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1-In analytical Chemistry, Sample Preparation refers to the ways during which a Sample is treated before Its analyses.
Preparation may be a vital Step in most analytical techniques, because the techniques are often not aware of the analyte in its in-situ form or the results are distroted by interfering Species.

2-Calibration Curves are wont to understand the instrumental response to an analyte, and to Predict the Concentration of analyte during a sample.
A Calibration Curve is made by first Preparing a group of ordinary Solutions with Known Concentration of the analyte.

3-Sample the object of the analytical Procedure (for example: a blood Sample)
Analyte the substance that is of interest in the analysis (for example: amount of hemoglobin in blood)
matrix the Constituents a Part from the analyte of the given Sample (for example: all the Constituents of blood except hemoglobin)

4- Buffer capacity is defined as the number of moles of a strong acid or a strong base that causes 1 L of the buffer solution to undergo a 1 unit change in PH

5-A

Sol/ $PH = Pka + \log \frac{NH_4 Na}{[NH_4]}$

Total number of mmoles of $NH_4 = 0.2 * 250 = 50$ mmol

$XSS\ NH_4 = 50 - 0.1 * V$

$[NH_4] = \frac{50 - 0.1V}{V + 250}$

$Ka = 5.6 \times 10^{-10}$

$Pka = -\log(5.6 \times 10^{-10})$

$Pka = 9.25$

$[NH_4 Na] = \frac{0.1V}{V+250}$

$PH = Pka + \log \frac{\frac{0.1V}{\cancel{V+250}}}{\frac{50-0.1V}{\cancel{V+250}}}$

$PH = 9.25 + \log \frac{0.1V}{50 - 0.1V}$

$7.7 = 9.25 + \log \frac{0.1V}{50-0.1V}$

$7.7 - 9.25 = \log \frac{0.1V}{50-0.1V}$

$-1.55 = \log \frac{0.1V}{50-0.1V}$

$\log 0.1V = -1.55(50 - 0.1V)$

$\log 0.1V = -77.5 + 0.155V$

$\log(0.1V - 0.155V) = -77.5$

$\log(-0.055) = -77.5$

$-0.055V = -\log[77.5]$

$-0.055V = -1.88 \rightarrow V = \frac{-1.88}{-0.055} = \boxed{34\ ml}$

5B- PH of water at 0.25 is PH = 7

$Kw\ (100C^\circ) = 55 \times Kw\ (25\ C^\circ)$

$= 55 \times (1 \times 10^{-14})\ M$

$\therefore PH\ (100C^\circ) = -\frac{1}{2} \log Kw\ (100C^\circ)$

$= -\frac{1}{2} \log [55 \times (1 \times 10^{-14})]$

$= -\frac{1}{2} \log [55 \times 10^{-14}]$

$= -\frac{1}{2} [\log 55 + \log 10^{-14}]$

$-\frac{1}{2} [1.740 - 14]$

$-\frac{1}{2} [-12.26]$

$= \boxed{6.13}$