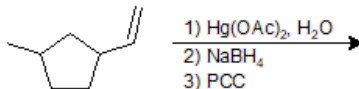


14.12: ADDITIONAL EXERCISES

14-1 What is the IUPAC name for the product of the following reaction?



- a) 1-(3-methylcyclopentyl)ethan-1-ol
- b) (3-methylcyclopentyl)acetaldehyde
- c) 1-(3-methylcyclopentyl)ethan-1-one
- d) 1-(3-methylcyclopentyl)ethane-1,2-diol

14-2 Convert 3-chlorocyclohexanol to the following products. Any of these products can be used as the reactant in any subsequent part.

- (a) 3-chlorocyclohexane
- (b) 3-chlorocyclohexyl tosylate
- (c) 3-chlorohexanone
- d) sodium 3-chlorocyclohexan-1-olate
- (e) 3-chloro-1-methylcyclohexanol
- (f) 1-bromo-3-chlorocyclohexane
- (g) 3-chlorocyclohexyl acetate
- (h) 1-chloro-3-ethoxycyclohexane

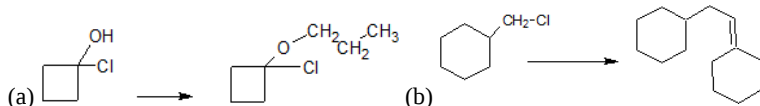
14-3 Show how you would synthesis the chloride, bromide, and iodide from the corresponding alcohols

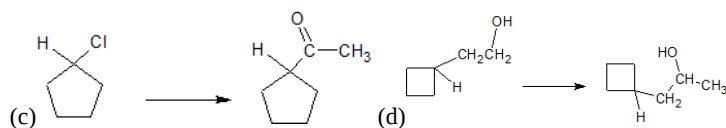
- (a) 1-halopentane (halo=chloro, bromo, iodo)
- (b) halocyclobutane
- (c) 1-halo-1-ethylcyclopentane
- (d) 1-halo-2-propylcyclopentane

14-4 Predict the major products of the following reactions. Clearly indicate stereochemistry where appropriate.

- (a) (R)-pentan-2-ol + TsCl in pyridine
- (b) (R)-2-pentyl tosylate + NaBr
- (c) cyclopentanol + $\text{CrO}_3/\text{H}_2\text{SO}_4$
- (d) 2-cyclopentylethanol + $\text{CrO}_3/\text{pyridine.HCl}$
- (e) 2-cyclopentylethanol + $\text{CrO}_3/\text{H}_2\text{SO}_4$
- (f) 1-propanol + HCl/ZnCl_2
- (g) 2-methylpropan-2-ol + HBr
- (h) ethanol + CH_3MgCl
- (i) potassium *tert*-butoxide + ethyl iodide
- (j) *tert*-butyl tosylate + sodium ethoxide
- (k) 1-methylcyclohexanol + $\text{H}_2\text{SO}_4/\text{heat}$
- (l) product from (k) + $\text{OsO}_4/\text{H}_2\text{O}_2$, then HIO_4
- (m) sodium cyclohexoxide + 1-iodopropane
- (n) sodium ethoxide + isopropyl tosylate
- (o) cyclopentylmethanol + $\text{DMSO} + \text{oxalyl chloride}$
- (p) cyclopropanol + DMP reagent

14-5 Propose an efficient synthesis for each of the following transformation



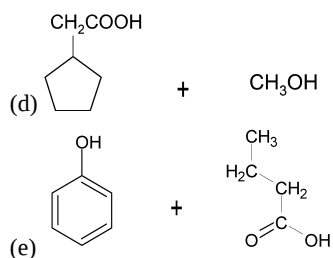


14-6 Predict the major products of sulfuric acid catalyzed dehydration

- (a) butan-1-ol
- (b) 2-methyl-3-pentanol
- (c) cyclohexanol
- (d) 1-cyclopentylethanol
- (e) cyclohexylmethanol
- (f) 2-methylcyclohexanol

14-7 Predict the products of the following ester synthesis reactions

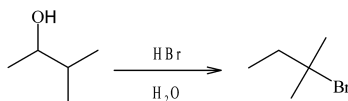
- (a) $\text{CH}_3\text{CH}_2\text{COOH} + \text{CH}_3\text{CH}_2\text{CH}_2\text{OH}$
- (b) $\text{CH}_3\text{CH}_2\text{OH} + \text{HNO}_3$
- (c) $\text{CH}_3\text{OH} + \text{H}_3\text{PO}_4$



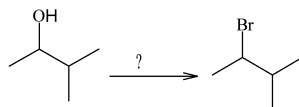
14-8 Show how you would convert (R)-2-pentanol to:

- (a) (S)-2-chloropentane
- (b) (R)-2-bromopentane
- (c) (S)-2-pentanol

14-9 When 3-methyl-2-butanol reacts with concentrated aqueous HBr, the major product is 2-bromo-2-methylbutane



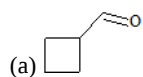
- a) Propose a plausible mechanism for the above reaction
- b) Show how you would convert 3-methyl-2-butanol into 2-bromo-3-methylbutane:

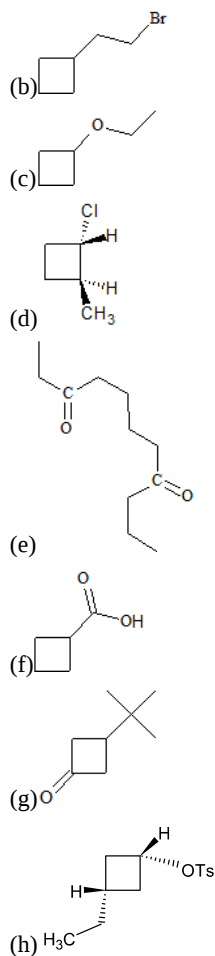


14-10 Predict the major products when trans-2-ethylcyclopentanol reacts with the following reagents. Include stereochemistry if necessary.

- (a) PBr_3
- (b) SOCl_2
- (c) Lucas reagent
- (d) concentrated HBr
- (e) TsCl/py then NaCN
- (f) TsCl/py then NaOEt

14-11 Using an alcohol of your choice, show how you would synthesis each following compound.

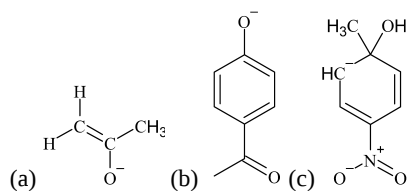




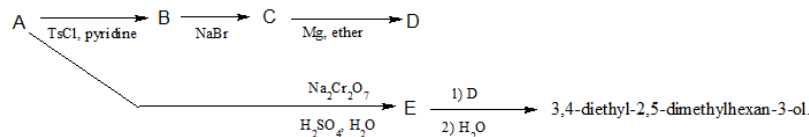
14-12 Describe chemical tests that can be used to distinguish the following pairs of compounds. Include the reagents, reaction conditions, observations, and chemical equations in your answers.

- 2-propanol and 2-methyl-2-propanol
- 1-propanol and 2-propanol
- cyclopentanol and cyclopentene
- cyclopentanol and 1-cyclopentylethanone
- cyclopentanone and 1-methylcyclopentanol

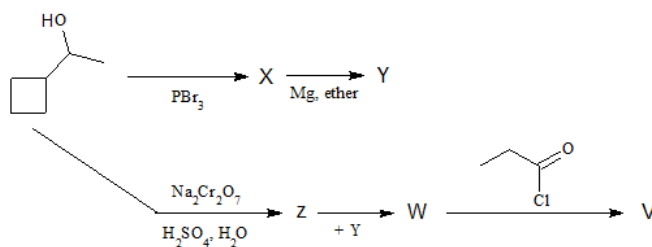
14-13 Draw important resonance structures for the following compounds



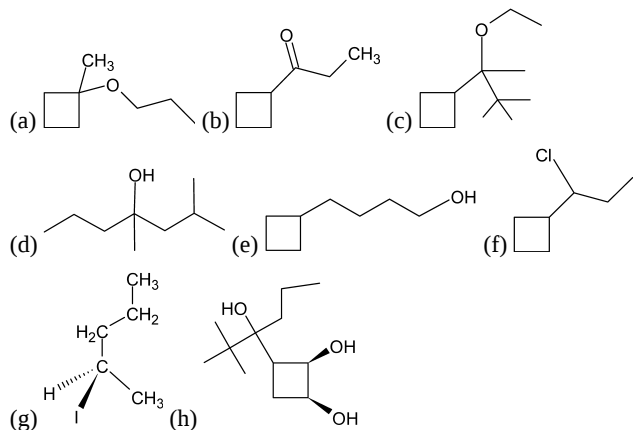
14-14 The following sequence of reaction transforms alcohol A to 3,4-diethyl-2,5-dimethylhexan-3-ol. Propose structure for compounds A, B, C, D, and E.



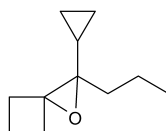
14-15 Consider the following transformation. Identify the structures of compound X, Y, Z, W, and V.



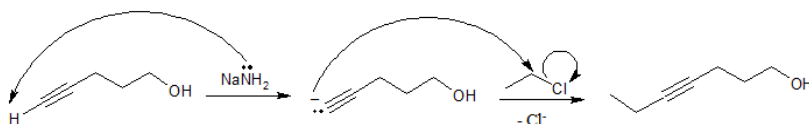
14-16 Show how each of the following compounds can be synthesized. You might use any alcohol containing five or fewer carbon atoms as your starting materials.



14-17 Show how you would synthesize the following compound. Only use alcohols containing four or fewer carbons as your organic materials. You might use any necessary solvents and inorganic reagents.



14-18



a) The above transformation does not work because of a common conceptual error. What is the conceptual error implicit in this transformation?

b) Show how you could accomplish the transformation in good yield?

14-19 X and Y are constitutional isomers of molecular formula C_3H_6O . Given the following results with four chemical test, propose structures and assign IUPAC names for X and Y.

	$SOCl_2$	$K_2Cr_2O_7$	Br_2 (liquid)	Tollens' reagent
Compound X	No Rxn	Orange \rightarrow Green	No Rxn	No Rxn
Compound Y	Bubbles	Orange \rightarrow Green	Decolorize	Grey precipitate of Silver

14-20 The Williamson ether synthesis converts an alkyl halide or tosylate to an ether. Would the following synthesis be possible? If not, explain why not and show an alternative synthesis that would be more likely to work.

