{[ClO_2^-]} = 8.3 \times 10^{-13}$$

15) $K_a \cdot K_b = \frac{[ClO_2^-][H_3O^+]}{[HClO_2]} \cdot \frac{[HClO_2][OH^-]}{[ClO_2^-]}$

$$K_a \cdot K_b = [H_3O^+][OH^-]$$



17) $K_w = (1.2 \times 10^{-2})(8.3 \times 10^{-13}) = \boxed{1 \times 10^{-14}}$ ← very small!

Auto-ionization of water

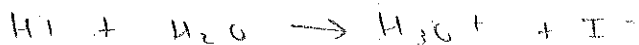
- water acts as acid & base

- equal amts - neutral

- more hydronium - acidic

- more hydroxide - basic

Determine $[H_3O^+]$ & $[OH^-]$ at $25^\circ C$ in
 $6.0 \times 10^{-2} M$ HI (aq) ← strong acid

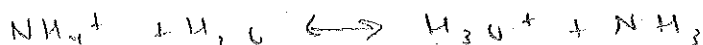


$$[H_3O^+] = 6.0 \times 10^{-2} M$$

$$K_w = [H_3O^+][OH^-] = 1 \times 10^{-14} = 6.0 \times 10^{-2} [OH^-]$$

$$[OH^-] = 1.7 \times 10^{-13}$$

Determine $[H_3O^+]$ & $[OH^-]$ in $6.0 \times 10^{-2} M$ NH_4^+
↑
 weak acid.



$$K_a = \frac{[H_3O^+][NH_3]}{[NH_4^+]}$$

R				
I	6×10^{-2}	\times	0	0
C	$-x$		$+x$	$+x$
E	$6 \times 10^{-2} - x$		x	x

$$K_a = ?$$

$$K_b = NH_3$$

$$K_a \cdot K_b = 1 \times 10^{-14}$$

$$\frac{1 \times 10^{-14}}{1.8 \times 10^{-5}}$$

$$K_a = 5.6 \times 10^{-10} = \frac{(x)(x)}{(6.0 \times 10^{-2} - x)}$$

$$= x = \sqrt{(5.6 \times 10^{-10})(6 \times 10^{-2})}$$