Chemistry 2541, Fall 2015
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. Which of the following represents the order of increasing **acidity** for compounds the box?

(**1**) HBr (**2**) $BrCH_2CO_2H$ (**3**) CH_3CH_2OH (**4**) CH_3NH_2 (**5**) CH_3CH_2Br

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)

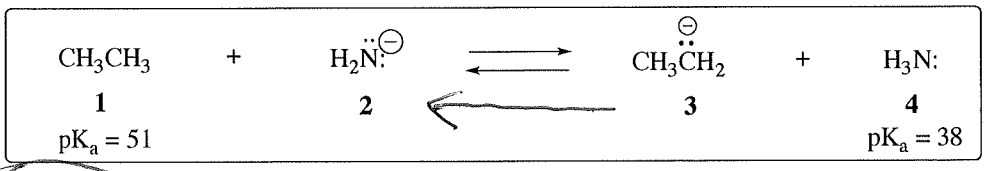
2. Which one of the following compounds has **pKa** with the **smallest** numeric value?

A) $(CH_3)_2O$ **B)** CH_3NH_2 **C)** CH_3OH **D)** CH_3I

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

A) LiI **B)** $(CH_3)_2NLi$ **C)** LiOH **D)** $(CH_3)_3CH$

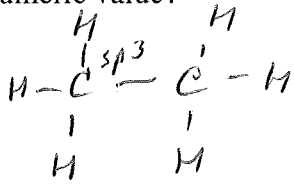
4. Which species **predominate** in the following **equilibrium**?



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

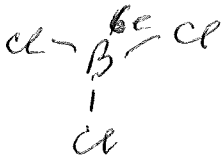
5. Which one of the following compounds has **pKa** with the **highest** numeric value?

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

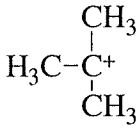


6. Which of the following is a **Lewis acid**?

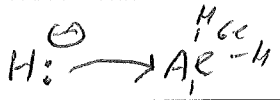
A) NaCl **B)** NH_3 **C)** $NaAlCl_4$ **D)** BCl_3



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

A)  **B)** $CH_3CH_2\ddot{O}H$ **C)** $AlCl_3$ **D)** $(CH_3)_3B$

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



$$LiH + AlH_3 \longrightarrow LiAlH_4$$

1 **2**

A) **1** is Bronsted Acid and **2** is Bronsted Base

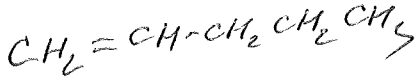
B) **1** is Bronsted Base and **2** is Bronsted Acid

C) **1** is Lewis Acid and **2** is Lewis Base

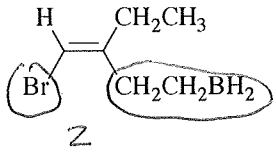
D) **1** is Lewis Base and **2** is Lewis Acid

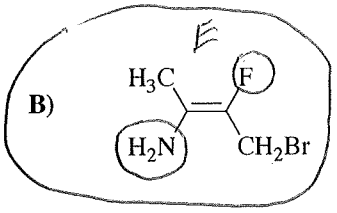
9. How many double bonds has an **alkene** with a molecular formula C_5H_{10}?

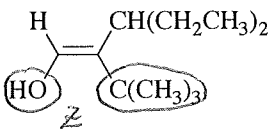
A) 1 **B) 2** **C) 3** **D) 4**

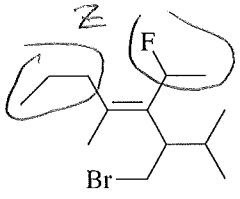


10. Which of the following alkenes has an ***E*-configuration** of the double bond?

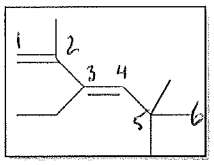
A) 

B) 

C) 

D) 

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

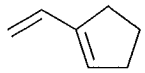
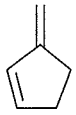
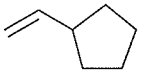
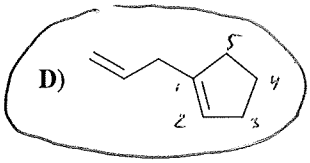
C) (*Z*)-3-vinyl-2,5,5-trimethyl-3-hexene

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

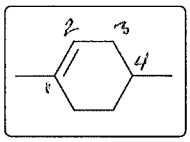
12. Which of the following alkenes **does not show *cis, trans*** isomerism of the double bond?

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**?

A)  **B)**  **C)**  **D)** 

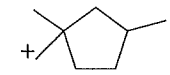
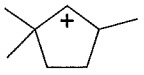
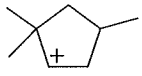
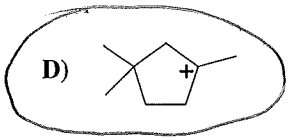
14. What is the **IUPAC name** for the compound shown in the box?



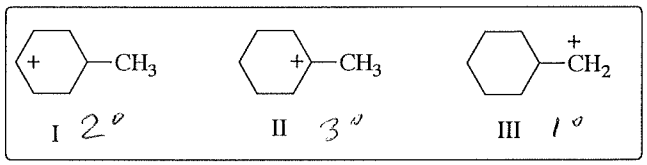
A) 1,5-dimethylcyclohexene **B)** 1,4-dimethylcyclohexene

C) 2,5-dimethylcyclohexene **D)** 1,6-dimethylcyclohexene

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

A)  **B)**  **C)**  **D)** 

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



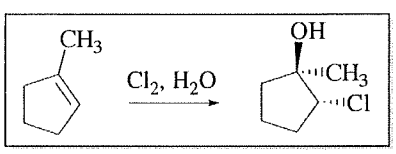
A) I < III < II (most stable) **B)** II < I < III (most stable)

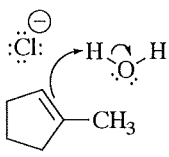
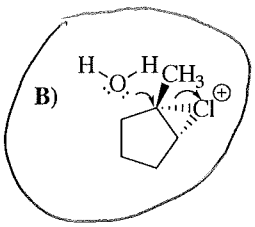
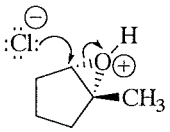
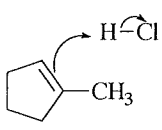
C) III < I < II (most stable) **D)** III < II < I (most stable)

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

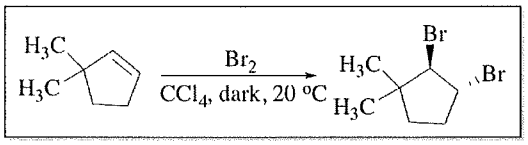
A) H_2O **B)** Br_2 **C)** NaBr **D)** $H_2C{=}CH_2$

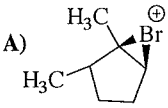
18. Which one of the following four schemes (**A-D**) represents a **step** in the **mechanism** of the reaction in the box?

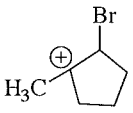


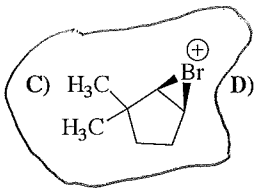
A)  **B)**  **C)**  **D)** 

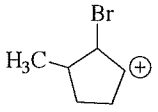
19. What is the structure of an **intermediate** in the reaction shown in the box?



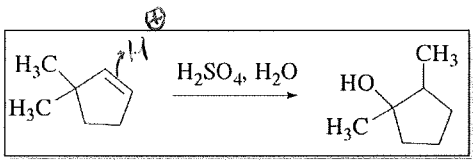
A) 

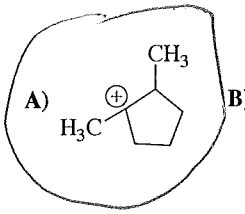
B) 

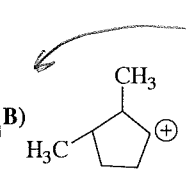
C) 

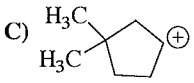
D) 

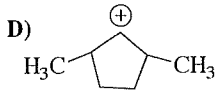
20. What is the structure of an **intermediate** in the **rearrangement** reaction shown in the box?



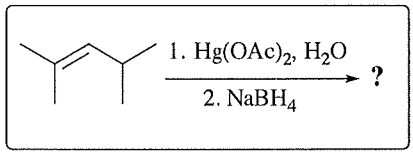
A) 

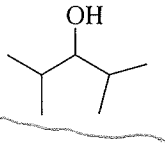
B) 

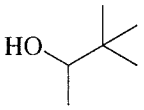
C) 

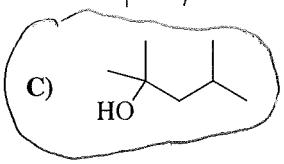
D) 

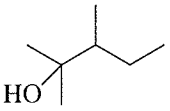
21. What is the main **product** of the reaction shown in the box?



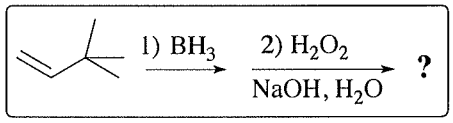
A) 

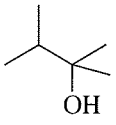
B) 

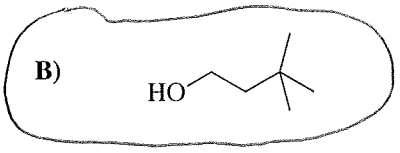
C) 

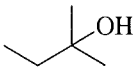
D) 

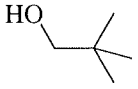
22. What is the main **product** of the reaction shown in the box?



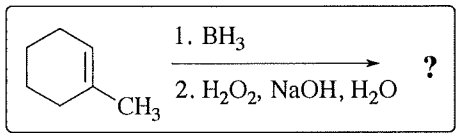
A) 

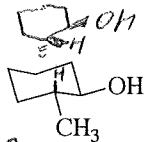
B) 

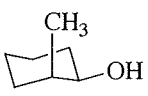
C) 

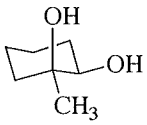
D) 

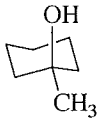
23. What is a main **product** of the reaction shown in the box?



(A) 

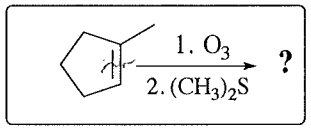
B) 

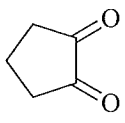
C) 

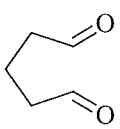
D) 

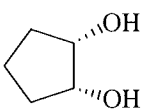
Syn-addition of H-OH

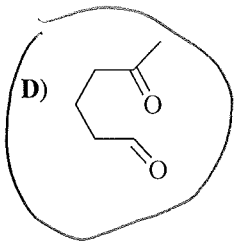
24. What is a main **product** of the reaction shown in the box?



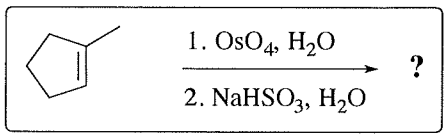
A) 

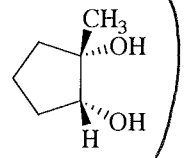
B) 

C) 

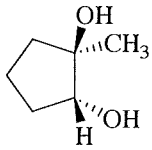
D) 

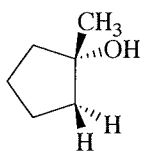
25. What is a main **product** of the reaction shown in the box?

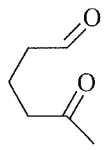


A) 

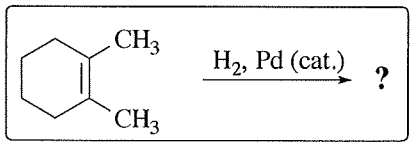
Syn-

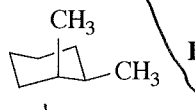
B) 

C) 

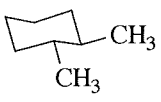
D) 

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

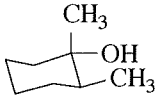


A) 

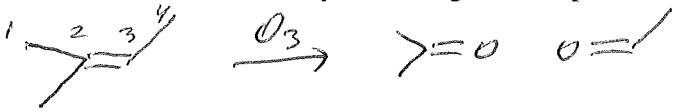
cis-

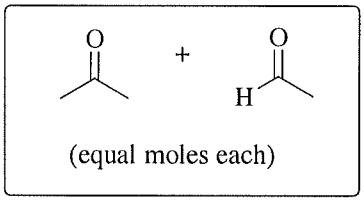
B) trans 

C) trans 

D) 

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

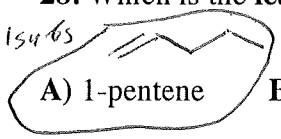


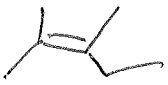


A) *trans*-2-butene **B)** 2-methyl-2-butene

C) *R*-3-methyl-1-pentene **D)** (*Z*)-3-methyl-2-pentene

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

154 65 

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):