

Chemistry 2541, Fall 2017

Midterm Exam 2

Key

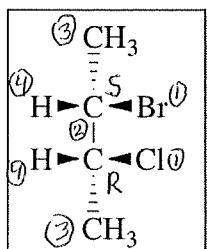
(100 points)

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).

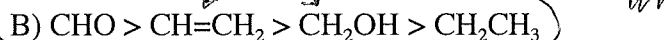
1. What is the IUPAC name for the compound shown in the box?



- A) (2*S*,3*S*)-2-bromo-3-chlorobutane **B) (2*S*,3*R*)-2-bromo-3-chlorobutane**
 C) (2*R*,3*S*)-2-bromo-3-chlorobutane D) (2*R*,3*R*)-2-bromo-3-chlorobutane

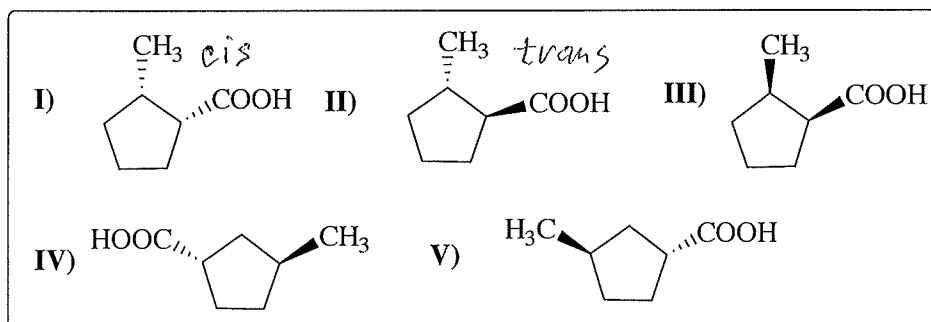
2. Consider the following orders of priority (highest to lowest). Which order is **incorrect**?

- A) OH > CO₂H > CHO > CH=CH₂
 C) OH > CH₂Cl > CH₂CH₃ > CH₃



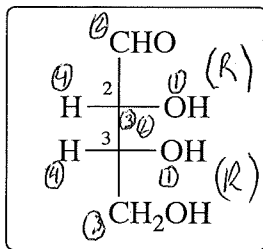
Two correct answers; both get 3 pts

3. What is the relationship of structure I to the other structures shown in the box? Which one of the following pairs is a pair of **diastereomers**?



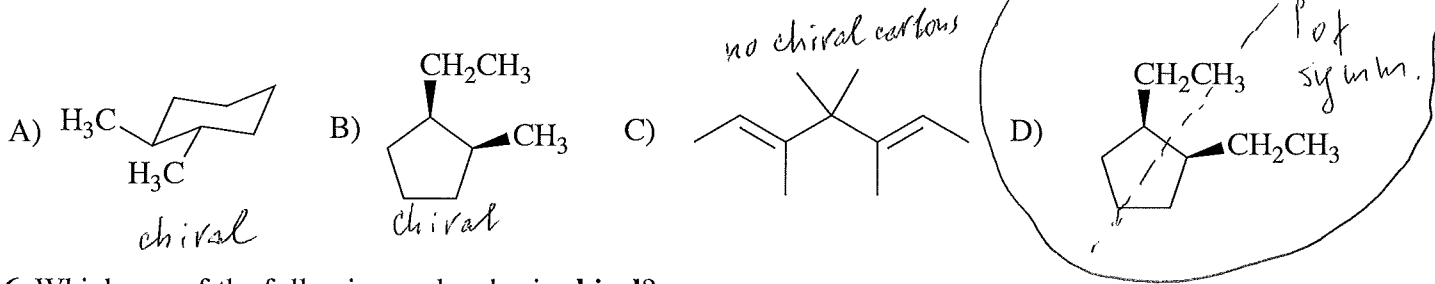
- A) I and II** B) I and III
 C) I and IV D) I and V

4. What is the **configuration** (*R* or *S*) at the carbon atoms 2 and 3 of the molecule shown in the box?

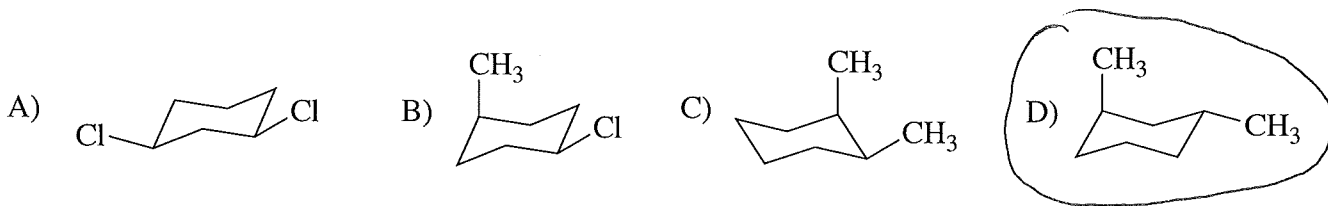


- A) 2*R*,3*R* B) 2*S*,3*R*
 C) 2*R*,3*S* D) 2*S*,3*S*

5. Which one of the following molecules is a **meso** compound?



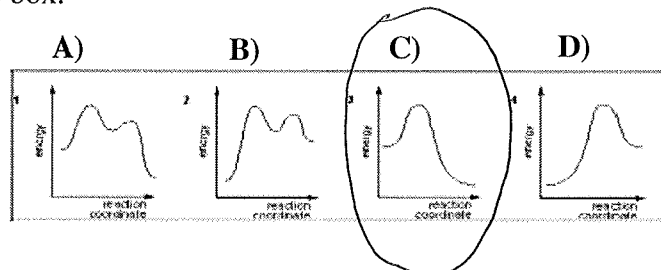
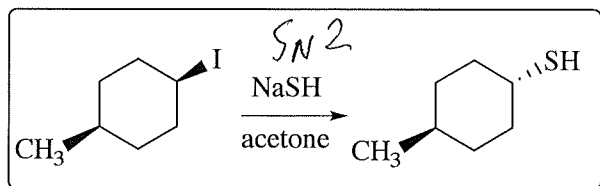
6. Which one of the following molecules is **chiral**?



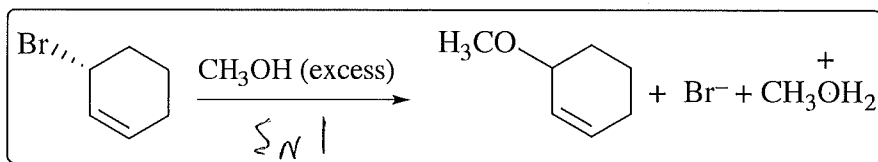
7. Which of the statements below is NOT true about **stereoisomers**?

- A. They have the same connectivity of atoms B. They have the same molecular weight
 C. They have the same orientation of atoms in space D. They have the same molecular formula

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

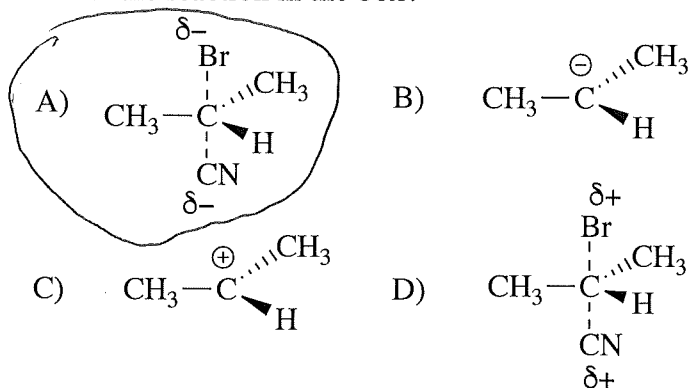
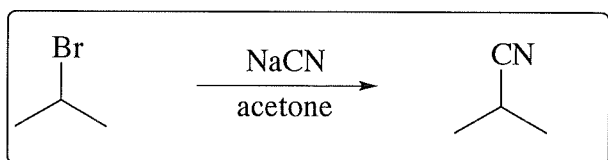


9. What is the **rate equation** for the reaction in the box?

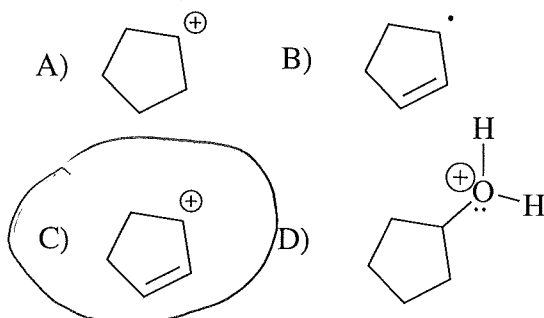
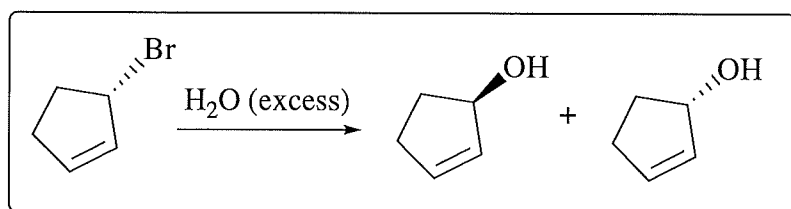


- A) Rate = $k[\text{RBr}][\text{CH}_3\text{OH}]$
 B) Rate = $k[\text{RBr}]$
 C) Rate = $k[\text{RBr}][\text{Br}^-]$
 D) Rate = $k[\text{CH}_3\text{OH}]$

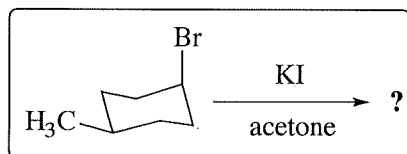
10. Which structure best represents the **transition state** for the reaction in the box?



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

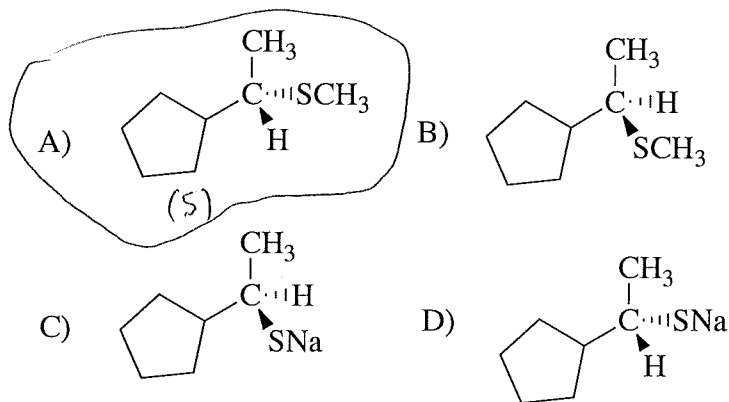
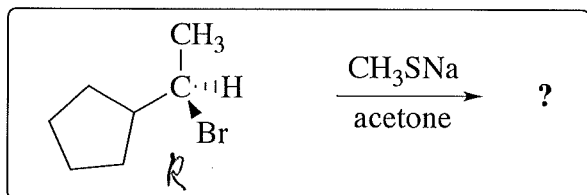


12. What is the IUPAC name of the major **product** for the reaction shown in the box?

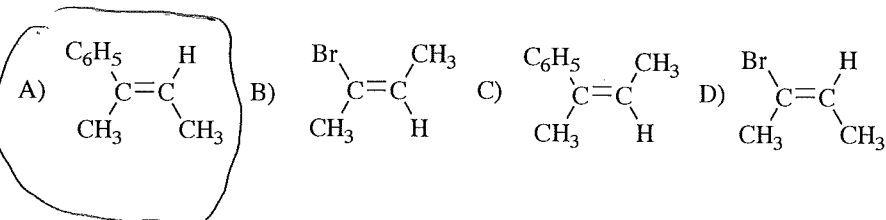
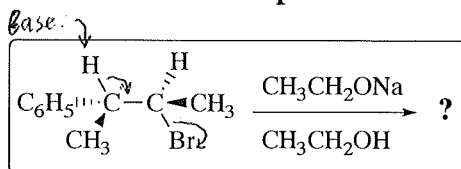


- A) *cis*-1-bromo-4-methylcyclohexane B) *trans*-1-bromo-4-methylcyclohexane
 C) *cis*-1-iodo-4-methylcyclohexane D) *trans*-1-iodo-4-methylcyclohexane

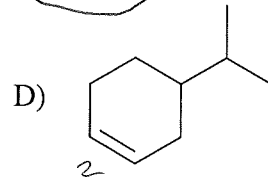
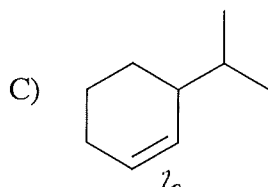
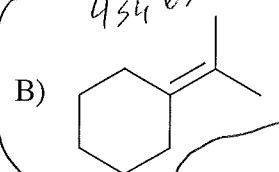
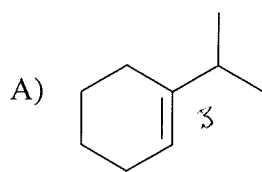
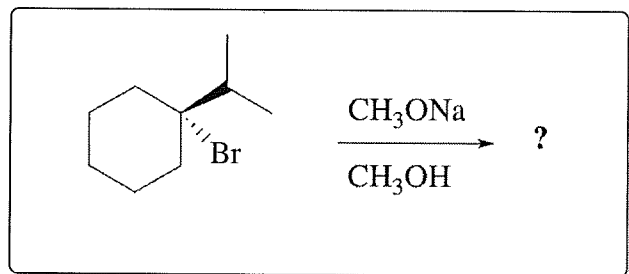
13. What is the main **product** of the reaction shown in the box?



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



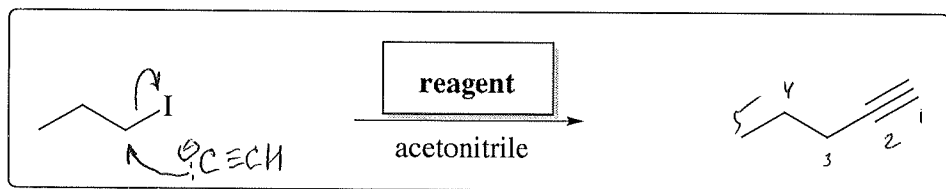
15. What is the main **product** of the reaction shown in the box?



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

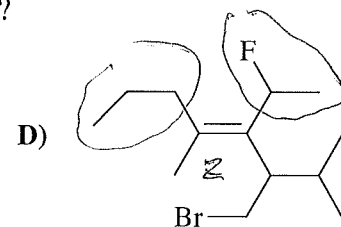
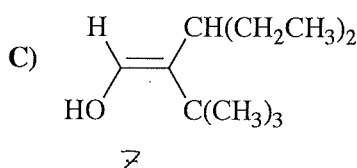
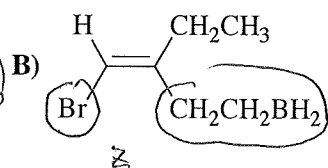
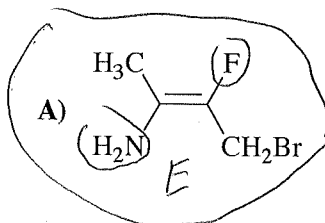
- A) bromocyclohexane B) 2-bromo-2-methylbutane C) 1-bromo-3-methylcyclobutane D) bromoethane

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

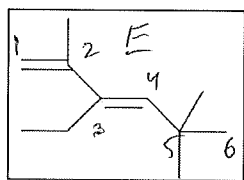


- A) NaCN B) HC≡CNa
C) NaN₃ D) CH₃C≡CNa

18. Which of the following alkenes has an **E-configuration** of the double bond?



19. What is the **IUPAC name** for the compound shown in the box?



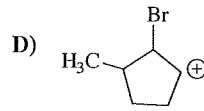
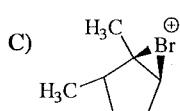
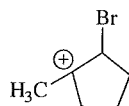
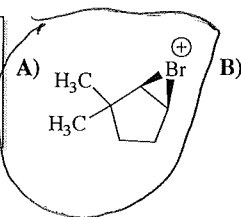
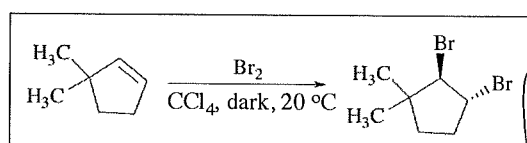
A) (*E*)-3-ethyl-2,5,5-trimethyl-1,3-hexadiene

B) (*Z*)-3-ethyl-2,5,5-trimethyl-1,3-hexadiene

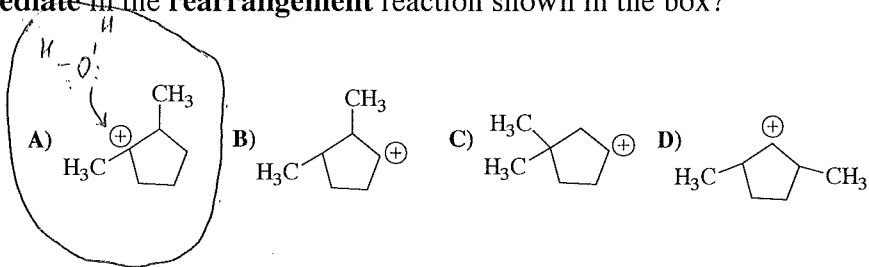
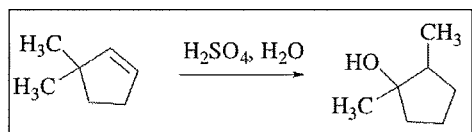
C) (*E*)-3-vinyl-2,5,5-trimethyl-3-hexene

D) (*Z*)-3-vinyl-2,5,5-trimethyl-3-hexene

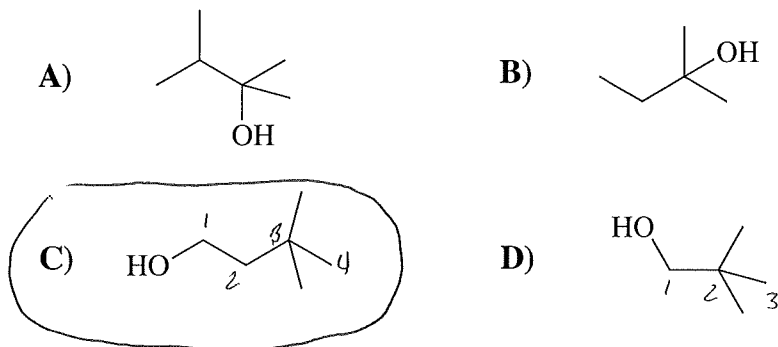
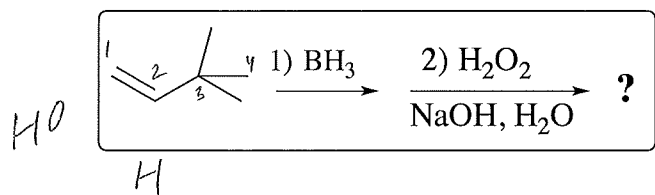
20. What is the structure of an **intermediate** in the reaction shown in the box?



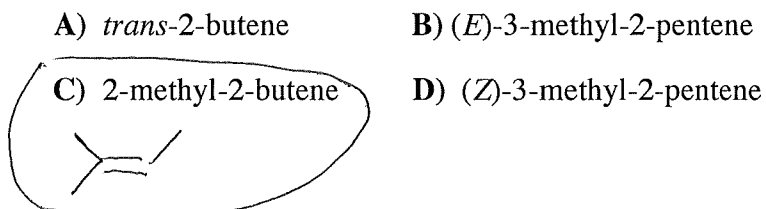
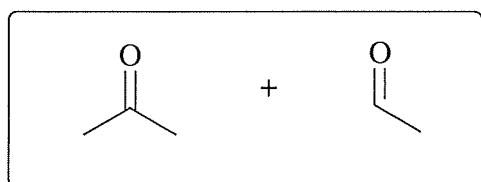
21. What is the structure of an **intermediate** in the **rearrangement** reaction shown in the box?



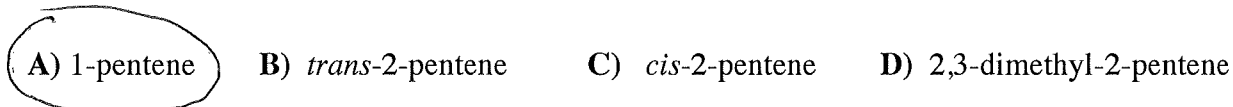
22. What is the main **product** of the reaction shown in the box?



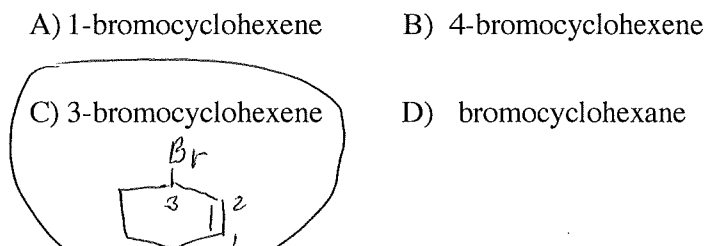
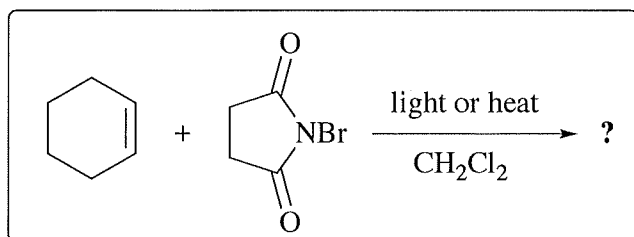
23. What alkene when treated with **ozone** and then with $(\text{CH}_3)_2\text{S}$ gives the products shown in the box?



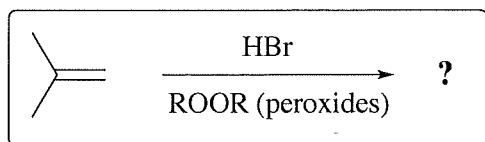
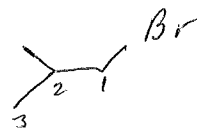
24. Which is the **least stable** alkene?



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

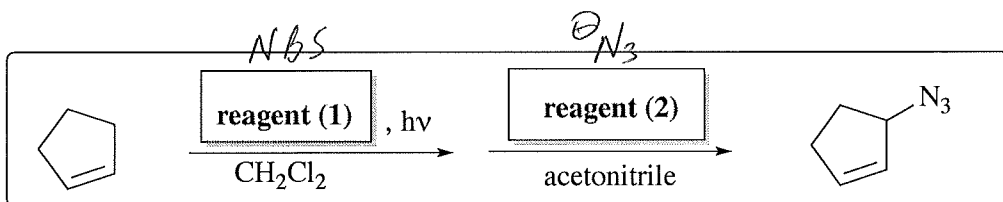


26. What is the IUPAC name of the major **product** for the reaction shown in the box?



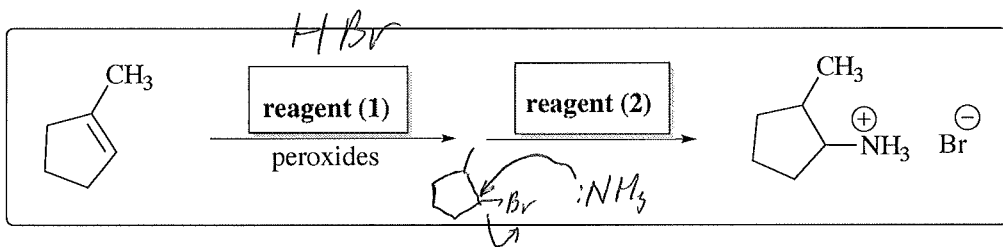
- A) 1-bromo-2-methylpropane B) 2-bromo-2-methylpropane
 C) 3-bromo-2-methyl-1-propene D) 1,2-dibromo-2-methylpropane

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



- A) (1) HBr, (2) NaN₃
 B) (1) NBS, (2) NaN₃
 C) (1) NaNH₂, (2) Br₂
 D) (1) NaNH, (2) CH₃Br

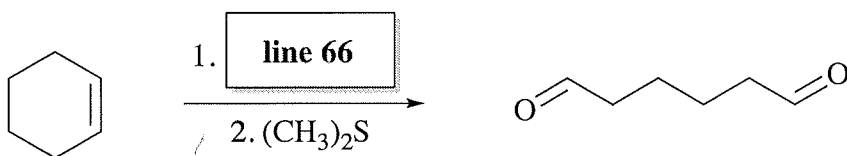
28. Which sequence of **reagents** can be used for the reaction shown in the box?



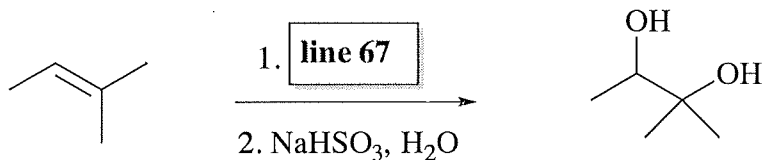
- A) (1) NBS, (2) NH₃
 B) (1) HBr, (2) CH₃NH₂
 C) (1) HBr, (2) NH₃
 D) (1) Br₂, (2) CH₃NH₂

Question 29: Please write your answers in boxes 66-69 on the back of the Scantron form

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



O₃



O₅ O₄

