

1992 Q6

$$pK_a = -\log K_a$$

The equations and constants for the dissociation of three different acids are given below.



- (a) From the systems above, identify the conjugate pair that is best for preparing a buffer with a pH of 7.2. Explain your choice.

The best conjugate pair would be H_2PO_4^- & HPO_4^{2-}

1 pt correct pair

When $[\text{H}_2\text{PO}_4^-] = [\text{HPO}_4^{2-}]$, the pH of the system equals the pK_a for the pair which is 7.2

1 pt explanation

- (b) Explain briefly how would you prepare the buffer solution described in (a) with the conjugate pair you have chosen.

Dissolve equal moles (or amounts) of H_2PO_4^- & HPO_4^{2-} (or appropriate compounds) in water

1 pt

- (c) If the concentrations of both the acid and the conjugate base you have chosen were doubled, how would the pH be affected? Explain how the capacity of the buffer is affected by this change in concentrations of acid and base.

1 pt pH will Δ
1 pt capacity ↑
1 pt why? Δ

Double [] of Acid + Base would not change pH. But the Capacity of the Buffer would increase because there is more moles of conjugate acid & conjugate base to react with added Base or Acid

- (d) Explain briefly how you could prepare the buffer solution in (a) if you had available the solid salt of only one member of the conjugate pair and solutions of a strong acid and a strong base.

Add strong Base to SALT of Conjugate Acid (solid)

1 pt

or
Add strong Acid to SALT of Conjugate Base (solid)