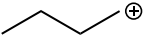
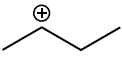
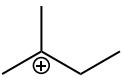
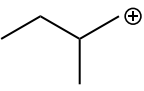


Organic Chemistry**Final Exam****Part I: Multiple-Choice Questions (45%)**

1. Ionic reaction:
 - A. undergoes a heterolytic reaction process
 - B. must have at least one carbocation intermediate
 - C. usually has only one step
 - D. contains free radicals to propagate reaction chain
2. Which of the following species is a nucleophile:
 - A. methyl carbocation (H_3C^+)
 - B. butane ($\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_3$)
 - C. hydroxide (OH^-)
 - D. none of above
3. What is $\text{S}_{\text{N}}2$ stand for:
 - A. bimolecular nucleophilic substitution
 - B. two-molecular nucleophilic substitution
 - C. unimolecular nucleus subtraction
 - D. double-molecular electrophilic substitution
4. Which of the following carbocation is the most stable:
 - A. 
 - B. 
 - C. 
 - D. 

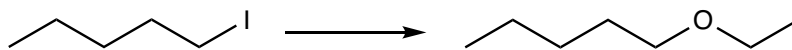
5. Which of the following species is the best leaving group:

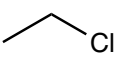
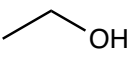
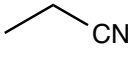

- A. chloride (Cl^-)
- B. iodide (I^-)
- C. hydroxide ($-\text{OH}$)
- D. alkoxide ($-\text{OR}$)

6. The rate law for the $\text{S}_{\text{N}}1$ reaction is:

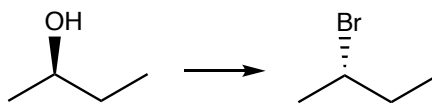
- A. $\text{rate} = k [\text{substrate}]$
- B. $\text{rate} = k [\text{nucleophile}]$
- C. $\text{rate} = k [\text{substrate}][\text{nucleophile}]$
- D. $\text{rate} = k$

7. Identify the reagent used for the following transformation:



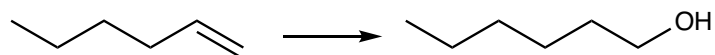
- A.  Cl
- B.  OH
- C.  CN
- D. 

8. Identify the reagent used for the following transformation:



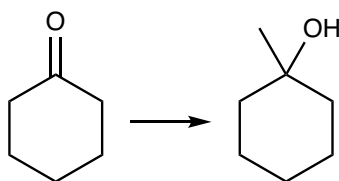
- A. H_3O^+
- B. HBrO_3
- C. CH_3Br
- D. HBr

9. Identify the reagent(s) used for the following transformation:



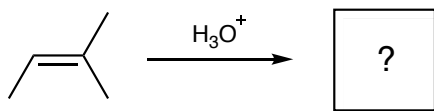
- A. H_2O_2
- B. H_3O^+
- C. 1) $\text{Hg}(\text{OAc})_2, \text{H}_2\text{O}$; 2) NaBH_4
- D. 1) $\text{BH}_3 \cdot \text{THF}$; 2) $\text{H}_2\text{O}_2, \text{NaOH}$

10. Identify the reagent(s) used for the following transformation:



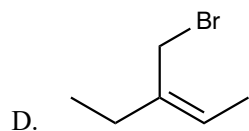
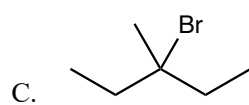
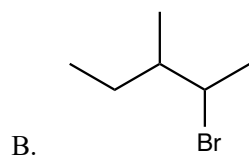
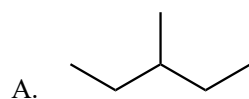
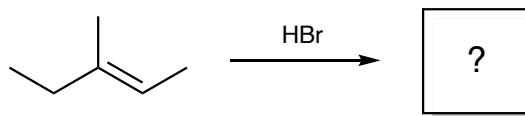
- A. $\text{CH}_3\text{MgBr}, \text{NaOH}$
- B. 1) CH_3MgBr ; 2) H_2O
- C. 1) MgBr_2 ; 2) H_2O
- D. $\text{CH}_3\text{MgBr}, \text{H}_2\text{O}$

11. Identify the major product of the following reaction:

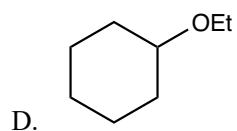
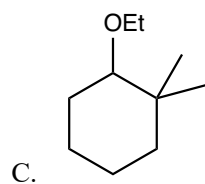
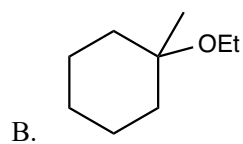
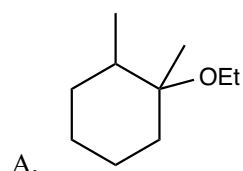
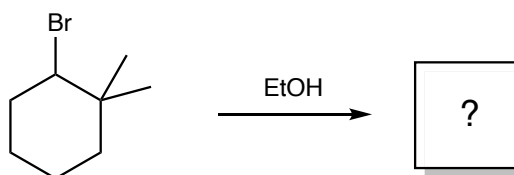


- A.
- B.
- C.
- D.

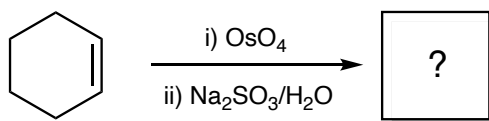
12. Identify the major product of the following reaction:



13. Identify the major product of the following reaction:

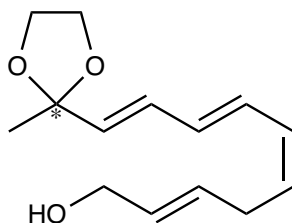


14. Identify the major product of the following reaction:



- A. + En.
- B. + En.
- C. + En.
- D.

15. Identify the oxidation number of the asterisk(*) marked carbon atom:



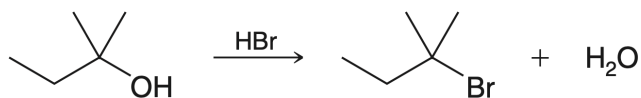
- A. -2
- B. 0
- C. +2
- D. +4

Part II: Fill-in-Blank and Short Answer Questions (15%)

16. The S_N2 reaction is characterized by the inversion of stereochemical configuration, or the Walden inversion. This feature is called _____ (stereospecificity / stereoselectivity / regioselectivity).
17. Because elimination reaction has a _____ (negative / positive / zero) value of ΔG at low temperature, and its ΔS is _____ (negative / positive / zero), heat is needed to add for a greater yield.
18. Markovnikov addition is to add hydrogen to the carbon which links to _____ (more / less) hydrogen atoms.
19. Explain the difference between transition state and intermediate.
- _____
- _____
- _____
20. Describe the teaching assistant. Make sure you have mentioned at least three features of her appearance. You can use either Chinese or English.

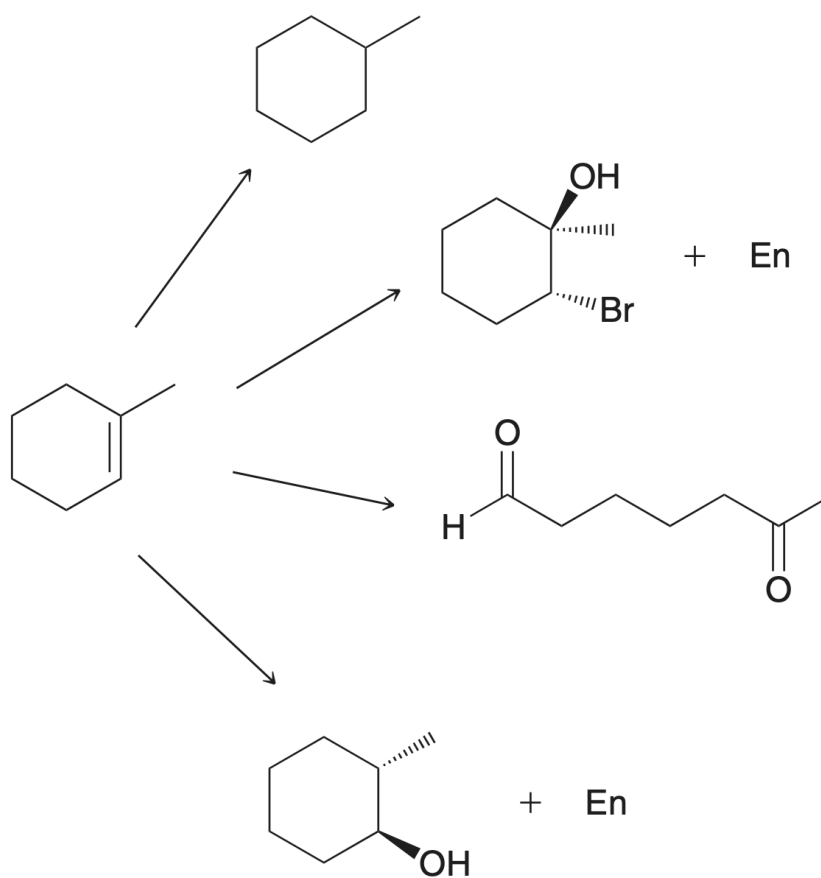
Part III: Free-Response Questions (40%)

21. Consider the following substitution reaction:



- (a) Determine whether this reaction proceeds via an S_N1 or S_N2.
- (b) Draw the mechanism of this reaction.
- (c) What is the rate equation of this reaction?
- (d) Would the reaction occur at a faster rate if sodium bromide were added to the reaction mixture?
- (e) Draw an energy diagram of this reaction.

22. Identify the reagents you would use to accomplish each of the following transformations, and propose a mechanism for one of these reactions that you are familiar.



23. Write a short essay to give suggestions and/or evaluations to your teacher and teaching assistant.

- Clearly illustrate your viewpoints in detail.
- You can use either Chinese or English.
- There is no minimum requirement or limit for the word count.

[illegible]