1. A solution of 1-methylcyclohexene (0.1 M) dissolved in acetone solvent was reacted with 1 equivalent of bromine. Draw the preferred product.

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\text{[Diagram: Cyclohexene + Br}_2\text{]} 
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If 0.1 M of lithium iodide was also dissolved in the acetone solvent, how would the preferred product change? Discuss what factors need to be considered.

What changes would occur if 0.1 M of lithium chloride was dissolved in acetone instead?

2. An unknown compound (1) with a molecular formula of C\(_8\)H\(_{15}\)Br\(_1\) was found to be saturated. When 1 was reacted with sodium methoxide, two enantiomers (2 and 3) with molecular formula C\(_8\)H\(_{14}\) were obtained. When either 2 or 3 were hydrogenated they both yielded cis-1,3-dimethylcyclohexane. Also when either 2 or 3 were reacted with ozone followed by dimethyl sulfide, a dialdehyde (C\(_8\)H\(_{14}\)O\(_2\)) was obtained. Propose structures for compounds 1, 2 and 3.

Compound 1 can be either of two diastereomers. Draw the structure of the two diastereomers. One of the diastereomers reacts faster with sodium methoxide to yield compounds 2 and 3. Which diastereomer reacts faster? Why?

3. An unknown compound (1, C\(_5\)H\(_8\)) was deprotonated with NaNH\(_2\) quantitatively and then reacted with 1-bromopropane to generate compound 2. When 2 was reacted with potassium permanganate only butanoic acid (a linear four carbon carboxylic acid, C\(_4\)H\(_8\)O\(_2\)) was obtained. Compound 2 was reduced under two different conditions to generate alkenes 3 and 4. When compound 3 was reacted with Br\(_2\) a meso compound was obtained, while when compound 4 was reacted with Br\(_2\) a chiral compound was obtained. What are the structures for compounds 1-4 and what reducing conditions were used to generate compounds 3 and 4 respectively?