Calculations:

↳ Dilute solution of HCl.
Initial concentration: 0.1 M.

$C_1V_1 = C_2V_2$

$(0.1M)(0.001L) = (0.001M)(V_2)$

$V_2 = \frac{(0.1)(0.001)}{(0.001)} = 0.1L$ distilled water.

∴ Adding 0.001 of 0.1 M HCl to 0.1 L of distilled water will produce 0.001M HCl.

BUFFER SOLUTION:

Isoelectric point = 4.44
pH of buffer = 5.44
$pK_a = 4.75$

$5.44 = 4.75 + \log\left(\frac{V_B}{V_A}\right)$

$4.898 = V_B / V_A$

(1) $(4.898)(V_A) = V_B$

(2) $V_A + V_B = 0.050L$
$V_B = 0.050 - V_A$
$4.898V_A = 0.050 - V_A$
$5.898V_A = 0.050L$
$V_A = 8.48 \approx 8.50mL$
$\therefore V_B = 41.5mL.$

% ERROR:

pH meter: 5.41
Calculation: 5.44

$\frac{\text{Actual} - \text{Theoretical}}{\text{Actual}} \times 100$

5.41

$\frac{5.44 - 5.39}{5.44} \times 100 = 0.55\%$ Erro

Discussion:

According to our percent error calculation, our pH had a 0.55% error compared to the value measured by the pH meter. One source of error might have been the calibration of our pH meter. For example, instead of being at 7.00, it read 7.03. Also, during the gravity filtration, small particles of percipitate may have leaked into the solution, which should have been free of solid. Also, buret readings are subjective and include some degree of uncertainty (effects calculation Buffer systems are extremely necessary in biological systems. For example, the human body can only function within small ranges of pH. Thus,