QUIZ A
Aspirin Synthesis

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CH 113A

1. (4 points) Write a balanced equation for the synthesis of aspirin. What is the catalyst (if any) in this process? What is the solvent?

\[ \text{catalyst } (\text{H}_2\text{SO}_4) \]

2. (4) Circle the structures below which would give a positive FeCl₃ test:

   - OH
   - OH
   - CH₂OH
   - COOH
   - HOOC

3. (3) There are two basic types of filtration in common use in the organic lab - vacuum filtration and gravity filtration. Briefly explain which is used under what circumstances; that is, tell how you know whether to use gravity versus vacuum filtration.

   Vacuum filtration to isolate solid compound.
   Gravity filtration to remove small amounts of solid impurities.
4. (3) Suppose you begin with 29.5 g of salicylic acid and use an excess of acetic anhydride when performing the reaction of Problem 1 above. If you obtain 27.4 g of aspirin your percent yield is \( \frac{71.0}{0.24} \% \). (Write answer in blank and show your work below.) Assume the following: MW salicylic acid = 138 and the MW of aspirin is 180.

\[
\frac{29.5 \text{ g}}{138 \text{ g/mol}} = 0.214 \text{ mol ASA} \\
\frac{29.4 \text{ g}}{180 \text{ g/mol}} = 0.164 \text{ mol ASA} \\
0.152 \times 100 = 71.0 \%
\]

5. (6) Refer to the following equations in answering the questions below.

Suppose that you are using 12.0 g phthalic anhydride and 6.00 mL of methanol.

Assume At. Wts.: H=1; C=12; O=16

\[
\begin{align*}
\text{phthalic anhydride} & : 12.0 \text{ g} \\
& \rightarrow 148 \text{ g/mol} \\
& = 0.0811 \text{ mol} \\
\text{methyl alcohol} & : 6.00 \text{ mL} \\
& = 0.091 \text{ g} \\
& = 0.091 \times 0.791 \text{ g/mol} = 0.72 \text{ g/mol} \\
& = 4.75 \text{ g} \\
& = 0.148 \text{ mol} \\
\text{dimethyl phthalate} & : 194 \text{ g/mol} \\
& = 0.148 \text{ mol} \\
\text{H}_2\text{O} & : 18 \text{ g/mol} \\
& = 0.148 \text{ mol} \\
\text{MW} & = 18
\end{align*}
\]

(a - 1 pt) Balance the equation by filling in the box above.

(b - 1 pt) Calculate the molecular weight of dimethyl phthalate and enter this number in the space beneath the equation above.

(c - 2 pt) What is the limiting reagent? (Circle one):

- phthalic anhydride
- methyl alcohol

(d - 2 pt) What is the theoretical yield of dimethyl phthalate in grams?

Answer = \( \frac{14.4}{194} \text{ g} \times 0.074 \text{ mol} \times 194 \text{ g/mol} \)

\[
\frac{0.148 \text{ mol}}{2} = 0.074 \text{ mol}
\]

or, \( C_{10}H_{10}O_4 = 120 + 10 + 64 = 194 \)