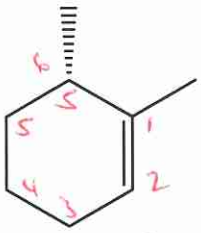
Organic 211 Test# 3 A2, B2 October 27, 2020

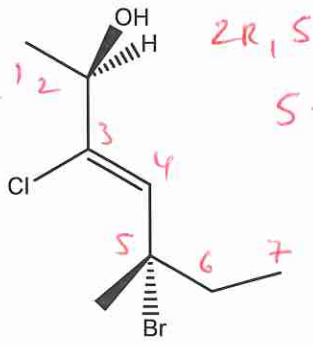
Name:_____

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)



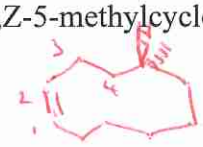
a) 6S 1,6-dimethylcyclohexene



b) 2R, 5S 5-bromo-3-chloro-5-methylhex-3-en-2-ol

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

d) R,Z-5-methylcyclodec-1-ene

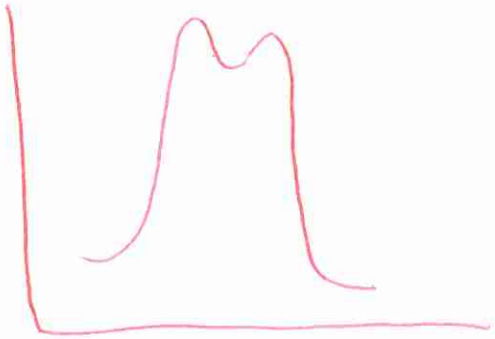


2) Consider the reaction of 1-chloro-4-methylhexane with sodium iodide. Assuming no other changes, how would it affect the rate if one simultaneously doubled the concentration of 2-chloro-2-methylpentane AND sodium iodide? Explain your answer. (3 pts.)

bad question!

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

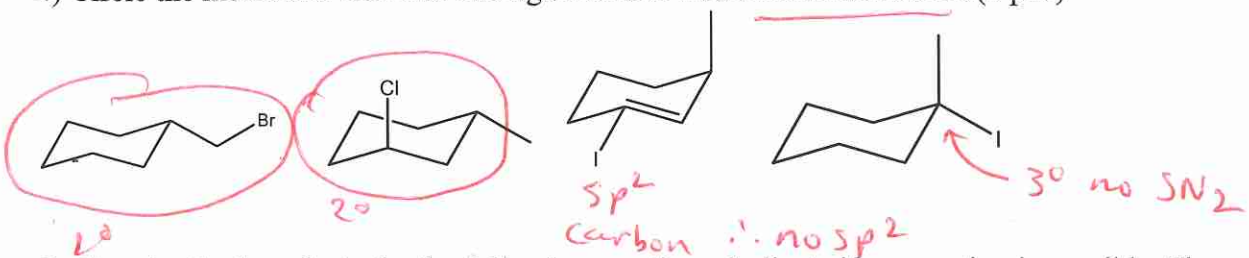
if you chose S_N2



if you chose S_N1

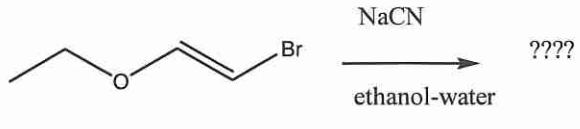
SN_2 reaction

4) Circle the molecules that will undergo reaction with NaSH in Acetone.(3 pts.)



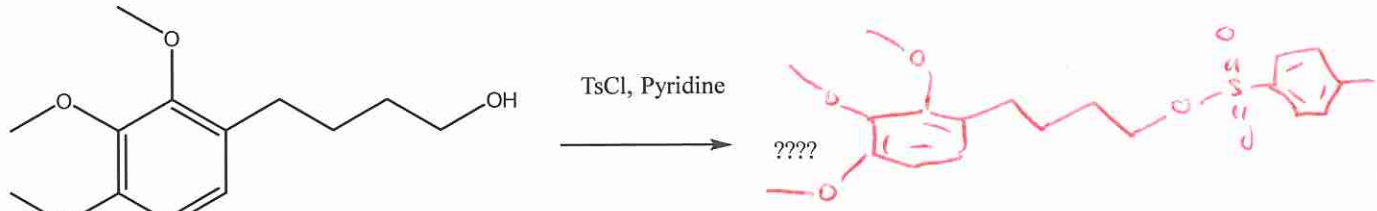
5) Give the final products for the following reactions. Indicate if no reaction is possible. Show stereochemistry if important. (3 pts. each)

a)

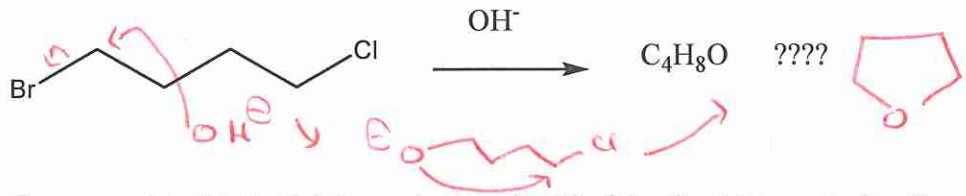


no reaction is possible.

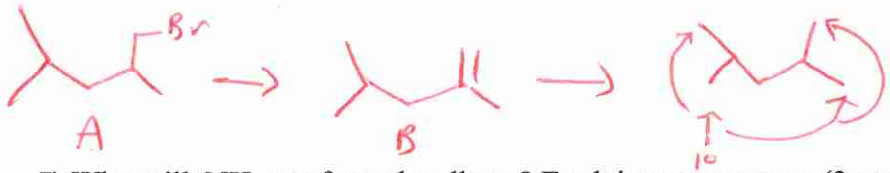
b)



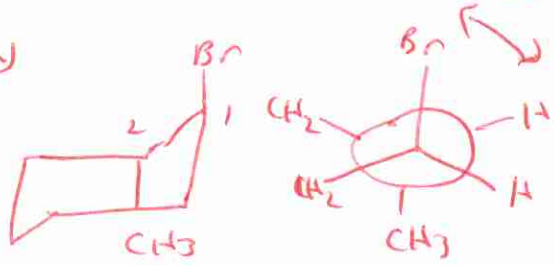
c)



6) Compound A ($C_7H_{15}Br$) is a primary alkyl halide. It yields a single alkene (compound B) on being heated with sodium tert-butoxide in tert-butyl alcohol. Hydrogenation of compound B yields 2,4-dimethylpentane. Identify compounds A and B. (4 pts.)



7) Why will $^-NH_2$ not form the alkene? Explain your answer. (3 pts.)



not anti or syn coplanar

So NH_2 won't do E2 with carbon bearing methyl group

Only 1 substituent on double bond

trans with 2 substituents is most stable

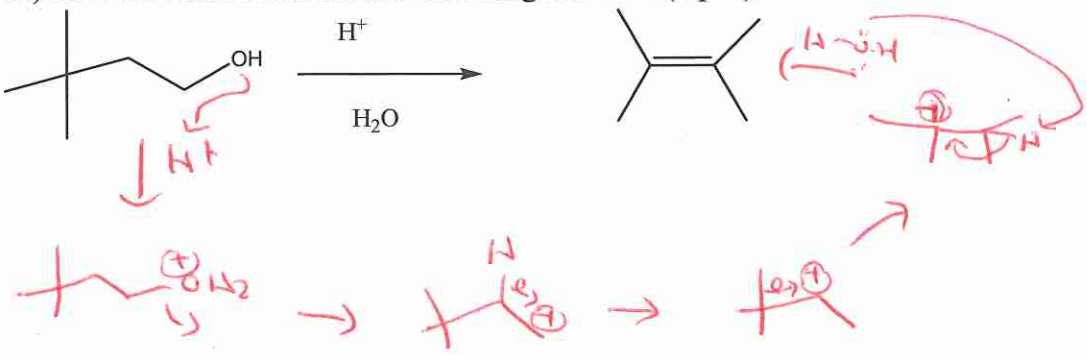
cis is less stable than trans due to van der Waal strain

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

9) Give a molecule with a tetrasubstituted alkene and 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 same on both ends of alkene

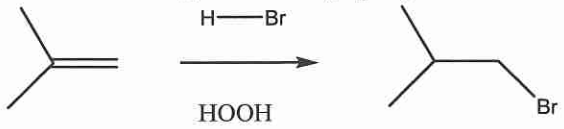
10) Give the mechanism for the following reaction. (5 pts.)

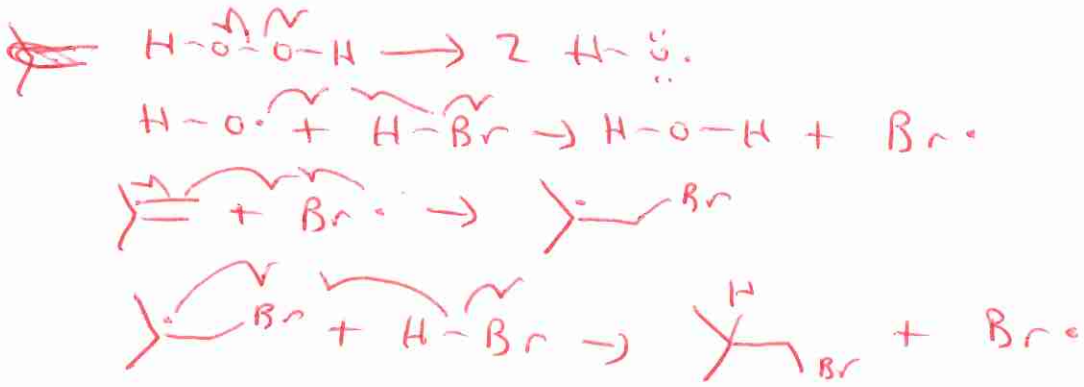


11) A study of the hydrolysis behavior of chlorofluorocarbons carried out by the EPA found that 1,2-dichloro-1,1,2-trifluoroethane underwent dehydrohalogenation on treatment with aqueous sodium hydroxide. a) Draw the product. b) Give the mechanism for this reaction. (3 pts. each part)

fluorine won't leave but chlorine will.

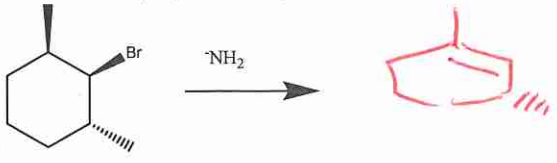
12) Give the mechanism for the following reaction. (6 pts.)



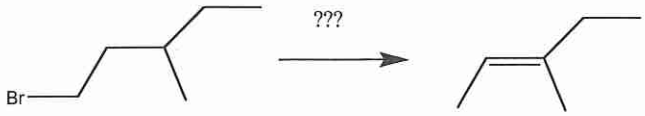


13) Reactions: Give the missing reactant, reagent, or product for the following reactions. Give stereochemistry if important. Indicate if no reaction is possible. E_1 products are not required to be drawn for SN_1/E_1 reactions. You may draw one product and write +E for enantiomer or +D for diasteromer. (3 pts. each)

a)



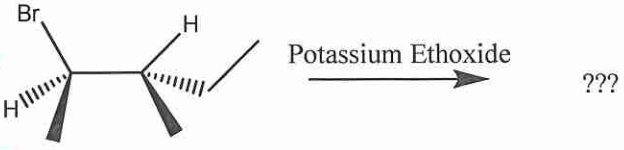
b)



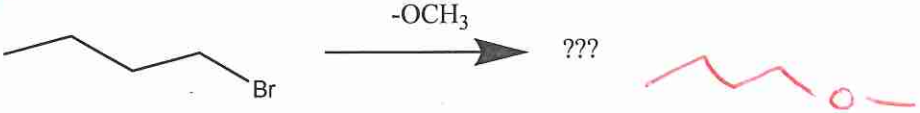
any base $NH_2^{\ominus}$, $OH^{\ominus}$, $O^{\ominus}-CH_3$

rotate to ant. coplanar

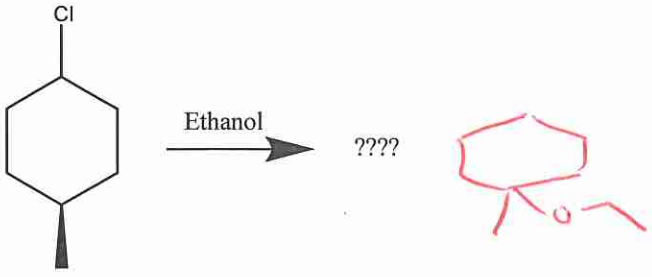
c)

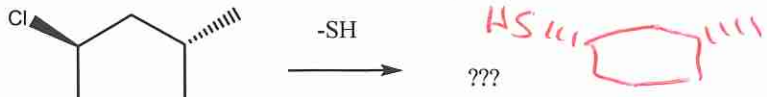


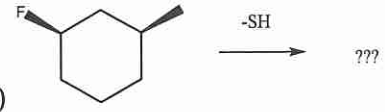
d)



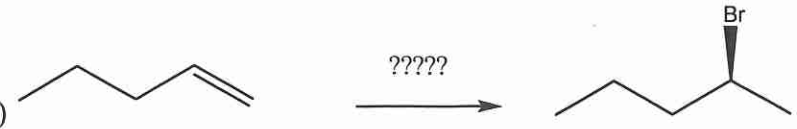
e)



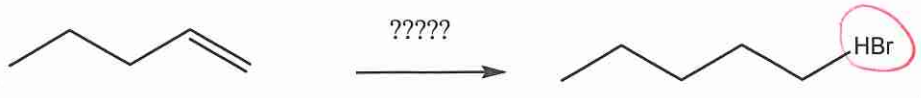
f) 

g) 

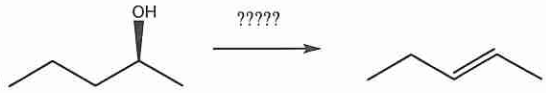
no reaction. Fluorine will not leave sp3 carbon.

h) 

HBr / no peroxides

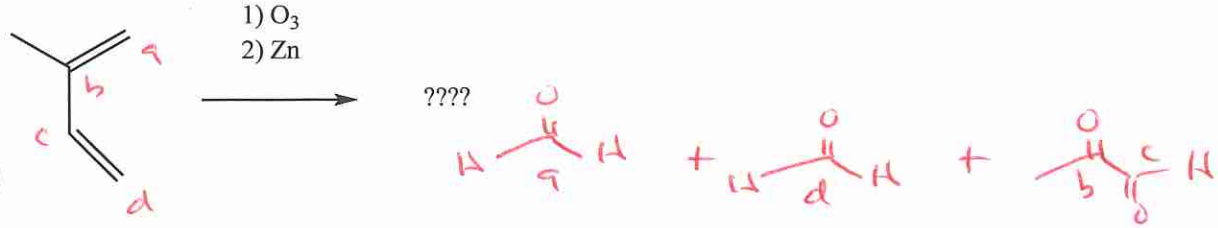
i) 

bad question

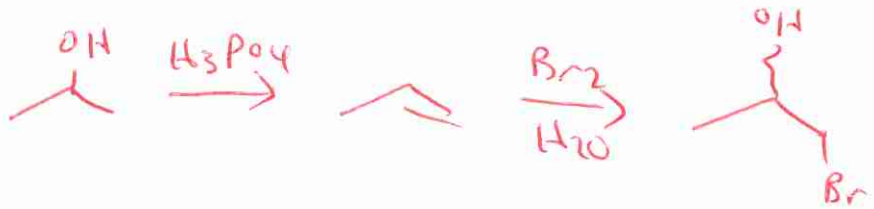
j) 

H_3PO_4 or H_2SO_4

k) 

l) 

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.)

$SN_2/E_2/SN_1/E_1$ 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 SN_2, E_2 or SN_1/E_1.

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. SN_1 and SN_2 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 E_2 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 SN_1 reaction may dominate.