CONCEPT: TITRATIONS: DIPROTIC & POLYPROTIC BUFFERS

Diprotic Buffers

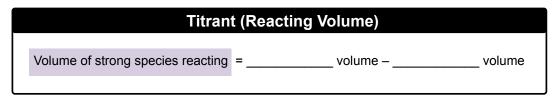
- Deal with the presence of _____ equivalence points and Henderson-Hasselbalch Equations as a result of 2 K_a values.
 - ☐ The relationships between the equivalence points and equations are shown as:

Diprotic Buffers			
Dissociation Steps	H ₂ A —	HA-	= A ²⁻
	Form	Form	Form
Ka-Kb Equations ■ = K _W ■ = K _W			
Henderson–Hasselbalch Equations	pH = pKa + log [pH = pKa + log	



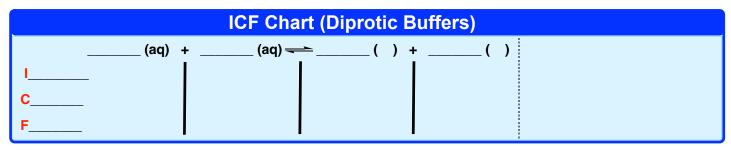
EXAMPLE: Calculate the pH of 100 mL of a 0.250 M H_2CO_3 when 120.0 mL of 0.250 M NaOH are added. $Ka_1 = 4.3 \text{ x}$ 10^{-7} and $Ka_2 = 5.6 \text{ x}$ 10^{-11} .

Calculate the equivalence volume needed by the strong species to reach the _____ equivalence point.



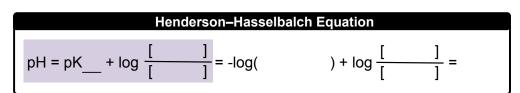
Use STEPS 1 to 3 to setup the ICF Chart.

- □ _____ the 1st equivalence point volume: Start with the acidic form and pK_{a1}.
- \Box the 1st equivalence point volume: Start with the intermediate form and pK_{a2}.



STEP 4: The Henderson-Hasselbalch Equation is used for a ______ to find the pH of a solution.

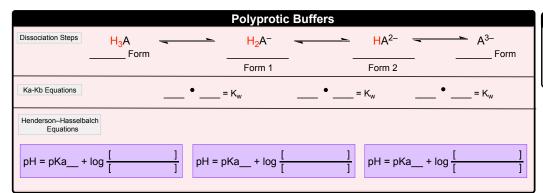
□ Using the FINAL ROW, use the moles of the _____ and ____ to find the pH.

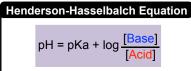


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Polyprotic Buffers

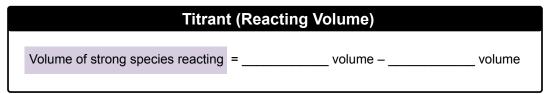
- Deal with the presence of _____ equivalence points and Henderson-Hasselbalch Equations as a result of 3 K_a values.
 - □ The relationships between the equivalence points and Henderson-Hasselbalch equations are shown as:





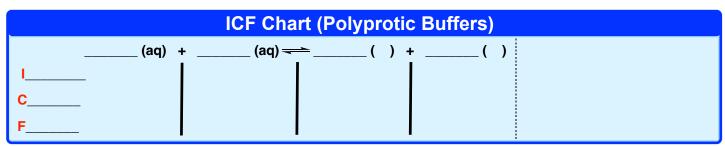
EXAMPLE: Calculate the pH of 30.0 mL of a 0.10 M $H_3C_6H_5O_7$ when 50.0 mL of 0.20 M NaOH are added. $K_{a1} = 7.4 \text{ x}$ 10^{-4} , $Ka_2 = 1.7 \text{ x} 10^{-5}$ and $Ka_3 = 4.0 \text{ x} 10^{-7}$.

Calculate the equivalence volume needed by the strong species to reach the _____ equivalence point.

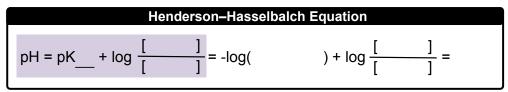


Use **STEPS 1 to 3** to setup the ICF Chart.

- \square the 1st equivalence point volume: Start with the acidic form and pK_{a1}.
- \Box the 1st equivalence point volume: Start with the intermediate form 1 and pK_{a2}.
- $\hfill\square$ the 2^{nd} equivalence point volume: Start with the intermediate form 2 and pKa3.



STEP 4: Using the FINAL ROW, use the moles of the _____ and ____ to find the pH.



CONCEPT: TITRATIONS: DIPROTIC & POLYPROTIC BUFFERS PRACTICE: Calculate the pH of 75.0 mL of a 0.10 M of phosphorous acid, H ₃ PO ₃ , when 80.0 mL of 0.15 M NaOH are added. K _{a1} = 5.0 x 10 ⁻² , Ka ₂ = 2.0 x 10 ⁻⁷ .
PRACTICE: Find the pH when 100.0 mL of a 0.1 M dibasic compound B (pKb ₁ = 4.00 ; pK _{b2} = 8.00) was titrated with 11 ml of a 1.00 M HCl.
PRACTICE: Suppose you have 50.1 mL of a H_3PO_4 solution that you titrate with 15.4 mL of 0.10 M KOH solution to reach the endpoint. What is the concentration of H_3PO_4 of the original H_3PO_4 solution?