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so many fake sites. this is the first one which worked! Many thanks

Calculating the pH of an acidic buffer solution

Calculate the pH of the solution formed when 500mL of 0.1 mol L⁻¹ of weak acid HX is mixed with 500mL of a 0.2 mol L⁻¹ solution of its salt NaX. $K_a = 4 \times 10^{-5}$.

$$K_a = \frac{[\text{H}_3\text{O}^+(\text{aq})][\text{X}^-(\text{aq})]}{[\text{HX}(\text{aq})]}$$

re-arrange $[\text{H}_3\text{O}^+(\text{aq})] = \frac{[\text{HX}(\text{aq})] K_a}{[\text{X}^-(\text{aq})]}$

The solutions have been mixed; the volume is now 1 L

therefore $[\text{HX}] = 0.05 \text{ mol L}^{-1}$ and
 $[\text{X}^-] = 0.10 \text{ mol L}^{-1}$

Substituting $[\text{H}_3\text{O}^+(\text{aq})] = \frac{0.05 \times 4 \times 10^{-5}}{0.1} = 2 \times 10^{-5} \text{ mol L}^{-1}$

$$\text{pH} = -\log_{10} [\text{H}_3\text{O}^+(\text{aq})] = 4.70$$

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