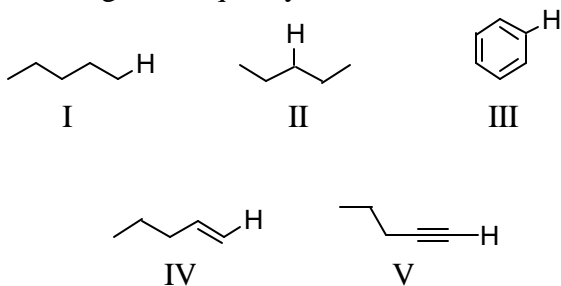


Sample exam questions for First exam – CHM 2211

1. The IR absorption due to the stretching of which of these carbon-hydrogen bonds occurs at the highest frequency?

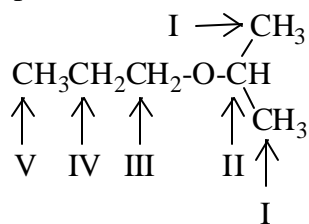


- A) I
B) II
C) III
D) IV
E) V

2. How many signals would you expect to find in the ^1H NMR spectrum of $\text{CH}_3\text{OCH}_2\text{CH}_2\text{OCH}_3$?

- A) 1
B) 2
C) 3
D) 4
E) 5

3. Which proton(s) of the compound below would appear as a triplet in the ^1H NMR spectrum?



- A) The protons on carbon II
B) The protons on carbon I and V
C) The protons on carbon III and V
D) The protons on carbon III and IV
E) The protons on carbon V

4. A compound with the molecular formula $C_6H_{15}N$ gave the following 1H NMR spectrum:
 triplet, δ 0.90
 quartet, δ 2.4

There were no other signals. The most likely structure for the compound is:

- A) $CH_3NCH_2CH_3$
 $\quad \quad \quad |$
 $\quad \quad \quad CH_2CH_2CH_3$
- B) $CH_3NCH_2CH_2CH_2CH_3$
 $\quad \quad \quad |$
 $\quad \quad \quad CH_3$
- C) $CH_3CH_2CH_2CH_2CH_2CH_2NH_2$
- D) $CH_3CH_2NCH_2CH_3$
 $\quad \quad \quad |$
 $\quad \quad \quad CH_2CH_3$
- E) $CH_3CH_2CH_2NCH_2CH_2CH_3$
 $\quad \quad \quad |$
 $\quad \quad \quad H$

5. How many ^{13}C signals would 1,2-dimethylbenzene give?

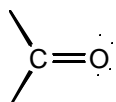


- A) 1
 B) 2
 C) 3
 D) 4
 E) 5
6. The data below from the molecular ion region of the mass spectrum of a halogen-containing compound are consistent with the presence of what halogen(s) in the original compound?

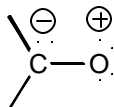
| | <u>intensity</u> |
|-----------|------------------|
| M^+ | 51.0 |
| $M^+ + 2$ | 100.0 |
| $M^+ + 4$ | 49.0 |

- A) One Br
 B) One Cl
 C) One Br and one Cl
 D) Two Br
 E) Two Cl

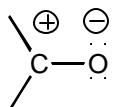
7. Which of the following resonance structures is not a significant contributor to the hybrid for the carbonyl group?



I



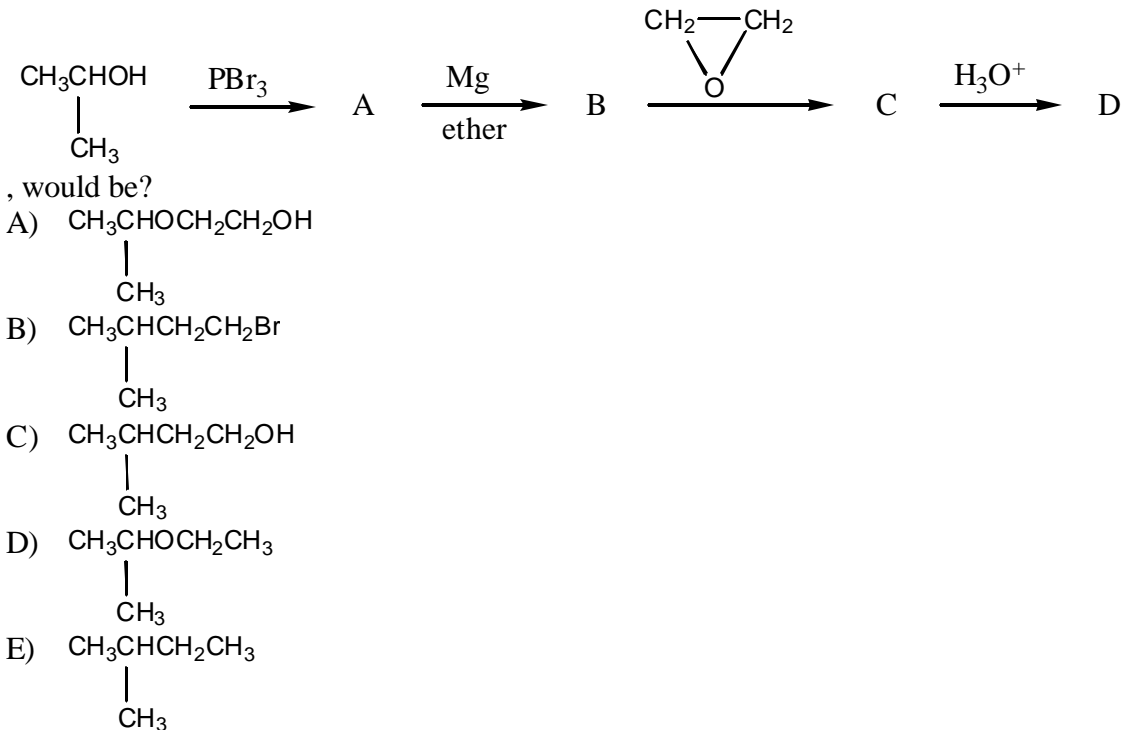
II



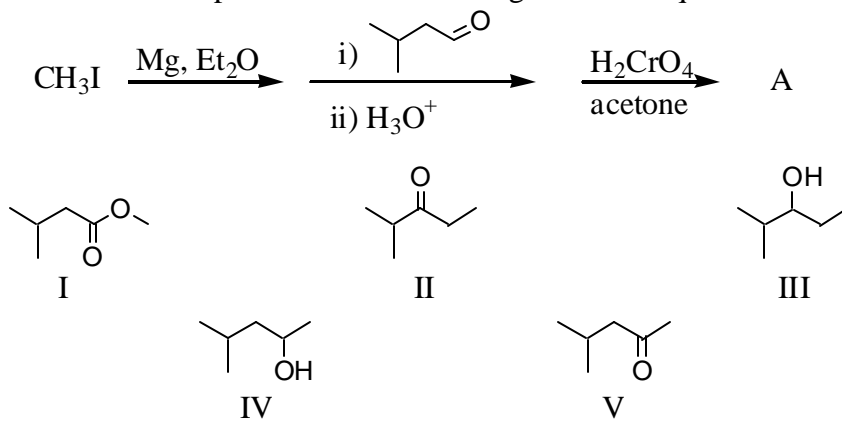
III

- A) I
 B) II
 C) III
 D) Neither II nor III is important.
 E) All are significant contributors.
8. CrO_3 in $\text{H}_2\text{SO}_4/\text{H}_2\text{O}$ will fail to give a positive test with which of these compounds?
- A) $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{OH}$
 B) $\text{CH}_3\text{CHCH}_2\text{CH}_3$
 C) $(\text{CH}_3)_3\text{COH}$
 D) $\text{CH}_3\text{CH}_2\text{CH}_2\overset{\text{H}}{\underset{\text{||}}{\text{C}}}\text{=O}$
 E) More than one of these

9. The final product, D, in the following reaction sequence,

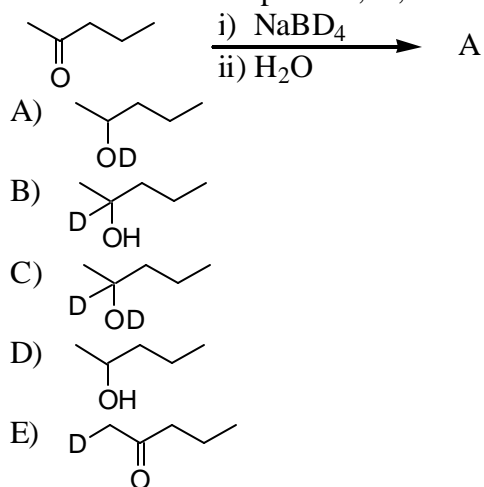


10. What is the final product of the following reaction sequence?

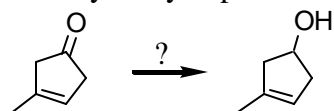


- A) I
B) II
C) III
D) IV
E) V

11. What would be the product, A, of the following reaction ?

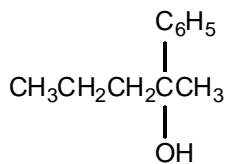


12. Which of the reagents listed below would efficiently accomplish the transformation of 3-methyl-3-cyclopentenone into 3-methyl-3-cyclopentenol?



- A) i) LiAlH_4 ; ii) H_2O
 B) $\text{NaBH}_4, \text{H}_2\text{O}$
 C) H_2, Pd
 D) A) and B)
 E) A), B) and C) of the above

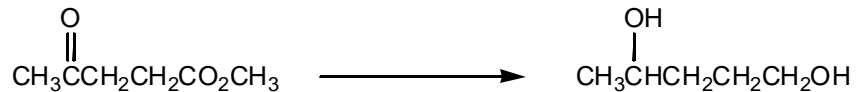
13.



Your task is to synthesize through a Grignard synthesis. Which pairs of compounds listed below would you choose as starting materials?

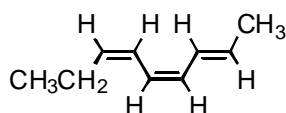
- A) $\text{CH}_3\text{CH}_2\text{CH}_2\text{Br}$ and $\text{CH}_3\overset{\text{O}}{\parallel}\text{CC}_6\text{H}_5$
 B) $\text{CH}_3\text{CH}_2\text{CH}_2\overset{\text{O}}{\parallel}\text{CH}$ and $\text{C}_6\text{H}_5\text{Br}$
 C) $\text{C}_6\text{H}_5\overset{\text{O}}{\parallel}\text{CH}$ and $\text{CH}_3\text{CH}_2\overset{\text{Br}}{\underset{\text{Br}}{\text{C}}}\text{CH}_3$
 D) More than one of these
 E) None of these

14. Select the correct reagent(s) for the following reaction:



- A) LiAlH_4 /ether; then H_3O^+
- B) NaBH_4 ; then H_3O^+
- C) H_2 with Pt/C
- D) A) and B)
- E) A), B) and C)

15. What is an IUPAC name for this triene?

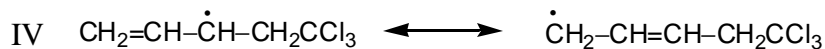
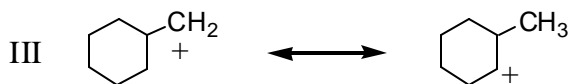
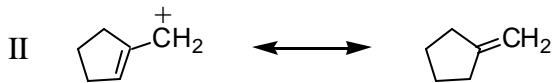


- A) (2E,4Z,6E)-2,4,6-Nonatriene
- B) (2Z,4E,6Z)-2,4,6-Nonatriene
- C) (2E,4Z,6Z)-2,4,6-Nonatriene
- D) (3Z,5Z,7E)-3,5,7-Nonatriene
- E) (3Z,5E,7E)-3,5,7-Nonatriene

16. Which of the following dienes would you expect to be the most stable?

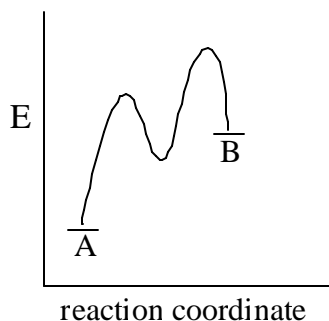
- A) $\text{CH}_3\text{CH}_2\text{CH}=\text{CHCH}_2\text{CH}=\text{CHCH}_3$
- B) $\text{CH}_3\text{CH}=\text{CHCH}=\text{CHCH}_2\text{CH}_3$
- C) $\text{CH}_2=\text{CHCH}_2\text{CH}_2\text{CH}_2\text{CH}=\text{CH}_2$
- D) $\text{CH}_2=\text{CHCH}=\text{CHCH}_2\text{CH}_2\text{CH}_3$
- E) $\text{CH}_3\text{CH}_2\text{CH}=\text{C}=\text{CHCH}_2\text{CH}_3$

17. Which is not an example of resonance?



- A) I
 B) II
 C) III
 D) IV
 E) None of these are examples of resonance

18. The accompanying diagram, which describes the fate of the intermediate in a reversible reaction, implies that:

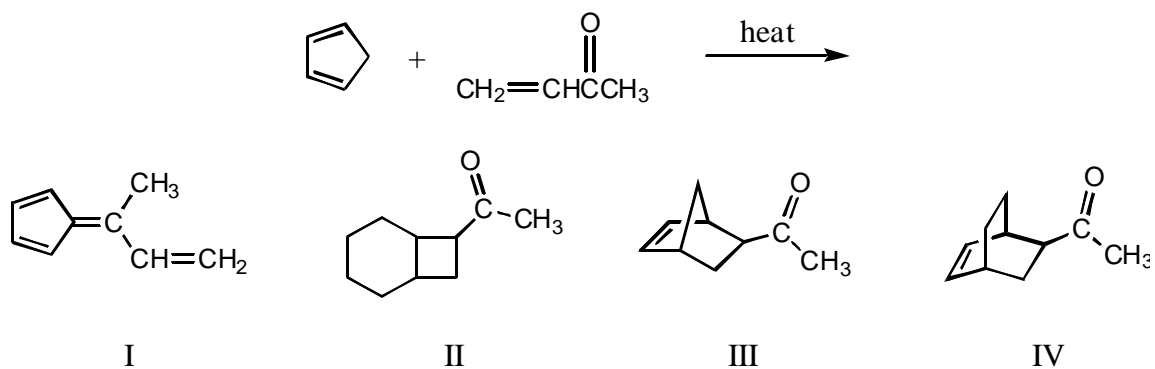


- A) the less stable product forms more rapidly.
 B) the more stable product forms more rapidly.
 C) product B will predominate at equilibrium.
 D) the intermediate has a short lifetime.
 E) No conclusions can be drawn as to either reaction rate or product stability.

19. Which of these dienes can undergo the Diels-Alder reaction?

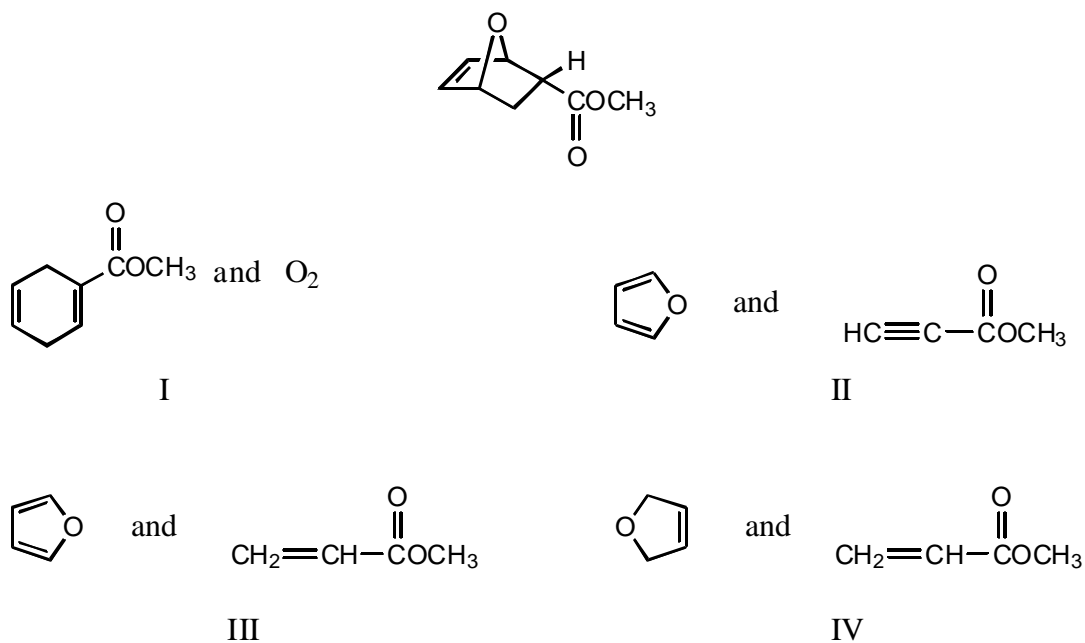
- A) 1,3-Pentadiene
 B) 1,4-Pentadiene
 C) 1,2-Butadiene
 D) 1,4-Cyclohexadiene
 E) All of the above can undergo the Diels-Alder reaction

20. What would be the product of the following reaction?



- A) I
- B) II
- C) III
- D) IV
- E) All of these

21. Which diene and dienophile would you choose to synthesize the following compound?

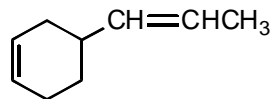
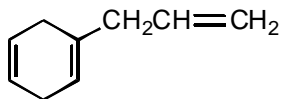
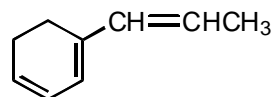
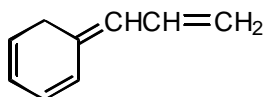
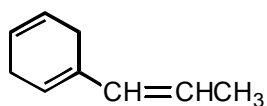


- A) I
- B) II
- C) III
- D) IV
- E) None of these

22. Which of the following could be used to synthesize 3-bromocyclopentene?

- A) Cyclopentene + Br₂, CCl₄, 25°
- B) Cyclopentene + NBS, CCl₄ (ROOR)
- C) 3-Cyclopentenol + PBr₃
- D) Both A) and B)
- E) Both B) and C)

23. Which compound would have an UV absorption band at longest wavelength?



- A) I
- B) II
- C) III
- D) IV
- E) V

Answer Key

1. E
2. B
3. C
4. D
5. D
6. D
7. B
8. C
9. C
10. E
11. B
12. D
13. A
14. A
15. C
16. B
17. C
18. B
19. A
20. C
21. C
22. E
23. B