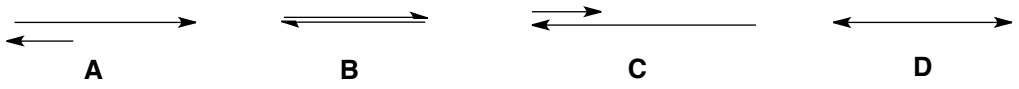
Poll question: ***How much time did you spend studying for this exam over the past week? Round to the nearest hour and enter the number in the*** **"EXAM NUMBER" section of the Scantron form. Example: 7 hours studying, enter "007" or 14 hours studying, enter "014"**

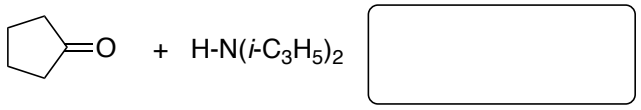
Section 1: Multiple choice. Questions 1-21 must be answered on the Scantron form by darkly shading the appropriate circle with pencil (or pen). Scantron responses will be used to calculate your grade. Please indicate your answers on this examination paper so that you are able to check your answers. The Scantron form will not be returned to you.

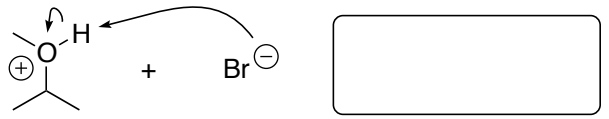
Note that ***more than one letter*** could be entered as an answer to a multiple choice question. Questions are not equally weighted in marks; it is ***not 1 mark per answer***.

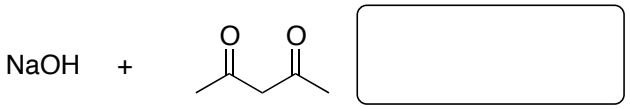
For questions 1 to 5, select the letter (**A**, **B**, **C**, **D**) that corresponds to the arrows that *best* describes the relationship between the 'reactants' and 'products':

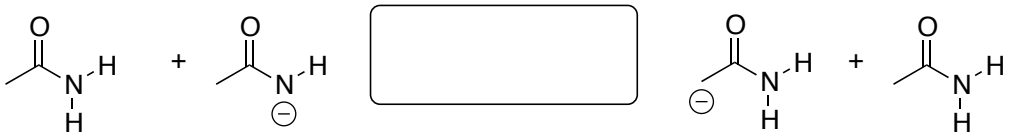


A **B** **C** **D**

1)  *products of proton transfer*

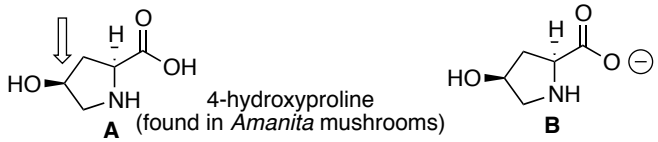
2)  *products of proton transfer*

3)  *products of proton transfer*

4) 

5) 

Questions 6-9. 4-Hydroxyproline (**A**) is found in the toxin of poisonous mushrooms. The relevant pK_A values for this compound in pH range from 0 to 14 are 1.92 and 9.73.

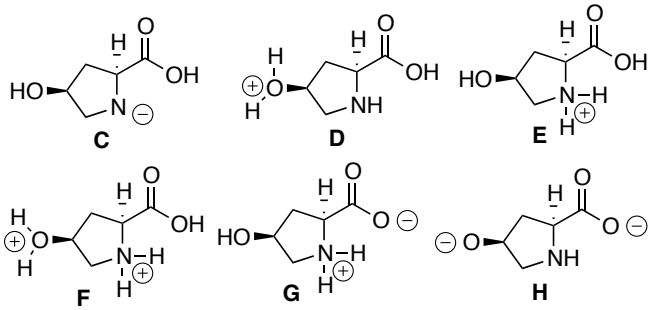


A **B**

6) What is the configuration of the indicated carbon atom in **A**? (**A**) *R* (**B**) *S*

What is the structure of the amino acid at:

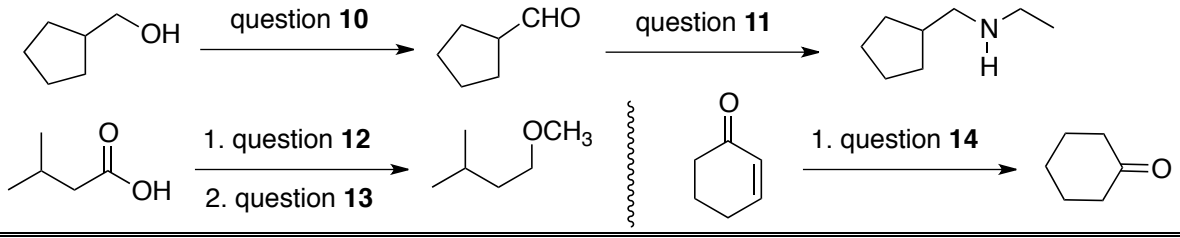
7) pH 7 (**A**-**H**)
8) pH 1 (**A**-**H)**
9) pH 12 (**A**-**H)**



C **D** **E** **F** **G** **H**

• For questions 10 to 14, select the reagents and reaction conditions that could best carry out the indicated transformations:

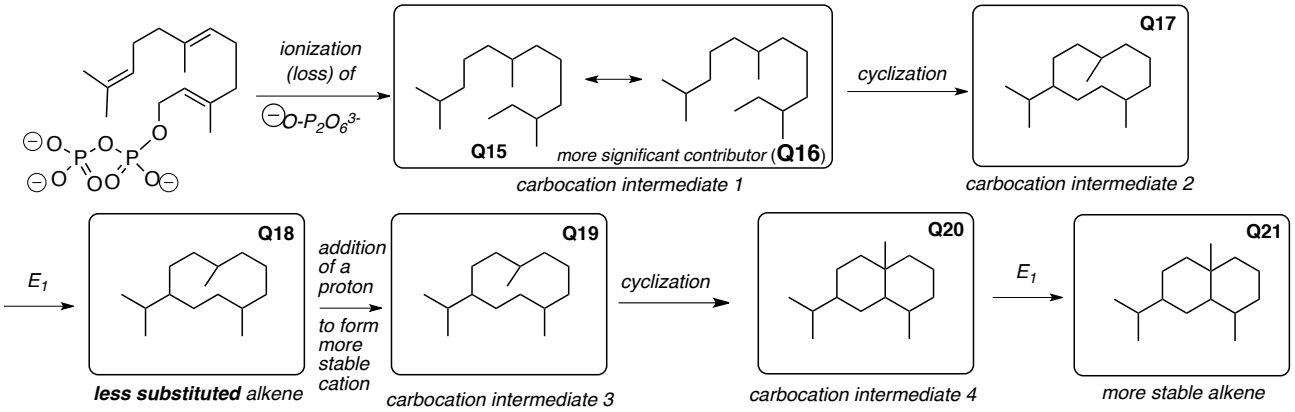
A	**B**	**C**	**D**	**E**
CrO_3, H_2SO_4, H_2O *then workup*	NaH, CH_3I, *solvent then workup*	a) $LiAlH_4$ b) H_3O^+ *workup*	CrO_3, pyridine, HCl *then workup*	PBr_3 *solvent then workup*
F	**G**	**H**	**I**	**J**
H_2NEt, mild acid H_2, Pd/C *then workup*	a) $NaBH_4$ MeOH b) *workup*	H_2NEt, mild acid *solvent then workup*	H_2, Pd/C *then workup*	NaH, H_2NEt *solvent then workup*



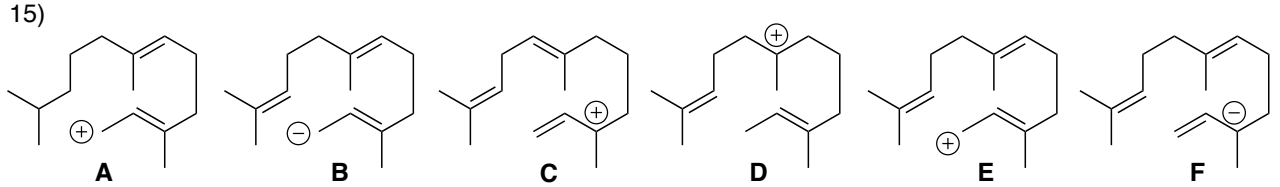
Questions 15-21.

A biosynthetic sequence is outlined on the next page (page 4). **A *blank practice version* of this question has been provided on page 7. You are strongly recommended to work on this page before you select your answers.** Page 7 will not be marked!

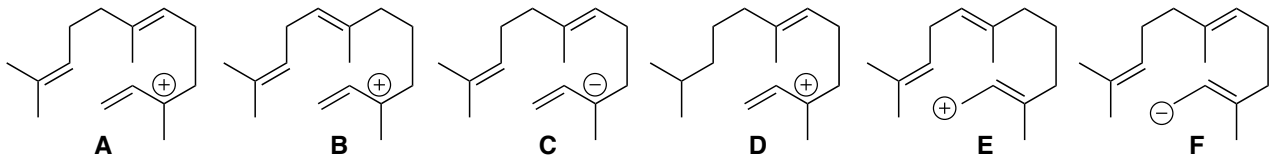
For each question, select the letter that represents the completed structure in boxes ***1-6*** through the addition of necessary features (formal charges, π bonds).



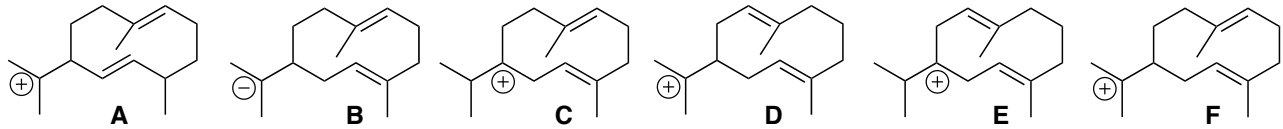
15)



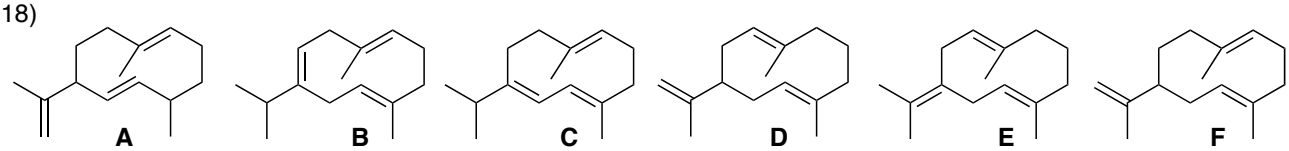
16)



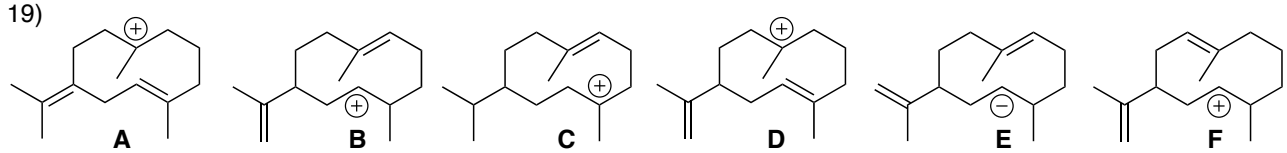
17)



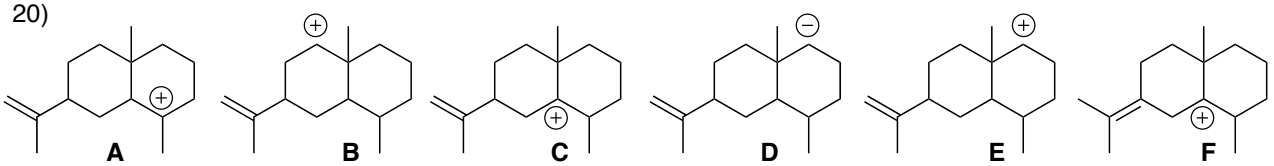
18)



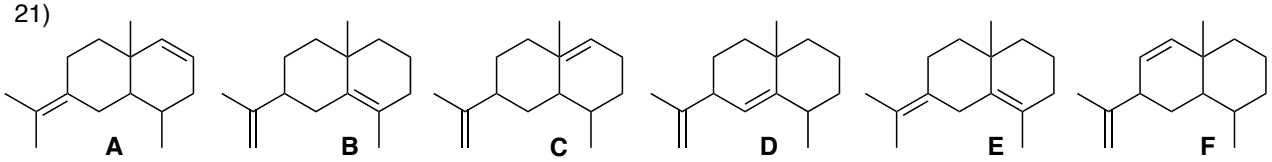
19)



20)



21)



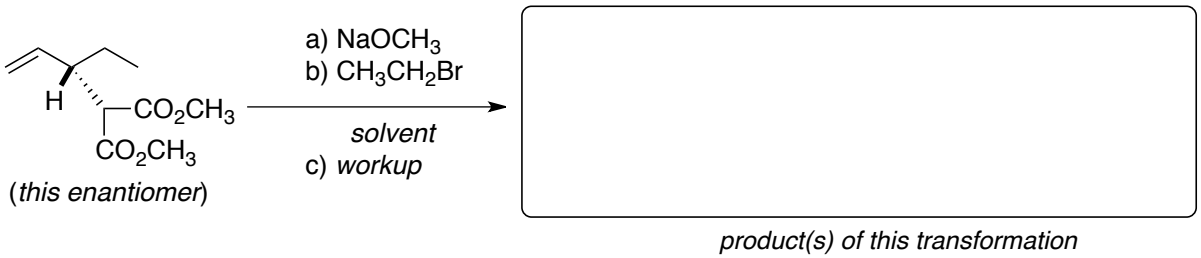
******END OF SCANTRON QUESTIONS******

Section 2. Short answer questions. Please write your answers in the designated space. Please note that in some cases it is better for you to work out your answer on practice paper and copy a neat version to the examination paper.

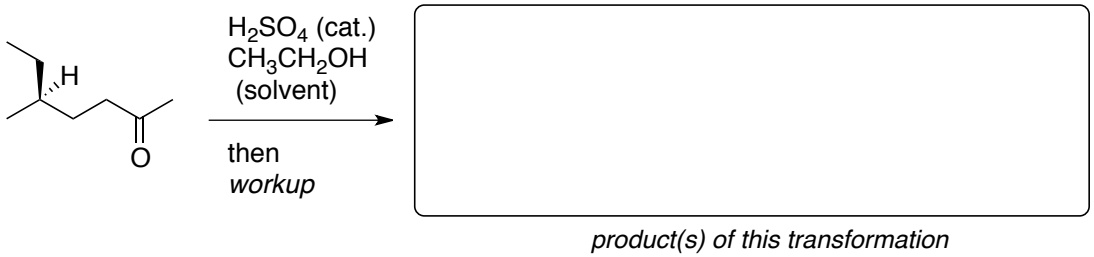
*****Messy and/or incoherent answers that are difficult to read or interpret may receive reduced or zero credit.*****

B-1 (12 marks) Provide the requested information. The *major* product(s) should be provided. ***Pay attention to stereochemical details; draw all appropriate stereoisomers.*** Marks will be removed if extra (incorrect) answers are shown.

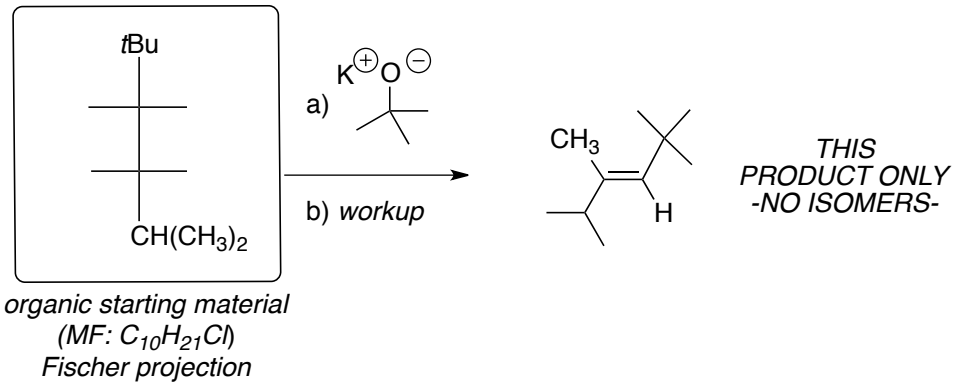
a)



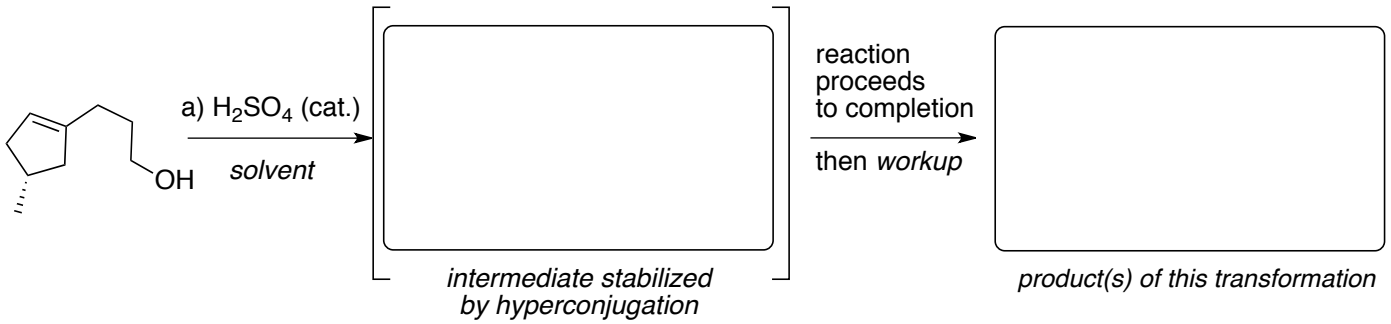
b)



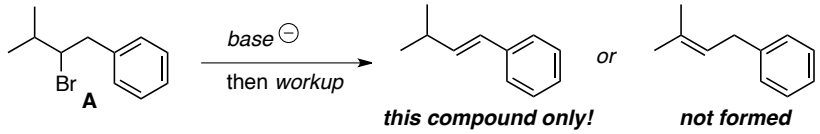
c)



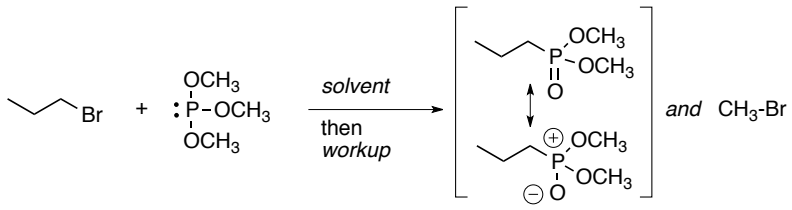
d)



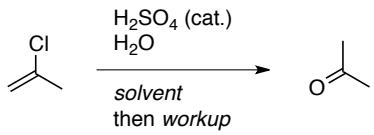
B-2) (4 marks) Treatment of compound **A** with strong base generates only one of two possible constitutional isomers. Using pictures accompanied with *brief comments*, provide an explanation for this observation. *Marks will be removed because of messy, difficult to read answers.*



B-3) (4 marks) Using arrows that represent electron movement, provide a mechanistic rationale for the following reaction. *Marks will be removed because of messy, difficult to read answers.*



B-4) (5 marks) Provide a mechanism using arrows that represent electron movement for the following transformation. *Marks will be removed because of messy, difficult to read answers.*



End of questions.

This is the practice model for questions 15-21 in the multiple choice section. It will not be marked.