

# CHE 322 Organic Chemistry II

Exam 3 Form 1

Thursday April 18, 2024

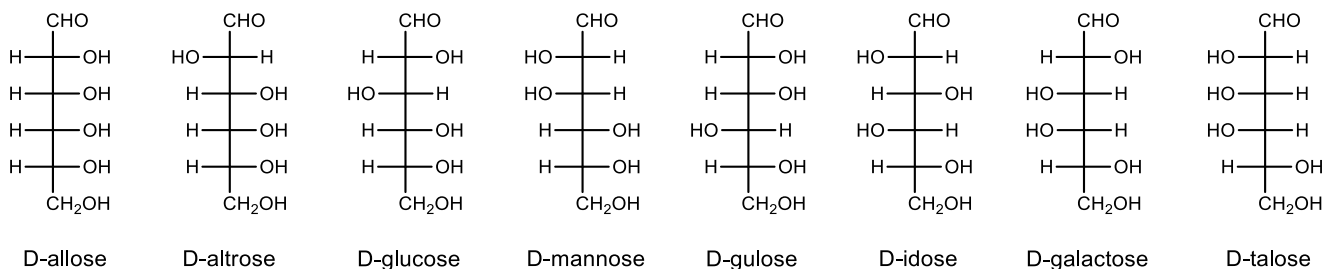
8:30 PM – 9:50 PM

1. Write your nine digit University ID number in the nine boxes provided and then bubble in each of the nine digits.
2. Print your name and sign your answer form using the spaces provided.
3. Questions 1 to 10 are multiple choice questions worth 5 points. Bubble your answers on the answer form. Questions 11-17 are short answer questions with points as indicated. Write out your answers in the indicated place on the answer form.

		Group																		
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	
Period	1	H																	He	
	2	Li	Be											B	C	N	O	F	Ne	
	3	Na	Mg												Al	Si	P	S	Cl	Ar
	4	K	Ca	Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn	Ga	Ge	As	Se	Br	Kr	
	5	Rb	Sr	Y	Zr	Nb	Mo	Tc	Ru	Rh	Pd	Ag	Cd	In	Sn	Sb	Te	I	Xe	
	6	Cs	Ba		Hf	Ta	W	Re	Os	Ir	Pt	Au	Hg	Tl	Pb	Bi	Po	At	Rn	
	7	Fr	Ra		Rf	Db	Sg	Bh	Hs	Mt	Ds	Rg	Cn	Nh	Fl	Mc	Lv	Ts	Og	



Stony Brook University



### Effects of Substituents on Electrophilic Aromatic Substitution

#### **Ortho-Para Directors**

##### Strongly Activating

-NH<sub>2</sub> -NHR -NR<sub>2</sub>

-OH -O<sup>-</sup>

##### Moderately Activating

-NHCOCH<sub>3</sub> -NHCOR

-OCH<sub>3</sub> -OR

##### Weakly Activating

-CH<sub>3</sub> -C<sub>2</sub>H<sub>5</sub> -R -C<sub>6</sub>H<sub>5</sub>

##### Weakly Deactivating

-F -Cl -Br -I

#### **Meta Directors**

##### Moderately Deactivating

-C≡N

-SO<sub>3</sub>H

-CO<sub>2</sub>H -CO<sub>2</sub>R

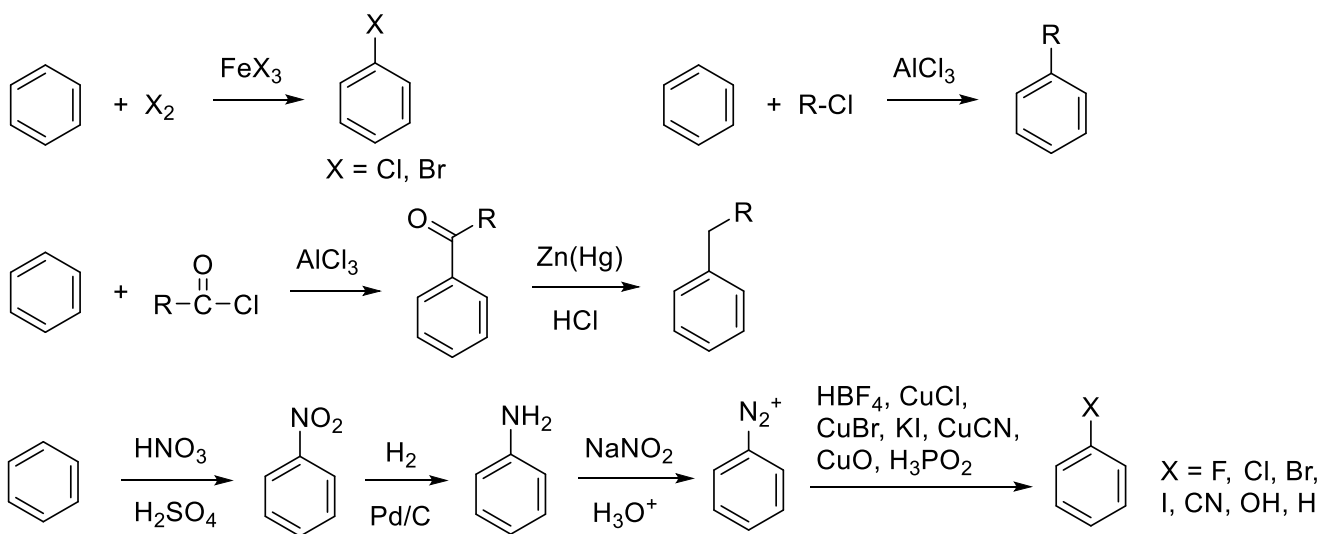
-CHO -COR

##### Strongly Deactivating

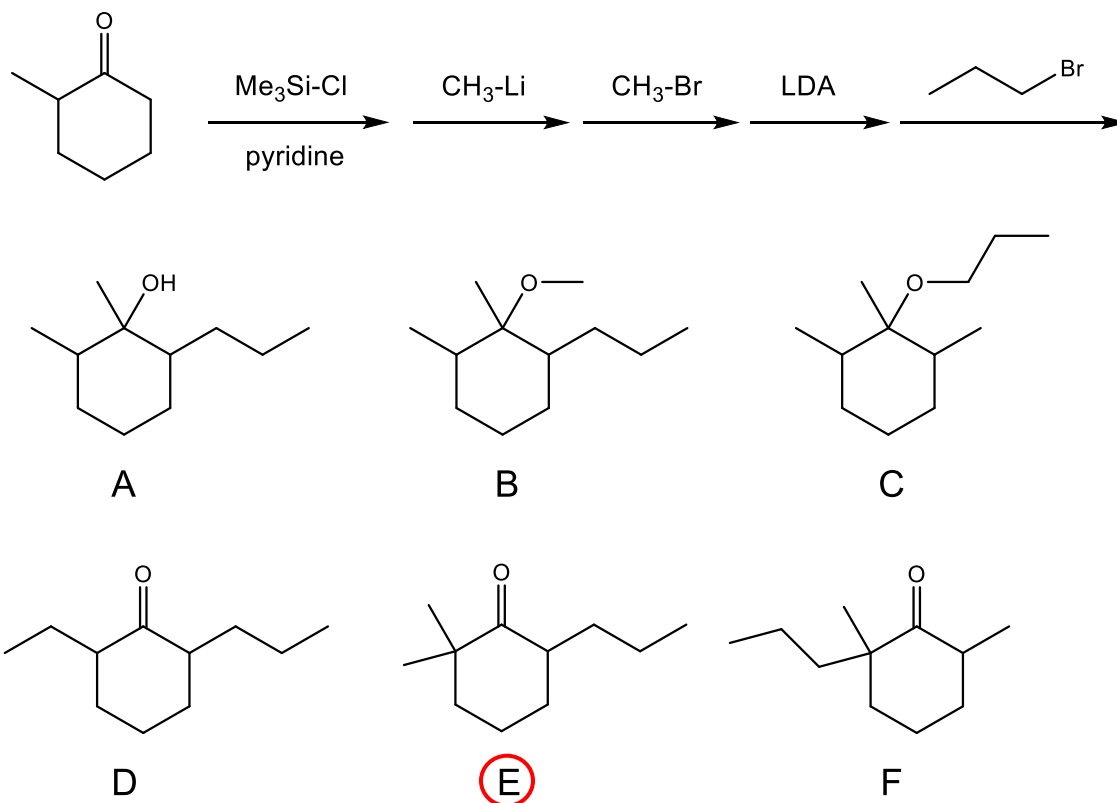
-NO<sub>2</sub>

-NH<sub>3</sub><sup>+</sup> -NR<sub>3</sub><sup>+</sup>

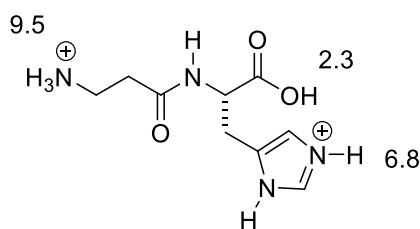
-CF<sub>3</sub> -CCl<sub>3</sub>



1. Choose the expected major product of the following reaction sequence.

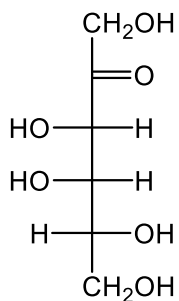


2. Carnosine ( $\beta$ -alanyl-L-histidine), shown in its fully protonated form acts as a buffer in muscle cells to neutralize the acid formed during anaerobic metabolism.  $\text{pK}_a$  values are 2.3, 6.8, and 9.5 for the carboxylic acid, histidine side chain, and primary amine groups respectively. Choose the proper description of charges on the major form of carnosine at pH 7.5.

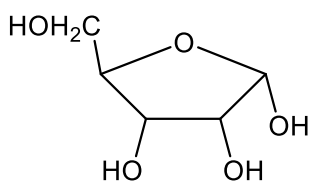


- A. No charges
- B. One negative charge only
- C. One positive charge only
- D. One negative charge and one positive charge
- E. Two negative charges and one positive charge
- F. One negative charge and two positive charges

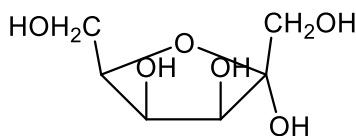
3. Which of the following is a correct Haworth projection of D-tagatose?



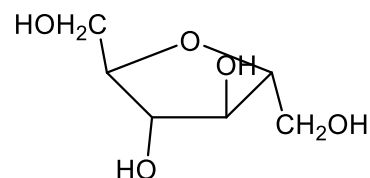
D-tagatose



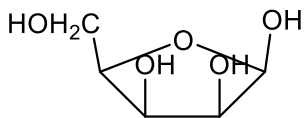
A



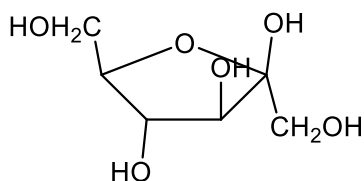
B



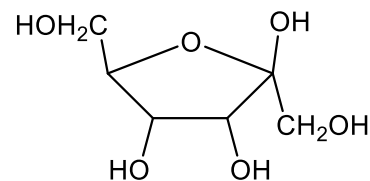
C



D

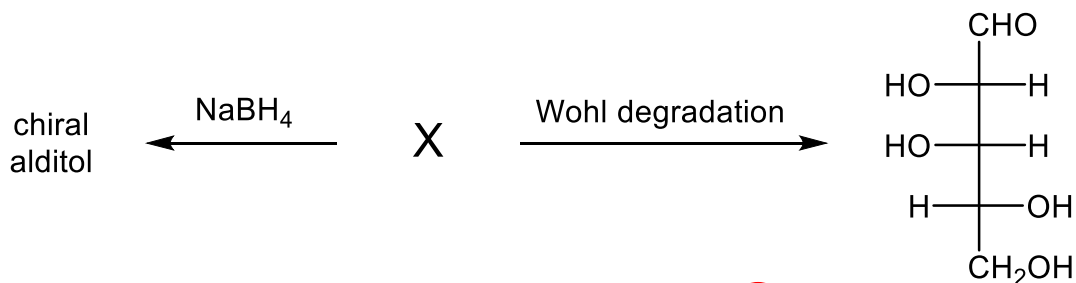


E



F

4. Determine the identity of monosaccharide **X** based on the reaction scheme below.



A. D-galactose

B. D-mannose

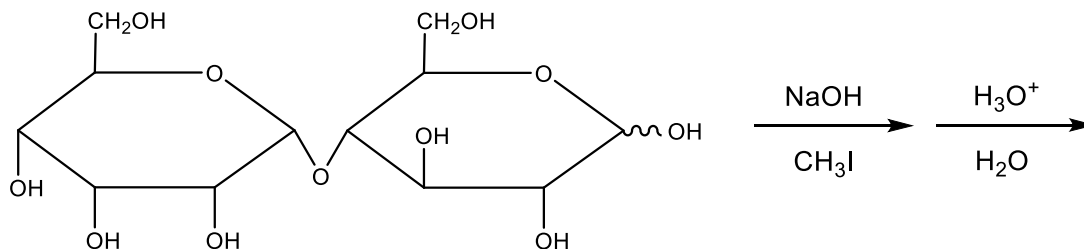
C. D-talose

D. either D-galactose or D-mannose

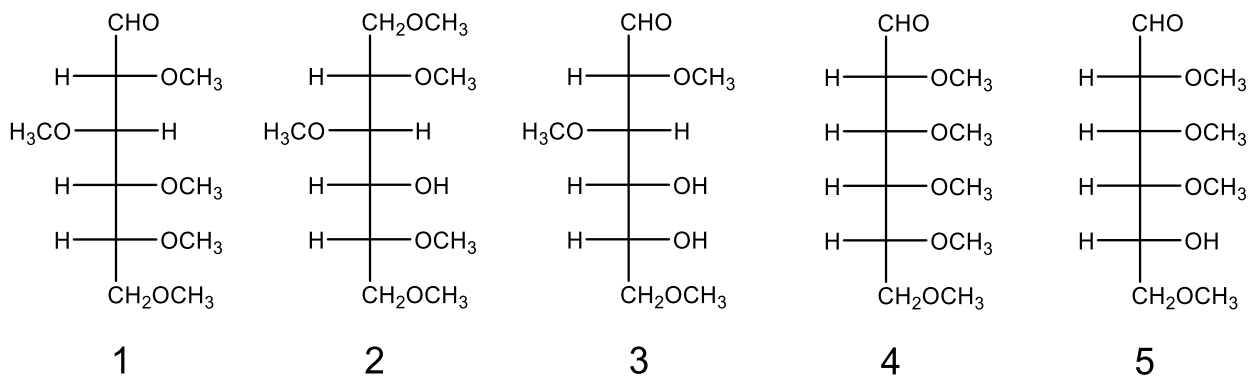
E. either D-galactose or D-talose

F. either D-mannose or D-talose

Use the following scheme to answer the next two problems.



5. Choose the two products of the reaction sequence shown above.

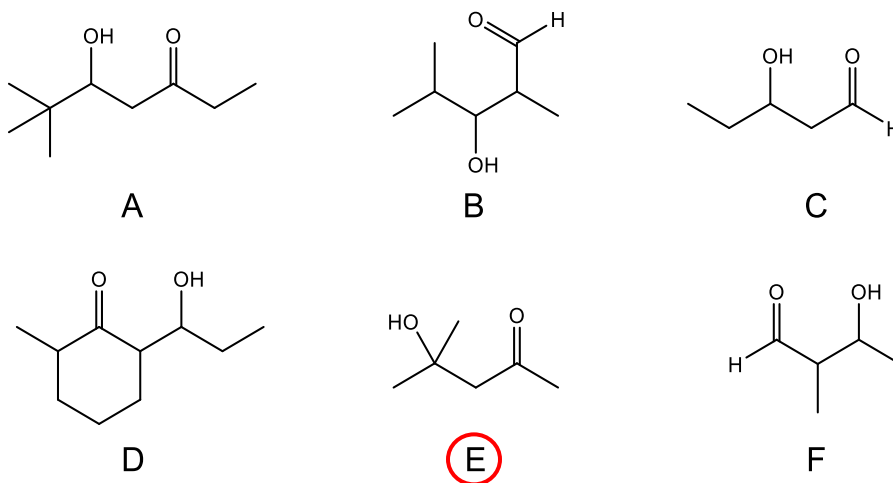


- A. 1 and 4    B. 1 and 5    C. 2 and 4    D. 2 and 5    E. 3 and 4    **F. 3 and 5**

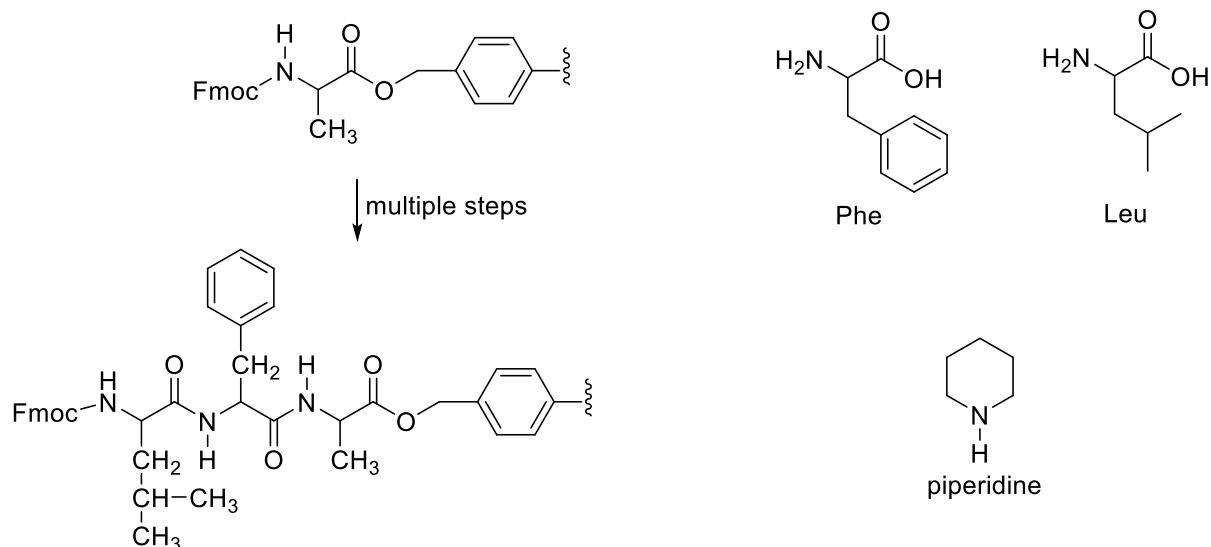
6. Which is the best description of the linkage in the disaccharide shown?

- A.  $\alpha$ -1,1    B.  $\alpha$ -1,3    **C.  $\alpha$ -1,4**    D.  $\beta$ -1,1    E.  $\beta$ -1,3    F.  $\beta$ -1,4

7. Which of the following aldol products is not from a crossed aldol reaction?

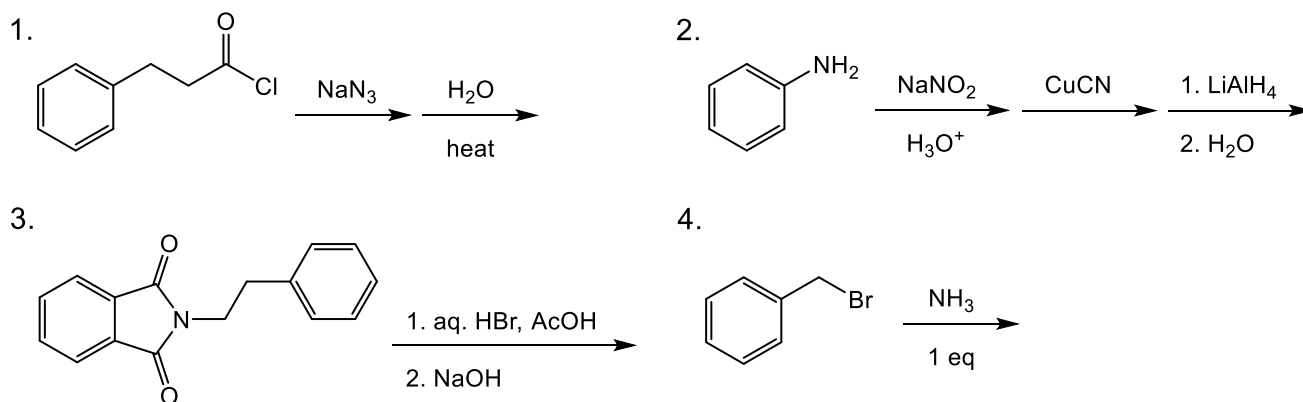


8. Choose the necessary reagents for achieving the transformation shown in the solid-phase peptide synthesis. TFA = trifluoroacetic acid, DIC = diisopropylcarbodiimide.



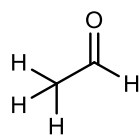
- A. 1. TFA 2. Fmoc-Leu, DIC 3. TFA 4. Fmoc-Phe, DIC  
 B. 1. TFA 2. Fmoc-Phe, DIC 3. TFA 4. Fmoc-Leu, DIC  
 C. 1. piperidine 2. Fmoc-Leu, DIC 3. Piperidine 4. Fmoc-Phe, DIC  
 D. 1. piperidine 2. Fmoc-Phe, DIC 3. Piperidine 4. Fmoc-Leu, DIC  
 E. 1. Fmoc-Leu, DIC 2. TFA 3. Fmoc-Phe, DIC 4. TFA  
 F. 1. Fmoc-Phe, DIC 2. piperidine 3. Fmoc-Leu, DIC 4. Piperidine

9. Which reactions or reaction sequences will give the same major product?

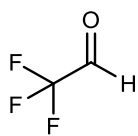


- A. 1 and 2    B. 1 and 3    C. 1 and 4    D. 2 and 3    E. 2 and 4    F. 3 and 4

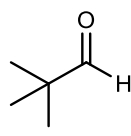
10. Which of the following aldehydes will participate in the haloform reaction?



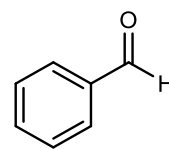
**A**



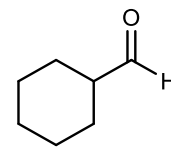
**B**



**C**

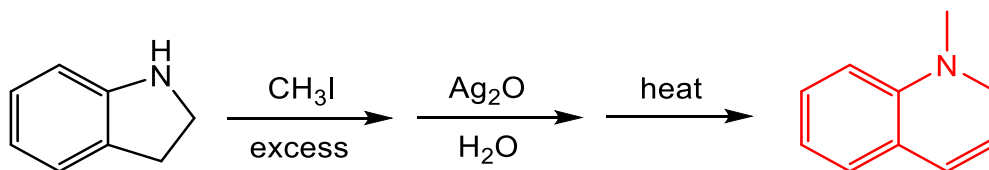


**D**

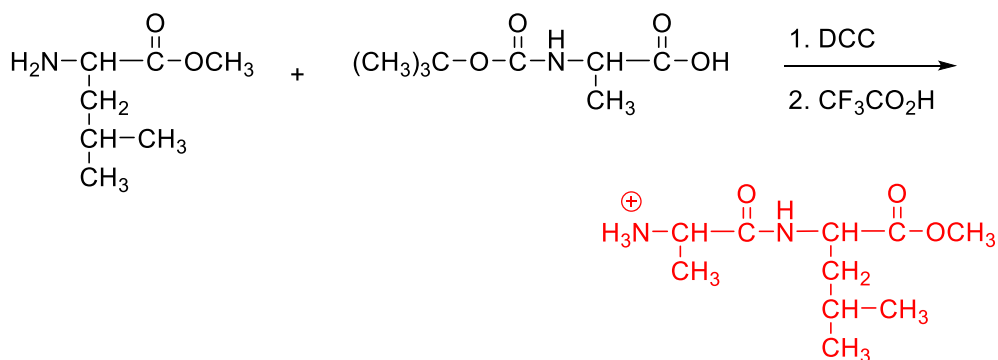


**E**

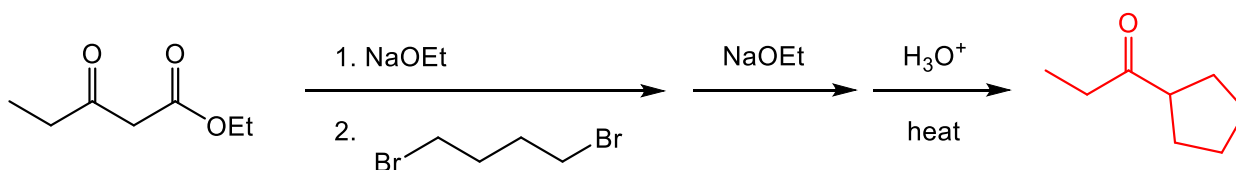
11. Draw the major product of the following Hofmann elimination. 5 pts



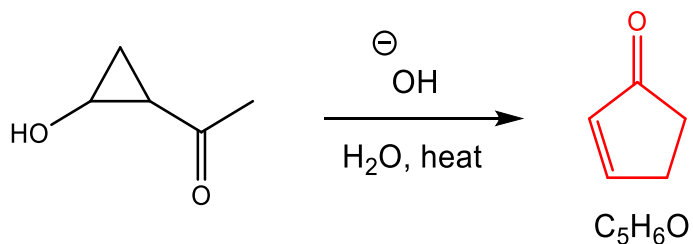
12. Draw the product of the reaction sequence shown. 5 pts



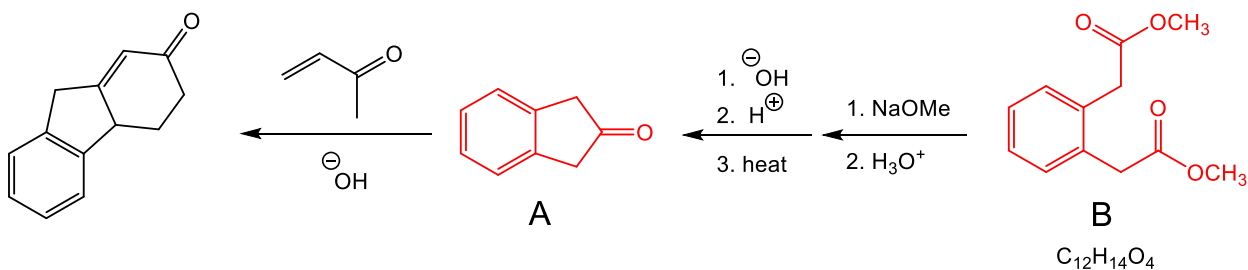
13. Draw the major product of the following reaction sequence. 5 pts



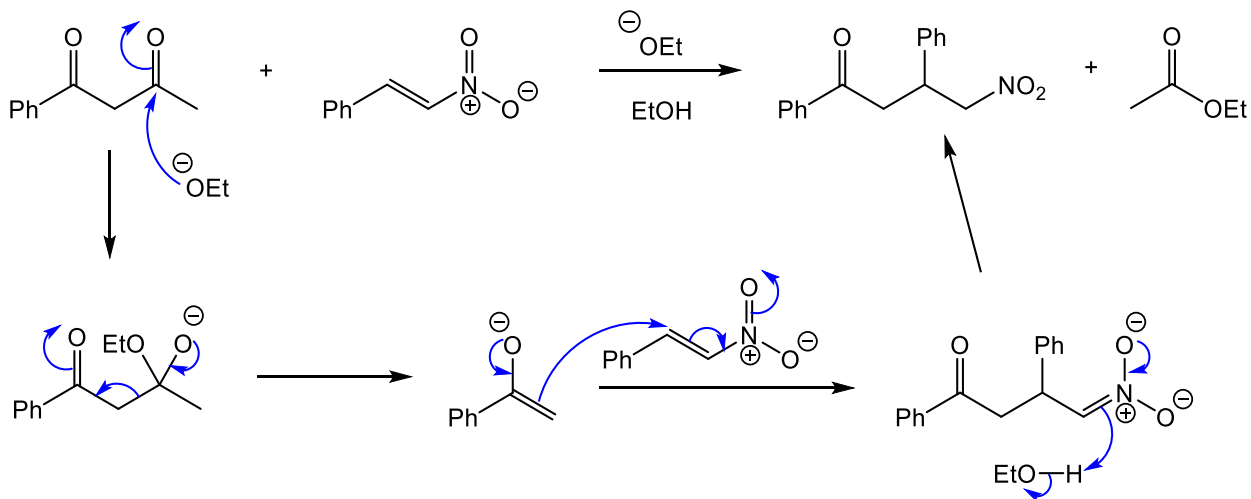
14. The following reaction undergoes a rearrangement that involves a retro aldol followed by an aldol condensation. Draw the product of this rearrangement. 5 pts



15. Based on the reaction scheme below, determine, and draw compounds **A** and **B**. 10 pts



16. Draw a curved arrow mechanism of the following reaction. HINT: begin with a retro-Claisen attack and finish with a Michael addition. 10 pts





17. Propose a synthesis of p-fluoroacetanilide from benzene. You may use any other reagents.  
10 pts

