Calculate pH of a solution after 10.0 mL of 1.0 M NaOH is added to 1.0 L of a Buffer solution, 0.60 M HF & 1.0 M Na_1F_1

1. Since adding strong base, need to use stoichiometry to get of all NaOH and then reassess type of bucket.

Resulting bucket calculations. Reacting (use stoichiometry) all NaOH, then see what species are left in bucket

$$NaOH + HF \Rightarrow H_2O + Na_1F_1$$

Can't stay with M must go to moles.

$$mol\ NaOH_r = (10.0mL)\left(\frac{1L}{1000mL}\right)(1.0M\ NaOH) = 0.010\ mol\ NaOH_r$$

$$mol\ HF_{Left} = mol\ HF_I - mol\ HF_r$$

$$= (1L)(0.60M\ HF) \quad (0.010\ mol\ NaOH_r)\left(\frac{1\ mol\ HF_r}{1\ mol\ NaOH}\right)$$

$$= 0.600\ mol\ HF_I - 0.010\ mol\ HF_r = 0.590\ mol\ HF_{Left}$$

$$[HF_L] = \frac{0.590\ mol\ HF}{1L + 0.010L} = \frac{0.590\ mol\ HF}{1.01L} = 0.536\ M$$

$$mol\ F^{1-}_{Left} = mol\ F^{1-}_I + mol\ F^{1-}_p$$

$$= (1L)(1.0M\ Na_1F_1)\left(\frac{1\ mol\ F^{1-}}{1\ mol\ Na_1F_1}\right) + (0.010\ mol\ NaOH)\left(\frac{1\ mol\ Na_1F_1}{1\ mol\ NaOH}\right)\left(\frac{1\ mol\ F^{1-}}{1\ mol\ NaF}\right)$$

$$= 1.00\ mol\ F^{1-}_I + 0.010\ mol\ F^{1-}_p$$

$$= 1.010\ mol\ F^{1-}_L$$

$$[F^{1-}] = \frac{1.010\ mol\ F^{1-}}{1.0L + 0.010L} = \frac{1.010\ mol\ F^{1-}}{1.010L} = 1.00M\ F^{1-}$$

HF
H^+F^{1-}
H_2O

still a buffer solution (H-H equ. still applies)

$$pH = pK_a + \log\frac{[F^{1-}]}{[HF]}$$

check 5% rule, $[H^+]$

$$pH = p(7.2\times10^{-4}) + \log\frac{1.0M}{0.536M}$$

$$\frac{3.87\times10^{-4}M}{0.536M}\cdot 100\% < 5\%$$

$$pH = 3.142 + 0.270$$

$$pH = 3.412$$

$$\boxed{pH = 3.41}$$