Preparation of a buffer of specific pH

$$pH = pK_a + \log\frac{[A^-]}{[HA]}$$

"phosphate buffer" $pH = 7.4$

$$10^{-7.4} = 3.98 \times 10^{-8}$$

$$H_3PO_4 \rightleftharpoons H_2PO_4^- + H^+ \quad K_{a1} = 7.5 \times 10^{-3}$$

$$pK_a = 7.21$$

$$H_2PO_4^- \rightleftharpoons HPO_4^{2-} + H^+ \quad K_{a2} = 6.2 \times 10^{-8}$$

$$HPO_4^{2-} \rightleftharpoons PO_4^{3-} + H^+ \quad K_{a3} = 4.8 \times 10^{-13}$$
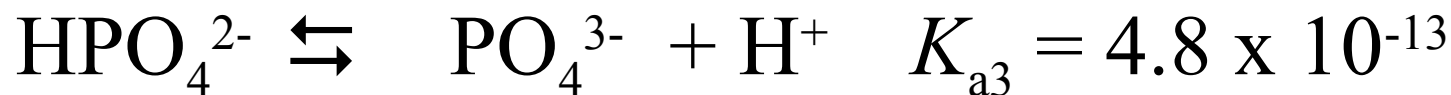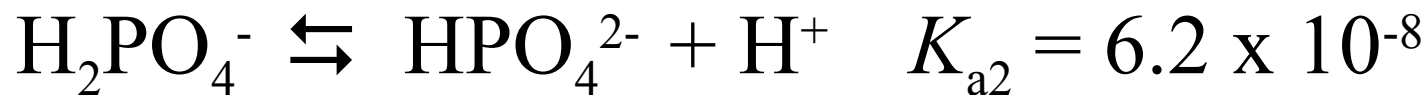
dissolve NaH_2PO_4 and Na_2HPO_4 in water

$$7.4 = -\log(6.2 \times 10^{-8}) + \log\frac{[HPO_4^{2-}]}{[H_2PO_4^-]}$$

$$0.19 = \log\frac{[HPO_4^{2-}]}{[H_2PO_4^-]}$$

$$1.55 = \frac{[HPO_4^{2-}]}{[H_2PO_4^-]}$$