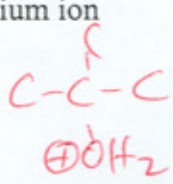
Chemistry 210
October 29, 2003

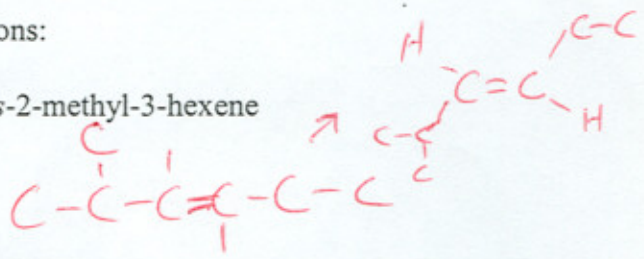
Name Key

16 1. Give structures for each of the following compounds or ions:

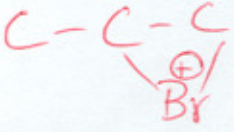
t-butyl oxonium ion



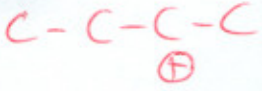
trans-2-methyl-3-hexene



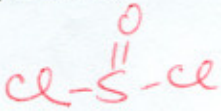
propylbromonium ion



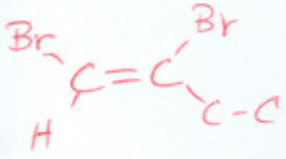
sec-butylcarbocation



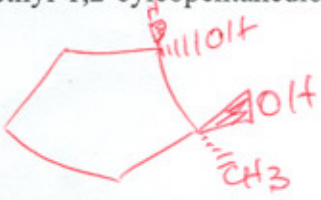
thionyl chloride



(Z)-1,2-dibromo-1-butene

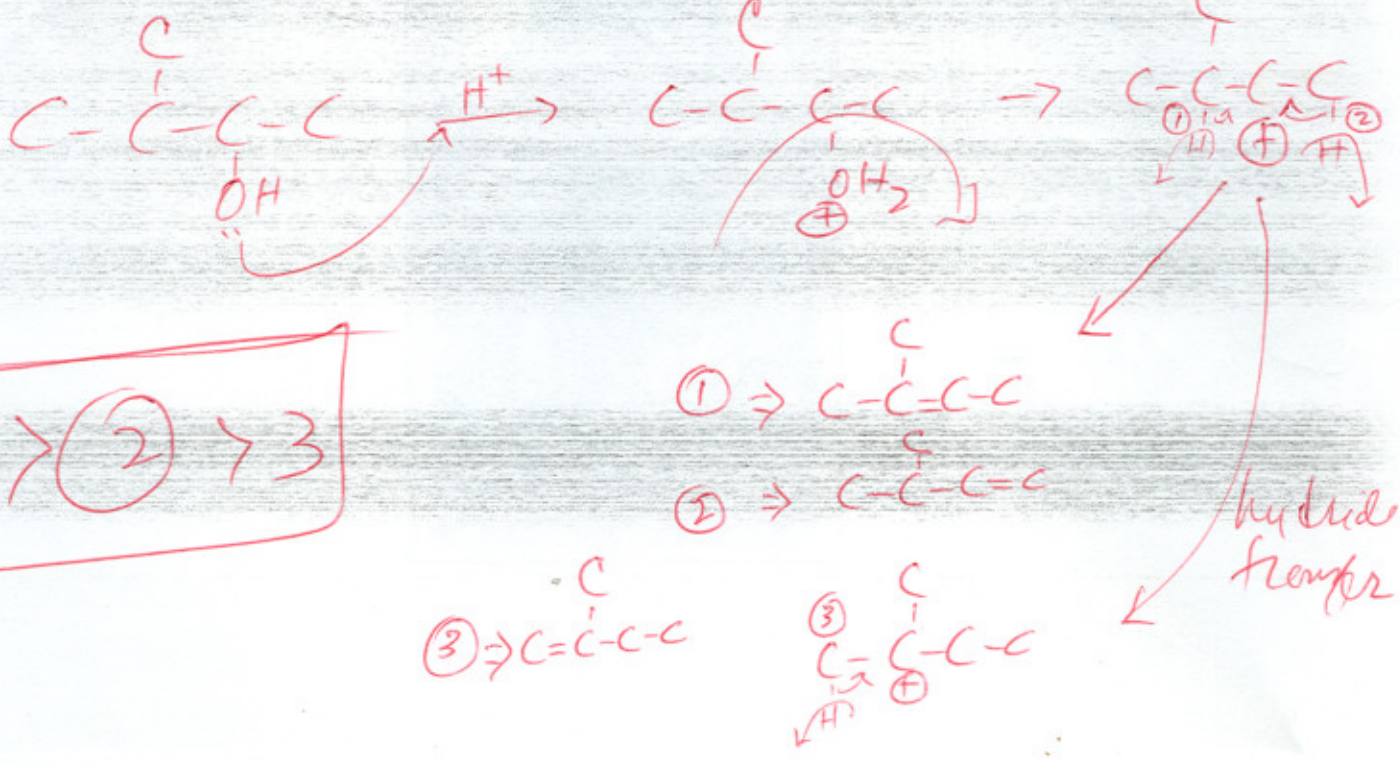


(*E*)-1-methyl-1,2-cylcopentanediol



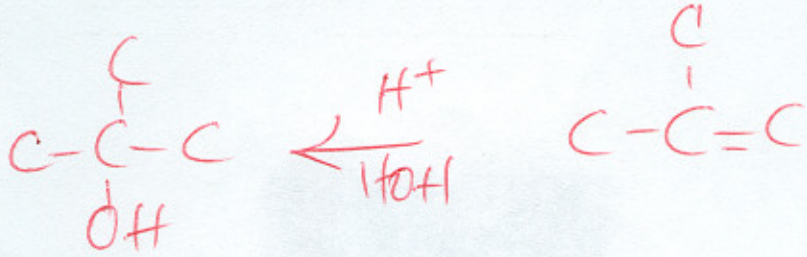
a 4-carbon aldehyde

12 2. Show the reaction mechanism for the acid-catalyzed elimination reaction of 3-methyl-2-butanol that actually produces three different alkenes. Alkyl and/or hydride shifts may be required. For the three potential products predict the order of increasing percentage of product formed (the product which is preferred will be formed more!).

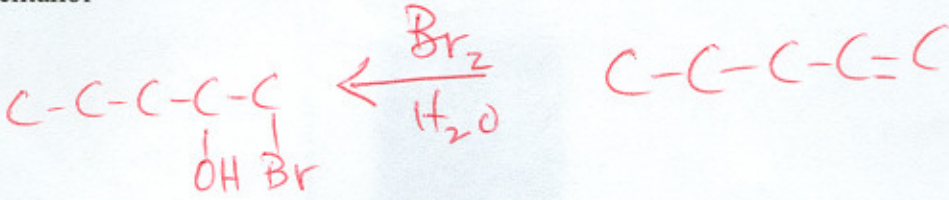


16 3. We have usually started with a reactant and showed the product. However, organic chemists are often given a product, and have to determine a good reactant. For the following products, show any *alkene* that could be used to produce the product shown. Include any other chemicals which may be required for these chemical transformations. *(Draw the structure of the product, to give yourself a better idea about structures of potential alkene reactants.)*

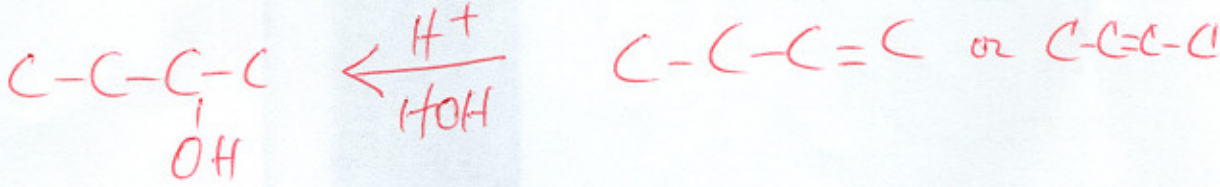
t-butyl alcohol



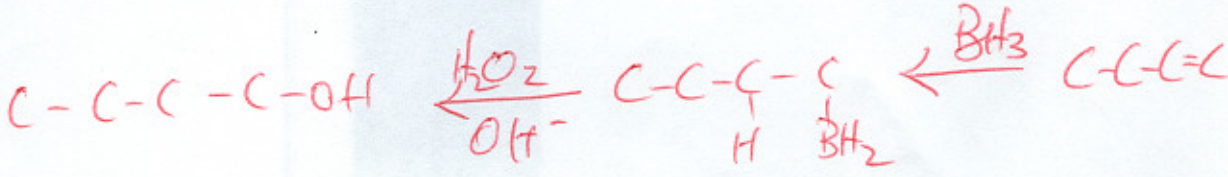
1-bromo-2-pentanol



2-butanol

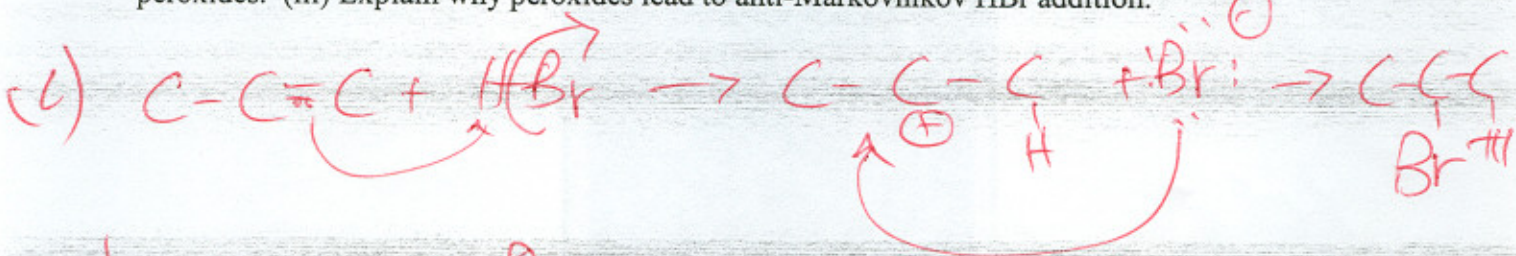


1-butanol

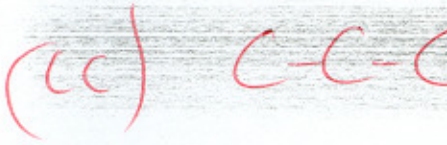


12 4. (i) Show the complete *reaction mechanism* (with arrows) and product for the reaction of propene and HBr, including the formation of the intermediate carbocation. (ii) Show the reaction product (*but no reaction mechanism is necessary*) for reaction of HBr and propene in the presence of peroxides. (iii) Explain why peroxides lead to anti-Markovnikov HBr addition.

(i)

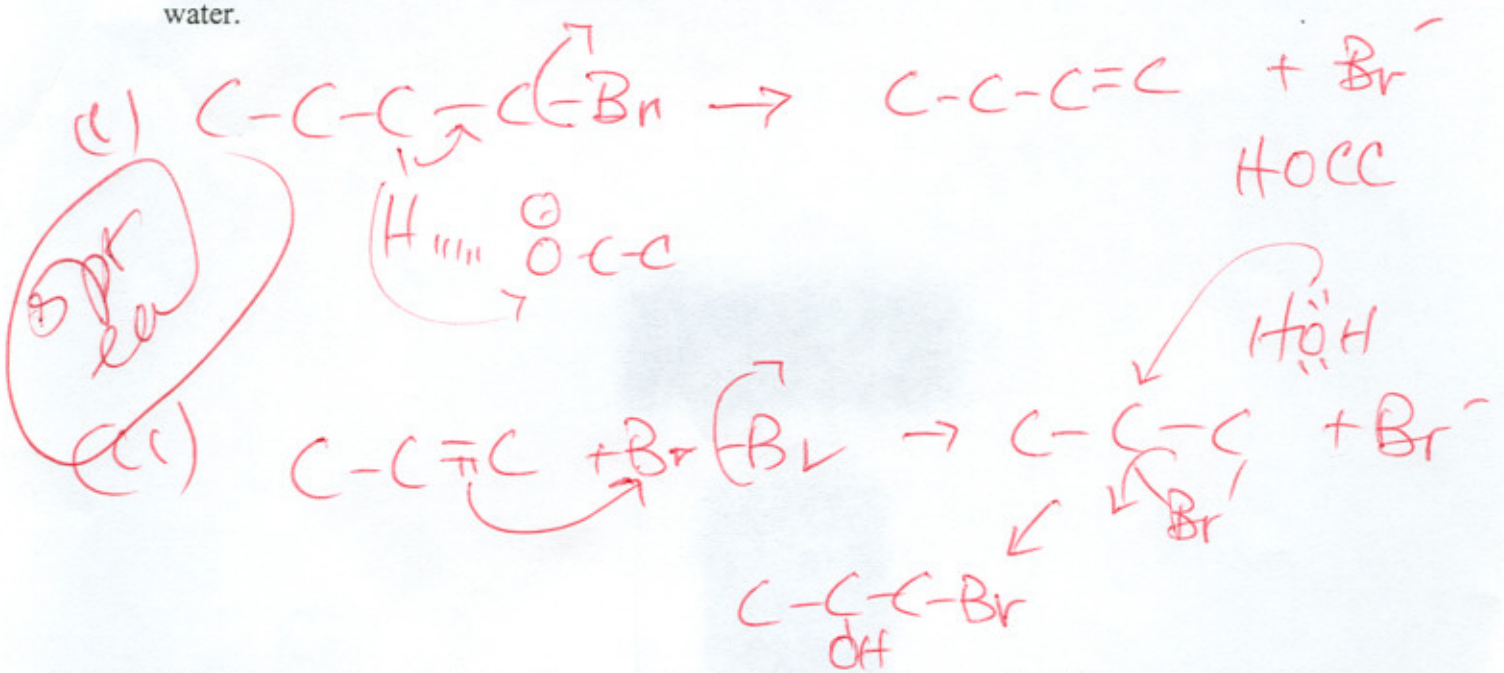


(ii)

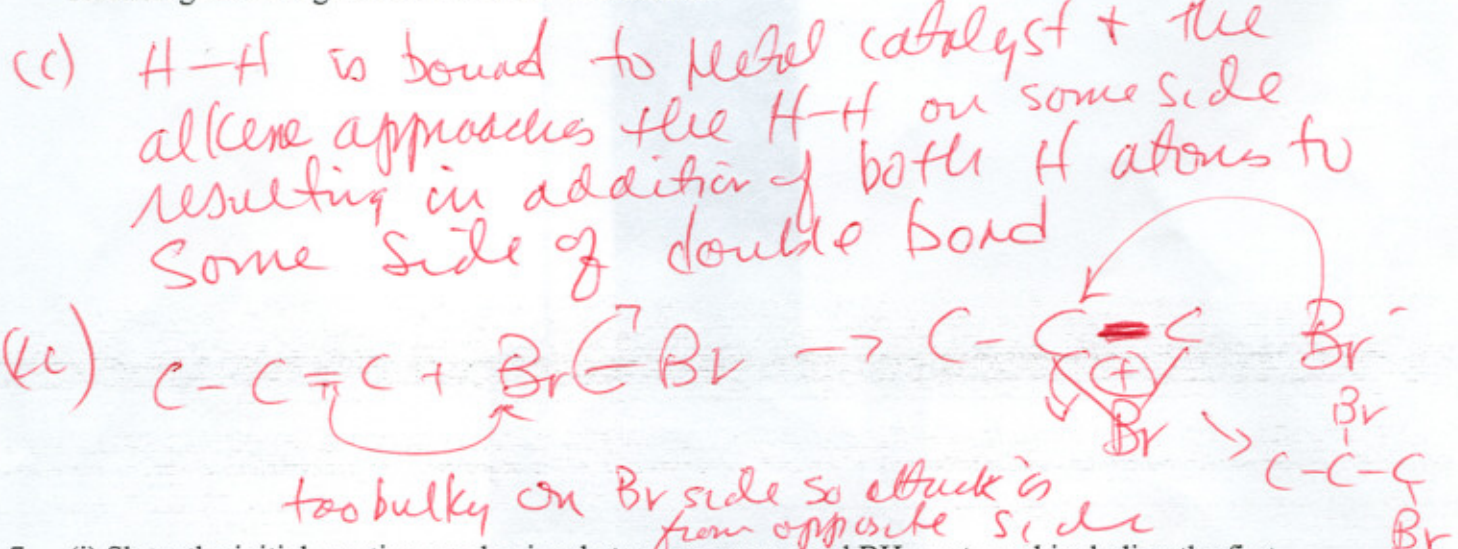


(iii) because a secondary free radical is more stable than 1° free radical

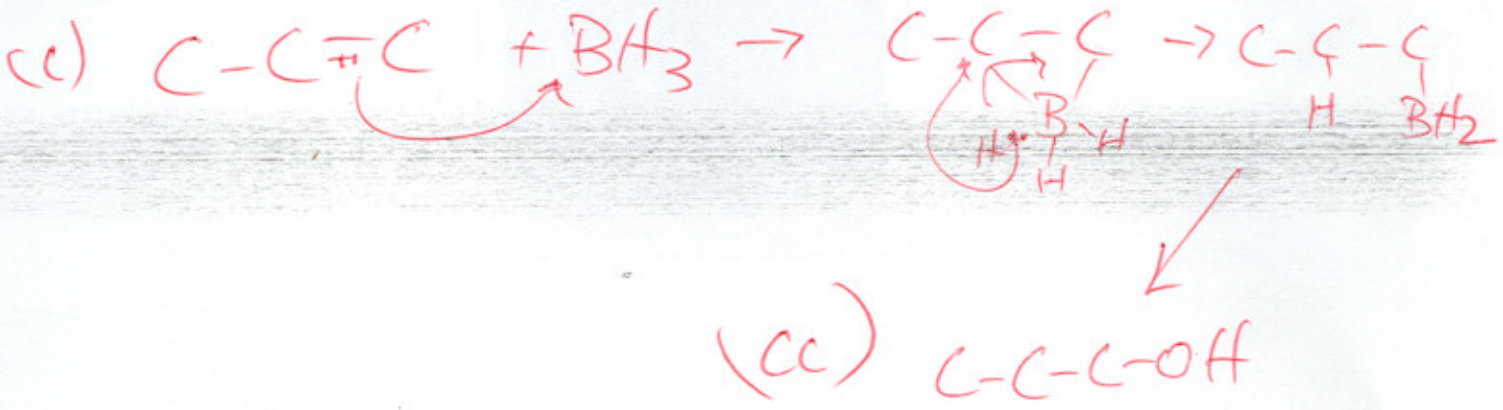
10 5. (i) Show the reaction mechanism for the E2 elimination of 1-bromobutane in the presence of sodium ethoxide. (ii) Show how a halohydrin can be formed starting with propene, Br_2 and water.



10 6. (i) Hydrogenation of alkenes is stereoselective. Describe how catalytic hydrogenation of an alkene occurs via *syn* addition. (ii) Show the reaction mechanism by which Br_2 reacts with propene, producing a bromonium ion (3-membered ring with a positive charge), and why the reaction goes through an *anti* addition mechanism.

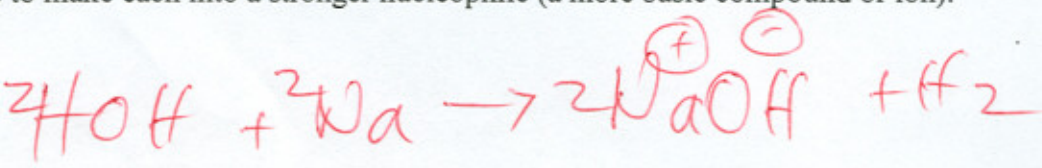


8 7. (i) Show the initial reaction mechanism between propene and BH_3 up to and including the first hydride ion transfer. (ii) What will be the structure for the alcohol produced following a complete hydroboration-oxidation process?



6 8. Each of the following compounds are weak nucleophiles as shown. Show a reaction that you could use to make each into a stronger nucleophile (a more basic compound or ion).

HOH



NH_3

ethanol

10 9. Show the reaction mechanism by which *t*-butyl bromide reacts with water to produce *t*-butyl alcohol, going through a carbocation.