**A 21.50 mL volume of 0.0950 M NaOH is required to reach the phenolphthalein endpoint in titration of a 3.15 g sample of vinegar.**
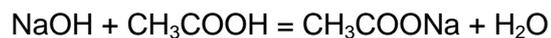**A) Calculate the number of moles of $CH_3COOH$ in the vinegar sample.**
**B) Calculate the mass of $CH_3COOH$ in the vinegar sample.**
**C) Calculate the percent by mass $CH_3COOH$ in the vinegar sample.**
**Assume the density of the vinegar is 1.00 g/mL.**

**Answer:**

$NaOH + CH_3COOH = CH_3COONa + H_2O$

$v(NaOH) = v(CH_3COOH)$

$C_M = \frac{v}{V} \qquad v = C_M V$

$C_M(NaOH) \cdot V(NaOH) = v(CH_3COOH)$

$a)\ v(CH_3COOH) = 0.0905 \cdot \dfrac{21.50}{1000} = 0.0019\ mol$

$b)\ v = \dfrac{m}{M} \qquad m = vM$

M ($CH_3COOH$) = 60 g/mol

$m(CH_3COOH) = 0.0019 \cdot 60 = 0.114\ g$

c) $\%(CH_3COOH) = \dfrac{pure(CH_3COOH)}{total(CH_3COOH)} \cdot 100\%$

$\%(CH_3COOH) = \dfrac{0.114}{3.15} \cdot 100\% = 3.62\%$