Answer on Question #41129 - Chemistry - Physical chemistry

Question.

Following solution are mixed to prepare buffer solution having pH=7

Answer:

To obtain buffer solution pH 7 you should use sodium dihydrogen phosphate and sodium hydroxide.

Way of preparation:

Dissolve 1.20g of sodium dihydrogen phosphate and 0.9g of disodium hydrogen phosphate in 1 liter volume distilled water.

$$c(H_2PO_4^-) = \frac{m(NaH_2PO_4)}{M(NaH_2PO_4) * V(H_2O)} = \frac{1.2}{119{,}98 * 1} = 0.01\frac{mol}{L}$$

$$c(HPO_4^{2-}) = \frac{m(Na_2HPO_4)}{M(Na_2HPO_4) * V(H_2O)} = \frac{0.9}{141{,}9 * 1} = 0.00634\frac{mol}{L}$$

Let's consider the equation:

$H_2PO_4^-$ = H^+ + HPO_4^{2-}, $K_{a2} = 6.34*10^{-8}$

c^0:	0.01		0.00634
Δc:	- x	+x	+x
[c]	(0.01 – x)	+x	(0.00634 + x)

$$K_{a2} = \frac{[HPO_4^{2-}][H^+]}{[H_2PO_4^-]}; [H^+] = x$$

$$K_{a2} = \frac{x * (0.00634 + x)}{(0.01 - x)}$$

$$x \ll 0.00634 \rightleftarrows \quad 6.34 * 10^{-8} = \frac{x * (0.00634)}{(0.01)}$$

$$10^{-7} = x$$

$$[H^+] = [PO_4^{3-}] = 10^{-7}$$

$$pH = -\log[H^+] = 7$$