Review Topics

An aqueous solution contains 1.3 ppm benzene (C₆H₆). What is the mass percent of benzene in this solution?

1.3 ppm C₆H₆ means there is $1.3 \times 10^{-6}$ g C₆H₆ / g solution

mass % C₆H₆ is defined as $\frac{g \text{ C}_6\text{H}_6}{g \text{ solution}} \times 100$

Therefore,

$$\text{mass} \ % \ C_6H_6 = \frac{1.3 \times 10^{-6} \ g \ C_6H_6}{g \ \text{solution}} \times 100 = 1.3 \times 10^{-4} \ %$$

The density of a 70.5% by mass aqueous solution of perchloric acid is 1.67 g/mL. How many milliliters of this solution are needed to make 0.250 L of a 1.00 M solution of perchloric acid?

First calculate the molarity of the perchloric acid solution.

molarity = mol solute / L solution

one liter of concentrated perchloric acid solution weighs

$$1000 \ mL \ \text{solution} \times \frac{1.67 \ g \ \text{solution}}{mL \ \text{solution}} = 1670 \ g \ \text{solution}$$

one liter of concentrated perchloric acid solution contains

$$1670 \ g \ \text{solution} \times \frac{70.5 \ g \ \text{HClO}_4}{100 \ g \ \text{solution}} = 1.17 \times 10^3 \ g \ \text{HClO}_4$$

Therefore,

$$\frac{1.17 \times 10^3 \ g \ \text{HClO}_4}{L \ \text{solution}} \times \frac{1 \ \text{mol} \ \text{HClO}_4}{100.5 \ g \ \text{HClO}_4} = \frac{11.7 \ \text{mol} \ \text{HClO}_4}{L \ \text{solution}} = 11.7 \ M$$
Solutions to Chem 321 Work Group Set 1 Questions

Review Topics

Now apply the dilution formula \((M_1V_1 = M_2V_2)\) and solve for \(V_1\).

\[
V_1 = \frac{(1.00 \text{ M})(0.250 \text{ L})}{11.7 \text{ M}} = 0.0214 \text{ L} = 21.4 \text{ mL}
\]

Write an expression for the reaction quotient for the following reaction.

\[
\text{Hg}_2\text{Cl}_2(\text{s}) + \text{H}_2(\text{g}) \rightleftharpoons 2\text{Hg}(\text{l}) + 2\text{Cl}^-(\text{aq}) + 2\text{H}^+(\text{aq})
\]

\[
Q = \frac{[\text{Cl}^-]^2[\text{H}^+]^2}{P_{\text{H}_2}}
\]