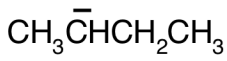
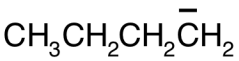
"Grade or Education" = 1

CHEM 2261/01
Summer 09
Exam 3
Chapters 7-9

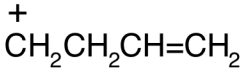
1. Figure out which speciec in each of the pairs shown below is more stable. Pairs of structures share the same letter, like **a1** and **a2**. Pick the **CORRECT** statement from the multiple choices.



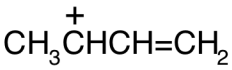
a1



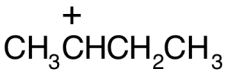
a2



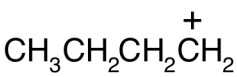
c1



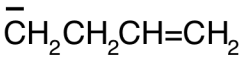
c2



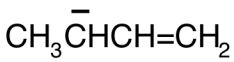
b1



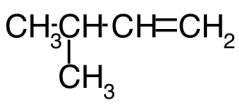
b2



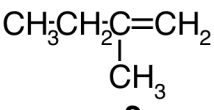
d1



d2



e1

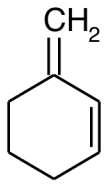


e2

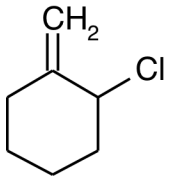
__ A. **e1** is more stable than **e2**.
__ B. **d2** is more stable than **d1**.
__ C. **c1** is more stable than **c2**.
__ D. **b2** is more stable than **b1**.
__ E. **a1** is more stable than **a2**.

Rationale:
Chapter 9 Problem 35(a,b,c,d,e)

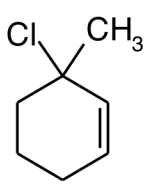
2. Find the structures of the major 1,2 and 1,4 addition products resulting from the reaction of diene **a** (shown below) with HCl. Figure out which structure is the kinetic product of this reaction and which structure is the thermodynamic product. Choose the **CORRECT** statement from the multiple choices.



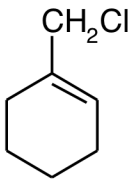
a



1



2



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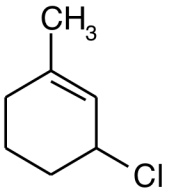
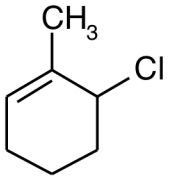


4



5

__ A. The kinetic product has structure **1** and the thermodynamic product has structure **3**.

__ B. The kinetic product has structure **2** and the thermodynamic product has structure **4**.

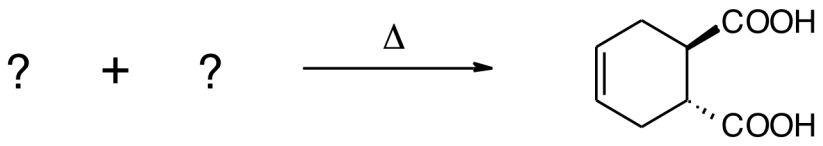
__ C. Both the kinetic and the thermodynamic products have structure **5**.

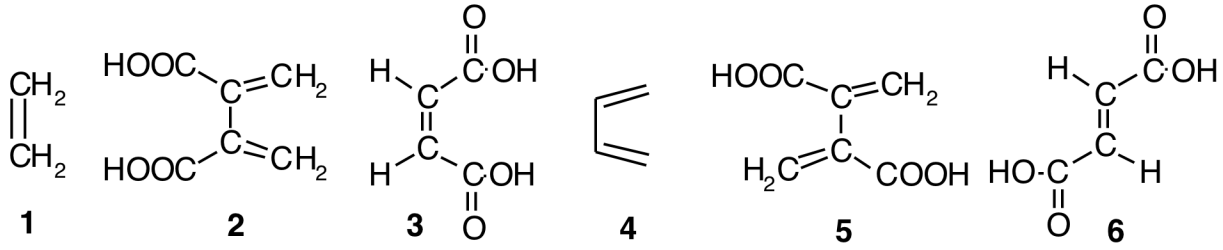
__ D. The kinetic product has structure **4** and the thermodynamic product has structure **2**.

__ E. The kinetic product has structure **3** and the thermodynamic product has structure **1**.

Rationale:
Chapter 7 Problem 31a

3. What diene and what dienophile could be used to carry out the reaction shown below? Find the answer corresponding to a **CORRECT** choice of diene and dienophile.





__ A. Compound **4** is the diene and compound **3** is the dienophile.

__ B. Compound **6** is the diene and compound **1** is the dienophile.

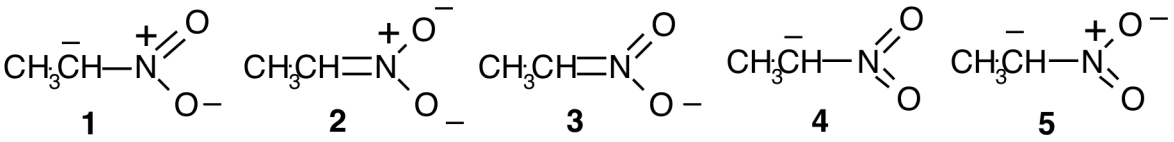
__ C. Compound **5** is the diene and compound **1** is the dienophile.

__ D. Compound **2** is the diene and compound **1** is the dienophile.

__ E. Compound **4** is the diene and compound **6** is the dienophile.

Rationale:
Chapter 7 Problem 40f

4. Find all of the resonance contributor(s) for the species whose structure is labelled **1** below. Choose the statement which is **CORRECT** about the relationship between the structure labelled **1** and its resonance contributor(s)



__ A. **1**, **2**, and **5** are the resonance contributors of this species; **1** and **5** are the major contributors and **2** is the minor contributor to the resonance hybrid.

__ B. **1**, **2**, and **5** are the resonance contributors of this species; **2** is the major contributor and **1** and **5** are minor contributors to the resonance hybrid.

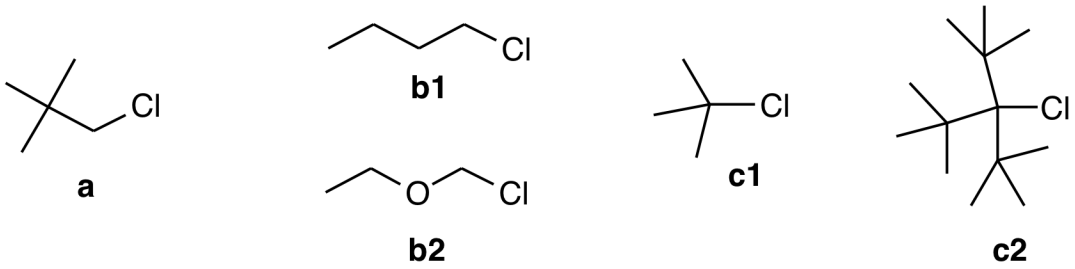
__ C. **1** and **2** are the resonance contributors of this species; **1** is the major contributor and **2** is the minor contributor to the resonance hybrid.

__ D. **1**, **3**, and **4** are the resonance contributors of this species; **3** is the major contributor and **1** and **4** are minor contributors to the resonance hybrid.

__ E. **1**, **3**, and **4** are the resonance contributors of this species; **3** and **4** are the major contributors and **1** is the minor contributor to the resonance hybrid.

Rationale:
Chapter 7 Problem 48(a5)

5. Use the numbered structures shown below to choose the **CORRECT** statement from the multiple choices.



__ A. **a** will react faster with CH_3S^- than it will with $(CH_3)_2CHS^-$.

__ B. **b1** will react faster with HO^- than **b2** will.

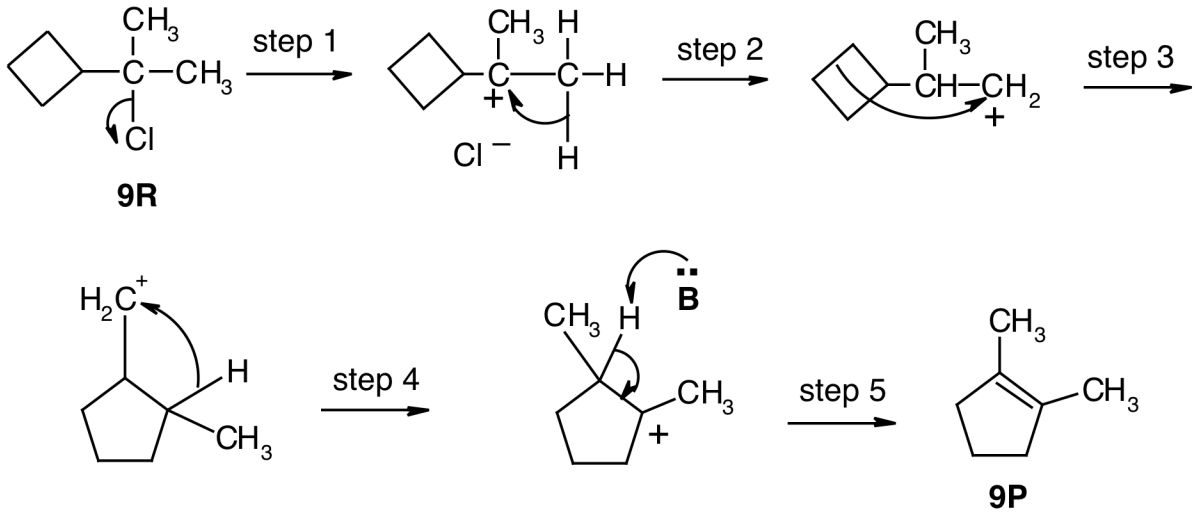
__ C. **c1** will react with H_2O faster than **c2** will.

__ D. $(CH_3)_3CBr$ will react faster with CH_3CH_2OH than it will with H_2O.

__ E. **c2** will not react with H_2O.

Rationale:
Chapter 8 Problem 48

6. A student proposed the 5-step mechanism shown below to convert the substance with structure **9R** into **9P**. Which steps are **WRONG** in this proposed mechanism?



__ A. Steps 1, 2, and 3 are wrong.

__ B. Steps 3, 4, and 5 are wrong.

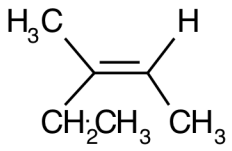
__ C. Steps 1 and 5 are wrong.

__ D. Steps 2, 3, and 4 are wrong.

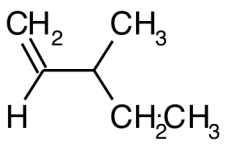
__ E. Step 5 is wrong.

Rationale:
Chapter 9 Problem 9

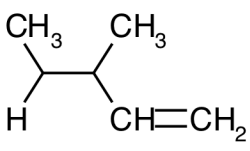
7. Find the elimination product(s) of (2R,3R)-2-chloro-3-methylpentane + high concentration of CH_3O^- among the numbered structures below. Choose the **CORRECT** product(s) of this reaction.



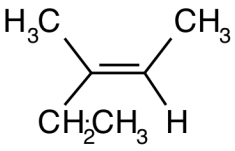
1



2



3



4

__ A. **1** is the product of this reaction.

__ B. **3** is the product of this reaction.

__ C. **2** is the product of this reaction.

__ D. **4** is the product of this reaction.

__ E. **1** and **3** are both products of this reaction.

Rationale:
Chapter 9 Problem 48d

8. Pick the statement which **CORRECTLY** indicates which compound in a pair will give a higher substitution-product to elimination-product ratio when it reacts with isopropyl bromide.

__ A. **CH_3O^-** will give a higher substitution-to-elimination ratio than **CH_3S^-**.

__ B. **$^-$OCN** will give a higher substitution-to-elimination ratio than **$^-$SCN**.

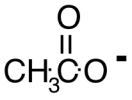
__ C. **Ethoxide ion** will give a higher substitution-to-elimination ratio than **tert-butoxide ion**.

__ D. None of the other choices is correct.

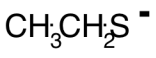
__ E. **Cl^-** will give a higher substitution-to-elimination ratio than **Br^-**.

Rationale:
Chapter 9 Problem 40

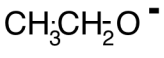
9. Rank the ions whose structures are shown below in order of **DECREASING** nucleophilicity in methanol (strongest nucleophile listed first).



1



2



3

__ A. **3** > **2** > **1**

__ B. **1** > **2** > **3**

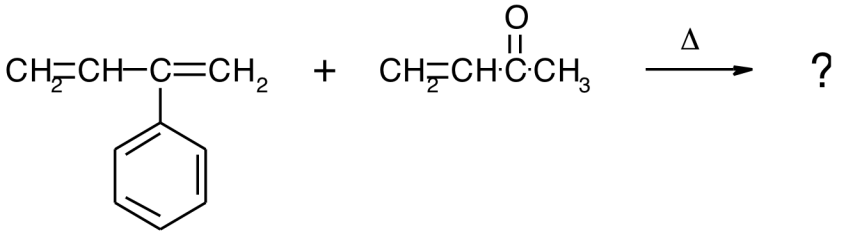
__ C. **1** > **3** > **2**

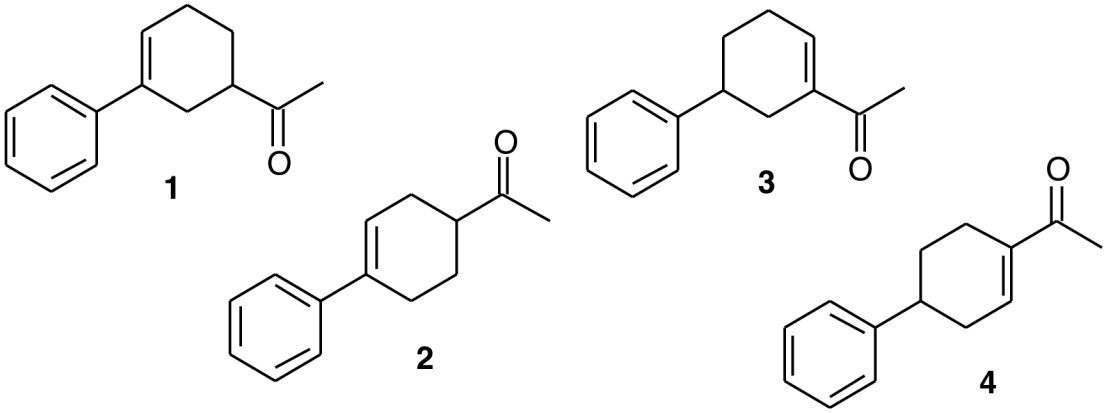
__ D. **2** > **1** > **3**

__ E. **2** > **3** > **1**

Rationale:
Chapter 8 Problem 42a

10. Find the **MAJOR** product of the Diels-Alder reaction shown below among the numbered structures shown below the reaction. Make certain that you use the preferred alignment of the reactants to generate the major product. Pick the choice which gives the number found under the correct structure of this product.





__ A. **4**

__ B. **1**

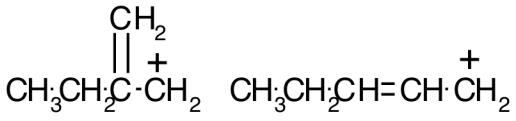
__ C. None of the numbered structures is the major product of this reaction.

__ D. **2**

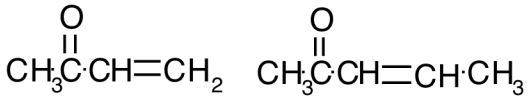
__ E. **3**

Rationale:
Chapter 7 Problem 71b

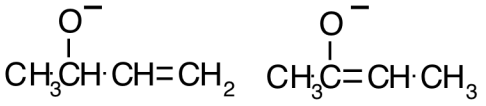
11. Figure out which species is the more stable of each of the labelled pairs shown below. A pair of species share the same letter, like **a1** and **a2** . Choose the statement which is **CORRECT** about the relative stabilities of these pairs of species.



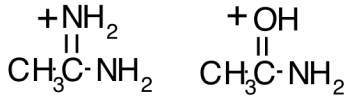
a1 **a2**



b1 **b2**



c1 **c2**



d1 **d2**

__ A. **b2** is more stable than **b1**.

__ B. **a1** is more stable than **a2**.

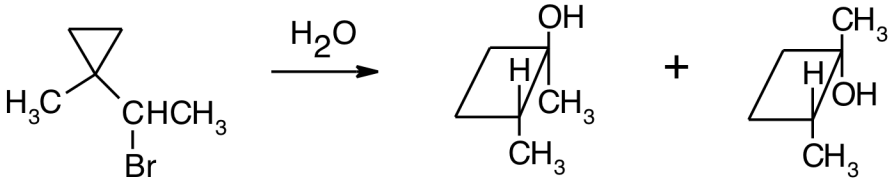
__ C. **d2** is more stable than **d1**.

__ D. None of the other choices is correct.

__ E. **c1** is more stable than **c2**.

Rationale:
Chapter 7 Problem 7

12. Work out the mechanism for the reaction shown below. The first step generates a carbocation and the second step involves the rearrangement of this carbocation to form a more stable carbocation. Choose the statement which is **CORRECT** about the **PRODUCT** of the **SECOND** step of this reaction (ie. the rearranged carbocation).



__ A. The carbocation is located on a tertiary carbon atom which is part of a 4-membered ring.

__ B. The intermediate which is the product of the second step is a 4-membered ring with a secondary carbocation located on one of the ring carbons and an ethyl group attached to the ring carbon on the opposite side of the ring from the carbocation..

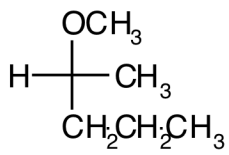
__ C. The intermediate which is the product of the second step is a 4-membered ring with an ethyl group attached to one of the ring carbons and a secondary carbocation on an adjacent carbon atom.

__ D. The carbocation is located on a tertiary carbon atom which is part of a 3-membered ring.

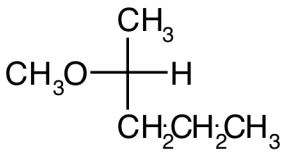
__ E. The carbocation is located on a secondary carbon atom which is part of a 4-membered ring.

Rationale:
Chapter 8 Problem 62

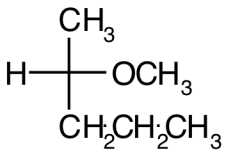
13. Examine the Fischer projections shown below. Choose the one which **CORRECTLY** shows the structure of the product of the reaction of (R)-2-bromopentane + high concentration of CH_3O^-.



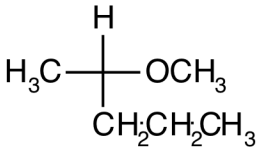
a1



a2



a3



a4

__ A. Structure **a2** is correct.

__ B. Structure **a4** is correct.

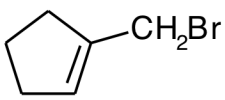
__ C. None of these structures is correct.

__ D. Structure **a1** is correct.

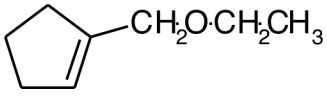
__ E. Structure **a3** is correct.

Rationale:
Chapter 8 Problem 45a

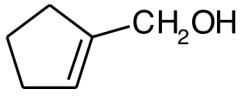
14. Find **ALL** of the **CORRECT** structures of the products obtained from the solvolysis of the compound with structure **b** (shown below) in ethanol. Choose the answer which gives all of the correct product structures and no wrong structures.



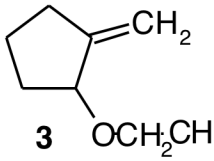
b



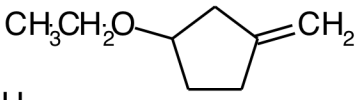
1



2



3



4

__ A. The products have structures **1** and **3**.

__ B. The products have structures **1** and **4**.

__ C. The products have structures **2** and **4**.

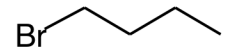
__ D. The products have structures **1** and **2**.

__ E. The products have structures **2** and **3**.

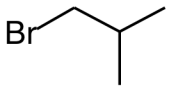
Rationale:
Chapter 8 Problem 46b

15. Indicate whether the alkyl halides listed in the table below will give primarily substitution products (S), only elimination products (E), both substitution and elimination products (S & E), or no products (X) when they are treated with the reagents under the reaction conditions shown in the table below. Put the correct abbreviations for substitution (S), Elimination (E) or no reaction (X) in the product column of the table for each reaction shown. These reactions are designated **a1** through **b4** in the multiple choices as presented in the table. Pick the **CORRECT** statement from the multiple choices.

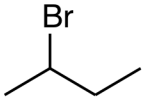
Rxn	Alkyl Halide	Reaction Conditions	Products
a1	1-bromobutane	methanol under $S_N1/E1$	
a2	1-bromo-2-methylpropane	methanol under $S_N1/E1$	
a3	2-bromobutane	methanol under $S_N1/E1$	
a4	2-bromo-2-methylpropane	methanol under $S_N1/E1$	
b1	1-bromobutane	sodium methoxide under $S_N2/E2$	
b2	1-bromo-2-methylpropane	sodium methoxide under $S_N2/E2$	
b3	2-bromobutane	sodium methoxide under $S_N2/E2$	
b4	2-bromo-2-methylpropane	sodium methoxide under $S_N2/E2$	



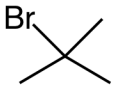
1-bromobutane
1



1-bromo-2-methylpropane
2



2-bromobutane
3



2-bromo-2-methylpropane
4

__ A. Reaction **b3** gives only elimination products.

__ B. Reaction **a4** gives no products.

__ C. Reaction **a2** gives both substitution and elimination products.

__ D. Reaction **a1** gives no products.

__ E. Reaction **b4** gives primarily substitution products.

Rationale:
Chapter 9 Problem 22

Answer Key

"Grade or Education" = 1

CHEM 2261/01
Summer 09
Exam 3
Chapters 7-9

1. B
2. B
3. E
4. B
5. A
6. D
7. D
8. C
9. E
10. D
11. A
12. A
13. E
14. A
15. D