Answer on Question#39444 - Chemistry - Inorganic Chemistry

Question

0.1M Na2HPO4 and 0.2M NaH2PO4.How much stock solutions and H2O would be needed to prepare 0.5M,2L of phosphate buffer at pH7.4?(pKa fr H2PO4 :7.2) can you guide me through it? i don't understand how this should be done.thanks

Answer:

The pH of buffer solutions can be determined using the following equation:

$pH = pK_a + lg [B^-]/[HB]$

where [HB] is the concentration of acid, and $[B^-]$ is the base concentration. In case of discussed buffer, the acid is NaH_2PO_4, and the base is Na_2HPO_4. Hence, knowing the pH and pK_a values, we can obtain the molar ratio between acidic and basic compounds:

$lg [Na_2HPO_4]/[NaH_2PO_4] = pH - pK_a$

$[Na_2HPO_4]/[NaH_2PO_4] = 1.58$

Dilution does not affect on pH of the buffer, hence we can simply compare the amounts of NaH_2PO_4 and Na_2HPO4 in the final solution.

Let “a” denote the volume of NaH_2PO_4 and “b” denote the volume of Na_2HPO_4.

$n(NaH_2PO_4) = a\cdot0.2$; $n(Na_2HPO_4) = b\cdot0.1$

$n(Na_2HPO_4)/n(NaH_2PO_4) = 1.58$

$a/b = 3.16$

So, to obtain buffer with pH = 7.4 you should take 3.16 parts of 0.1M Na_2HPO_4 per 1 part of 0.2M NaH_2PO_4.