Types of buffer problems

1 Add mixture of weak acid and base to make buffer

- given amounts of WA and WB, calculate pH

Calculate [HA]
Calculate [A-]
Find pKa
Solve HH for pH

- given target pH and Formal concentration (F) and volume of the buffer (V), calculate the amounts of WA and WB needed.

F = [A-] + [HA]
total moles = FV = mol HA + mol A-
Let mol HA = x, so mol A- = FV-x

pH = pKa + log((FV-x)/x)
solve for x

convert moles of HA and A- required to grams of weak acid and weak base

2. Mix weak acid with strong base to prepare buffer

- given amounts of WA and SB mixed, calculate pH

pH = pKa + log {mol SB/(mol WA-mol SB)}

- given amount of WA and target pH, calculate the amount of SB required

Let x = mol SB
pH = pKa + log {x/(mol WA-x)}, solve for x

3. Mix weak base with strong acid to prepare buffer

- given amounts of WB and SA mixed, calculate pH

= pKa + log {(mol WB – mol SA)/SA}

- given amount of WB and target pH, calculate the amount of SA required

Let x = mol SA
pH = pKa + log {(mol WB-x)/x}, solve for x

4. Add SB or SA to an existing buffer to adjust to a new pH.
   -given the initial pH, target pH, volume of buffer, and concentrations of WA and WB determine volume of SA or SB needed to adjust to the target pH.

   Convert [HA] and [A-] to mmoles
   Let x = the mmol of SA or SB added
   pHtarget = pKa +log {(mmol A- + x)/(mmol HA – x)
   The sign on x will indicate whether you need to add SA or SB. As written above, if x is positive you are adding SB, if x is negative you are adding SA.