

TEST ONE SKILLS/OBJECTIVES / OUTCOMES / COMPETENCIES

- The following list specifies **major** skills/competencies that you may be asked to demonstrate on tests.
- The list should not be viewed as exhaustive; anything that is addressed in the notes and is not designated either in the notes or in the lectures as “not test responsible” should be considered to be fair game for test assessment.

Ch		TEST ONE. ALCOHOL CHEMISTRY	Self-Assessment (Some but not all Graded)	Graded Assessment
10	Structure and Synthesis of Alcohols	<ol style="list-style-type: none"> Nomenclature: Draw and name alcohols, phenols, and diols, including alkenols and cyclic alcohols; or given a name, be able to draw the structure. Physical Properties: Predict and rank relative boiling points and solubilities of alcohols relative to other organic structures. Predict products or specify reactants involved in the conversion of alkenes, alkyl halides, or carbonyl compounds to alcohols; and be prepared to use these transformations in multi-step synthesis scenarios, whether that be product prediction or synthesis design or retrosynthesis. Grignard Reactions: Draw the expected products when organomagnesium reagents (Grignard reagents) react with aldehydes, ketones, esters (including cyclic esters), formaldehyde, or epoxides. Organometallic compatibility: Identify which solvents are appropriate for use when preparing and using RMgBr reagents; identify which haloalkanes could be effectively converted to RMgBr reagents and subsequently reacted intermolecularly with other carbonyls. Rank the relative reactivities of aldehydes, ketones, esters, alcohols, or water towards strong nucleophiles/bases such as RMgBr reagents. Mechanisms: Use arrow-pushing to display electron movement in chemical reactions involving RMgBr, LiAlH₄, or NaBH₄ and aldehydes, ketones, esters (including cyclic esters), or epoxides. Synthesis Design: Given a starting chemical, suggest reactants or sequences of reactions/reactants that could transform the reactant into a target product. (Presumably involving an alcohol as reactant, intermediate, or final product.) Retrosynthesis: Identify different combinations of chemicals that could be used to synthesize 1°, 2°, or 3° alcohols or derivatives thereof. Hydride Reduction Reactions: Predict products for reactions involving sodium borohydride or lithium aluminum hydride, including selective or non-selective reductions involving more than one carbonyl. Also be able to identify an appropriate hydride reducing agent for a particular reduction reaction. 	<ol style="list-style-type: none"> In-lecture in-notes problems Practice sets online Practice Tests Sapling homework problems Book practice problems 	<ol style="list-style-type: none"> Sapling homework Quiz 1 Test 1 Final Exam
11	Reactions of Alcohols	<ol style="list-style-type: none"> Acid-Base: Predict and rank acidities and basicities of alcohols and alkoxides relative to other organic structures; and predict when acid/base reactions will or won't be product favored Extraction: Identify and explain which chemicals will be extracted from an organic solvent into neutral water or into NaOH/water Predict the products (multi-reactions sequences may be involved) for reactions sequences involving alcohols and <ul style="list-style-type: none"> Reducing metals such as elemental Na or K Bases Oxidizing agents such as PCC and H₂CrO₄ Dehydrating agents such as H₂SO₄ or H₃PO₄ Halogenating agents such as HBr, PBr₃, HCl, HI, and SOCl₂ (including stereochemistry) Sulfonating agents such as TsCl and subsequent reactions Chemical Tests: Identify possible structures for a chemical given a chemical formula and chemical test results (Jones, Lucas, H₂/Pt reaction...) Mechanisms: Draw mechanisms for ROH → RX reactions, using HBr (or HCl or HI) or PBr₃. Synthesis Design: Given a starting chemical, suggest reactants or sequences of reactions/reactants that could transform the reactant into a target product. (Presumably involving an alcohol as reactant, intermediate, or final product.) Retrosynthesis: Design syntheses involving different combinations of chemicals that could be used to synthesize 1°, 2°, or 3° alcohols or derivatives thereof. A limited array of possible starting chemicals will be allowed. 	<ol style="list-style-type: none"> In-lecture in-notes problems Practice sets online Practice Tests Sapling homework problems Book practice problems 	<ol style="list-style-type: none"> Sapling homework Test 1 Final Exam