

**Marks**  
**6**

- The  $\text{H}_2\text{PO}_4^-$  and  $\text{HPO}_4^{2-}$  ions play a major role in maintaining the intracellular pH balance. Write balanced equations to show how a solution containing these ions can act as a buffer.

For phosphoric acid,  $K_{a1} = 7.1 \times 10^{-3} \text{ M}$ ,  $K_{a2} = 6.3 \times 10^{-8} \text{ M}$ ,  $K_{a3} = 4.2 \times 10^{-13} \text{ M}$ .  
At what pH would the  $\text{H}_2\text{PO}_4^- / \text{HPO}_4^{2-}$  buffer system be most effective? Why?

Calculate the ratio of  $\text{H}_2\text{PO}_4^- / \text{HPO}_4^{2-}$  needed to give a solution buffered to a pH of 7.35.