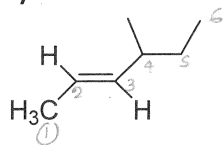


1) Name. Include E/Z stereochemistry in name, if necessary.

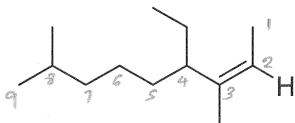
a)



(E)-4-methylhex-2-ene

also... 2-hexene

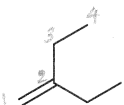
b)



(Z)-4-diethyl-3,8-dimethylnon-2-ene

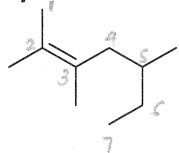
also ... -Z-nonene

c)



2-ethylbutene or 2-ethylbut-1-ene also... -1-butene

d)

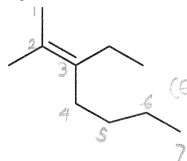


(E)-2,3,5-trimethylhept-2-ene

This is neither E nor Z

also ... -2-heptene

e)

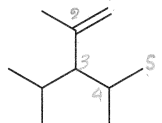


(E)-3-ethyl-2-methylhept-2-ene

This is neither E nor Z

also ... -2-heptene

f)

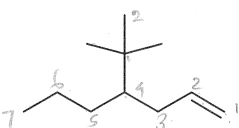


3-isopropyl-2,4-dimethylpent-1-ene

also... -1-pentene

use iso-, tert-, sec- prefixes in your substituent names, where necessary

g)

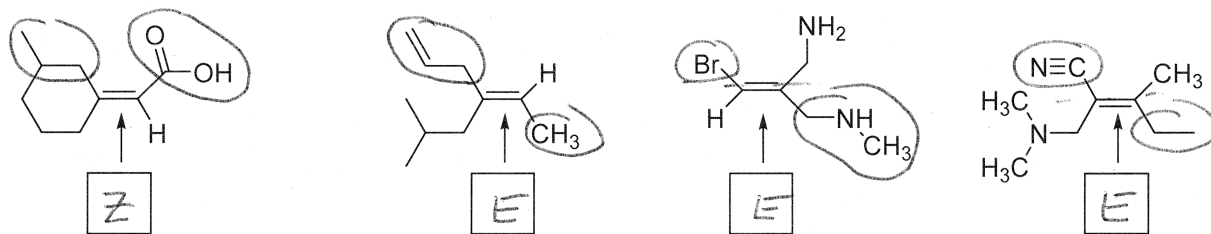
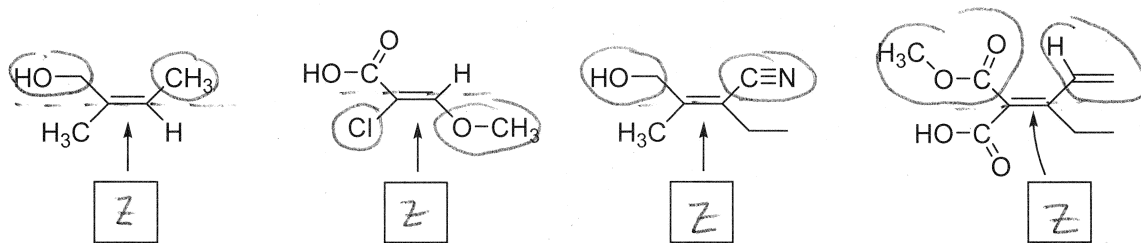


4-(1,1-dimethylethyl)hept-1-ene

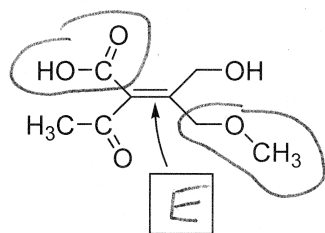
also ... -1-heptene

Do NOT use iso-, tert-, sec- prefixes in your substituent names; instead, use IUPAC numbering to identify substituent names, where necessary

2) Assign *E* or *Z* configuration. CIRCLE the highest priority groups for credit.



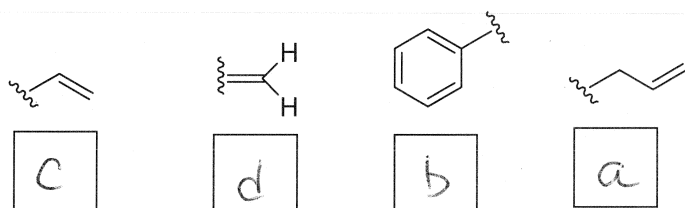
Corrected 10/23



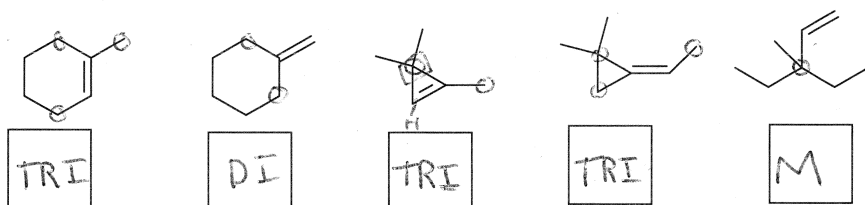
Corrected 10/23

3) Match the appropriate letter to the substituent below

a. Allyl	b. Phenyl	c. Vinyl	d. Methylene
----------	-----------	----------	--------------



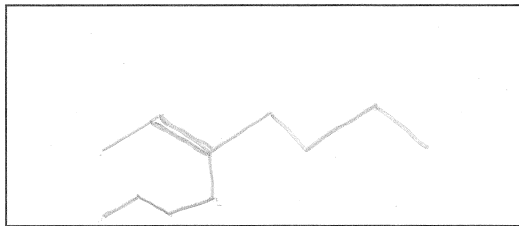
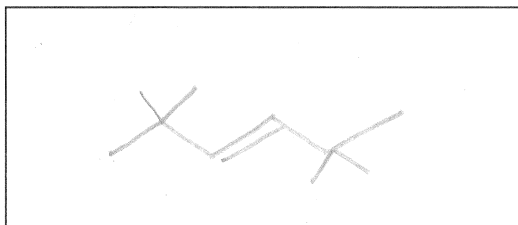
4) Classify each as (M)onosubstituted, (D)isubstituted, (TRI)substituted, or (TET)rasubstituted. Write M, D, TRI, or TET in boxes below.



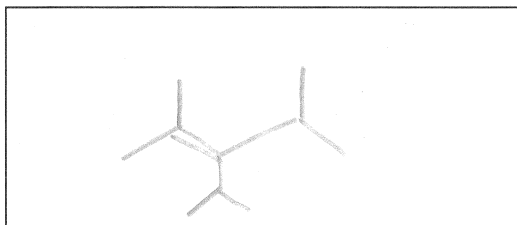
Corrected  
10/23

5) Draw.

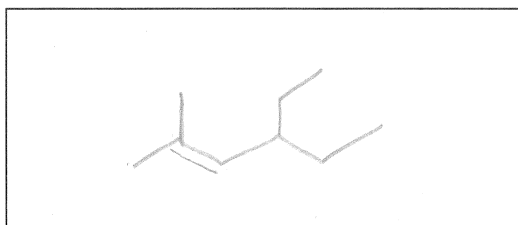
a) 3-butyl-2-heptene  
 $\wedge$

b) *trans*-2,2,5,5-tetramethyl-3-hexene

c) 3-isopropyl-2,4-dimethyl-2-pentene

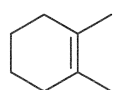


d) 4-ethyl-2-methyl-2-hexene

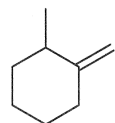


6) Arrange the following in order of increasing stability (1 is LEAST stable; 3 is MOST stable).

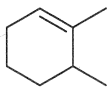
a)



3



1

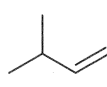


2

b)



3

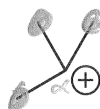
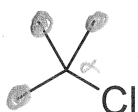
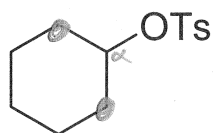
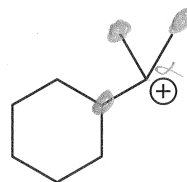
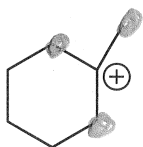
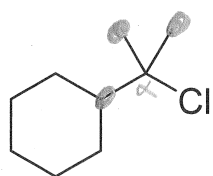


1



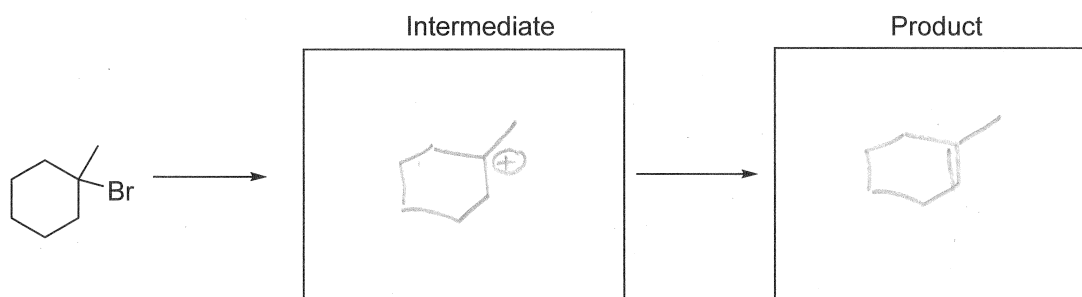
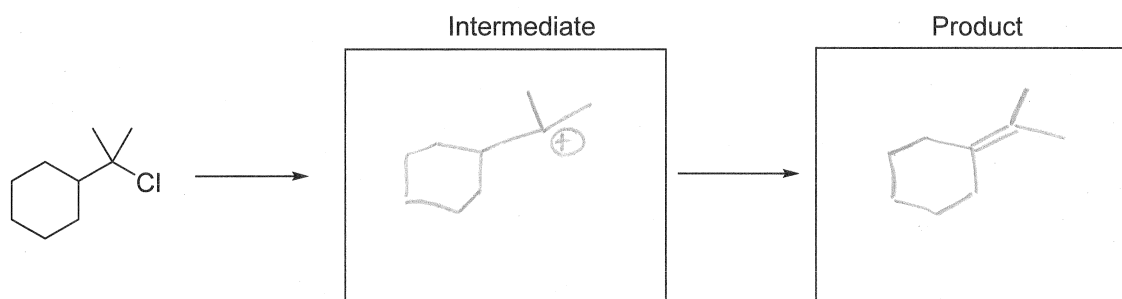
2

7) Place a dot on top of EACH beta-Carbon (●) and draw the letter ( **$\alpha$** ) next to the alpha-Carbon in the alkyl halide and carbocation compounds below.



8) For the E1 reactions below,

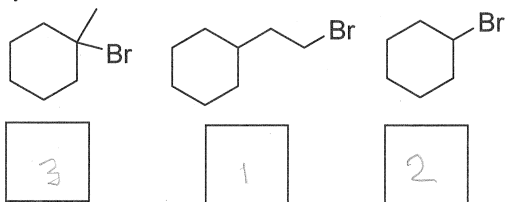
1. Provide the carbocation intermediate, then
2. Show the MOST stable product



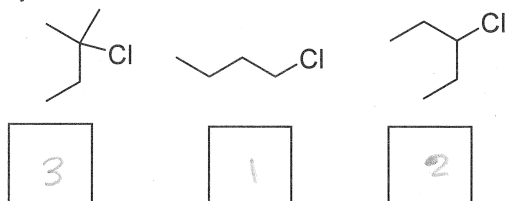


9) Arrange the following in order of increasing E2 reactivity (1 is LEAST reactive; 3 is MOST reactive).

c)



d)



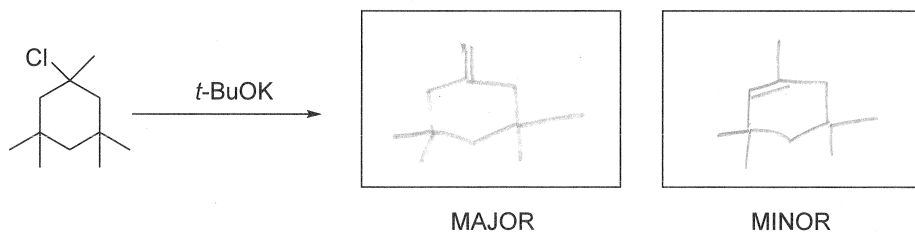
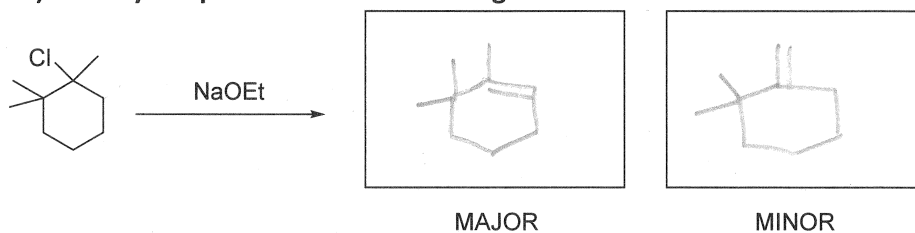
10) Consider the following data in the Table (this will not be provided on the exam, it's included here to help you understand how to approach the problems). Look at the SIZE of the base used and notice the product distribution between the Zaitsev and Hofmann products.

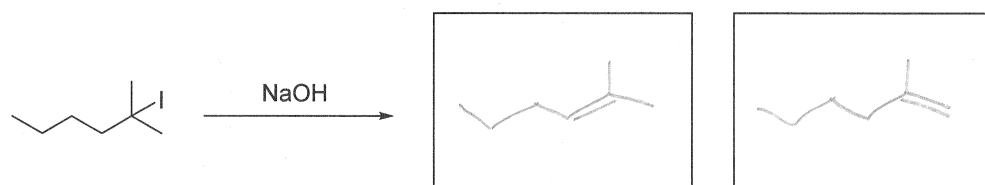
TABLE 8.1 PRODUCT DISTRIBUTION OF AN E2 REACTION AS A FUNCTION OF BASE		
	ZAITSEV	HOFMANN
EtO <sup>-</sup>	71%	29%
	28%	72%
	8%	92%

**NOTE:**  
 is written as *t*-BuOK

**Bulkier bases typically yield MAJOR proportion as the Hofmann product.**  
**The smaller bases (such as EtO<sup>-</sup> often seen as NaOEt or HO<sup>-</sup> yields more substituted alkene as the MAJOR product.**

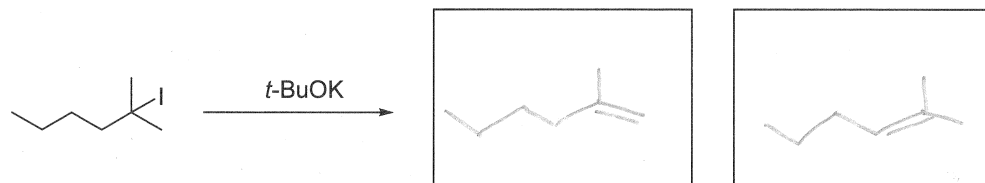
11) Identify the products of the following E2 reactions





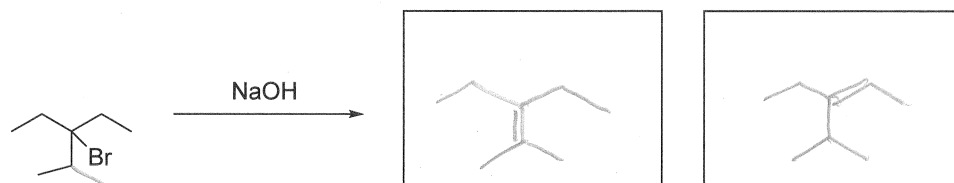
MAJOR

MINOR



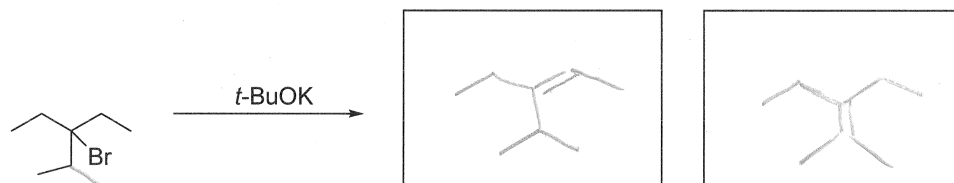
MAJOR

MINOR



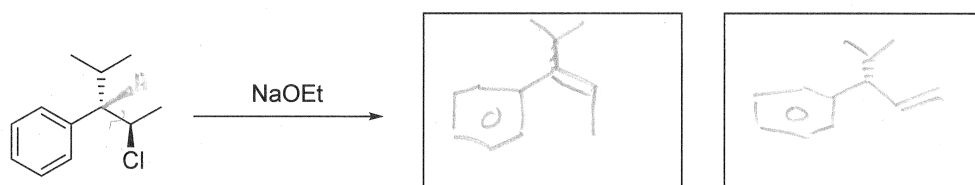
MAJOR

MINOR



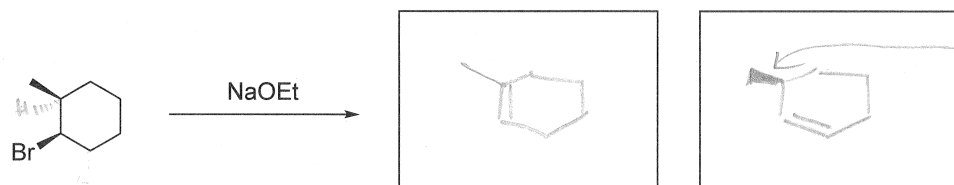
MAJOR

MINOR



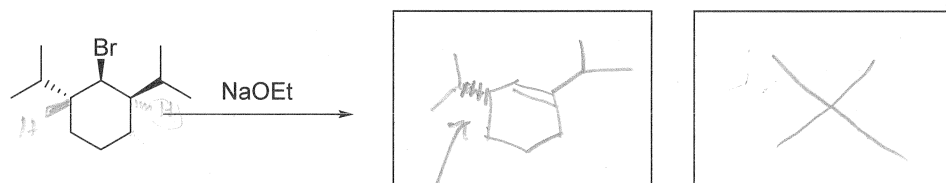
MAJOR

MINOR



MAJOR

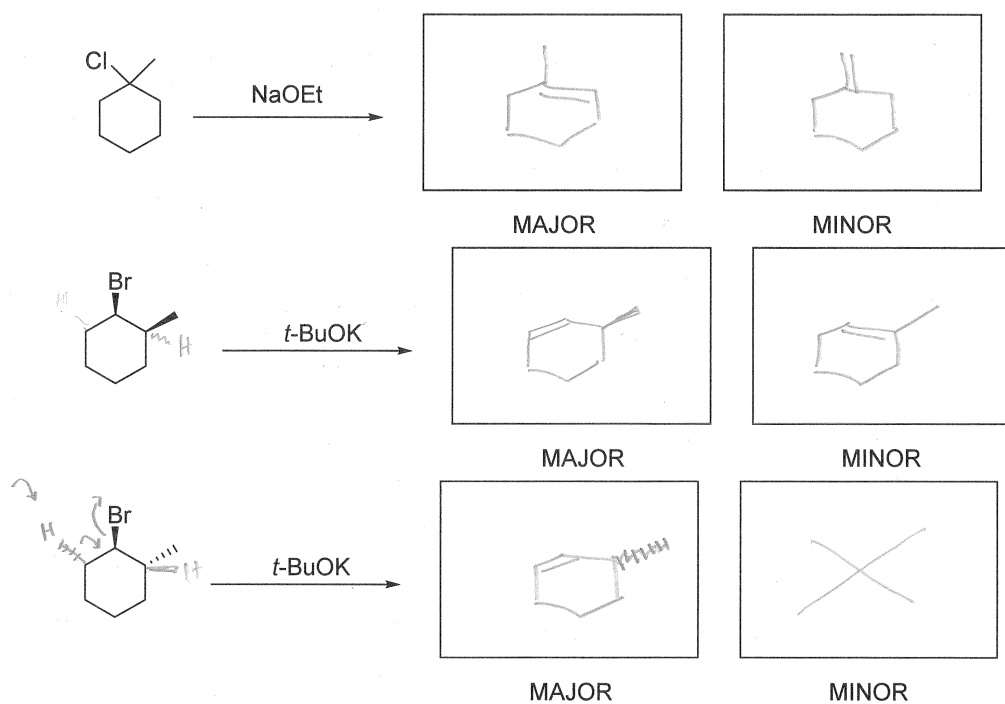
MINOR

*Note: still wedged up*

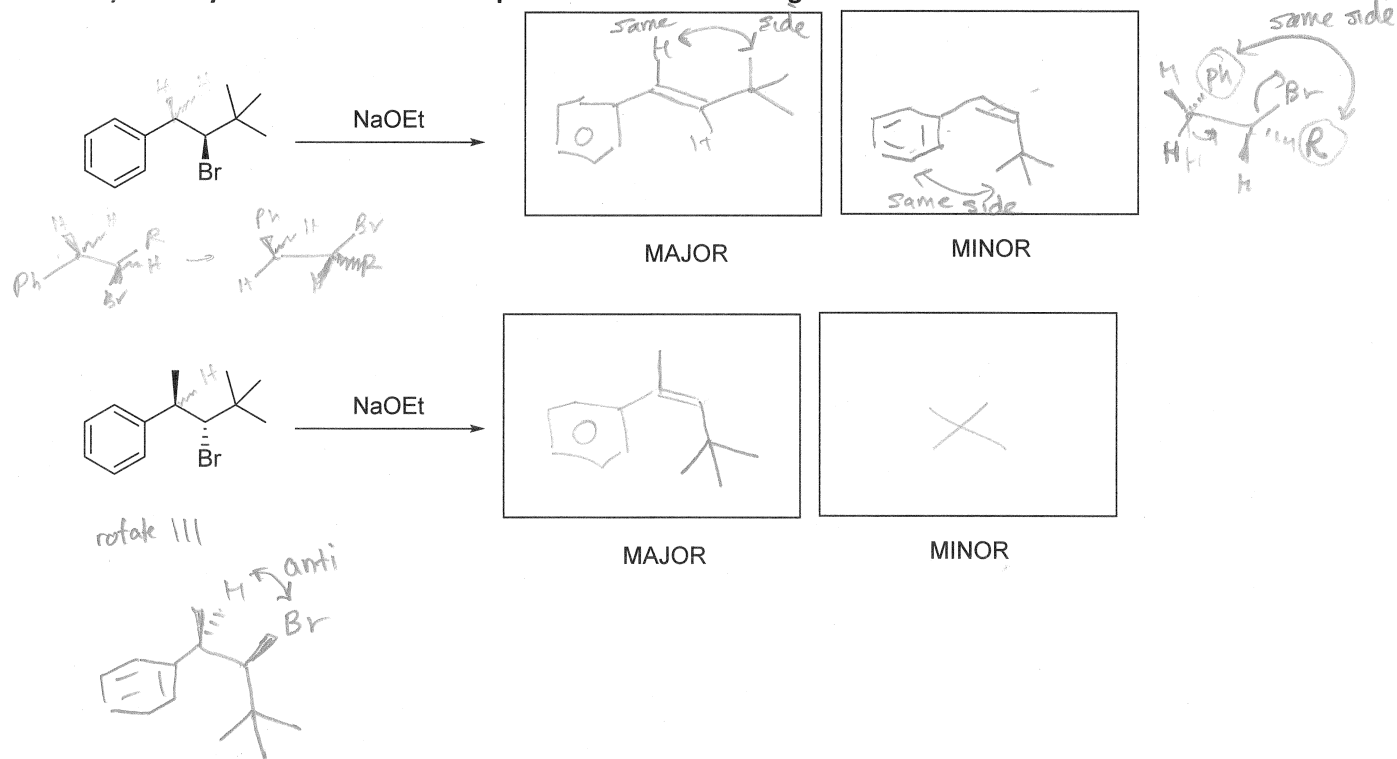
MAJOR

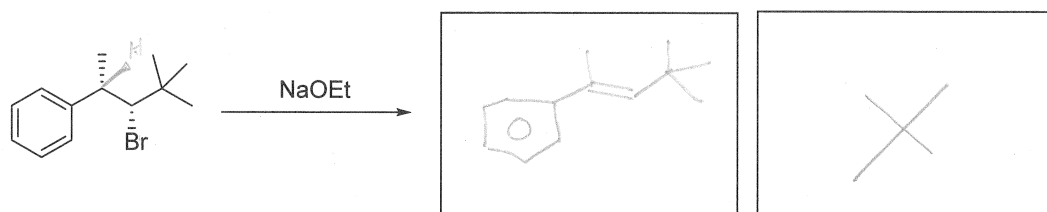
MINOR

*Note: stereochemistry remains*



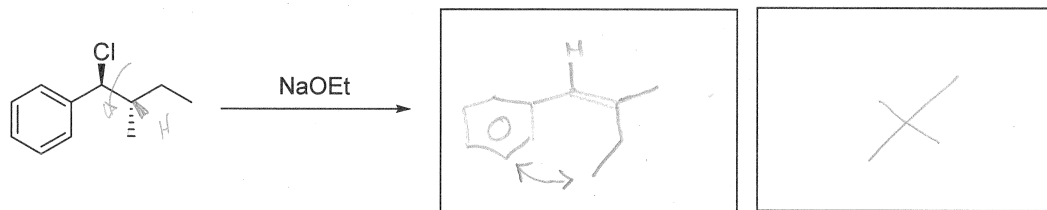
12) Identify the STEREOISOMERIC products of the following E2 reactions





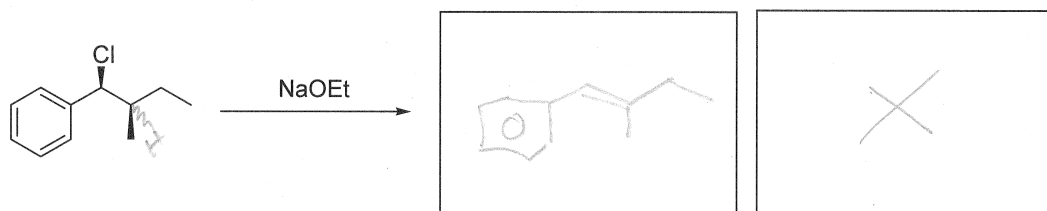
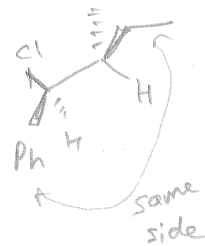
MAJOR

MINOR



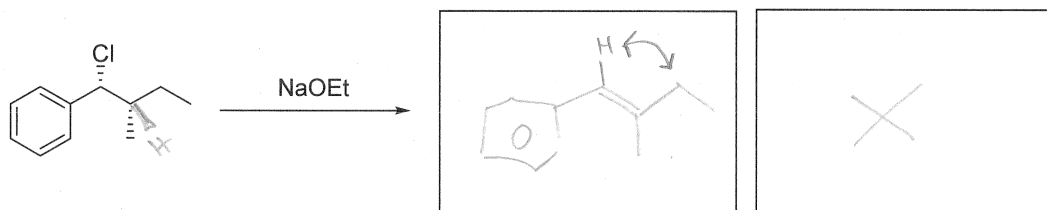
MAJOR

MINOR



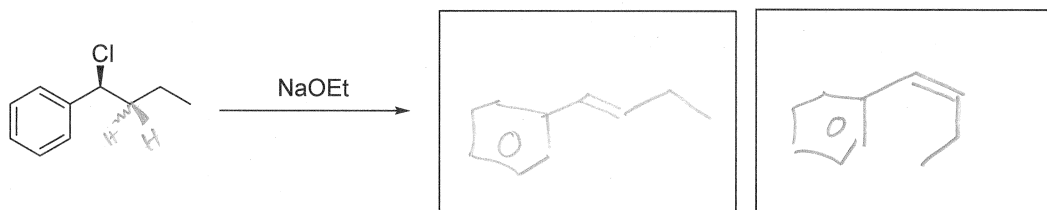
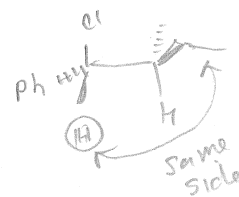
MAJOR

MINOR



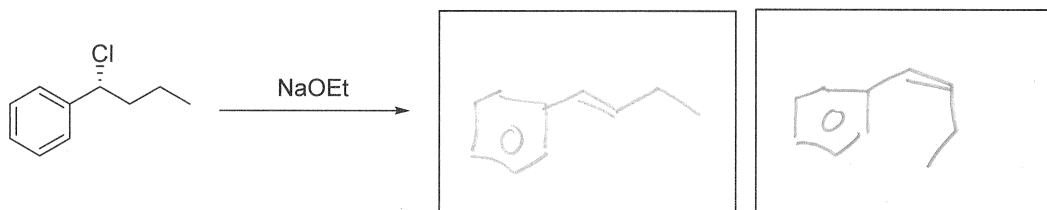
MAJOR

MINOR



MAJOR

MINOR



MAJOR

MINOR

13) Which base is used to yield the following as the MAJOR product.

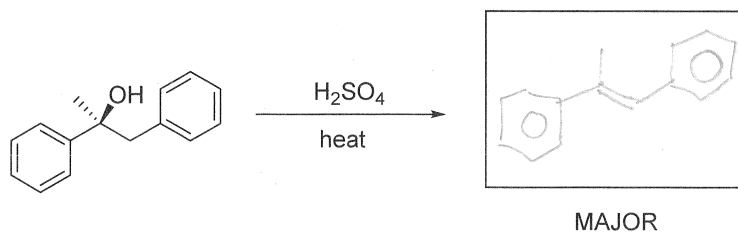
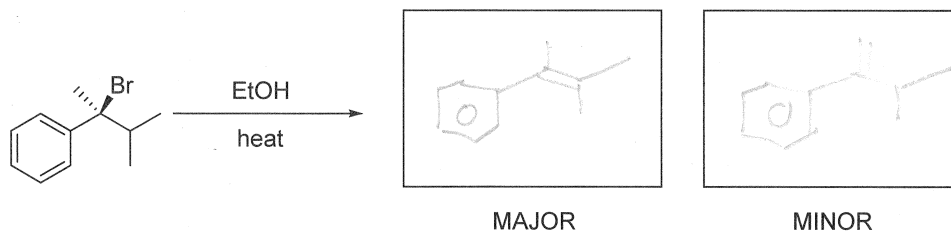
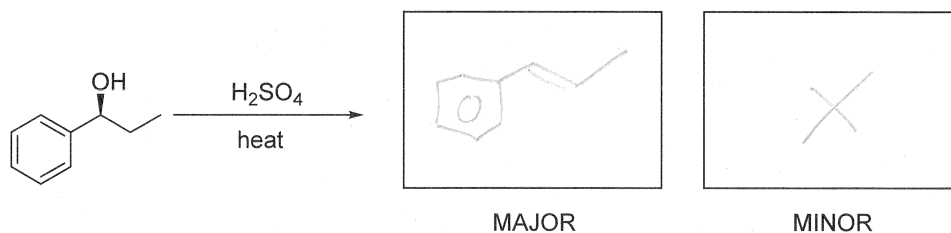
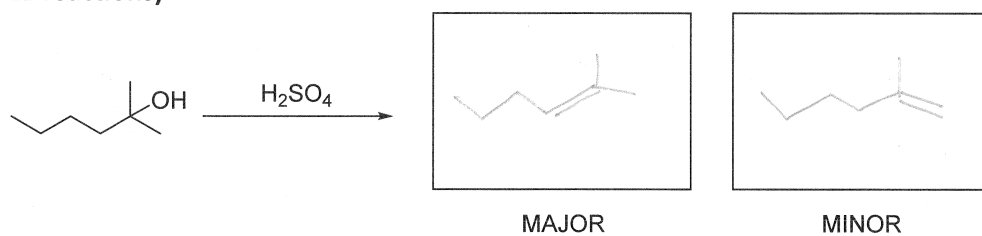
A. *t*-BuOK

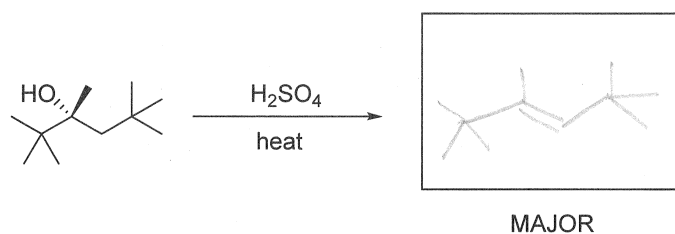
B. NaOH

Place Letter in the box.

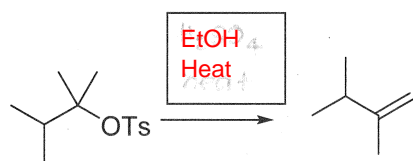
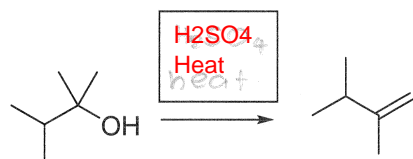
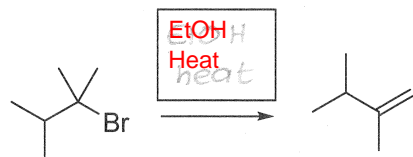


14) Identify the STEREOISOMERIC products of the following E1 reactions. Notice the strong acid reactant ( $\text{H}_2\text{SO}_4$  and heat) used with an alcohol ; notice that no strong acid is used with non-alcohol in E1 reactions)

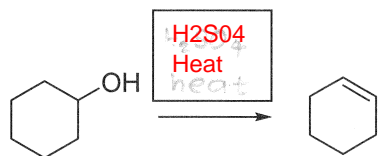




15) Provide the reactions conditions needed  $\text{H}_2\text{SO}_4/\text{heat}$  OR  $\text{EtOH}/\text{heat}$  to carry out the following E1 reactions.

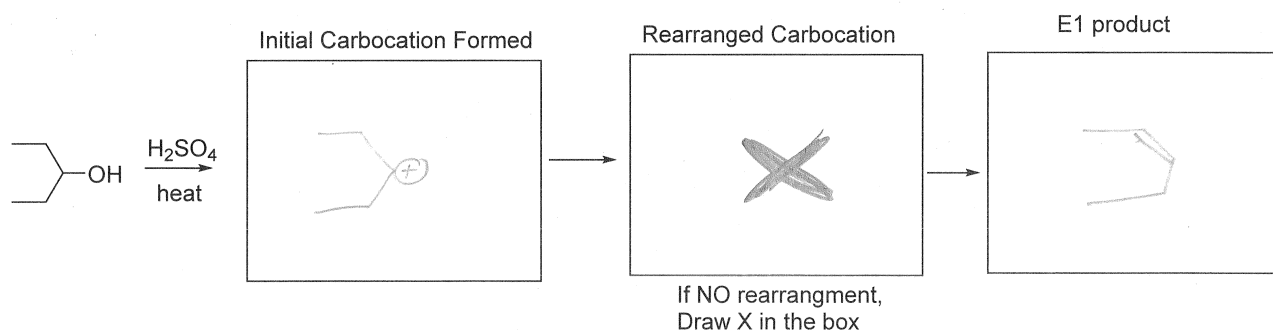
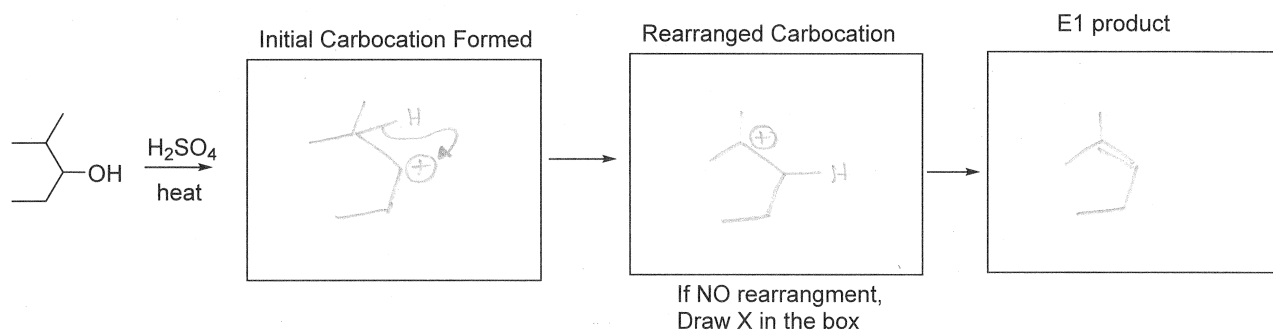
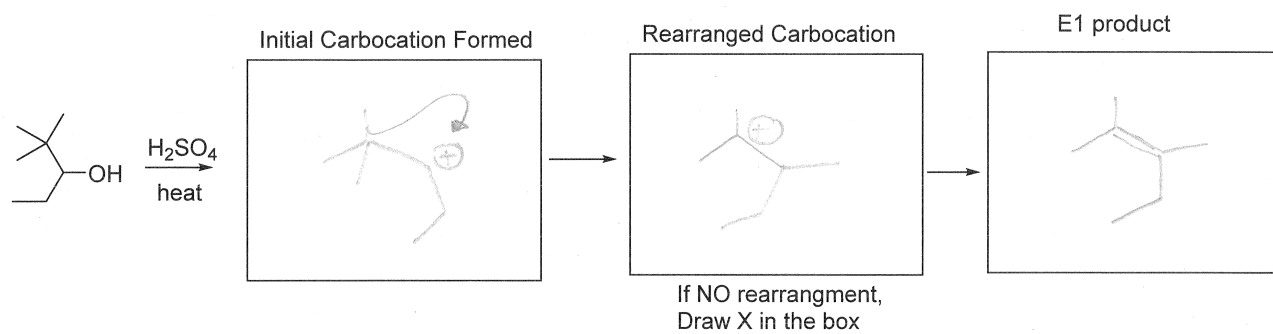
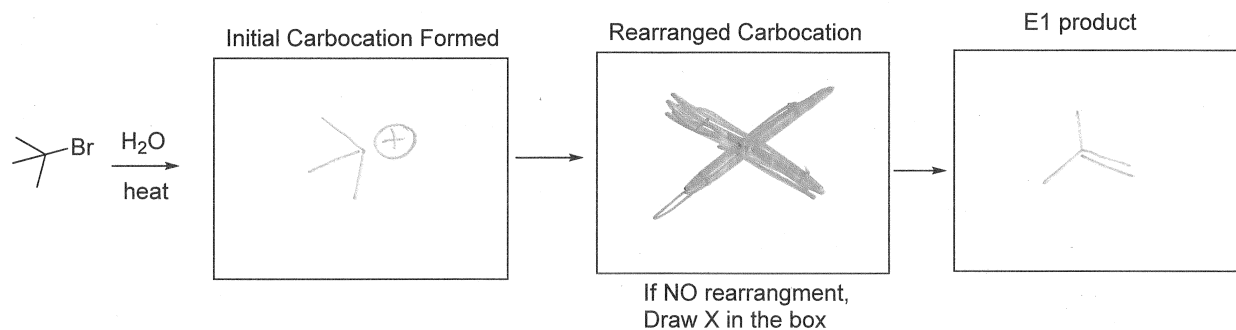


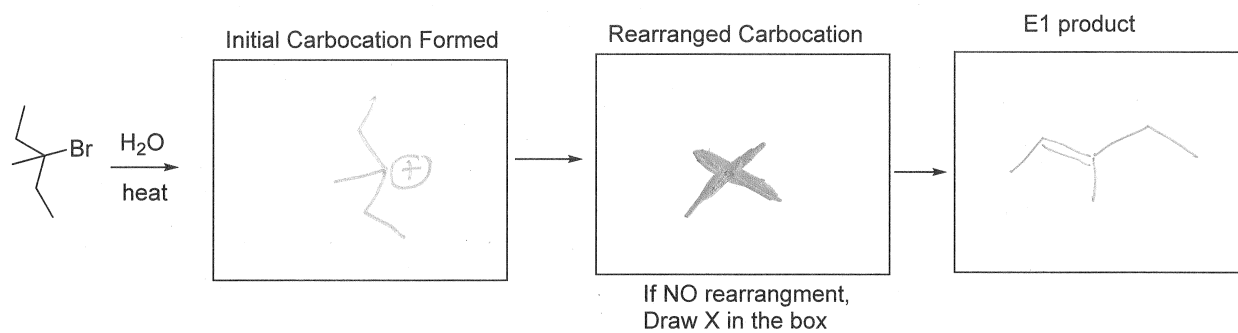
OTs is a good leaving group without acid catalysis!



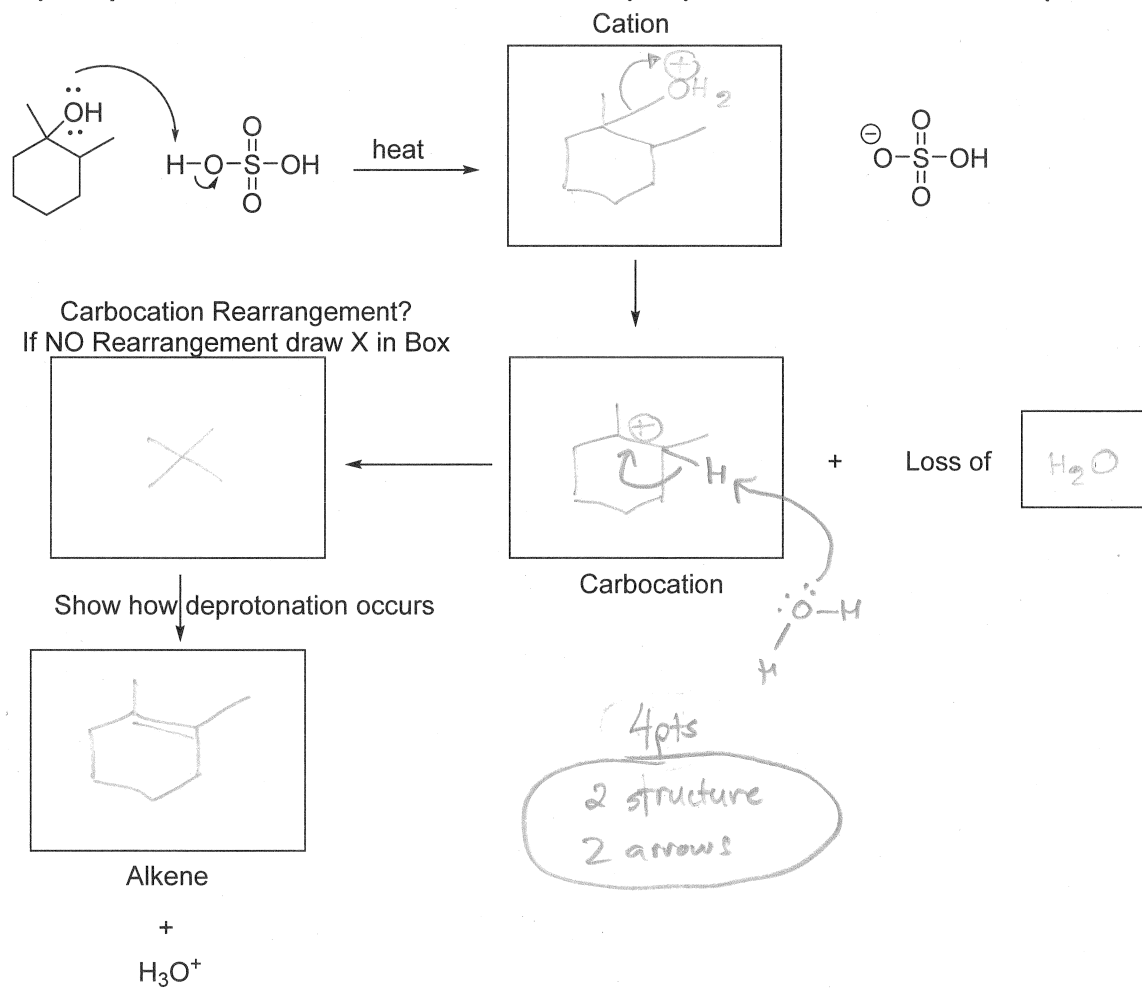
16) If the following E1 reaction involves a carbocation rearrangement, draw the initial carbocation formed, the carbocation made AFTER rearrangement, and then the alkene.

If no rearrangement occurs, Draw an X in the boxes.

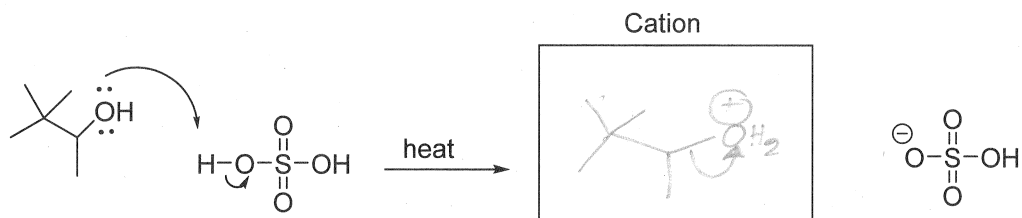




17) Complete the mechanisms. Use curved arrows ( $\curvearrowright$ ) to show movement of bond (electrons).

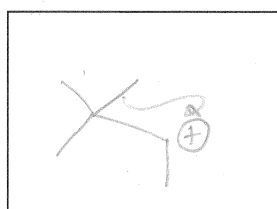
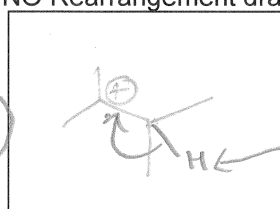




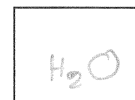


Cation

Carbocation Rearrangement?  
If NO Rearrangement draw X in Box

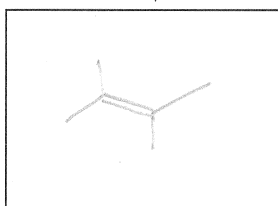


+ Loss of



Carbocation

Show how deprotonation occurs



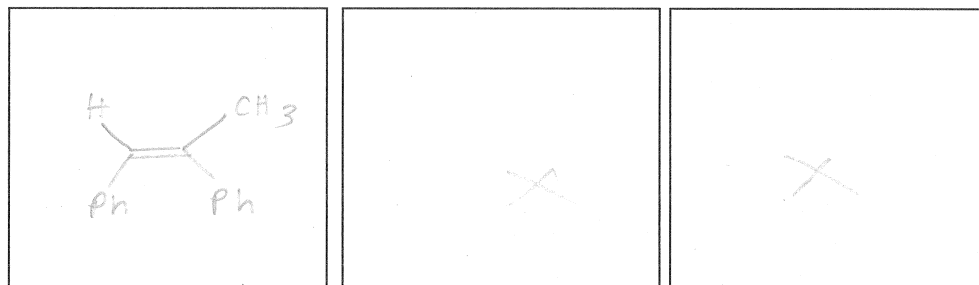
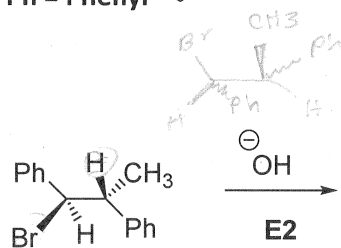
Alkene

+

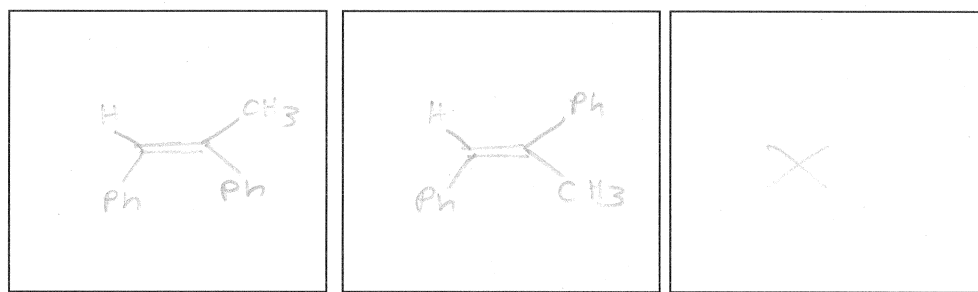
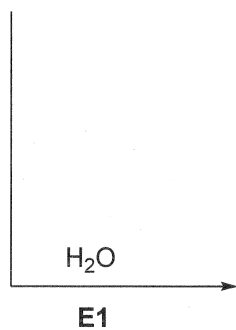
 $\text{H}_3\text{O}^+$

18) Draw the elimination product(s) for the reaction below (Include stereochemistry in products, when necessary).

Ph = Phenyl 

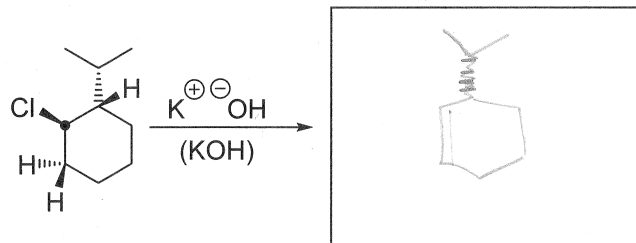


If 2 or fewer products place an X in the box(es) that you do not use

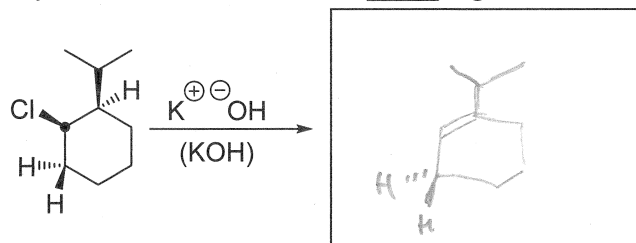


If 2 or fewer products place an X in the box(es) that you do not use

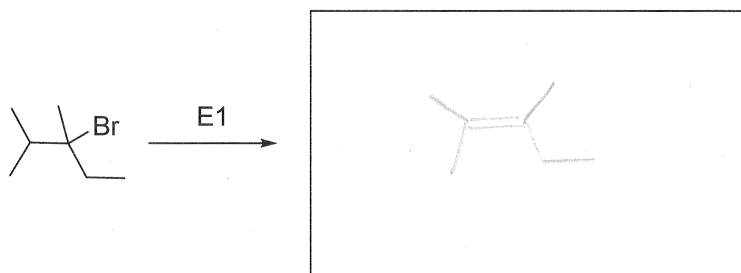
19) Draw the structure of the major organic ELIMINATION product



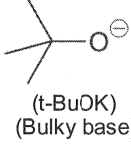
20) Draw the structure of the major organic ELIMINATION product



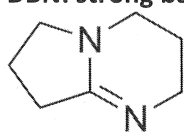
21) Predict the MAJOR alkene of the E1 reaction.



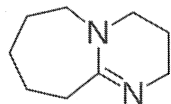
Become familiar with the reagents in the table below, this will not be provided on the exam. Find trends, make up mnemonics that help you remember those trends, if necessary.

Nucleophile (only)		Base (only)	Strong/Strong Nuc/Base	Weak/Weak Nuc/Base
<b>Halides</b> $\text{Cl}^-$ (NaCl) $\text{Br}^-$ (NaBr) $\text{I}^-$ (NaI)	<b>Sulfur nucleophiles</b> $\text{HS}^-$ (NaSH) $\text{H}_2\text{S}$ $\text{RS}^-$ (NaSR) $\text{RSH}$	$\text{H}^-$ (of NaH) DBN DBU	$\text{HO}^-$ (NaOH) $\text{MeO}^-$ (NaOMe) $\text{EtO}^-$ (NaOEt)  (t-BuOK) (Bulky base)	$\text{H}_2\text{O}$ MeOH EtOH
S <sub>N</sub> 2 or S <sub>N</sub> 1 reagents		E2 conditions	E2/S <sub>N</sub> 2 conditions	E1/S <sub>N</sub> 1 conditions

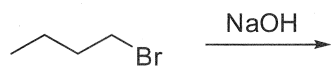
DBN: strong base, weak nucleophile



DBU: strong base, weak nucleophile



22) The mechanism(s) for the reaction below is: (CIRCLE mechanism(s) below)



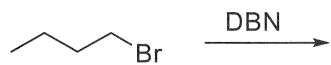
E1

S<sub>N</sub>1

E2

S<sub>N</sub>2

23) The mechanism(s) for the reaction below is: (CIRCLE mechanism(s) below)



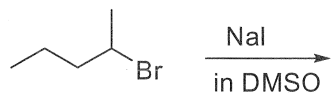
E1

S<sub>N</sub>1

E2

S<sub>N</sub>2

24) The mechanism(s) for the reaction below is: (CIRCLE mechanism(s) below)



25) what type of solvent is DMSO? *polar aprotic*

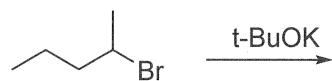
E1

S<sub>N</sub>1

E2

S<sub>N</sub>2

25) The mechanism(s) for the reaction below is: (CIRCLE mechanism(s) below)



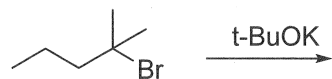
E1

S<sub>N</sub>1

E2

S<sub>N</sub>2

26) The mechanism(s) for the reaction below is: (CIRCLE mechanism(s) below)



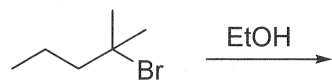
E1

S<sub>N</sub>1

E2

S<sub>N</sub>2

27) The mechanism(s) for the reaction below is: (CIRCLE mechanism(s) below)



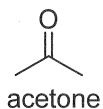
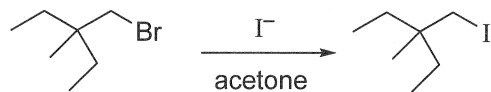
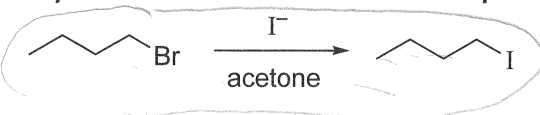
E1

S<sub>N</sub>1

E2

S<sub>N</sub>2

28) Consider the reactions below for questions 29 – 32.



29) The alkyl bromide starting materials in these reactions are classified as

- A) 3°      B) 4°      C) 1°      D) 2°?

C

LETTER here

30) The solvent (acetone) in these reactions is:

- A) polar protic  
 B) nonpolar protic  
 C) nonpolar aprotic  
 D) polar aprotic

D

LETTER here

31) Circle the *faster* reaction above?

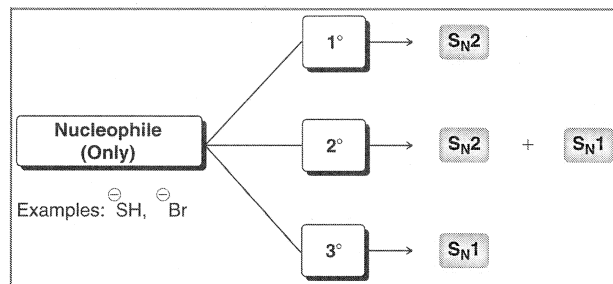
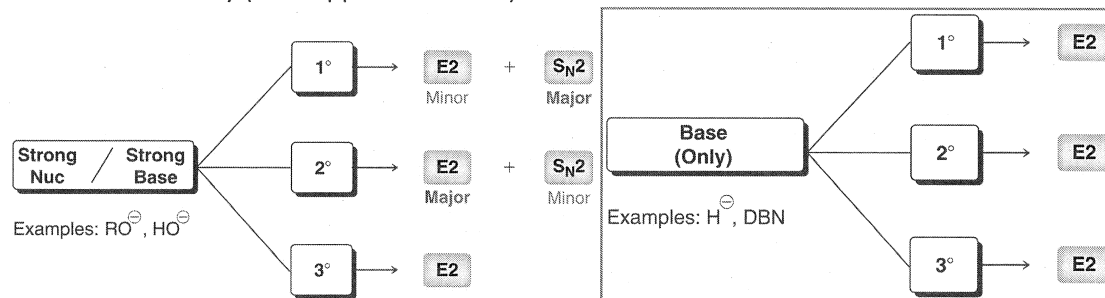
32) The mechanism for both reactions above is:

- A) E1      B) S<sub>N</sub>1      C) E2      D) S<sub>N</sub>2

D

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For Reference Only (not supplied on exam)



33) Identify the MAJOR product of the following reactions. SHOW STEREOCHEMISTRY WHEN NECESSARY

