

Competition Corner: Buffer Bounds

g10_u05_w20

Use only supplied mole models. Separate a direction-of-change claim from an exact-pH claim and state the finite inventory that limits capacity.

1. A buffer has 0.0060 mol HA and 0.0080 mol A^- . Add 0.0020 mol HCl. Find both final inventories and the new $n(A^-)/n(HA)$ ratio.
2. A second buffer has the same initial ratio as the first but one-half as many moles of each component. Compare acid-addition capacities without calculating an exact pH.
3. Critique: “Because a buffer reacts with added acid, its pH remains exactly constant.” Replace it with a defensible claim.
4. A student knows only the pH of a buffer. List two quantities still needed to decide whether 0.0030 mol HCl exceeds its acid-addition capacity.
5. For $H_2A + OH^- \rightarrow HA^- + H_2O$, explain why a one-to-one mole step is appropriate here but may not describe every acid-base system.