

## PROBLEMS

1. (10 points)

Consider the following reaction scheme. The starting material is a substituted benzene ring with a methyl group and a bromine atom. The reaction proceeds through a series of steps to form a final product. The steps are as follows:

- Starting material: 1-bromo-4-methylbenzene
- Step 1: Nitration (HNO<sub>3</sub>, H<sub>2</sub>SO<sub>4</sub>)
- Step 2: Reduction (Fe, HCl)
- Step 3: Diazotization (NaNO<sub>2</sub>, HCl, 0°C)
- Step 4: Coupling (Phenol)
- Step 5: Hydrolysis (NaOH, heat)
- Step 6: Acidification (HCl)
- Step 7: Decarboxylation (heat)
- Step 8: Final product: 4-methylphenol

Step	Reagents	Product
1	HNO <sub>3</sub> , H <sub>2</sub> SO <sub>4</sub>	1-bromo-4-methyl-2-nitrobenzene
2	Fe, HCl	1-bromo-4-methyl-2-aminobenzene
3	NaNO <sub>2</sub> , HCl, 0°C	1-bromo-4-methyl-2-diazobenzenesulfonamide
4	Phenol	4-methyl-2-diazobenzenesulfonamide
5	NaOH, heat	4-methyl-2-sulfamoylphenol
6	HCl	4-methyl-2-sulfamoylphenol
7	heat	4-methylphenol

2. (10 points)

Consider the following reaction scheme. The starting material is a substituted benzene ring with a methyl group and a bromine atom. The reaction proceeds through a series of steps to form a final product. The steps are as follows:

## DISCUSSION



Step	Reagents	Product
1	HNO <sub>3</sub> , H <sub>2</sub> SO <sub>4</sub>	1-bromo-4-methyl-2-nitrobenzene
2	Fe, HCl	1-bromo-4-methyl-2-aminobenzene
3	NaNO <sub>2</sub> , HCl, 0°C	1-bromo-4-methyl-2-diazobenzenesulfonamide
4	Phenol	4-methyl-2-diazobenzenesulfonamide
5	NaOH, heat	4-methyl-2-sulfamoylphenol
6	HCl	4-methyl-2-sulfamoylphenol
7	heat	4-methylphenol

3. (10 points)

Consider the following reaction scheme. The starting material is a substituted benzene ring with a methyl group and a bromine atom. The reaction proceeds through a series of steps to form a final product. The steps are as follows: