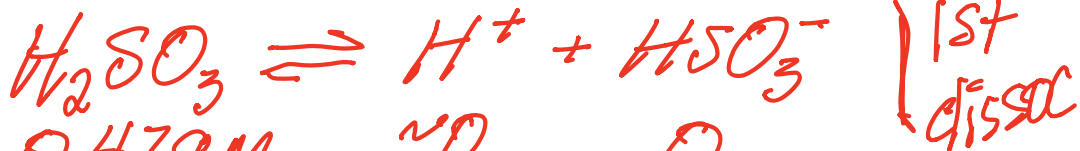


0.479 M



I	0.479 M	0	0
C	-x	+x	+x
E	0.479 - x	x	x
E	0.397 M	0.082 M	0.082 M

$K_{a1} = \frac{[H^+][HSO_3^-]}{[H_2SO_3]}$
 $1.7 \times 10^{-2} = \frac{(x)(x)}{.479 - x}$

$\frac{.479}{1.7 \times 10^{-2}} = 28$
not
 > 400

$1.7 \times 10^{-2} (.479 - x) = x^2$

$8.14 \times 10^{-3} - 1.7 \times 10^{-2} x = x^2$

$\frac{1}{a}x^2 + \frac{b}{a}x + \frac{c}{a} = 0$
 $\frac{1}{a}x^2 + 1.7 \times 10^{-2}x - 8.14 \times 10^{-3} = 0$

$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} = \frac{-1.7 \times 10^{-2} \pm \sqrt{(1.7 \times 10^{-2})^2 - 4(1)(-8.14 \times 10^{-3})}}{2(1)}$

$= \frac{-1.7 \times 10^{-2} \pm \sqrt{3.28 \times 10^{-2}}}{2}$

$[HSO_3^-] = [H^+] = x = \frac{-1.7 \times 10^{-2} \pm 0.181}{2} = \frac{.164}{2} = 0.082 M$



2nd dissociation

I	0.082	0.082	0
C	-x	+x	+x
E	0.082 - x	0.082 + x	x
E	0.082	0.082	6.4×10^{-8}

$$K_{a2} = 6.4 \times 10^{-8} = \frac{[H^+][SO_3^{2-}]}{[HSO_3^-]}$$

$$6.4 \times 10^{-8} = \frac{(0.082 + x)(x)}{0.082 - x}$$

$$x \ll 0.082$$

$$6.4 \times 10^{-8} \approx \frac{(0.082)(x)}{0.082}$$

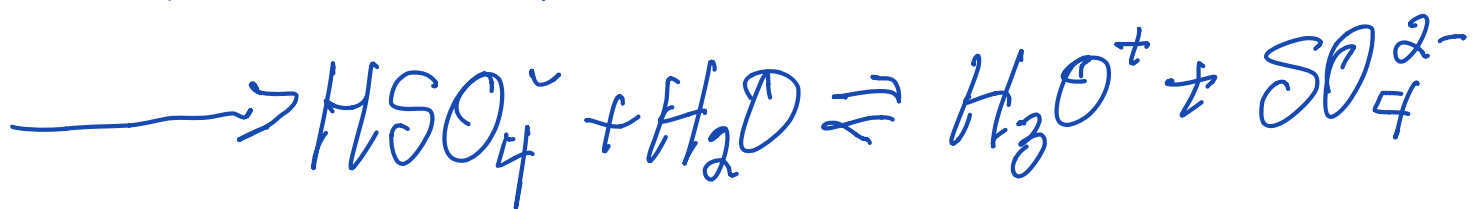
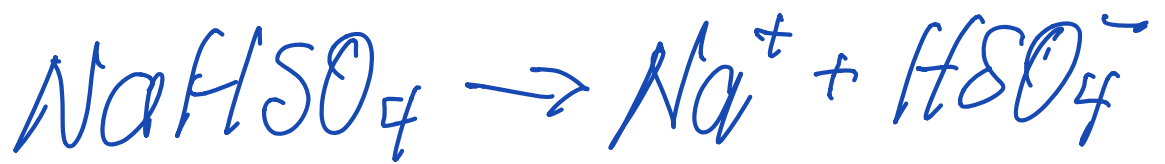
$$6.4 \times 10^{-8} \approx x$$

$$\text{pH} = -\log [H^+]$$
$$\approx -\log (0.082)$$

$$\text{pH} = 1.09$$

$$\frac{0.082}{6.4 \times 10^{-8}}$$
$$= 1.28 \times 10^7$$
$$(\gg 400)$$

0.578 M NaHSO_4



$$K_b = \frac{K_w}{K_{a1}} \approx \frac{1 \times 10^{-14}}{\text{very large}} \approx \frac{1 \times 10^{-14}}{1 \times 10^8} = 1 \times 10^{-22}$$

$$K_{a2} \approx \underline{1.2 \times 10^{-2}}$$

Calc the pH of 0.627M
NaHCO₃.



HCO₃⁻ can act as an acid
or a base!!

As an acid



or

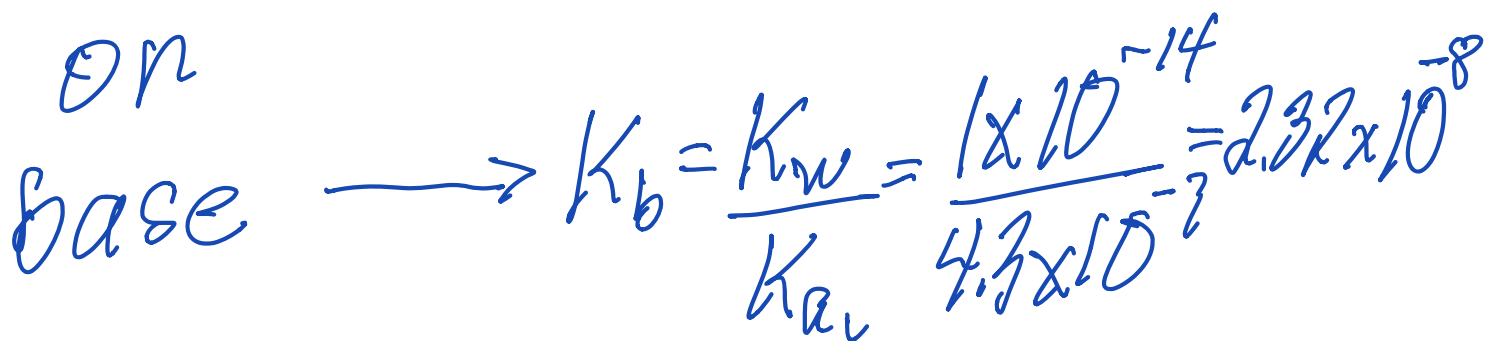
as a base



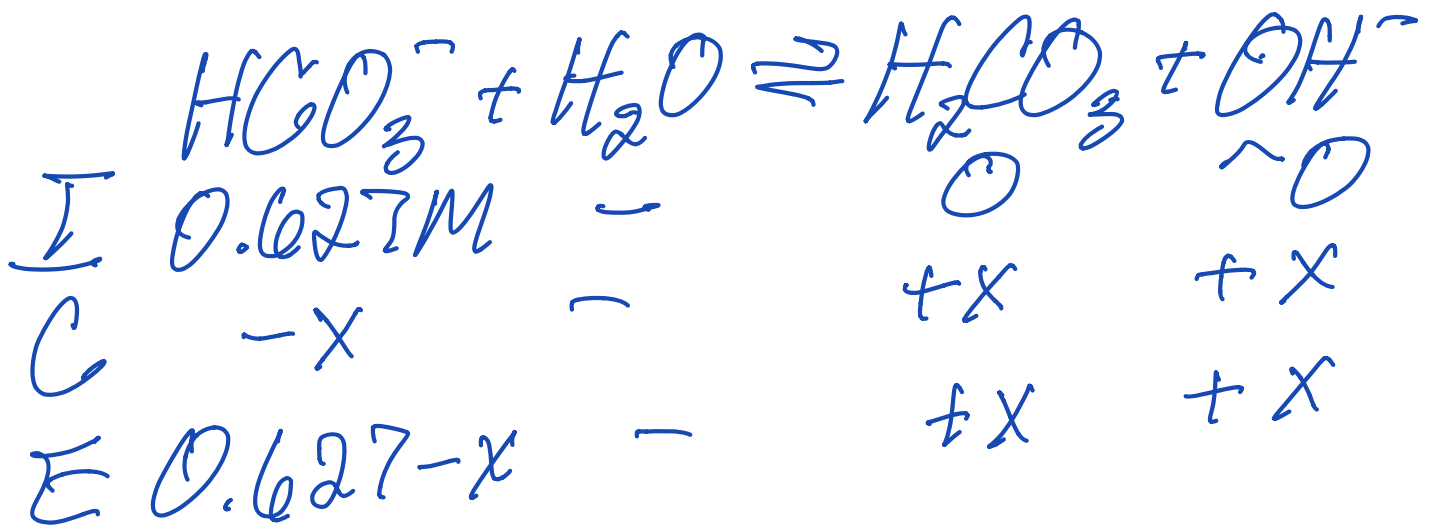
which one does HCO₃⁻
act as?



or



K_b is larger than K_{a2}
 so HCO_3^- acts as a base



$$K_b = 2.32 \times 10^{-8} = \frac{[\text{H}_2\text{CO}_3][\text{OH}^-]}{[\text{HCO}_3^-]}$$

$$2.32 \times 10^{-8} = \frac{(x)(x)}{0.627 - x} \quad x \ll 0.627$$

$$1.46 \times 10^{-8} = x^2$$

$$1.21 \times 10^{-4} \text{ M} = x = [\text{OH}^-]$$

$$\text{pOH} = -\log(1.21 \times 10^{-4})$$

$$= 3.92$$

$$\text{pH} = 14 - 3.92 = 10.08$$