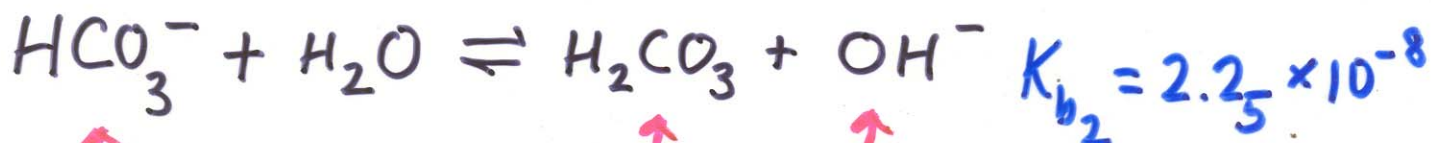


Consider an 800 mL solution with
0.40 mol NaHCO_3 (i.e. $F = 0.50 \text{ M}$).
Assume that the only reaction that
significantly impacts pH is



Use a "general chemistry" (non-systematic
approach) to compute pH.

$$K_{b2} = \frac{[\text{H}_2\text{CO}_3][\text{OH}^-]}{[\text{HCO}_3^-]} = \frac{x^2}{0.50 - x} = 2.25 \times 10^{-8}$$

$$x^2 + 2.25 \times 10^{-8} x - 1.125 \times 10^{-8} = 0$$

Using TI-83 solver,

$$x = 1.061 \times 10^{-4} \text{ M} = [\text{OH}^-]$$

$$\text{and } [\text{H}^+] = \frac{K_w}{[\text{OH}^-]} = \frac{1.0 \times 10^{-14}}{1.061 \times 10^{-4}} = 9.429 \times 10^{-11} \text{ M}$$

$$\text{so } \text{pH} = -\log [\text{H}^+] = \boxed{10.03}$$

↑
check this against
our demo...