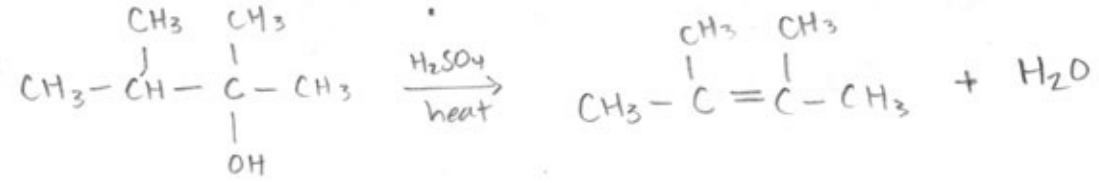
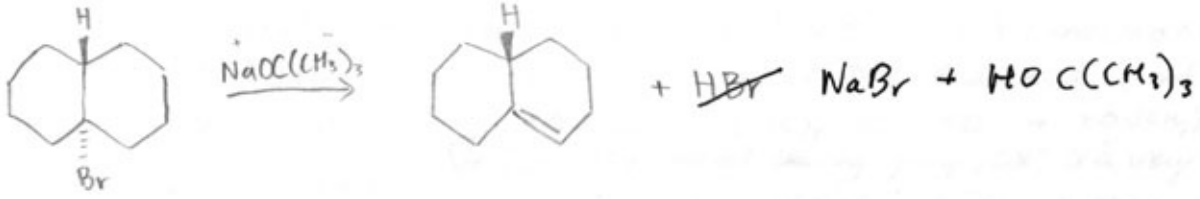
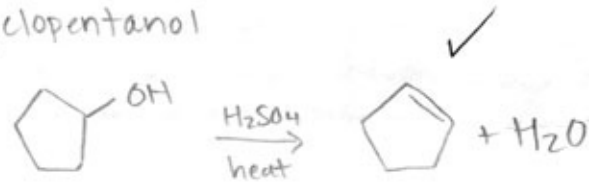
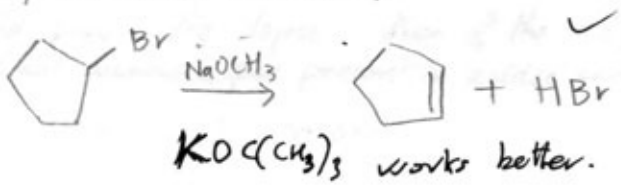
a) 

b) 

5. b) cyclopentanol

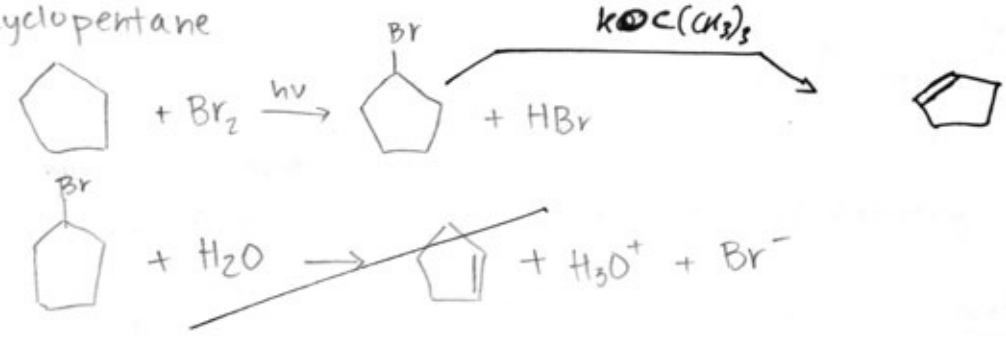


c) cyclopentyl bromide



$KOC(CH_3)_3$ works better.

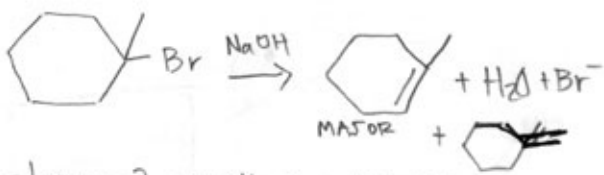
d) cyclopentane



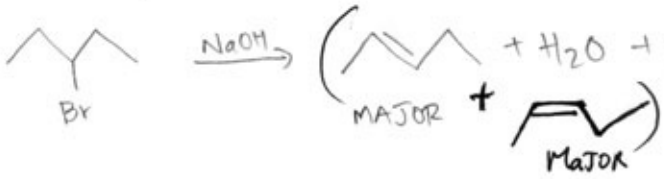
6. a) 1-bromobutane

b) 2-chlorobutane

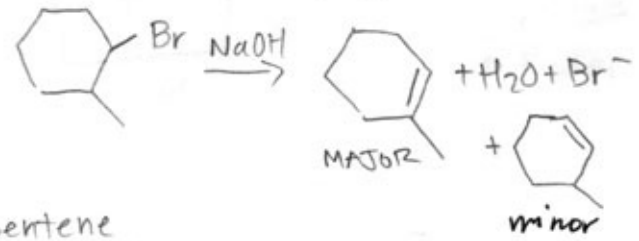
d) 1-bromo-1-methylcyclohexane



c) 3-bromopentane

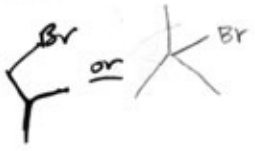


e) 1-bromo-2-methylcyclohexane

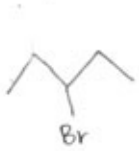


7. a) 1-butene

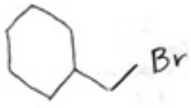
b) isobutylene



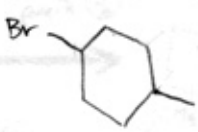
c) 2-pentene



methylenecyclohexane ✓



e) 4-methylcyclohexene ✓



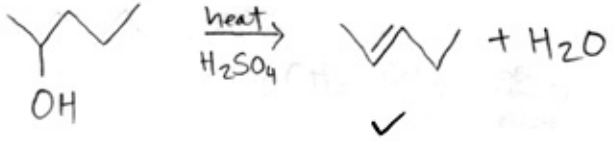
8. a) ① t-butoxide cannot dehydrate an alcohol through the E2 mechanism because it would remove the H off the alcohol rather than the H off the carbon to form a double bond. $ROH + {}^-OC(CH_3)_3 \rightleftharpoons RO^- + HOC(CH_3)_3$.

② Also, the potential leaving group, OH^-, is a very bad leaving group.

b) A strong acid protonates the OH in order to make the OH a better leaving group. A strong acid does not effectively dehydrohalogenate an alkyl halide because it does not remove a proton in order to form a double bond.

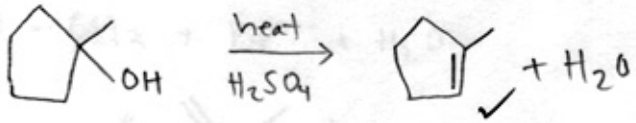
a halide is a decent leaving group. ~~The~~ hard part is the deprotonation of the adjacent H. that can be done only with a strong base (~~not possible in~~ ~~see~~ present in acidic conditions)

9. a) 2-pentanol



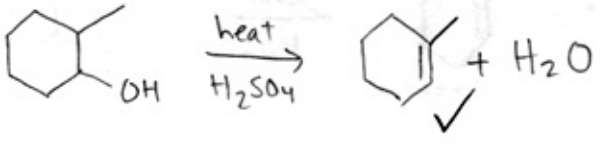
✓

b) 1-methylcyclopentanol



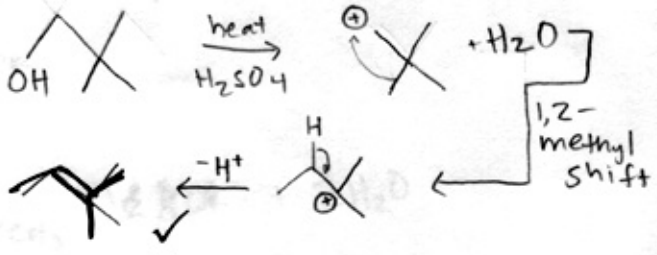
✓

c) 2-methylcyclohexanol



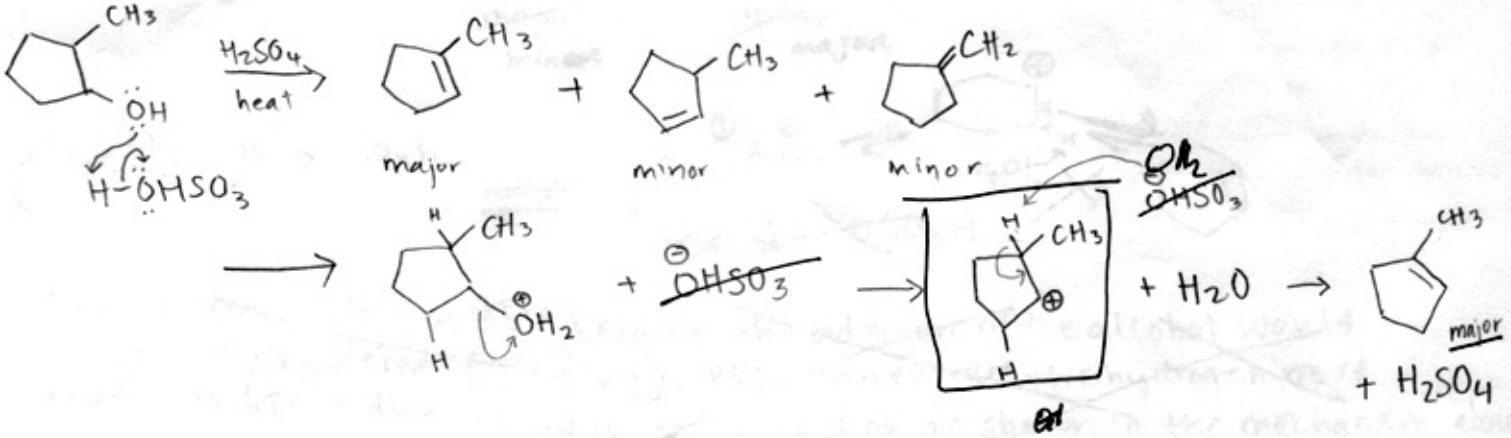
✓

d) 2,2-dimethyl-1-propanol



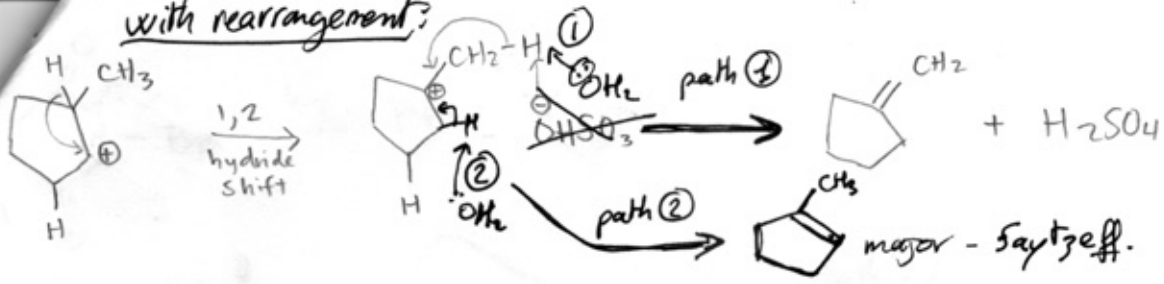
✓

10.

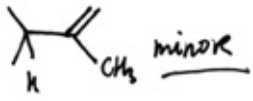


continued on following page...

with rearrangement:



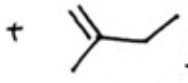
11. a) $(CH_3)_2CH-\underset{\underset{Br}{|}}{C}(CH_3)_2 \xrightarrow[KOH]{heat} (CH_3)_2C=C(CH_3)_2 + Br\cdot + H_2O$ (major)

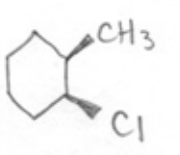


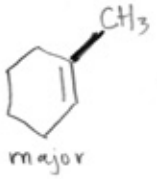
b) $(CH_3)_2CH-\underset{\underset{Br}{|}}{CH}-CH_3 \xrightarrow[KOH]{heat} (CH_3)_2C=CH-CH_3 + (CH_3)_2CH-CH=CH_2 + 2Br^- + 2H_2O$

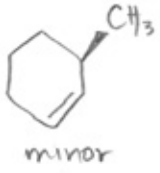
major ✓ minor

c) $(CH_3)_2\underset{\underset{Br}{|}}{C}-CH_2-CH_3 \xrightarrow[KOH]{heat} (CH_3)_2C=CH-CH_3 + Br^- + H_2O$

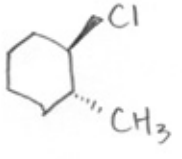


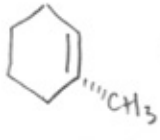
d) 

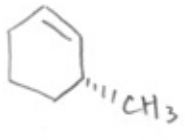
heat, KOH →


major
+


minor
+ ~~KCl~~ + $2H_2O$

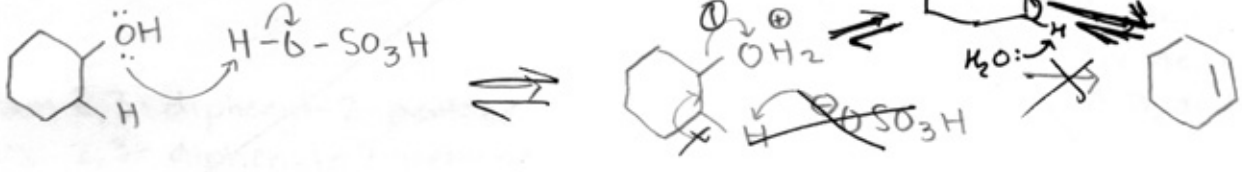
e) 

heat, KOH →


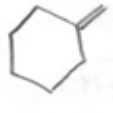
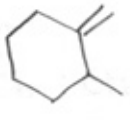
+


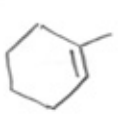
+ ~~2 KCl~~ + $2H_2O$

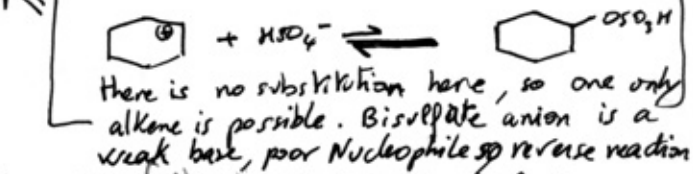
~~major~~ minor ~~minor~~ major

12. 

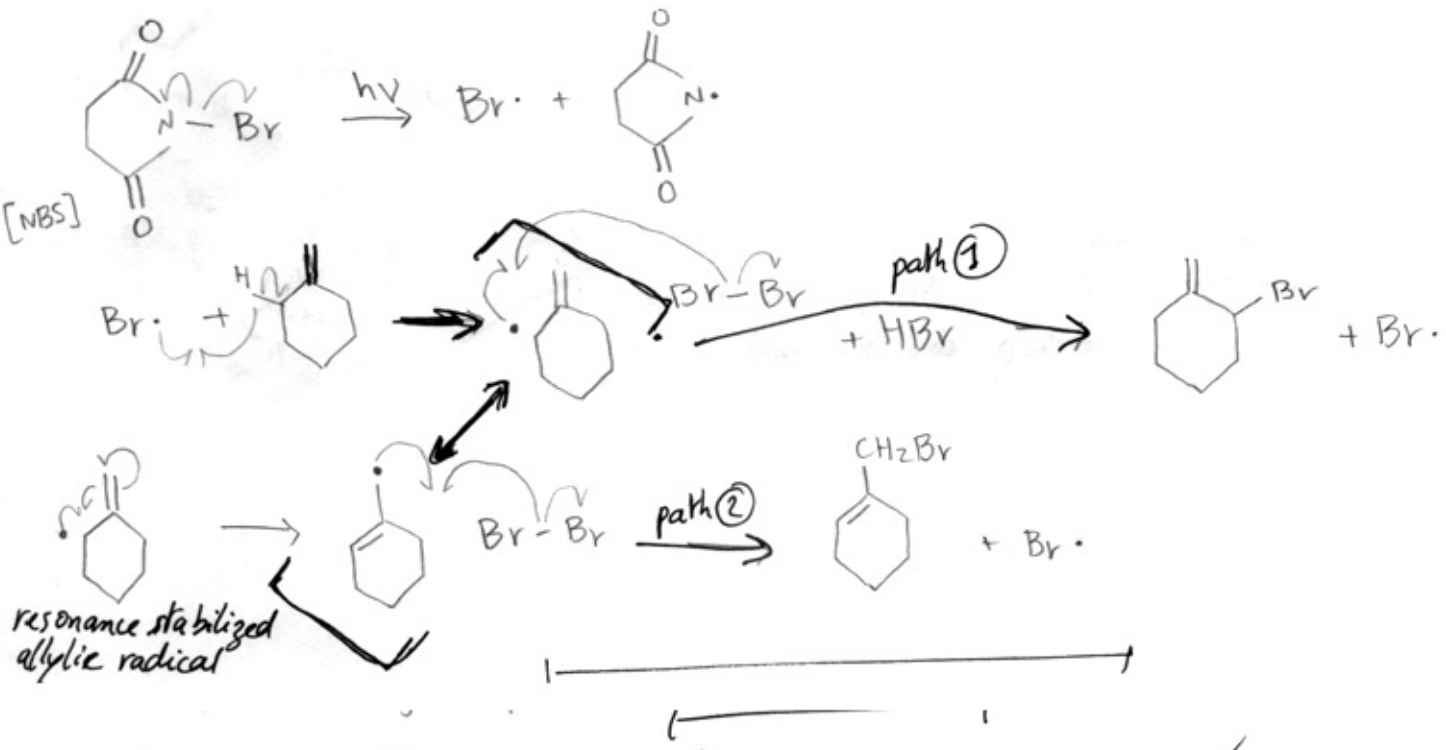
~~Substitution~~ isn't ~~favorable~~ because ~~the addition of the alcohol~~ would be sterically hindered (). HSO_3^- can ~~extract the hydrogen more~~ readily to ~~form~~ a double bond in an E1 reaction as shown in the mechanism above.

13. 
NBS, hν →


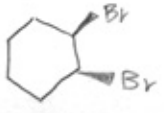
+




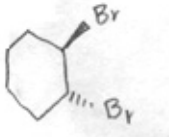
mechanism on following page... is faster.

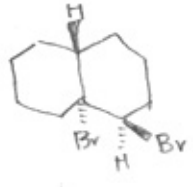
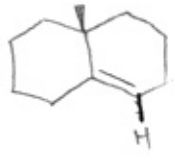


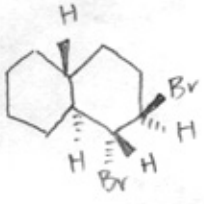
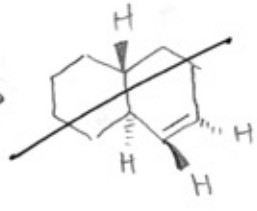
15. a) $CH_3-CH_2-\underset{\displaystyle Br}{\underset{|}{CH}}-CH_2-Br \xrightarrow{KI} CH_3-CH_2-CH=CH_2$ ✓

b)  KI → no reaction

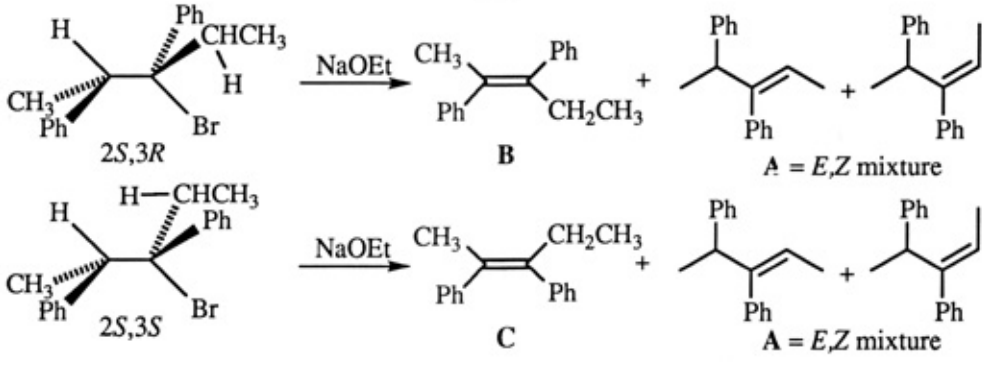
The 2 bromines are not trans and therefore cannot be trans-diaxial.

 KI →  ✓

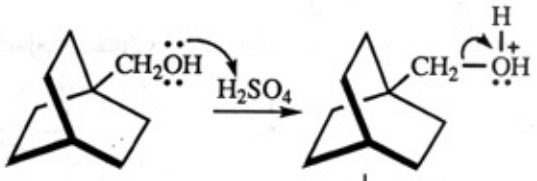
d)  KI →  ✓

e)  KI → 

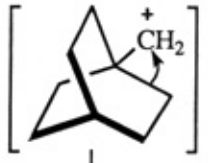
No reaction. The bromine are trans but they are diequatorial, lock conformation of the trans-decalin system.



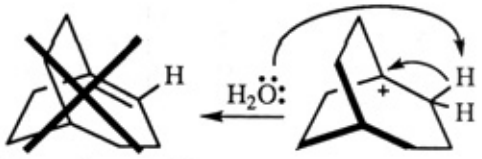
E2 dehydrohalogenation requires anti-coplanar arrangement of H and Br, so specific cis-trans isomers (**B** or **C**) are generated depending on the stereochemistry of the starting material. Removing a hydrogen from C-4 (achiral) will give about the same mixture of *cis* and *trans* (**A**) from either diastereomer.



Δ, $-H_2O$



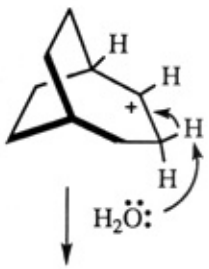
1° carbocation—terrible!—will rearrange; can't do hydride shift, must do alkyl shift = ring expansion



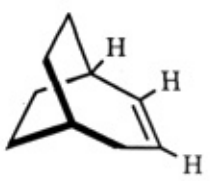
this is an unstable carbocation even though it is 3°; bridgehead carbons cannot be sp^2 (planar—try to make a model), so this carbocation does a hydride shift to a 2°, *more stable* carbocation

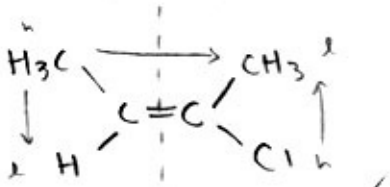
abstraction of adjacent H gives bridgehead alkene—violates Bredt's Rule

hydride shift

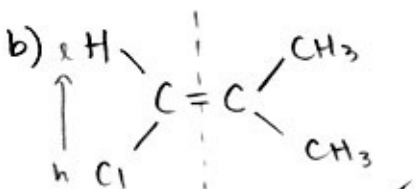


this 2° carbocation loses an adjacent H to form an alkene; can't form at bridgehead (Bredt's Rule)—only one other choice

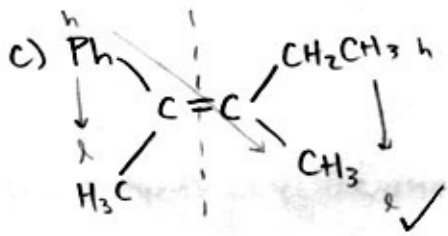


2. a) 

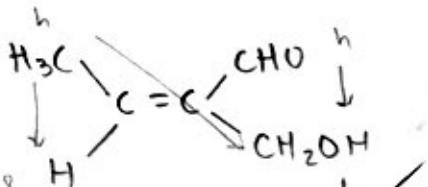
E-alkene ✓

b) 

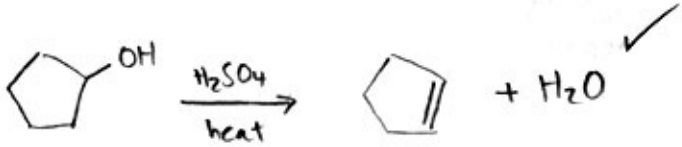
neither ✓

c) 

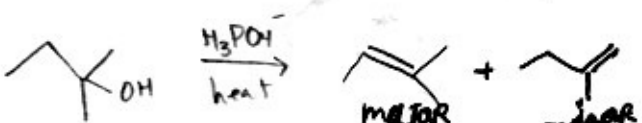
Z-alkene ✓

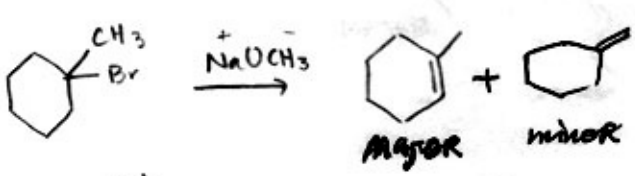
d) 

Z-alkene ✓

3. a) 

✓

b) 

c) 

d)