Esterification Post-Lab Test

1. Give a brief explanation of the purpose of the:
   a. Silica gel beads
   b. Sulfuric acid
   c. Anhydrous Magnesium Sulfate (MgSO₄)

2. Discuss the purpose of the gas chromatograph.

3. Two students, I. Dno and D. M. Whitt incorrectly measured out their reagents. They used:
   2 mL isopentyl alcohol (MW = 88.2 g/mole, density = 0.813 g/mL)
   2 mL acetic acid (MW = 60.1 g/mole, density 1.06 g/mL)
   a. What is the limiting reagent?
   b. What is the theoretical yield?

4. I. M. Smart and his partner A. Stute made aspirin (acetyl salicylic acid), which is an ester prepared from salicylic acid and acetic acid. Mr. Smart and Mr. Stute argued over the formula for the product. They need your help. In the formulas for the reactants, please circle the water molecule that is lost. Put a square around the alcohol function and a triangle around the acid function for this reaction. Then write the product, acetyl salicylic acid.

\[\text{Salicylic Acid} + \text{Acetic Acid} \rightarrow \text{Water} + \text{Acetyl salicylic acid}\]

5. An alleged drug dealer, R. Dum, was arrested with a package of white powder. The police suspected it to be cocaine but Mr. Dum swore that it was ground up "juicy fruit" gum. The police chemist knew that both cocaine and the flavoring for "juicy fruit" were esters. How would he prove that this evidence was either cocaine with gum flavoring added or pure gum flavoring?

6. How could the following additions and subtractions affect Mr. Le Châtelier's esterification reactions?
   a. Add more alcohol
   b. Remove the water produced