Multistep Organic Synthesis: Reaction Roadmaps

STUDENT PRACTICE WORKSHEET

Name: _____ Date: _____

Instructions: Select the best answer for questions 1–8 and briefly justify your choice using substrate, reagents, or reaction conditions. For 9–10, explain your reasoning in complete sentences.

1. First transformation for 1-bromopropane → 1-propanol:

A. Aqueous NaOH (SN2) B. PCC C. H_2/Lindlar D. CrO_3/H_2SO_4

Reasoning: _____

2. Convert 1-propanol to propanal with:

A. PCC B. Jones reagent C. Excess hot $KMnO_4$ aqueous D. $NaBH_4$

Reasoning: _____

3. Convert propanal to propanoic acid with:

A. Aqueous oxidant B. PCC exclusively C. $NaBH_4$ D. $LiAlH_4$

Reasoning: _____

4. Why work backward from the target?

A. Identify feasible bond/functional group changes B. Avoid balancing equations C. Make the molecule longer automatically D. Ignore the starting material

Reasoning: _____

5. A proposed route changes C_3 starting material into C_4 product with no C–C bond formation. What is the concern?

A. Carbon-count mismatch B. Solvent color C. Temperature only D. No issue

Reasoning: _____

6. To retain an aldehyde from a primary alcohol, avoid:

A. Aqueous Jones oxidation B. PCC C. Dess–Martin periodinane D. Swern oxidation

Reasoning: _____

7. Best two-step route: primary bromide → aldehyde?

A. Substitution to alcohol, mild oxidation B. Excess H_2/Pd, bromination C. Strong oxidation first, SN1 later D. Radical chlorination, reduction

Reasoning: _____

8. If a route requires SN2 at a tertiary carbon, one should:

A. Redesign the route B. Assume fast SN2 C. Ignore sterics D. Increase concentration only

Reasoning: _____

9. **Write a two-step conversion of 1-bromopropane to propanal.**

10. **Why should Jones oxidation not be used for the second step when propanal is the target?**