

Chemistry 2541, Fall 2015

Midterm Exam 3

(100 points)

Important notes:

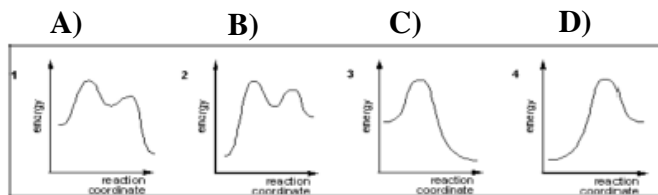
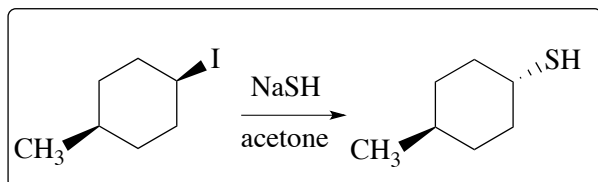
- Please use the provided Scantron form for your answers; you can keep the sheet with the questions and can use it as scratch paper
- Do not forget to write your name on the Scantron form
- You will not receive credit for unmarked answers or for more than one mark on answer line
- Your scores will be posted on eGradebook; graded Scantron forms will not be returned to students.

Questions 1-28 (84 pts): Please mark the appropriate box on the front of the Scantron form (3 pts each).

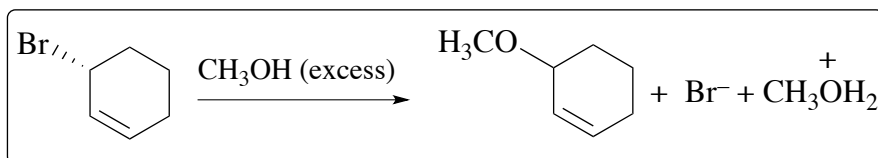
1. What is the common name of **3-chloropropene**?

- A) propenyl chloride B) allyl chloride C) vinyl chloride D) methylene chloride

2. What is the **energy diagram** for the reaction in the box:

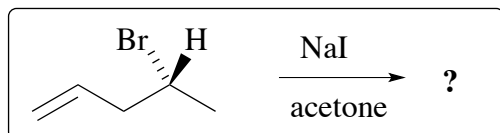


3. What is the **rate equation** for the reaction in the box?



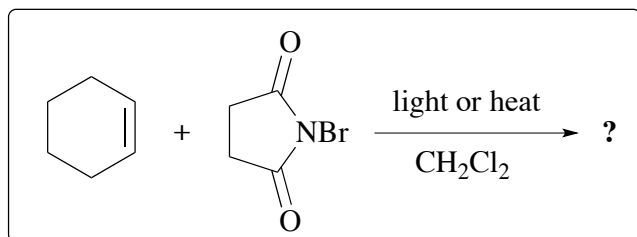
- A) Rate = $k [\text{RBr}][\text{CH}_3\text{OH}]$
 B) Rate = $k [\text{RBr}]$
 C) Rate = $k [\text{RBr}][\text{Br}^-]$
 D) Rate = $k [\text{CH}_3\text{OH}]$

4. What is the IUPAC name of the major **product** for the reaction shown in the box?



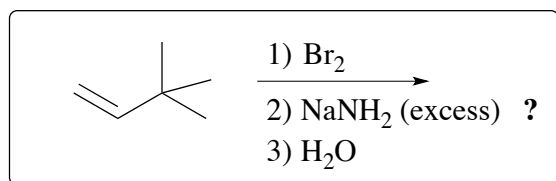
- A) (S)-2-iodopentane B) (R)-2-iodopentane
 C) (S)-4-iodo-1-pentene D) (R)-4-iodo-1-pentene

5. What is the IUPAC name of the major **product** for the reaction shown in the box?



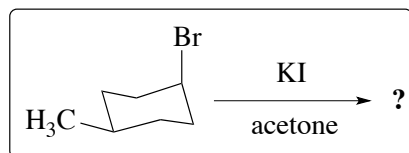
- A) 1-bromocyclohexene B) 2-bromocyclohexene
C) 3-bromocyclohexene D) bromocyclohexene

6. What is the IUPAC name of the major **product** for the reaction shown in the box?



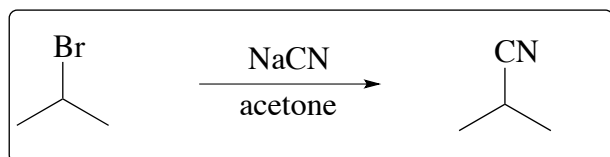
- A) 3,3-dimethyl-1-butyne B) 4,4-dimethyl-2-pentyne
C) 4,4-dimethyl-1-pentyne D) 3,3-dimethyl-1-pentyne

7. What is the IUPAC name of the major **product** for the reaction shown in the box?



- A) *cis*-1-iodo-4-methylcyclohexane B) *trans*-1-iodo-4-methylcyclohexane
C) *cis*-4-bromo-1-methylcyclohexane D) *trans*-4-bromo-1-methylcyclohexane

8. Which structure best represents the **transition state** for the reaction in the box?

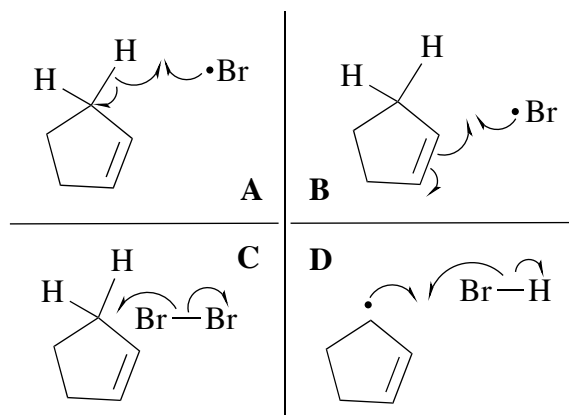
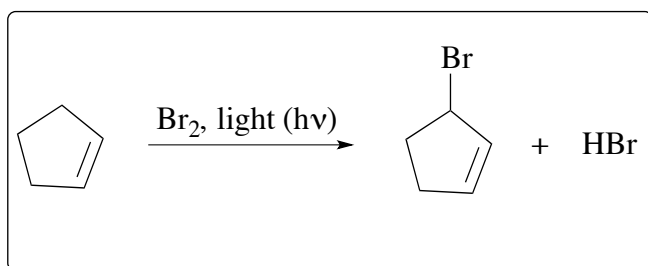


- A)
- B)
- C)
- D)

9. Which best describes the rate-limiting step in the S_N1 mechanism?

- A)
- B)
- C)
- D)

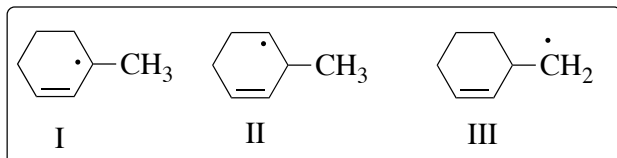
10. Which one of the following four schemes (A-D) represents a **step** in the **mechanism** of the reaction in the box?



11. Which of the following is the **least stable radical**?



12. Arrange the **radicals** shown in the box in order of increasing stability.

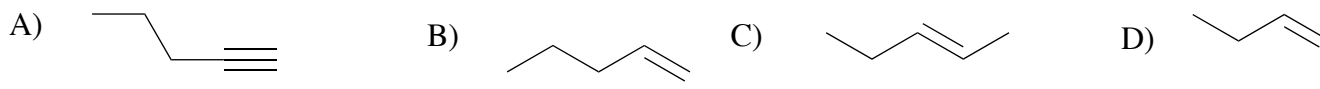
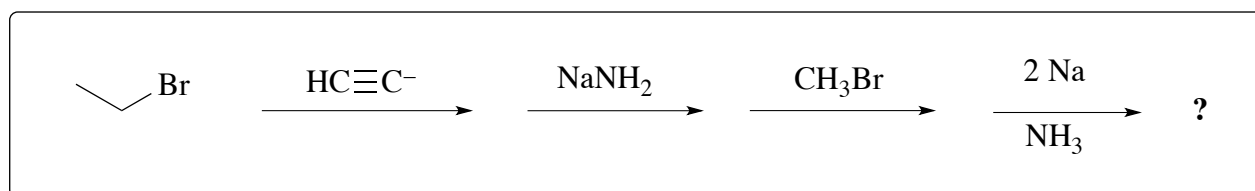


- A) (least stable) I < III < II B) (least stable) II < I < III
C) (least stable) III < I < II D) (least stable) III < II < I

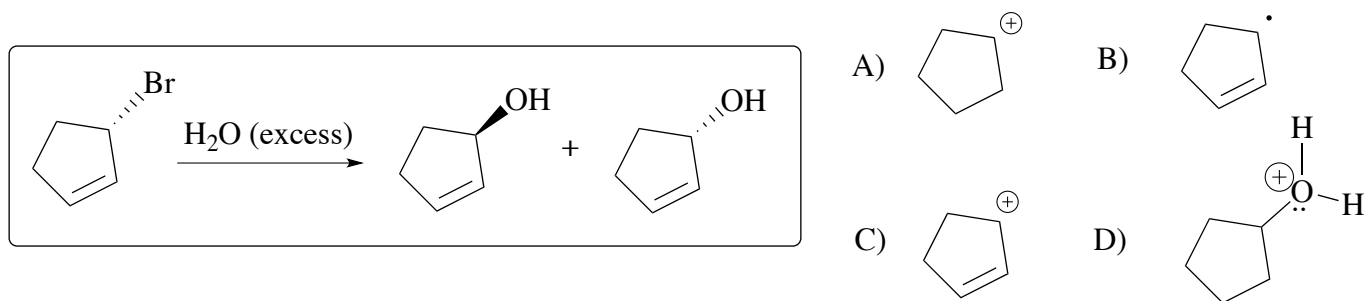
13. Which of the following compounds is **not a nucleophile**?

- A) H_2O B) CH_3OH C) $(\text{CH}_3)_3\text{N}$ D) $(\text{CH}_3)_3\text{B}$

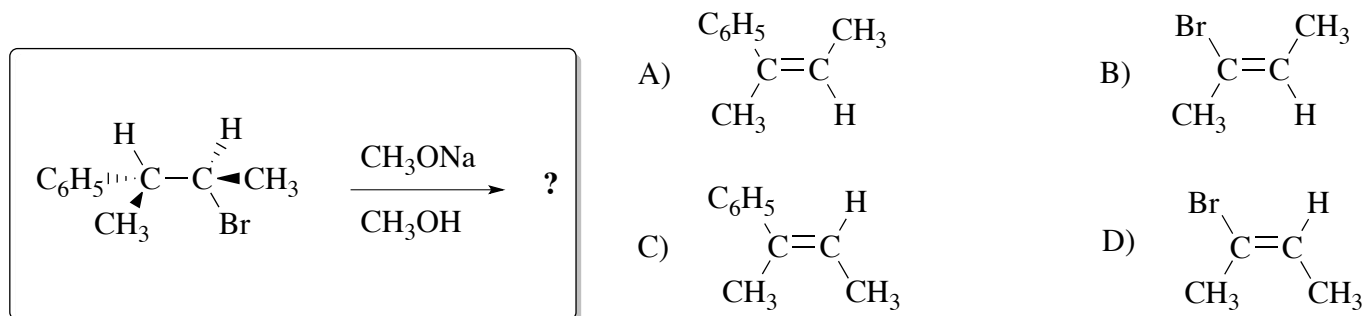
14. What is the main **product** of the reaction sequence shown in the box?



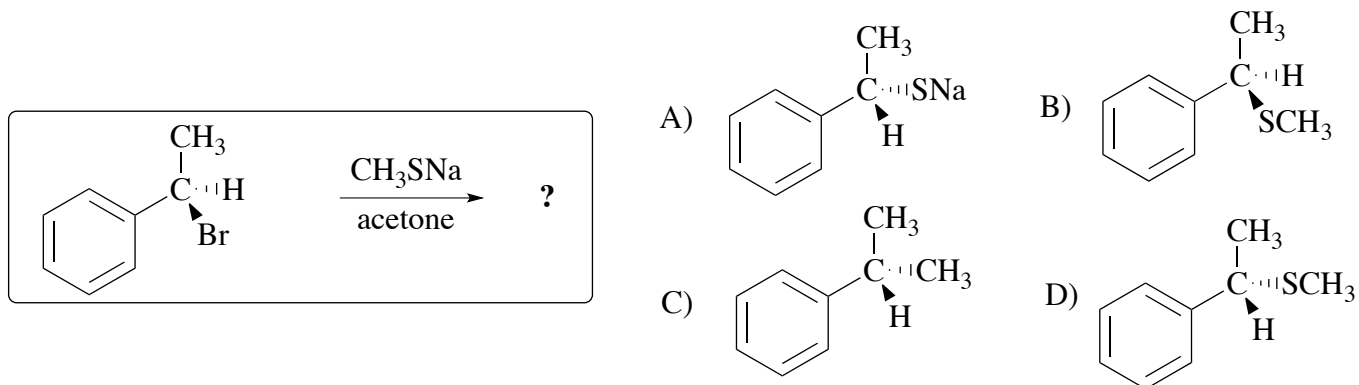
15. What is the structure of an **intermediate** in the reaction shown in the box?



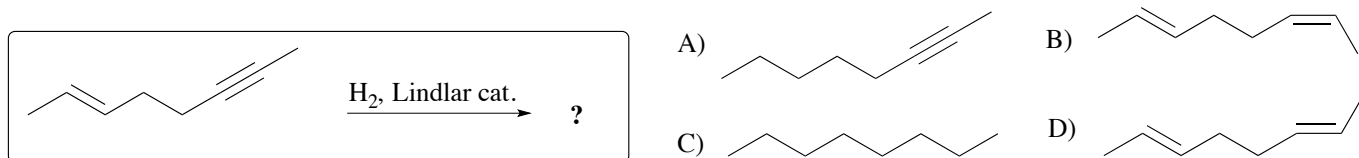
16. What is the main **product** of the **E2-elimination** reaction shown in the box?



17. What is the main **product** of the reaction shown in the box?



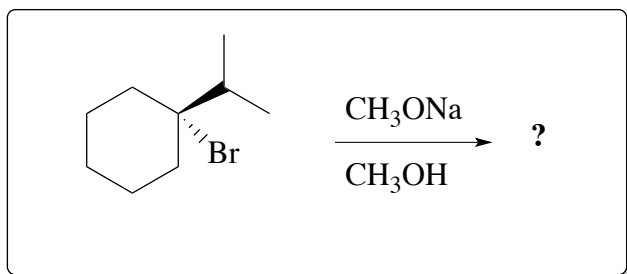
18. What is a main **product** of the reaction shown in the box?



19. Which one of the following compounds has the **best leaving group**?

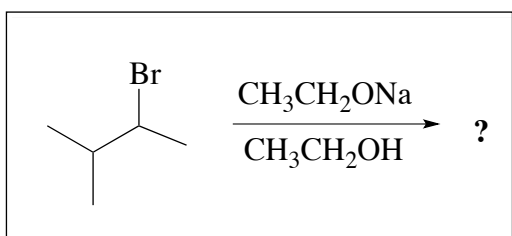
- A) cyclohexanol B) bromocyclohexane C) chlorocyclohexane D) fluorocyclohexane

20. What is the main **product** of the reaction shown in the box?



- A) B) C) D)

21. What is the main **product** of the reaction shown in the box?



- A) B) C) D)

22. Which of the following bromoalkanes reacts the **fastest** with sodium cyanide, **NaCN**, in **acetonitrile**?

- A) bromoethane B) 2-bromo-2-methylbutane C) 1-bromo-3-methylcyclobutane D) bromocyclohexane

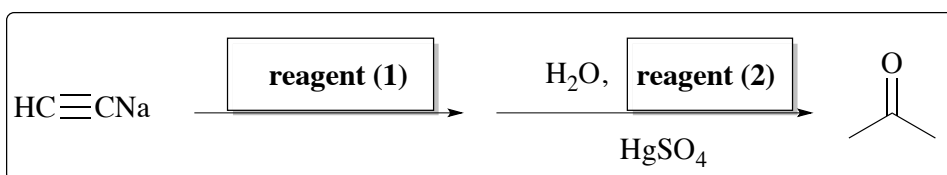
23. In which of the following **solvents** would the reaction of **1-bromobutane** with sodium azide, **NaN₃**, proceed the **fastest**?

- A) methylene chloride B) methanol C) chloroform D) DMSO

24. Which one of the following compounds is the **best** choice as a **reagent** for an **E2** reaction?

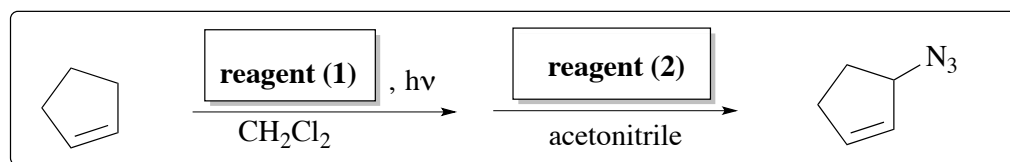
- A) *t*-BuCl B) C₂H₅ONa C) NaI D) C₂H₅OCH₃

25. Which sequence of **reagents** can be used for the reaction shown in the box?



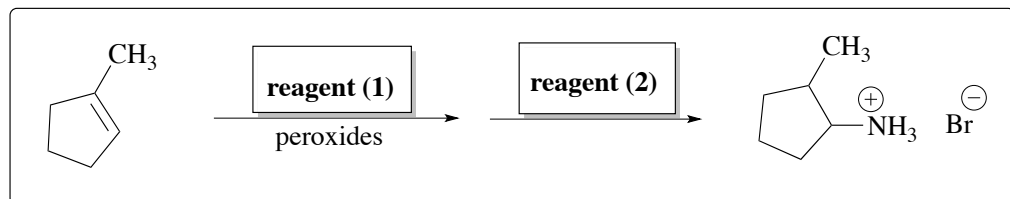
- A) (1) CH₃Br, (2) (sia)₂BH
B) (1) Na, (2) (sia)₂BH
C) (1) NaNH₂, (2) H₂SO₄
D) (1) CH₃Br, (2) H₂SO₄

26. Which sequence of **reagents** can be used for the reaction shown in the box?



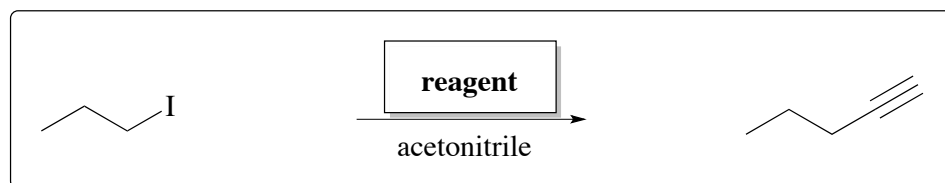
- A) (1) HBr, (2) NaN_3
- B) (1) NBS, (2) NaN_3
- C) (1) NaNH_2 , (2) Br_2
- D) (1) NaNH , (2) CH_3Br

27. Which sequence of **reagents** can be used for the reaction shown in the box?



- A) (1) NBS, (2) NH_3
- B) (1) HBr, (2) CH_3NH_2
- C) (1) HBr, (2) NH_3
- D) (1) Br_2 , (2) CH_3NH_2

28. Which **reagent** can be used for the reaction shown in the box?



- A) NaCN B) $\text{HC}\equiv\text{CNa}$
- C) NaN_3 D) $\text{CH}_3\text{C}\equiv\text{CNa}$

Question 29: Please write your answers into the appropriate space on the back of the Scantron form

29. Provide the **reagents** that give indicated products in high yield (4 pts each):

