Example Questions

Mass of base for a certain pH

eg) What mass of Sr(OH)$_2$ needs to be added to 300.0 mL of soln. in order to prepare a solution with a pH = 12.56

Plan: pH $\rightarrow$ pOH $\rightarrow$ [OH$^-$] $\rightarrow$ [Sr(OH)$_2$] $\rightarrow$ mol Sr(OH)$_2$ $\rightarrow$ g Sr(OH)$_2$

$$pOH = 14.00 - 12.56 = 1.44$$
$$[OH^-] = \text{antilog} \ (-1.44) = 0.036308 \text{ M}$$

$$\text{Sr(OH)}_2 \rightarrow \text{Sr}^{2+} + 2\text{OH}^-$$

$$[\text{Sr(OH)}_2] = 0.036308 \text{ M OH}^- \times 1 \text{ M Sr(OH)}_2 = \frac{0.0181539 \text{ M}}{2 \text{ M OH}^-}$$

$$\text{mol} = \text{M} \times \text{L} = 0.0181539 \text{ M} \times 0.3000 \text{ L} = 0.005446 \text{ mol}$$

$$\text{mass} = 0.005446 \text{ mol Sr(OH)}_2 \times \frac{121.6 \text{ g}}{1 \text{ mol}} = 0.66 \text{ g}$$
**Dilution Questions With pH**

eg) How much water do you add to change one pH to another?

**Plan:**

1. Convert both pH's to \([H_3O^+]\)
2. Use Dilution formula (eg. To calculate FV)
   \[FC \times FV = IC \times IV\]
3. Use \(WA = FV - IV\)

eg) How much water needs to be added to 350.0 mL of a solution with a pH = 2.00 to bring the pH to 2.70?

\[\text{FC} = 0.010 \text{M} \; \text{(IC)}\]

<table>
<thead>
<tr>
<th>(\text{Initial} )</th>
<th>pH</th>
<th>([H_3O^+])</th>
<th>Volume</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.00</td>
<td>0.010 M (IC)</td>
<td>350.0 mL (IV)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>(\text{Final} )</th>
<th>pH</th>
<th>([H_3O^+])</th>
<th>Volume</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.70</td>
<td>0.0019953 M (FC)</td>
<td>FV = ?</td>
<td></td>
</tr>
</tbody>
</table>

\[FV \times FC = IV \times IC\]

\[FV = \frac{IV \times IC}{FC} = \frac{350.0 \text{ mL} \times 0.010 \text{ M}}{0.0019953 \text{ M}}\]

\[FV = 1754.1553 \text{ mL}\]
\[ WA = FV - IV \]
\[ = 1754.1553 \text{ mL} - 350.0 \text{ mL} = 1404.155 \text{ mL} \]

\[ \text{Ans. : } \frac{1400 \text{ mL}}{1.4 \times 10^3 \text{ mL}} \]

\[ 2SD \]