

Chemistry 2541, Fall 2015

Midterm Exam 2

(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. Which of the following represents the order of increasing **acidity** for compounds the box?

(1) HBr (2) BrCH₂CO₂H (3) CH₃CH₂OH (4) CH₃NH₂ (5) CH₃CH₂Br

- A) 1 (strongest) > 2 > 3 > 4 > 5 (weakest) B) 2 (strongest) > 5 > 4 > 3 > 1 (weakest)
C) 5 (strongest) > 1 > 2 > 3 > 4 (weakest) D) 1 (strongest) > 5 > 2 > 3 > 4 (weakest)

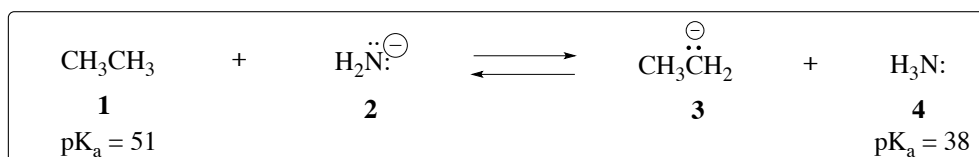
2. Which one of the following compounds has **pKa** with the **smallest** numeric value?

A) (CH₃)₂O B) CH₃NH₂ C) CH₃OH D) CH₃I

3. Which one of the following compounds is the **strongest base**?

A) LiI B) (CH₃)₂NLi C) LiOH D) (CH₃)₃CH

4. Which species **predominate** in the following **equilibrium**?



- A) 1 and 2 B) 1 and 4 C) 2 and 3 D) 3 and 4

5. Which one of the following compounds has **pKa** with the **highest** numeric value?

- A) C_2H_4 B) C_2H_2 C) CH_3CO_2H D) C_2H_6

6. Which of the following is a **Lewis acid**?

- A) $NaCl$ B) NH_3 C) $NaAlCl_4$ D) BCl_3

7. Which of the following is a **Lewis base**?

- A) $H_3C-\overset{\overset{CH_3}{|}}{\underset{\underset{CH_3}{|}}{C^+}}$ B) CH_3CH_2OH C) $AlCl_3$ D) $(CH_3)_3B$

8. Which statement is correct for the following reaction shown in the box?

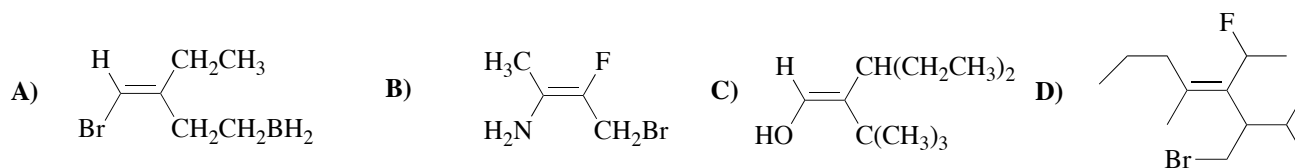


- A) **1** is Bronsted Acid and **2** is Bronsted Base
B) **1** is Bronsted Base and **2** is Bronsted Acid
C) **1** is Lewis Acid and **2** is Lewis Base
D) **1** is Lewis Base and **2** is Lewis Acid

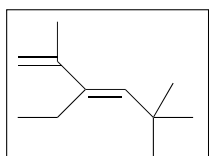
9. How many double bonds has an **alkene** with a molecular formula C_5H_{10} ?

- A) **1** B) **2** C) **3** D) **4**

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



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

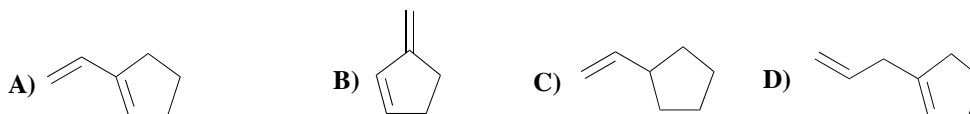


- A) (Z)-3-ethyl-2,5,5-trimethyl-1,3-hexadiene B) (E)-3-ethyl-2,5,5-trimethyl-1,3-hexadiene
C) (Z)-3-vinyl-2,5,5-trimethyl-3-hexene D) (E)-3-vinyl-2,5,5-trimethyl-3-hexene

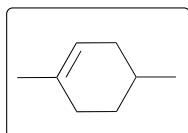
12. Which of the following alkenes **does not show** *cis, trans* isomerism of the double bond?

- A) 2-Pentene B) 2-Methyl-1-pentene C) 3-Methyl-2-pentene D) 4-Methyl-2-pentene

13. Which one of the following structures is **1-allylcyclopentene**?



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

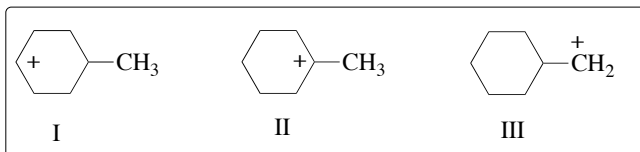


- A) 1,5-dimethylcyclohexene B) 1,4-dimethylcyclohexene
C) 2,5-dimethylcyclohexene D) 1,6-dimethylcyclohexene

15. Which of the following is the **most stable carbocation**?



16. Arrange the **carbocations** shown in the box in order of increasing stability.

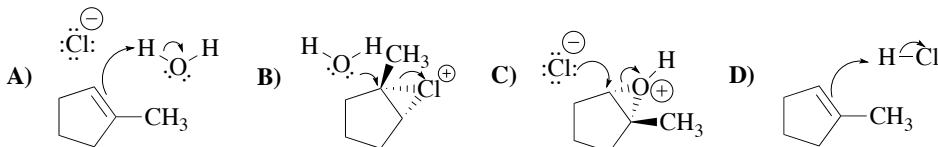
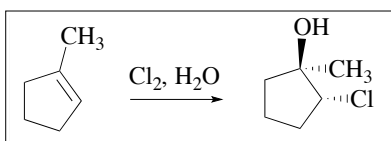


- A) I < III < II (most stable) B) II < I < III (most stable)
C) III < I < II (most stable) D) III < II < I (most stable)

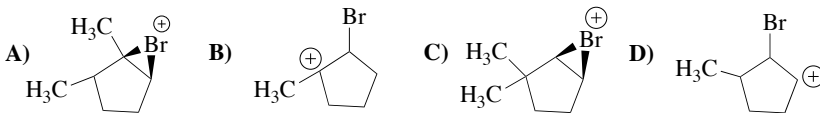
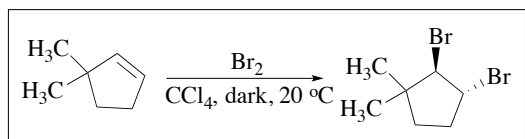
17. Which of the following is an **electrophile**?

- A) H₂O B) Br₂ C) NaBr D) H₂C=CH₂

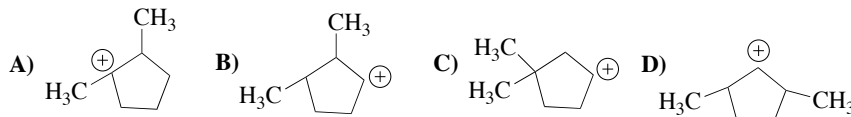
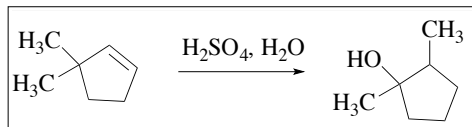
18. Which one of the following four schemes (A-D) represents a **step** in the **mechanism** of the reaction in the box?



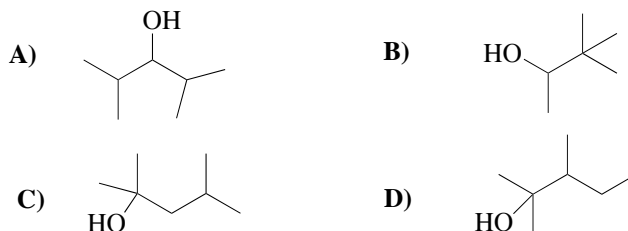
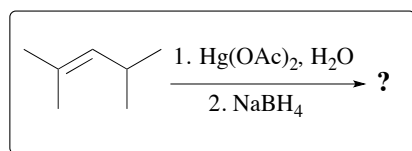
19. What is the structure of an **intermediate** in the reaction shown in the box?



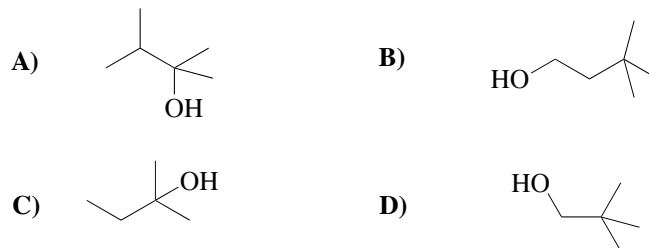
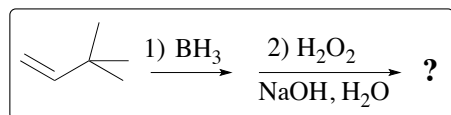
20. What is the structure of an **intermediate** in the **rearrangement** reaction shown in the box?



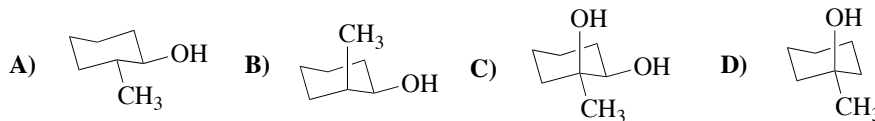
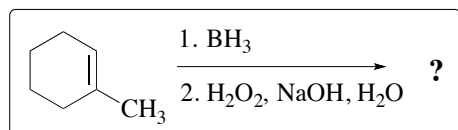
21. What is the main **product** of the reaction shown in the box?



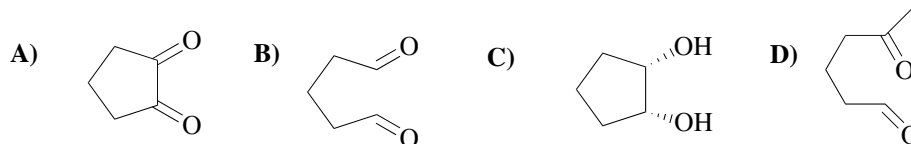
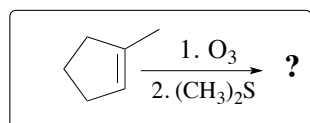
22. What is the main **product** of the reaction shown in the box?



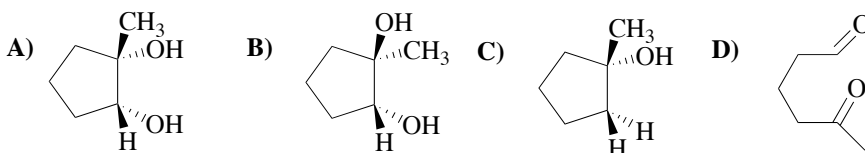
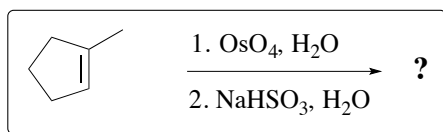
23. What is a main **product** of the reaction shown in the box?



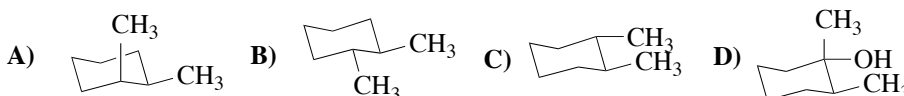
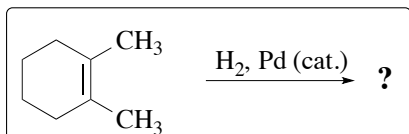
24. What is a main **product** of the reaction shown in the box?



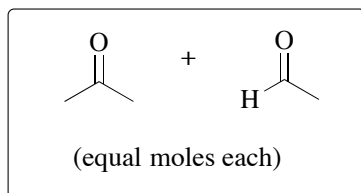
25. What is a main **product** of the reaction shown in the box?



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



27. What alkene when treated with **ozone** and then with dimethyl sulfide gives the products shown in the box?



- A) *trans*-2-butene B) 2-methyl-2-butene
 C) *R*-3-methyl-1-pentene D) (*Z*)-3-methyl-2-pentene

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

- A) 1-pentene B) *trans*-2-pentene C) *cis*-2-pentene D) 2,3-dimethyl-2-pentene

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

29. Provide the **reagent** that gives the indicated product in high yield (4 pts each):

