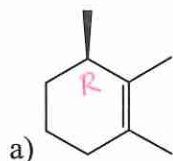


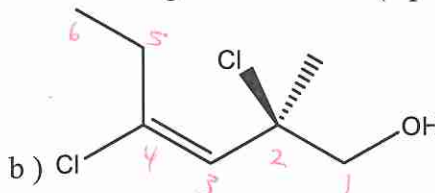
Name: _____

Directions: The exam is worth 110 points but scored out of 100 points.

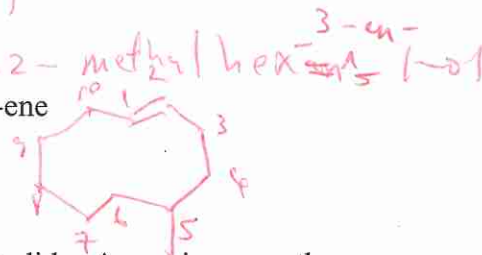
1) Give the name if given the structure or the structure if given the name. (3 pts. each)



c) (S)-2,3-epoxy-2-methylbutane



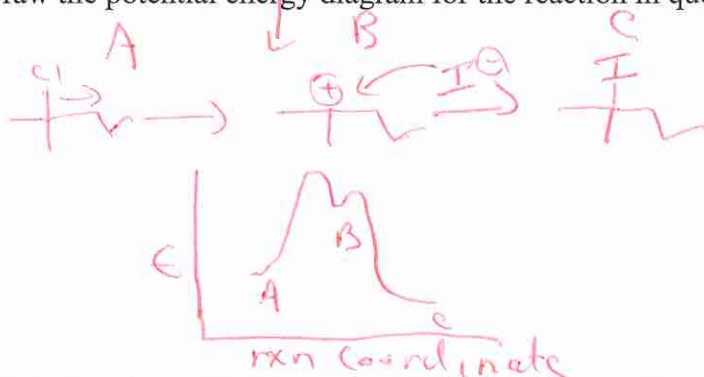
d) E-5-methylcyclodec-1-ene



2) Consider the reaction of 2-chloro-2-methylpentane with sodium iodide. Assuming no other changes, how would it affect the rate if one simultaneously doubled the concentration of 2-chloro-2-methylpentane AND sodium iodide? Explain your answer. (3 pts.)

A doubling both means the rate doubles. the concentration of NaI does not affect rate.
 $3^\circ \text{ halide so } S_N1 \text{ rate} = k [A] [NaI]^0$

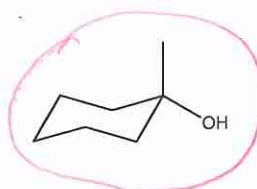
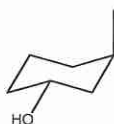
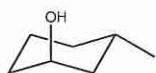
3) Draw the potential energy diagram for the reaction in question # 2. (3 pts.)



4) Circle the alcohol that is converted to the corresponding chloride at the fastest rate on reaction with concentrated hydrochloric acid. Put a box around the alcohol that reacts at the slowest rate. (3 pts.)

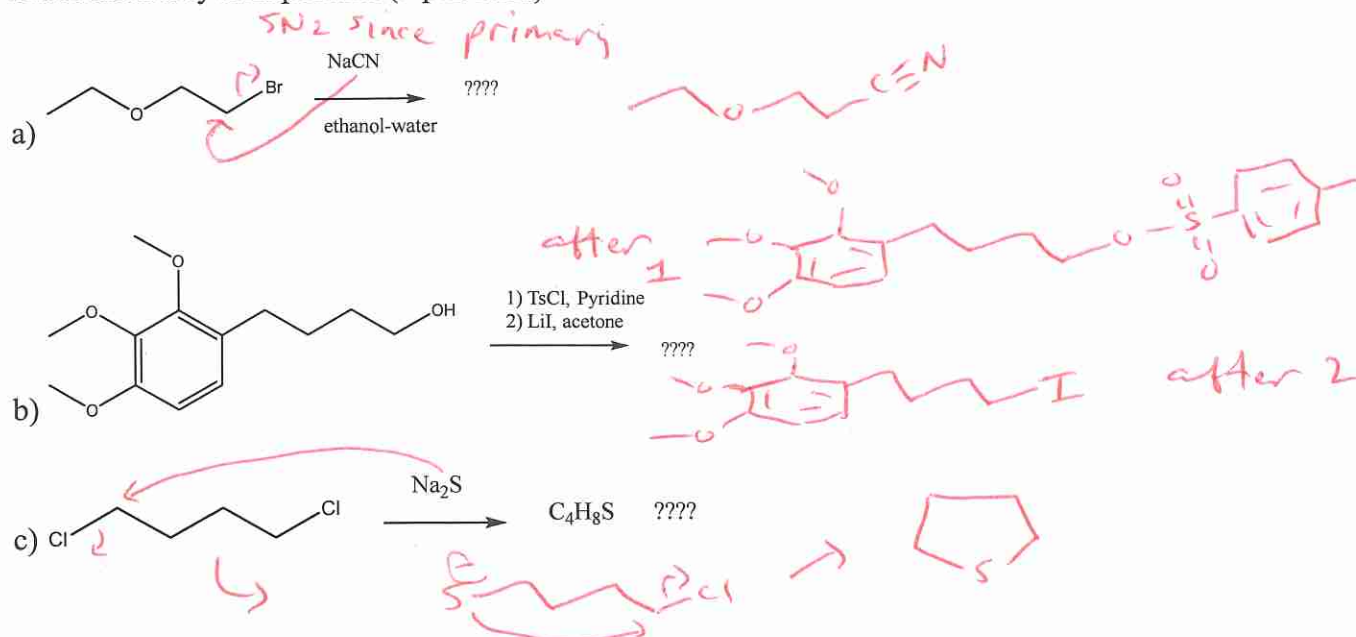


1° alcohol

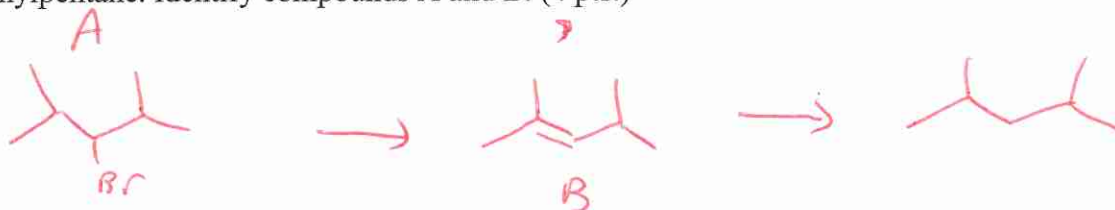


3° alcohol

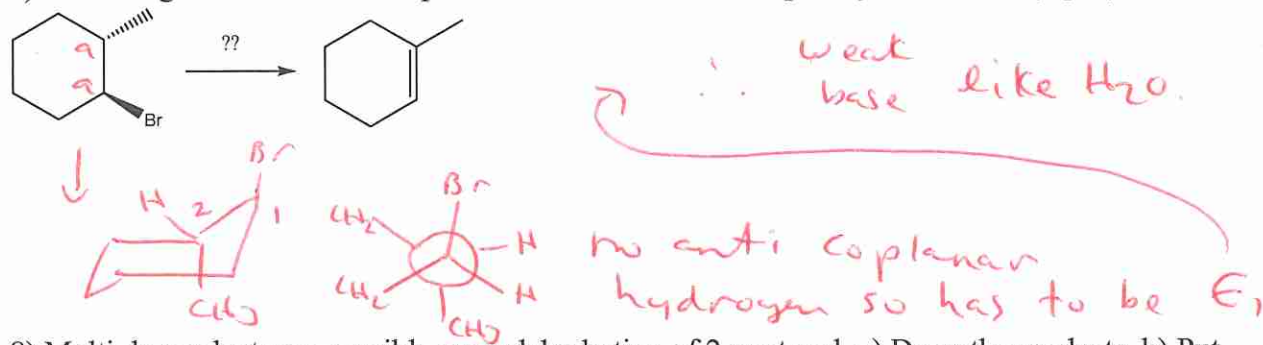
5) Give the final products for the following reactions. Indicate if no reaction is possible. Show stereochemistry if important. (3 pts. each)



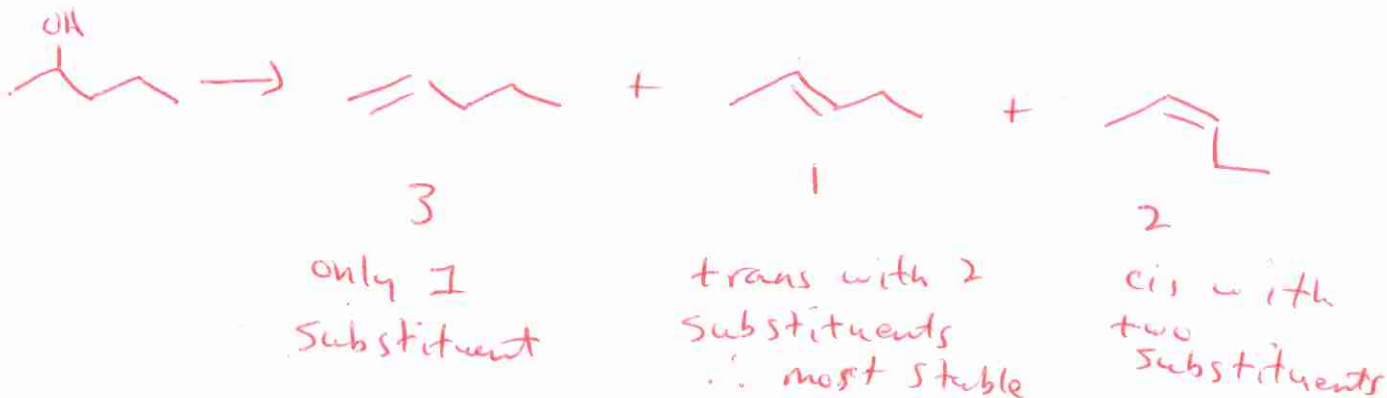
6) Compound A ($\text{C}_7\text{H}_{15}\text{Br}$) is not a primary alkyl halide. It yields a single alkene (compound B) on being heated with sodium ethoxide in ethanol. Hydrogenation of compound B yields 2,4-dimethylpentane. Identify compounds A and B. (4 pts.)



7) What reagent will best accomplish the reaction below? Explain your answer. (3 pts.)



8) Multiple products are possible upon dehydration of 2-pentanol. a) Draw the products. b) Put them in order from most stable = 1 to least stable. Explain their order. (3 pts. each part)



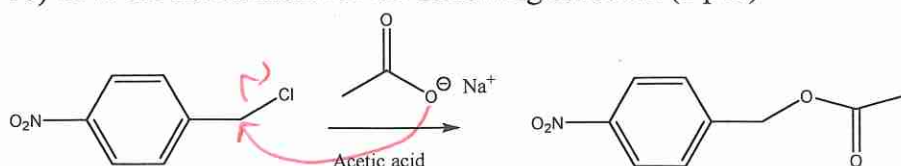
$C_6H_{12} = 10$ of unsaturation

9) Give a molecule with molecular formula C_6H_{12} that will give one product upon reaction with H^+/H_2O , $BH_3:THF$, HBr /no peroxides and HBr /peroxides. (4 pts.)

must be Symmetrical
50



10) Give the mechanism for the following reaction. (5 pts.)

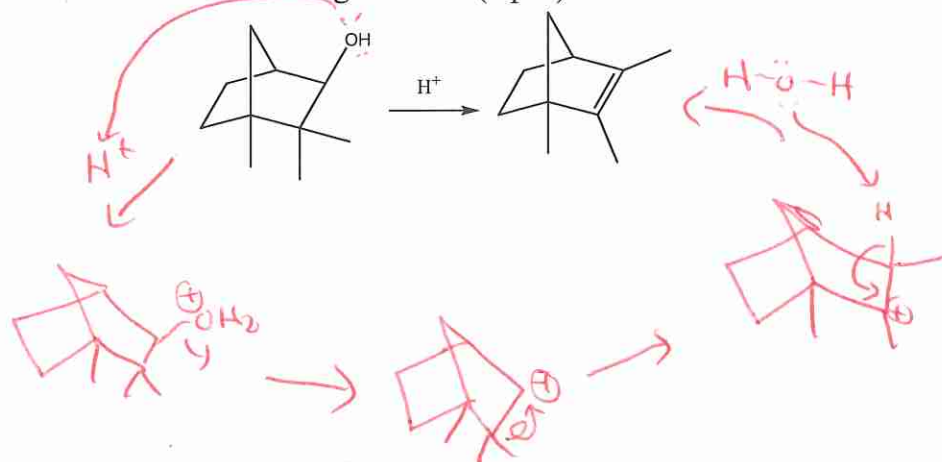


11) A study of the hydrolysis behavior of chlorofluorocarbons carried out by the EPA found that 1,2-dichloro-1,1,2-trifluoroethane underwent dehydrohalogenation on treatment with aqueous sodium hydroxide. a) Draw the product. b) Give the mechanism for this reaction. (3 pts. each part)

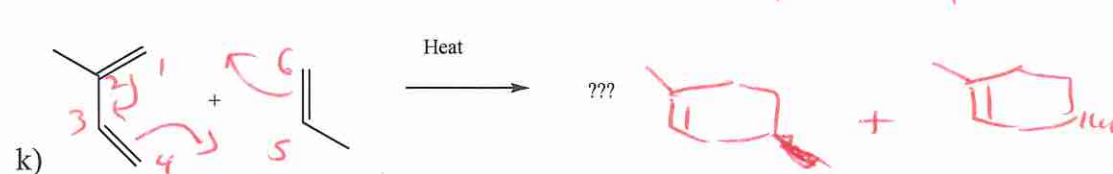
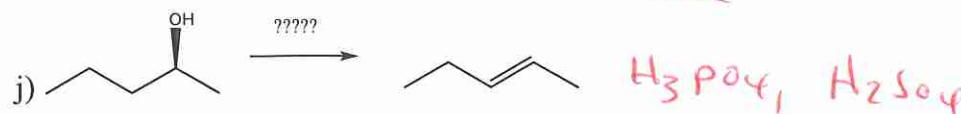
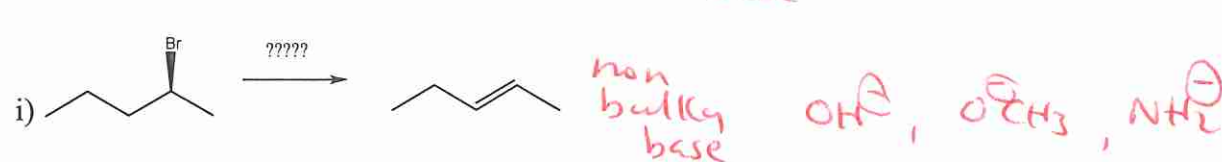
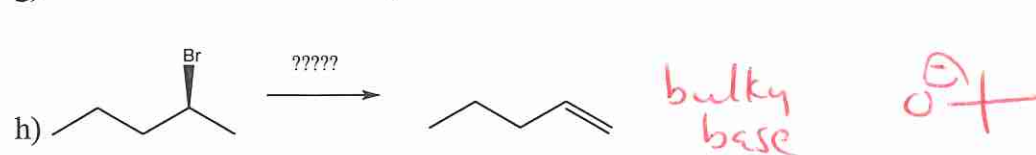
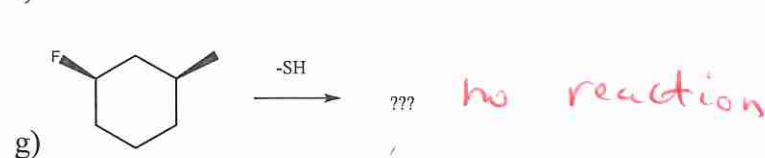
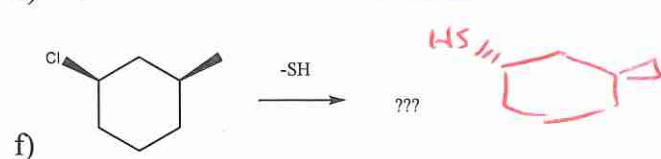
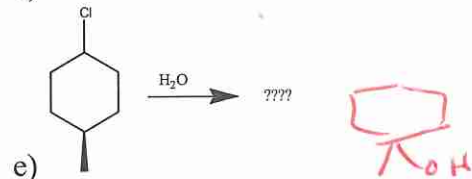
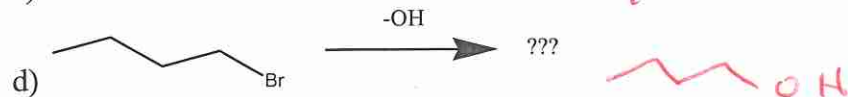
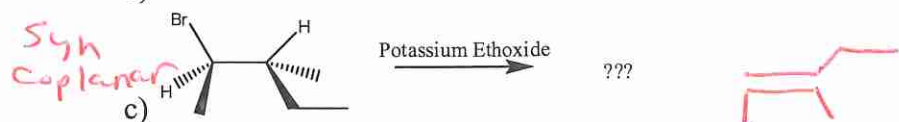


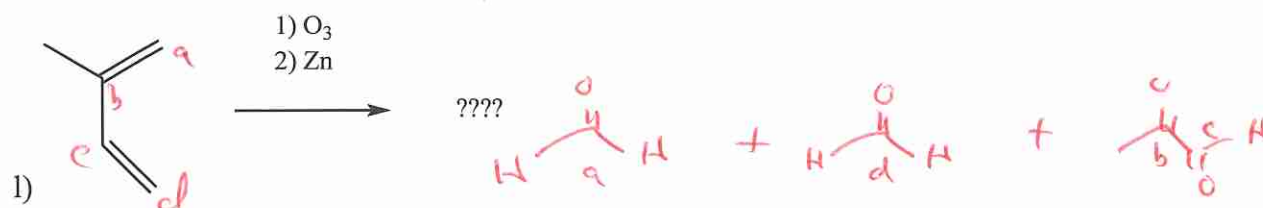
E_2 reaction

12) Give the mechanism for the following reaction. (6 pts.)

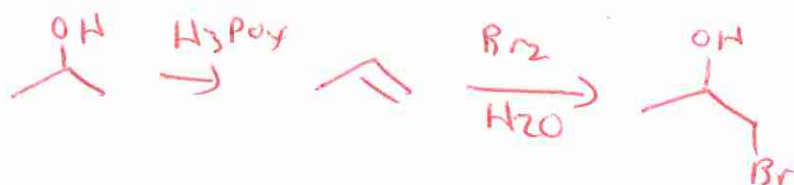


13) Reactions: Give the missing reactant, reagent, or product for the following reactions. Give stereochemistry if important. Indicate if no reaction is possible. E₁ products are not required to be drawn for S_N1/E₁ reactions. You may draw one product and write +E for enantiomer or +D for diastomer. (3 pts. each)





14) Synthesis: Outline a synthesis of 1-bromo-2-propanol from 2-propanol. Use any needed organic or inorganic reagents. (5 pts.)



15) Give something you studied that was not asked on this test. (5 pts.)

SN₂/E₂/SN₁/E₁ Decision Table

Substitution/Elimination Determination Table

Reference: Dr. Mark Arant (Northeast Oklahoma University) uses a table very similar to this one for determining whether a reaction goes SN₂, E₂ or SN₁/E₁.

pKa of conjugate acid of nucleophile	Primary Halides	Secondary Halides	Tertiary Halides
<10	SN ₂	SN ₂ – polar aprotic solvent SN ₁ /E ₁ – polar protic solvent	SN ₁ /E ₁
10-25	SN ₂	E ₂	E ₂
>25	E ₂	E ₂	E ₂

How to read the chart: 1) Determine whether the carbon that has the leaving group is primary, secondary, or tertiary. 2) Next, draw the conjugate acid of the nucleophile and determine its pKa. Exceptions: a) This table determines the reaction most likely to take place. SN₁ and SN₂ are limiting reactions with most reactions taking place by a combination of mechanisms instead of by just one mechanism. b) If the base is bulky like tert-butoxide, elimination will dominate via E₂ even though the pKa of tert-butyl alcohol is less than 25. c) If the primary carbocation is stabilized (i.e. allyl or benzyl) the SN₁ reaction may dominate.