



NEWFOLDER



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Name: Chem 3152 Honors



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75 B

Exam 1

40N Chem 3152 Soloshonok

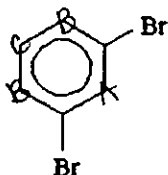
Question 1: Which of the following spectroscopic techniques uses the lowest energy of the electromagnetic radiation spectrum?

- 526
- A) UV
 - B) Visible
 - C) IR
 - D) X-ray
 - E) NMR

Question 2: How many signals would you expect to see in the ^1H NMR spectrum of the following compound? $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_3$

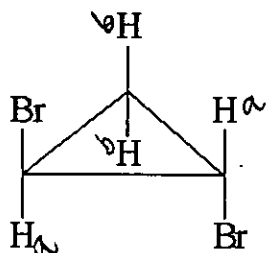
- b a a b
- A) 1
 - B) 3
 - C) 2
 - D) 4
 - E) 6

Question 3: How many signals would you expect to see in the ^1H NMR spectrum of the following compound?



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

Question 4: How many signals would you expect to see in the ^1H NMR spectrum of the following compound?

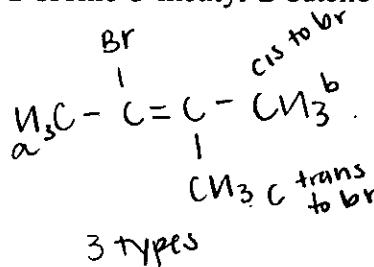


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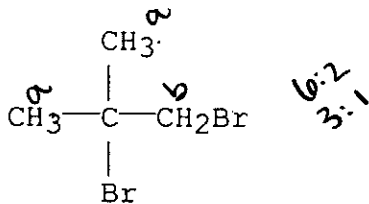
- A) 2 *S*
- B) 5
- C) 1
- D) 4
- E) 3

X **Question 5:** How many proton NMR singlets will 2-bromo-3-methyl-2-butene exhibit?

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

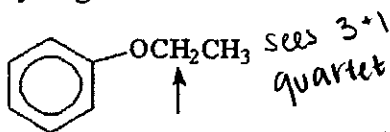


Question 6: What is the ratio of the protons in the following compound?



- A) 3:3:2
- B) 3:2
- C) 6:2:1
- D) 3:1 *O*
- E) 3:2:1

X **Question 7:** What splitting pattern is observed in the proton NMR spectrum for the indicated hydrogens?

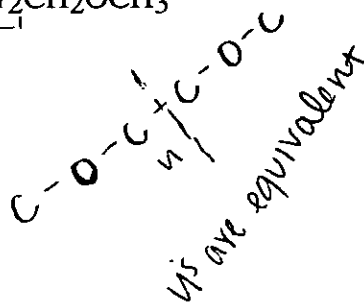


- A) singlet
- B) doublet
- C) triplet
- D) quartet *S*
- E) quartet of doublets

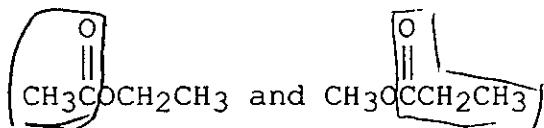
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Question 8: What splitting pattern is observed in the proton NMR spectrum for the indicated (bold and italicized font) hydrogens? $\text{CH}_3\text{OCH}_2\text{CH}_2\text{OCH}_3$

- A) singlet
- B) doublet
- C) triplet**
- D) quartet
- E) quartet of triplets



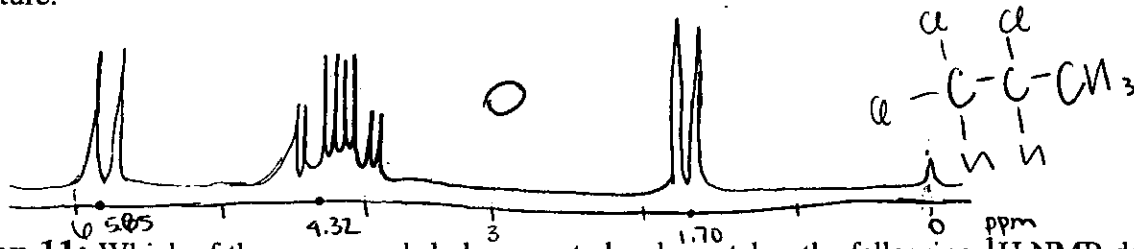
Question 9: Which of the following technique(s) can readily distinguish between:



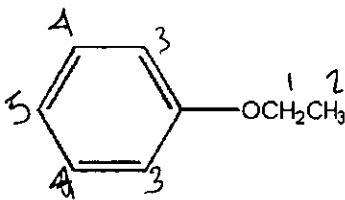
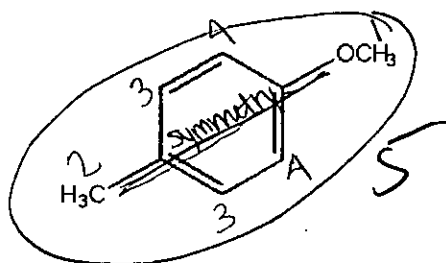
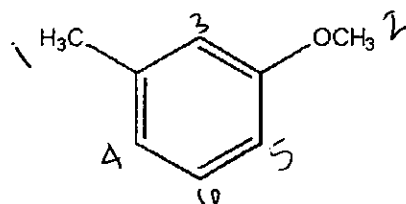
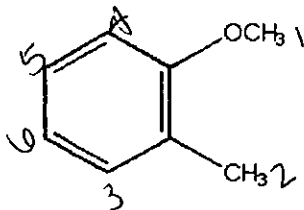
- A) NMR *yes - different*
- B) IR *no - same functional groups*
- C) MS *yes - different mm*
- D) A and B
- E) A and C**

Question 10: An unknown compound, $\text{C}_3\text{H}_5\text{Cl}_3$, gave the following proton NMR data:

Doublet at 1.70 ppm (3H); doublet of quartets at 4.32 ppm (1H); Doublet at 5.85 ppm (1H). Please draw the structure.



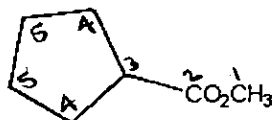
Question 11: Which of the compounds below most closely matches the following ^1H NMR data: 7.6 (2H, d), 7.3 (2H, d), 3.5 (3H, s), 2.2 (3H, s)? Please, circle the correct compound



- 2H on ring
- 2H on ring
- 3H R-O-CH₃
- 3H -CH₃

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Question 12: How many distinct carbon signals are expected in the proton-decoupled ^{13}C NMR spectrum of the compound below?



- A) 7
B) 6
C) 3
D) 4

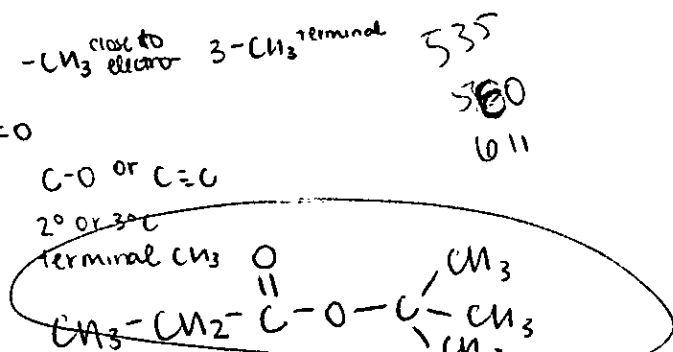
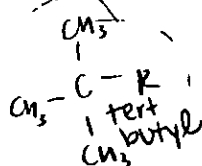
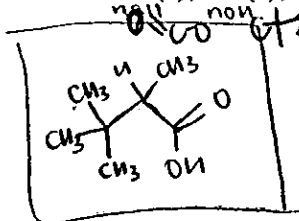
E) 5

Question 13: Provide the structure that is consistent with the following spectral data: MF- $\text{C}_7\text{H}_{14}\text{O}_2$

IR (cm^{-1}): 2950, 1750
 ester $\text{C}-\text{C}-\text{N}_3$ $\text{C}=\text{O}$
 no sp^2 or sp

^1H NMR: 2.3 (2H, q), 1.0 (3H, t), 0.9 (9H, s)

^{13}C NMR: 185 (s), 78 (s), 29 (t), 14 (q), 12 (q)



Question 14: Which of the following molecular changes is necessary for mass spectrometry to occur?

- A) excitation of an electron from the ground state to higher energy state
 B) change of alignment of an electron in a magnetic field
 C) change of alignment of a proton in a magnetic field
 D) loss of an electron
 E) molecular vibration

Question 15: Which of the following statements best explains the information we can gain from mass spectrometry?

- A) It allows us to determine the number of protons in a compound
 B) It allows us to determine the kinds of functional groups in a compound
 C) It allows us to determine the molecular weight and the mass of some fragments of a compound
 D) It allows us to determine the presence and nature of a carbocation in the compound
 E) It allows us to determine the presence and nature of a free radical in the compound

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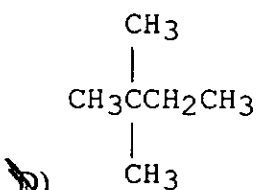
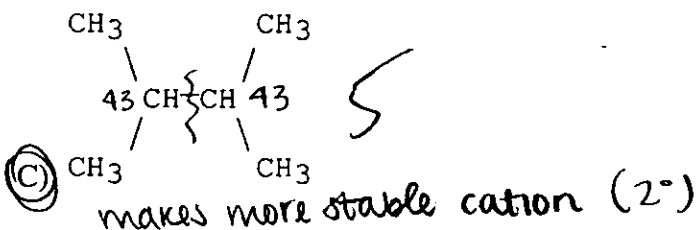
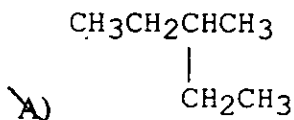
Question 16: Which compound's mass spectrum shows peaks at M, M+2, and M+4 whose abundances (intensity) are in a ratio of 1:2:1?

- A) cyclohexanol
- B) chlorocyclohexane
- C) 1,2-dichlorocyclohexane
- D) 1-bromopentane



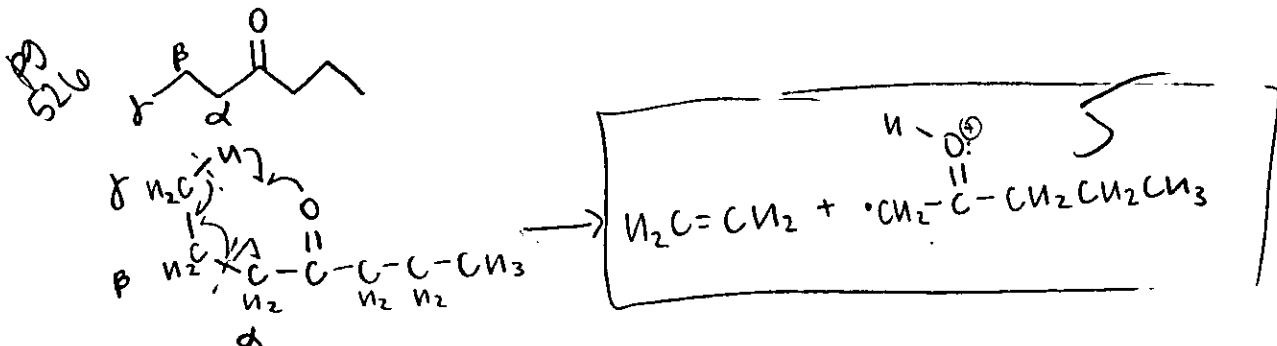
E) 1,5-dibromopentane \checkmark since $M = M+2$ for Br, there must be 2 Br

Question 17: Which of the following structures will give a base (most intensive) peak of 43 in mass spectrometry?



E) none of the above

Question 18: Provide the structure of the species which results when the molecular ion of 4-heptanone undergoes fragmentation via a McLafferty rearrangement.




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Question 19: Which of the following statements is not true about electromagnetic radiation?

- A) The velocity of light is directly proportional to the energy
- B) All molecules absorb electromagnetic radiation at some frequency
- C) Frequency is inversely proportional to wavelength
- D) Energy is directly proportional to frequency
- E) Energy is inversely proportional to wavelength

Question 20: Which of the following solvents is best used in infrared spectroscopy? (circle the correct answer)

- pg 532
- I. Water, H_2O
- II. Carbon tetrachloride, CCl_4
- III. Methanol, CH_3OH
- IV. Ethanol, CH_3CH_2OH
- V. Benzene, 

Question 21: Absorption of UV-visible energy by a molecule results in:

- A) vibrational transitions
- B) electronic transitions
- C) rotational transitions
- D) nuclear transitions
- E) none of the above

Question 22: Which of the following methods is most suitable for studying conjugation in molecules?

- A) IR
- B) NMR
- C) MS
- D) A and B
- E) UV-visible

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Exam 2

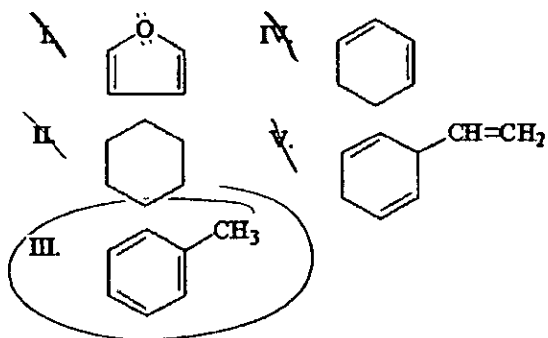
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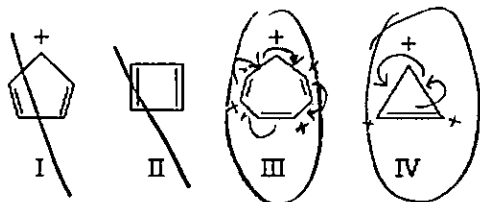
Question 1: Aromatic molecules contain _____ π electrons.

- A) no
- B) $4n + 2$ (with n an integer)
- C) $4n + 2$ (where $n = 0.5$)
- D) $4n$ (with n an integer)
- E) Unpaired

Question 2: Which of the following is an aromatic hydrocarbon?



Question 3: Which of the structures below would be aromatic?

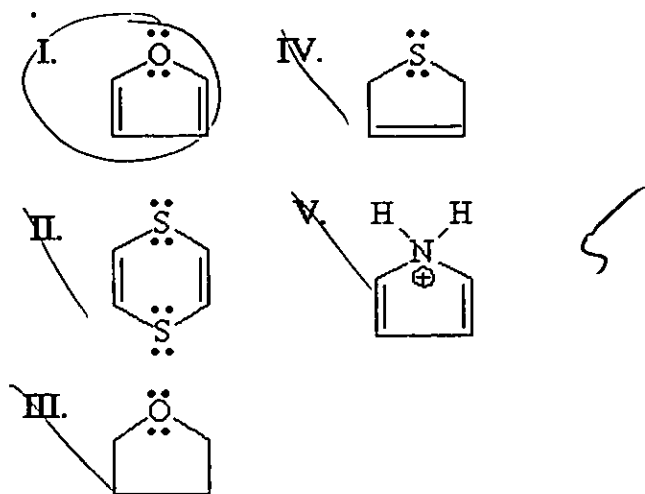


- A) I and IV
- B) I, III, and IV
- C) III and IV
- D) II
- E) all

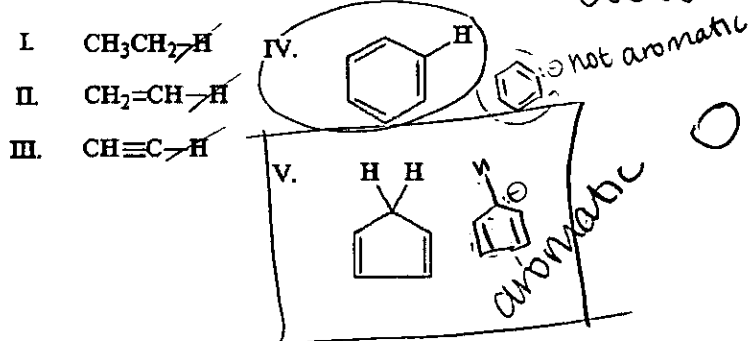
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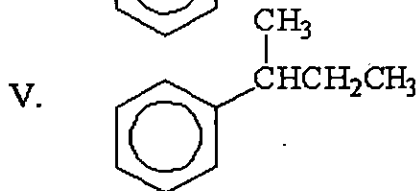
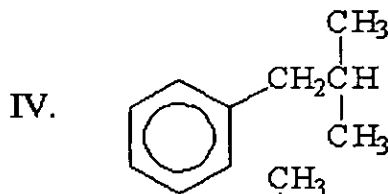
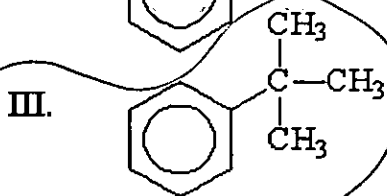
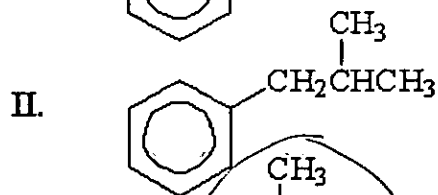
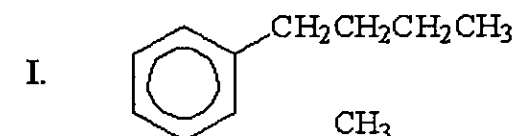
Question 4: Which of the following is aromatic?



Question 5: Which of the following is the most acidic?

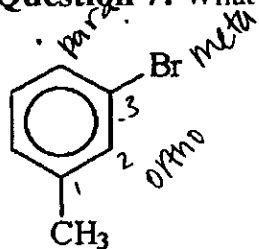


Question 6: What is the major product of the following Friedel-Crafts alkylation?



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Question 7: What is the name of the following compound?



m bromotoluene
3 bromotoluene

A) ~~m-bromomethylbenzene~~

B) m-bromotoluene

C) 3-bromotoluene

D) A and B

E) B and C

Question 8: The name ^{1 3 5}2,4,6-tribromobenzene is incorrect. Which of the following is the correct name?

A) tribromobenzene

B) m,m-dibromobenzene

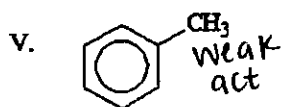
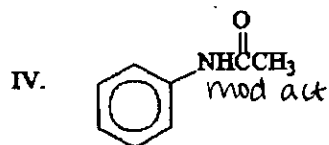
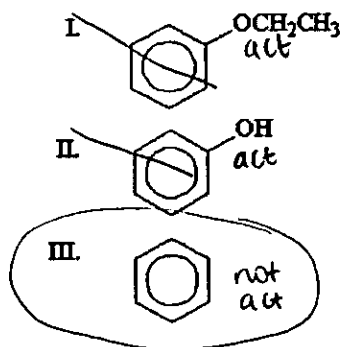
C) 3,5-dibromobenzene

D) 1,3,5-tribromobenzene

E) m,m,m-tribromobenzene



Question 9: Which of the following compounds reacts most slowly during ^{electrophilic} nitration?



most deactivating

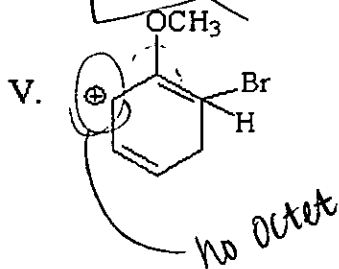
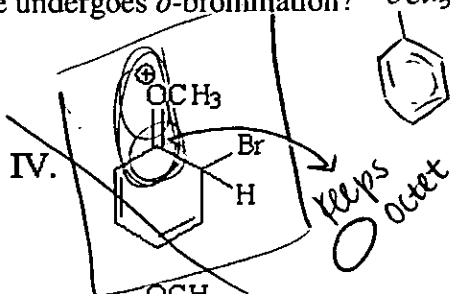
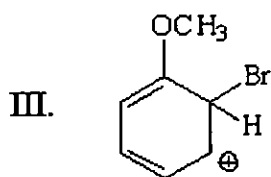
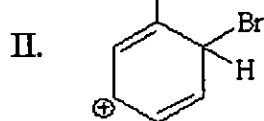
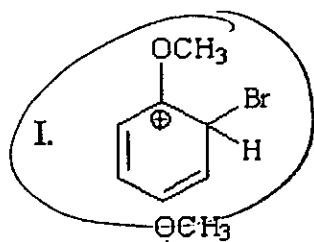
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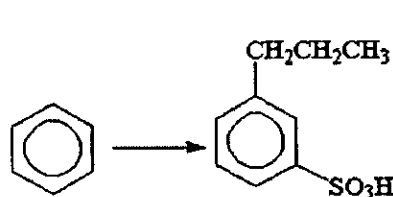
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Question 10: Which of the following structures is the most important contributor to the resonance hybrid formed when anisole undergoes *o*-bromination? *OCH₃ strongly act*



Question 11: Which is the best method for carrying out the following reaction?



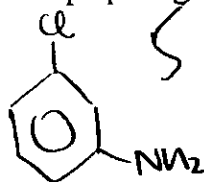
sulfonation meta
acylation meta
reduction

(40)

- I. $\text{SO}_3/\text{H}_2\text{SO}_4$; $\text{CH}_3\text{CH}_2\text{CH}_2\text{Cl}/\text{AlCl}_3$ IV. $\text{CH}_3\text{CH}_2\text{COCl}/\text{AlCl}_3$; $\text{Zn}(\text{Hg})/\text{HCl}/\text{heat}$; $\text{SO}_3/\text{H}_2\text{SO}_4$
 II. $\text{CH}_3\text{CH}_2\text{CH}_2\text{Cl}/\text{AlCl}_3$; $\text{SO}_3/\text{H}_2\text{SO}_4$ (V.) $\text{CH}_3\text{CH}_2\text{COCl}/\text{AlCl}_3$; $\text{SO}_3/\text{H}_2\text{SO}_4$; $\text{Zn}(\text{Hg})/\text{HCl}/\text{heat}$
 III. $\text{CH}_3\text{CH}_2\text{COCl}/\text{AlCl}_3$; $\text{SO}_3/\text{H}_2\text{SO}_4$

Question 12: Which of the following is the best method for preparing *m*-chloroaniline?

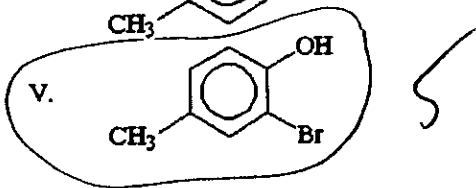
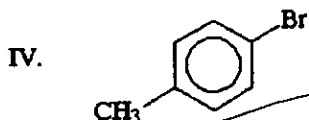
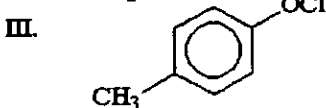
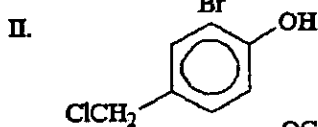
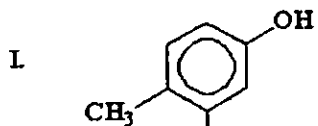
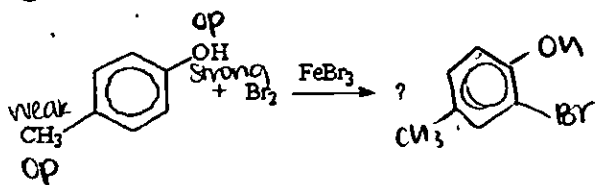
- A) NH_3 ; $\text{Cl}_2/\text{AlCl}_3$
 B) $\text{Cl}_2/\text{AlCl}_3$; NH_3
 C) $\text{Cl}_2/\text{AlCl}_3$; $\text{HNO}_3/\text{H}_2\text{SO}_4$; Sn/HCl ; HO^-
 (D) $\text{HNO}_3/\text{H}_2\text{SO}_4$; $\text{Cl}_2/\text{AlCl}_3$; Sn/HCl ; HO^-
 E) $\text{HNO}_3/\text{H}_2\text{SO}_4$; Sn/HCl ; HO^- ; $\text{Cl}_2/\text{AlCl}_3$



nitration
chlorination
reduction

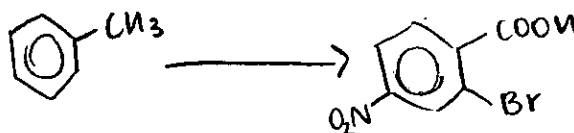
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Question 13: What is the major product of the following reaction?



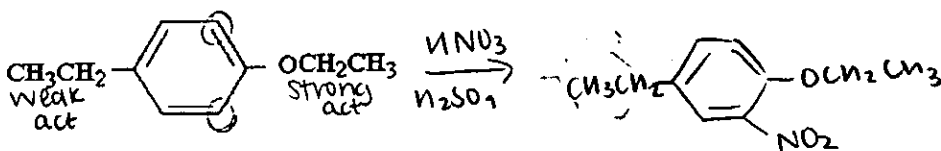
Question 14: Provide a series of synthetic steps by which 2-bromo-4-nitrobenzoic acid can be prepared from toluene.

- 1 nitration HNO3 in H2SO4
- 2 bromination Br2 in FeBr3
- 3 reduction Na2Cr2O7, H+, Δ



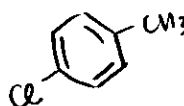
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Question 15: Provide the structure of the major mononitration product of the compound below.

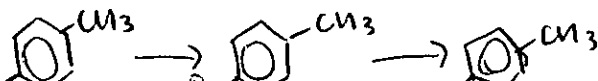


Question 16: What is the best method for the preparation of *p*-chlorotoluene in high yield?

- start with benzene; methylate; chlorinate
- start with benzene; chlorinate; methylate
- start with toluene; chlorinate
- start with chlorobenzene; methylate
- start with *p*-aminotoluene; NaNO2/HCl, 0°C ; CuCl

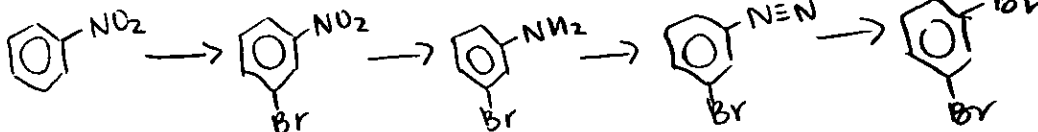
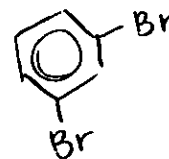


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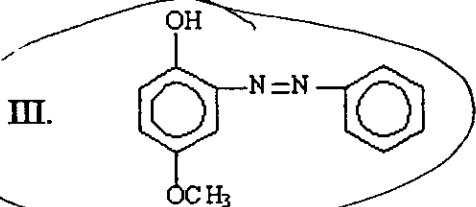
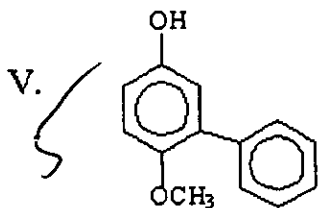
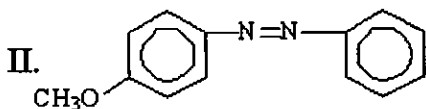
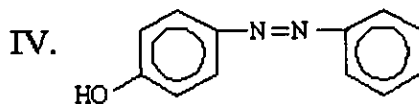
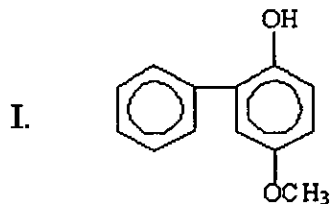
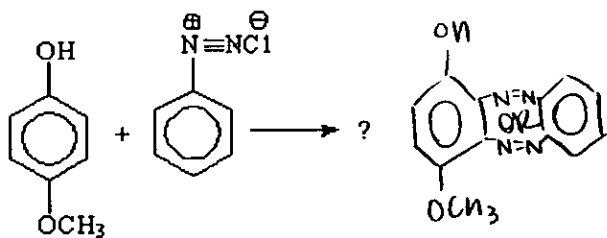


Question 17: What is the best method for the preparation of *m*-dibromobenzene from benzene?

- ~~A) nitrate; Sn/HCl; NaNO₂/HCl, 0°C; brominate twice~~
- ~~B) nitrate; Sn/HCl; NaNO₂/HCl, 0°C; brominate twice; H₃PO₂~~
- ~~C) nitrate; Sn/HCl; NaNO₂/HCl, 0°C; H₃PO₂; brominate twice~~
- (D) nitrate; brominate; Sn/HCl; NaNO₂/HCl, 0°C; CuBr**
- ~~E) brominate twice~~



Question 18: What is one of the products of the following reaction?



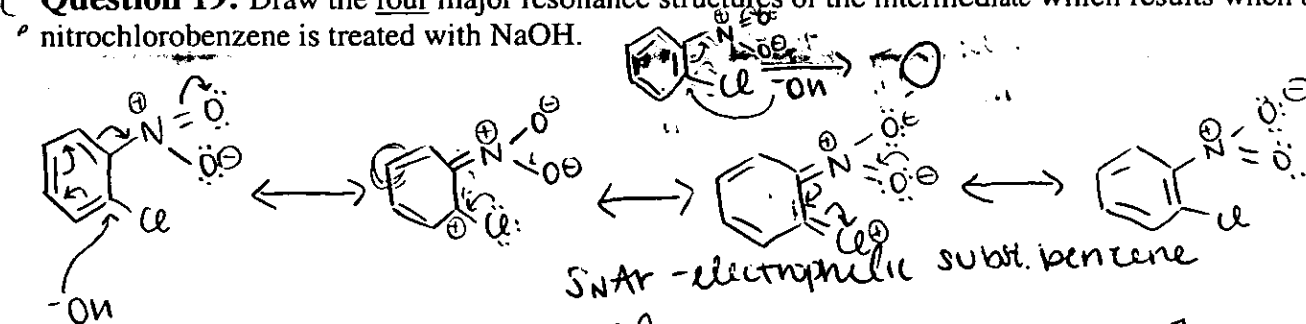
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Question 19: Draw the four major resonance structures of the intermediate which results when *o*-nitrochlorobenzene is treated with NaOH.

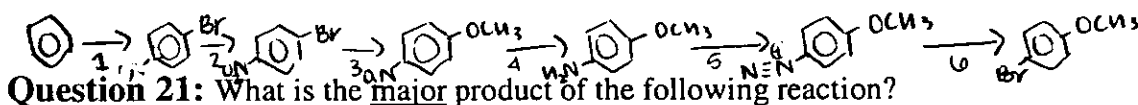
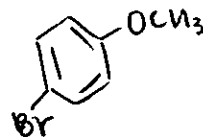


SNAr - electrophilic subst. benzene

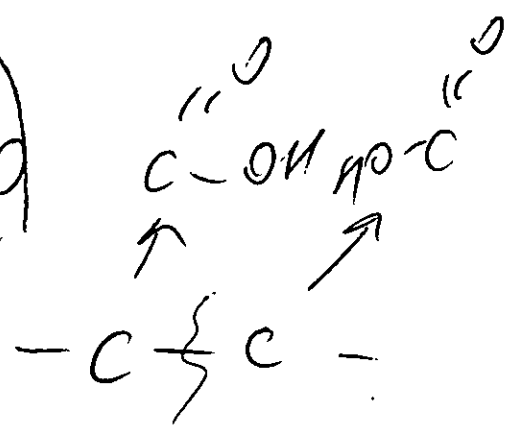
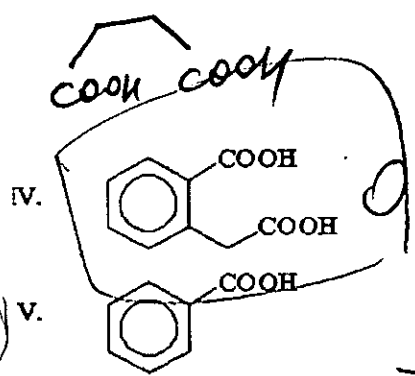
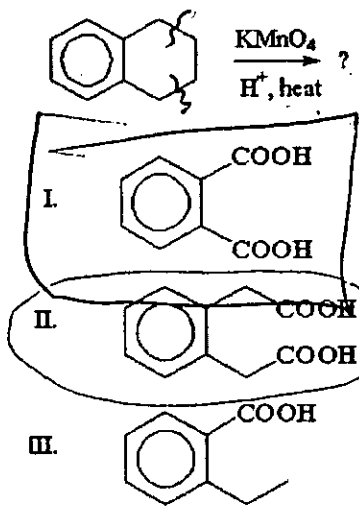
pg 707

Question 20: Provide a series of synthetic steps by which *p*-bromoanisole can be prepared from benzene.

- 1 bromination $\text{Br}_2, \text{FeBr}_3$
- 2 nitration $\text{HNO}_3, \text{H}_2\text{SO}_4$
- 3 $\text{S}_{\text{N}}\text{Ar}$ CH_3O^- , Δ
- 4 reduction H_2 ; Pd/C
- 5 diazonium $\text{NaNO}_2, \text{HCl}, 0^\circ\text{C}$
- 6 replace diazonium Br^- , CuBr

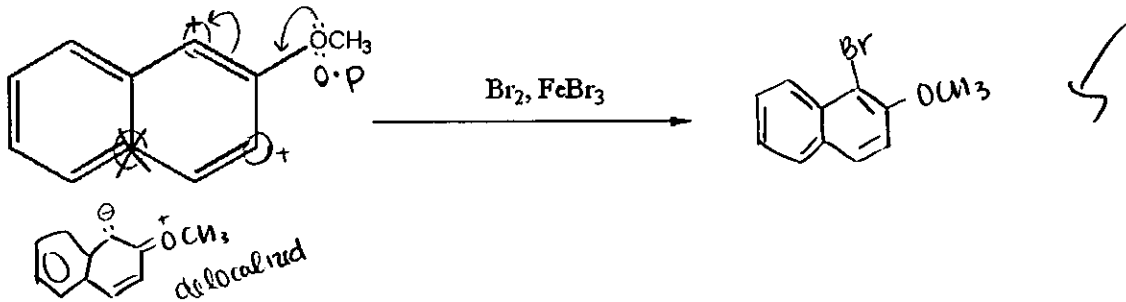


Question 21: What is the major product of the following reaction?



80

Question 22: Provide the structure of the major organic product of the following reaction.



Question 23: Which team will win in the OU-Miami game on Saturday? (3 pts)

- A) OU
- B) Miami
- C) Texas
- D) Arkansas

Handwritten numbers: 15 and 95.

Exam 3

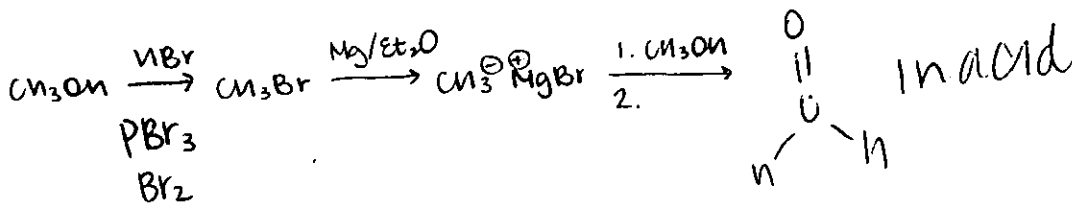
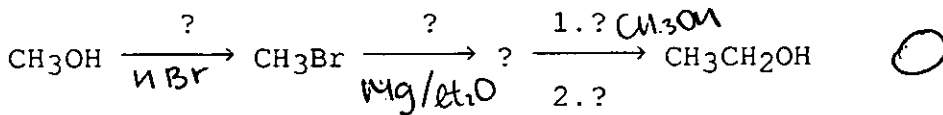
HON Chem 3152 Soloshonok

Question 1: List the following carbonyl compounds in order of decreasing reactivity toward nucleophiles:

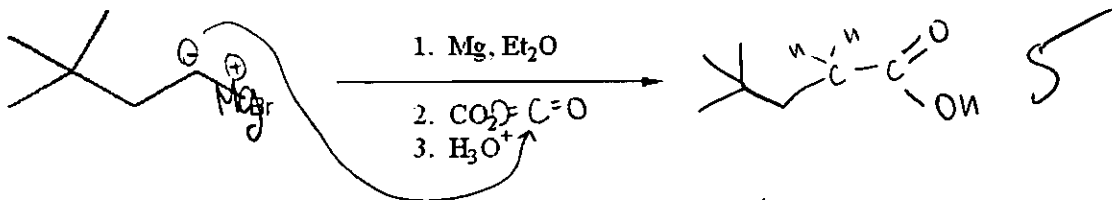
Ester (1), ~~acid chloride~~ (2), amide (3), ~~aldehyde~~ (4), ~~ketone~~ (5)

Answer: acyl chloride > aldehyde > ketone > ester > amide
 most _____ → least

Question 2: Complete the following reaction sequence by supplying the missing information: 1



Question 3: Provide the major organic product of the following.

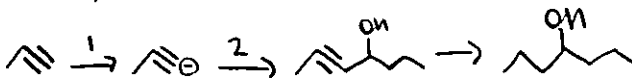


Question 4: Propose a sequence of steps to convert propyne to 4-heptanol.

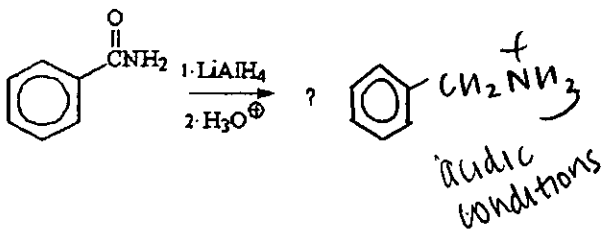
1) $\text{NaNH}_2/\text{NH}_3$

2) $\text{H}_2\text{C}=\text{O} + \text{CH}_3\text{CH}_2\text{CHO}$ / LiAlH_4

3) $\text{H}_2/\text{Pd/C}$



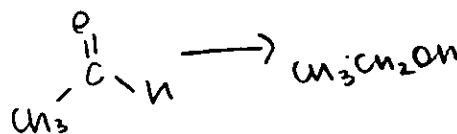
Question 5: What is the major product of the following reaction?



20

Question 6: Which of the following reagents can be used to reduce acetaldehyde to ethyl alcohol?

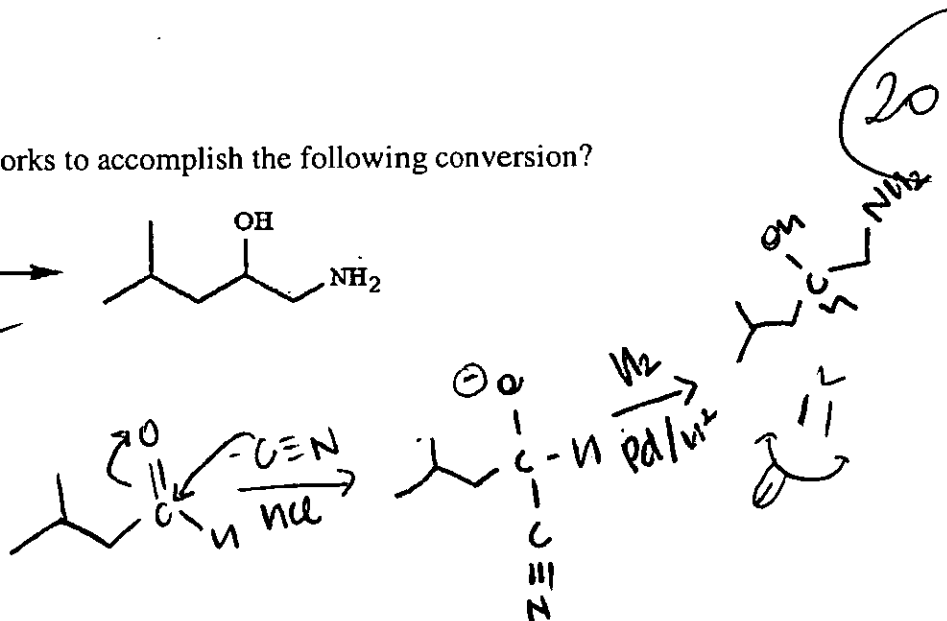
- A) 1. LiAlH_4 /2. H_3O^+
- B) 1. NaBH_4 /2. H_3O^+
- C) H_2/Pt
- D) A and B
- E) A and C
- F) A, B, and C
- G) B and C
- H) none of the above



Question 7: Which of the sequences works to accomplish the following conversion?

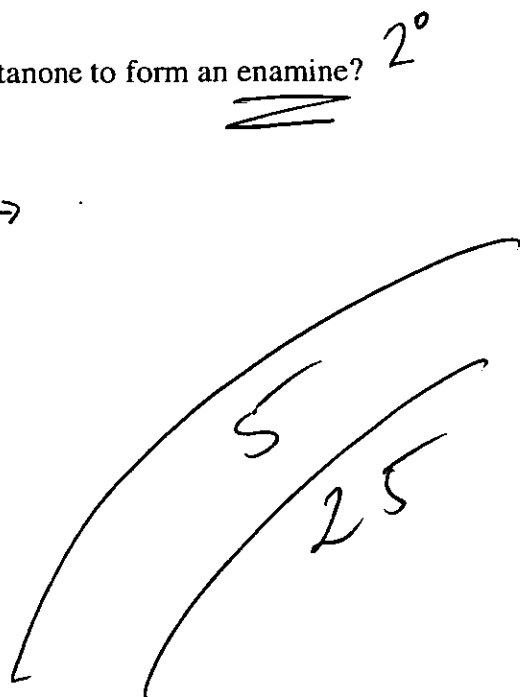
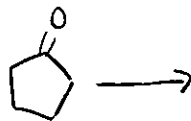


- A) 1. NaCN , HCl 2. H_2 , Pt
- B) 1. $\text{H}_2\text{NCH}_2\text{MgBr}$ 2. H_3O^+
- C) 1. NaNH_2 2. H_3O^+
- D) 1. H_2NNH_2 , H^+ 2. H_3O^+
- E) 1. NH_3 , H^+ 2. H_2 , Pt

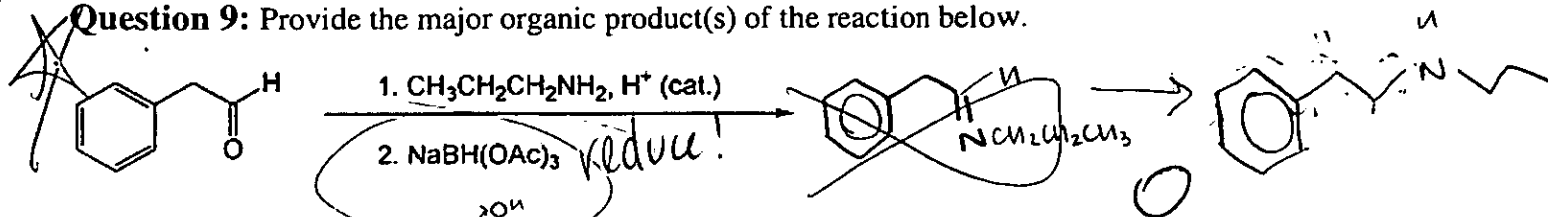


Question 8: Which of the following amines will react with cyclopentanone to form an enamine? 2°

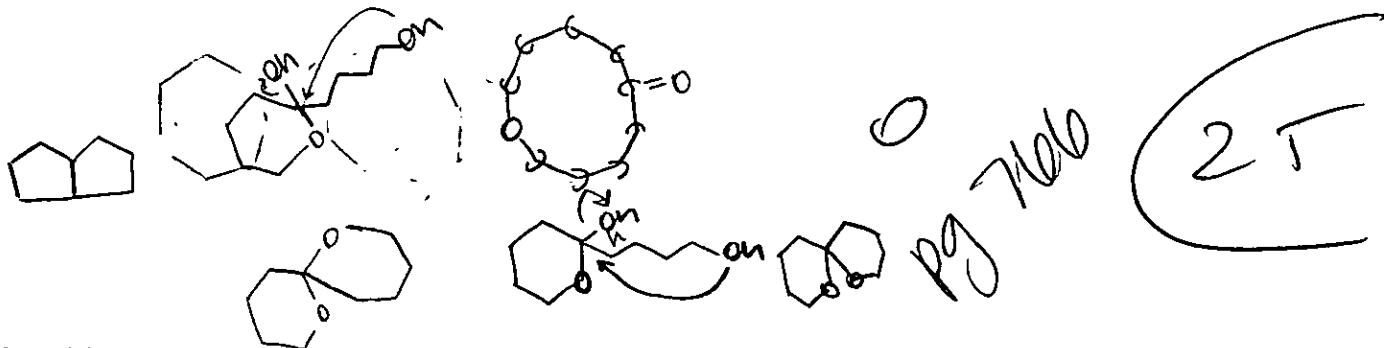
- A) $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{NH}_2$ 1°
- B) $(\text{CH}_3)_3\text{N}$ 3°
- C) pyridine 3°
- D) $(\text{CH}_3)_3\text{CNH}_2$ 1°
- E) aniline 1°
- F) none of the above



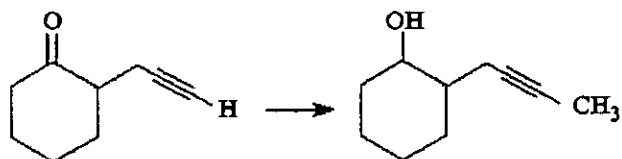
Question 9: Provide the major organic product(s) of the reaction below.



Question 10: When $\text{HOCH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{COCH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{OH}$ is heated in the presence of an acid catalyst, a reaction occurs. The product has the formula $\text{C}_9\text{H}_{16}\text{O}_2$. Provide the structure of this product.



Question 11: Propose a sequence of steps to carry out the following conversion.



$\text{NaNH}_2 / \text{NH}_3$
 CH_3Br
 $\text{NaBH}_4 / \text{H}_3\text{O}^+$

1) $\text{HO(CH}_2\text{)}_2\text{OH}$

protect $\text{C}=\text{O}$

2) $\text{NaNH}_2 / \text{NH}_3$

make $\equiv \text{C}^-$

3

3) CH_3I

add C

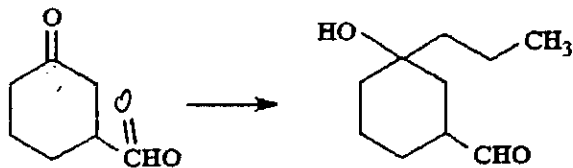
4) $\text{NH}_2\text{NH}_2 / \text{OH}^- , \Delta$

Wolff-Kishner reduction of unprotected $\text{C}=\text{O}$
take off protecting group/

5) $\text{HCl}, \text{H}_2\text{O}$

CH_3I
 H_3O^+
 NaBH_4 or LiAlH_4

Question 12: Propose a sequence of steps to carry out the following conversion:



1) $\text{HO(CH}_2\text{)}_2\text{OH}$

protect aldehyde $=\text{O}$

2) $\text{CH}_3\text{CH}_2\text{MgBr} / \text{H}_3\text{O}^+$... add R^- group

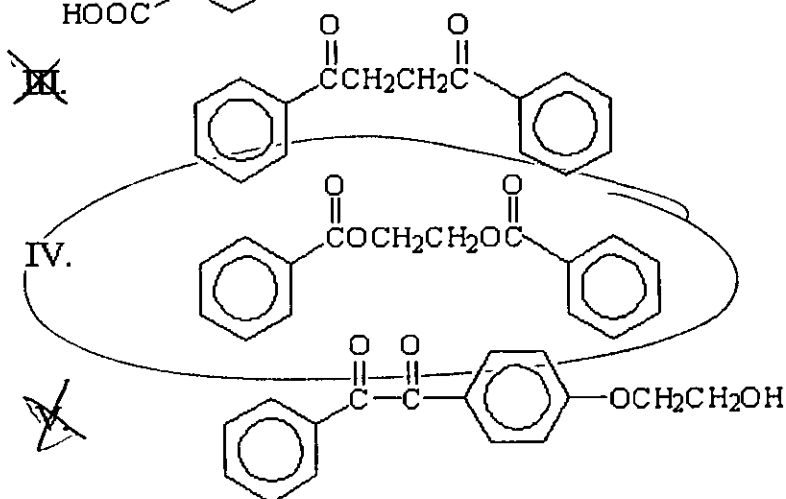
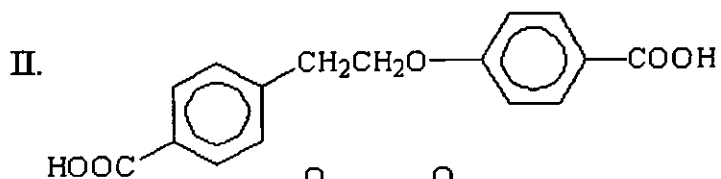
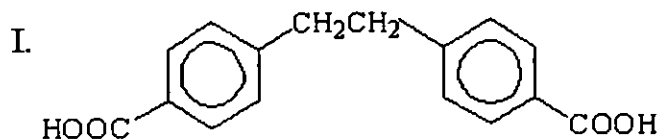
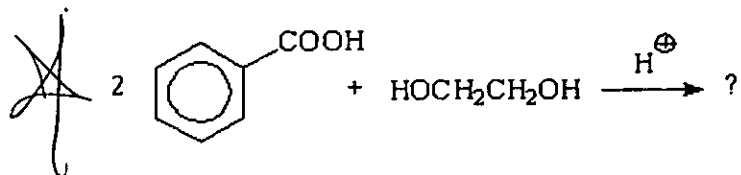
3) $\text{HCl}, \text{H}_2\text{O}$... remove protecting group

5

8

33

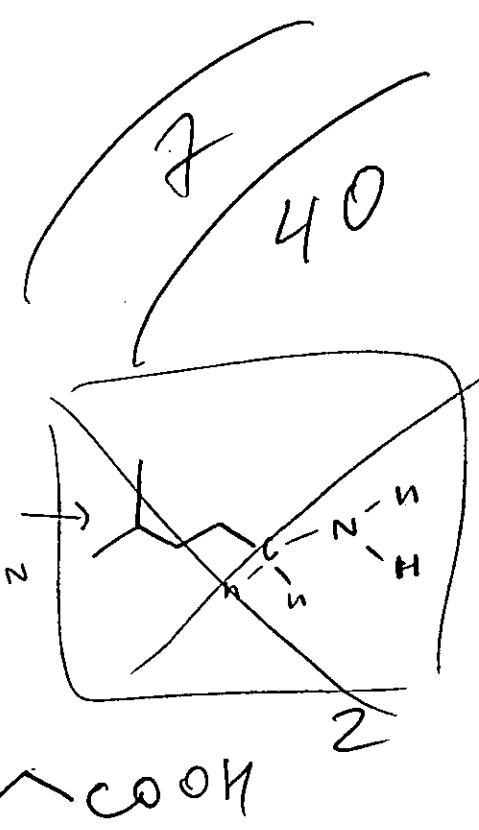
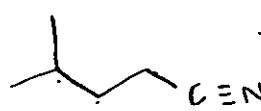
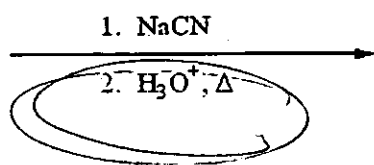
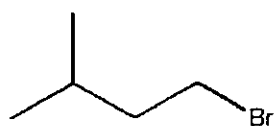
Question 16: What is the major organic product of the following reaction?



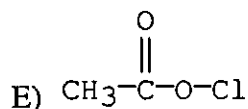
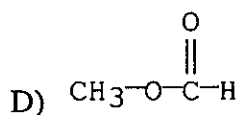
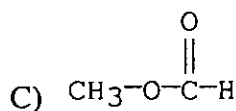
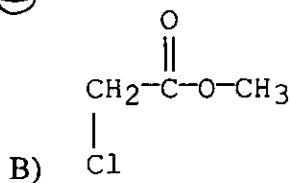
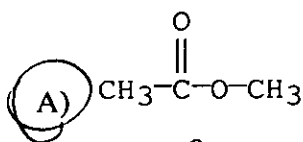
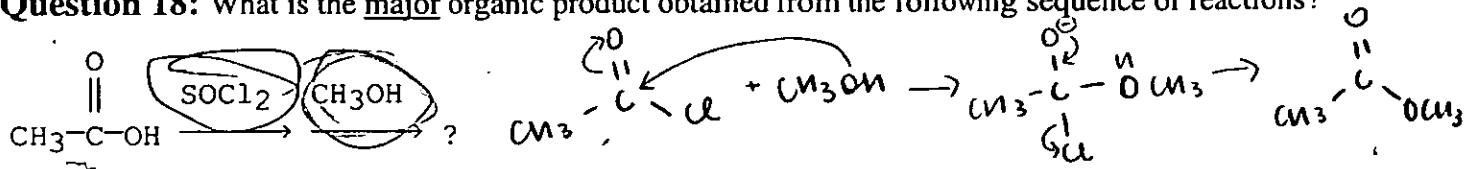
33

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

Question 17: Provide the major organic product of the following.



Question 18: What is the major organic product obtained from the following sequence of reactions?



40

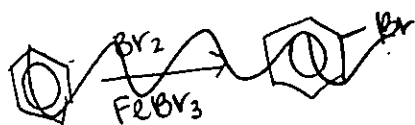
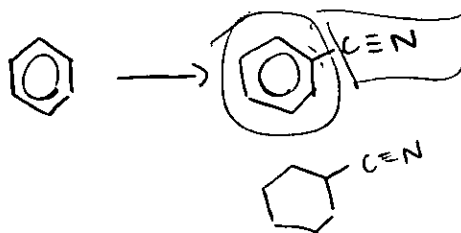
Question 19: Propose a synthesis of benzonitrile from benzene and any other necessary reagents.

1) Br_2

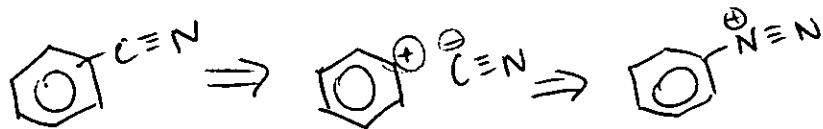
2) $-\text{C}\equiv\text{N}$

3)

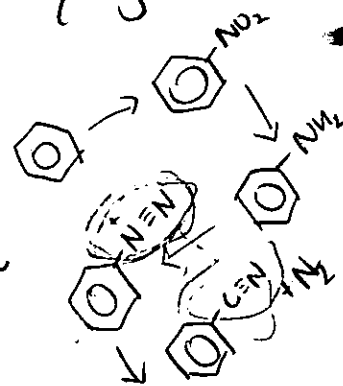
4)



Nitrile / reduce w/ Pd/H₂
diazonium pg 700
replace with C≡N

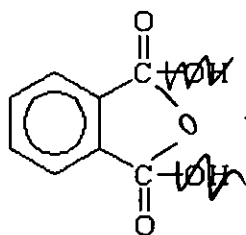


1. $\text{HNO}_3, \text{H}_2\text{SO}_4$
2. Fe, HCl
3. $\text{NaNO}_2, \text{HCl, cold}$
4. $\text{C}\equiv\text{N}$

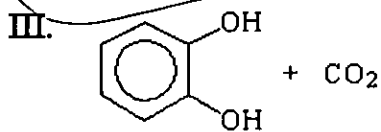
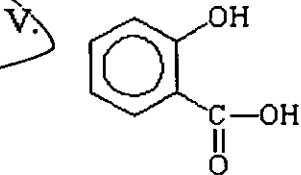
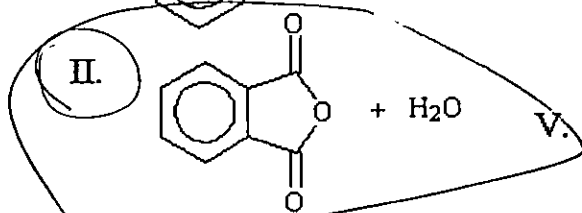
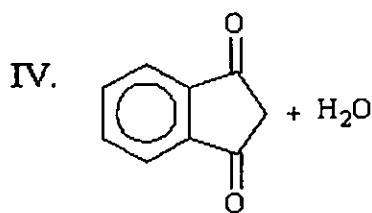
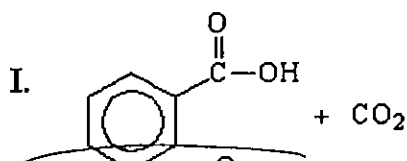


45

Question 20: What is the major product of the following reaction?



dehydration



A) I

B) II

C) III

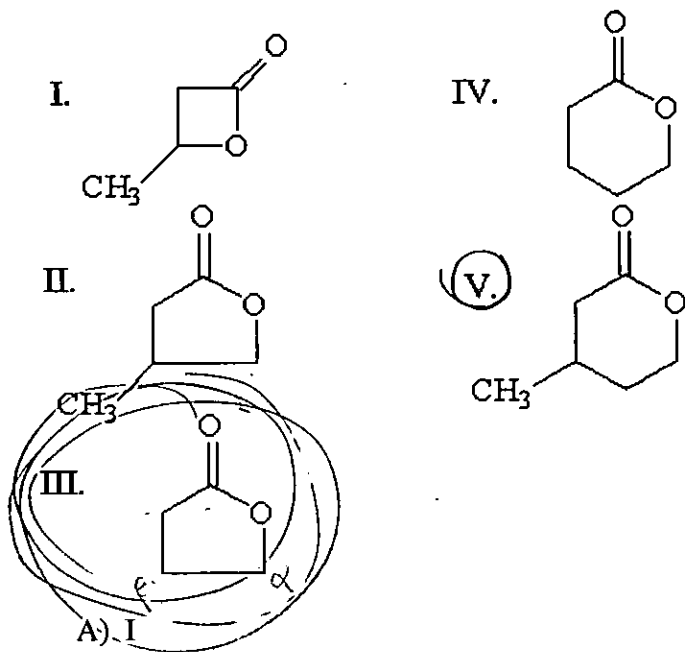
D) IV

E) V

45

5
50

Question 21: Which of the following compounds is γ -butyrolactone?



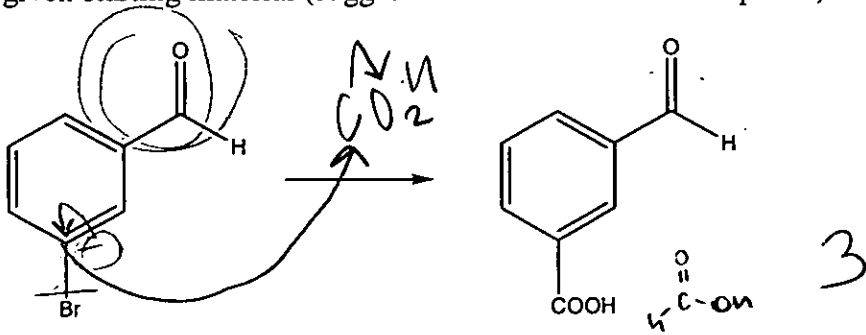
γ butyrolactone

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

50

γ butyrolactone

Question 22: Show (reaction sequence, reagents) how the target product can be prepared from the given starting material (suggested number of reaction steps - 4)



1. $\text{NOCH}_2\text{CH}_2\text{ON}$ protect = O
2. add $\text{O}_2 \rightarrow \text{NO}_2$ / H^+
3. $\text{HCl} / \text{H}_2\text{O} \Delta \rightarrow \text{R}-\text{C}(=\text{O})-\text{OH}$
4. $\text{HCl} / \text{H}_2\text{O}$ unprotect

1. $\text{NOCH}_2\text{CH}_2\text{ON}$
2. $\text{Mg}, \text{Et}_2\text{O}$
3. CO_2
4. $\text{HCl} / \text{H}_2\text{O}$

3
53

Question 23: Which team will win in the OU-Kansas game on Saturday? (3 pts)

- 1) OU
- 2) Kansas
- 3) none of the above

3

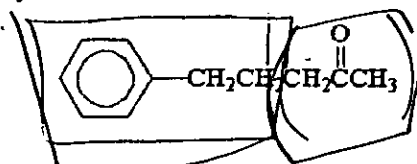
53

56

Exam 4

HON Chem 3152 Solution OK

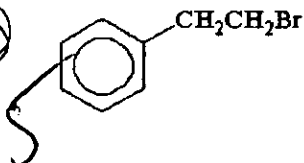
Question 1: What alkyl bromide should be used in the acetoacetic ester synthesis of the following methyl ketone?



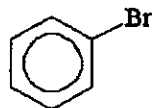
I. CH_3Br

II. $\text{CH}_3\text{CH}_2\text{Br}$

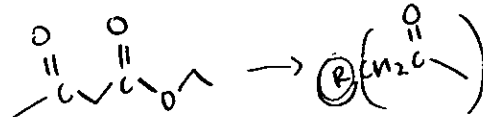
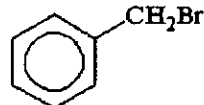
III.



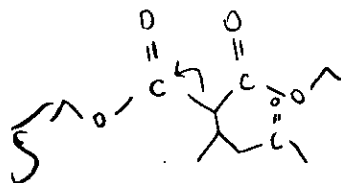
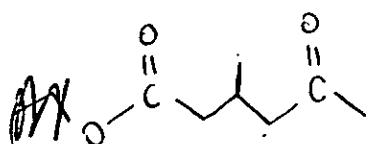
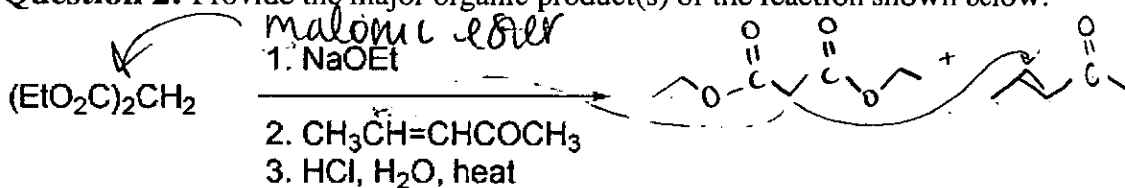
IV.



V.



Question 2: Provide the major organic product(s) of the reaction shown below.

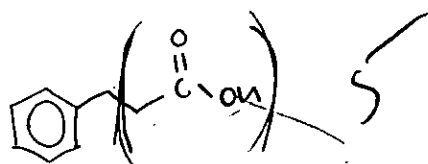


Question 3: What product results when malonic ester is treated with the following sequence of reagents:

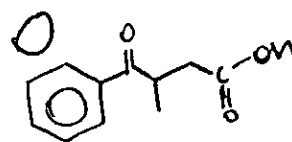
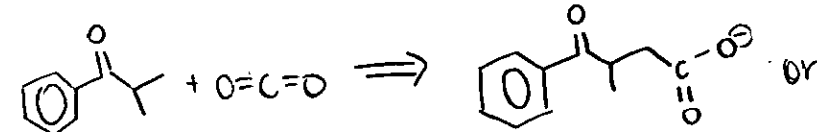
1) $\text{NaOCH}_2\text{CH}_3$;

2) PhCH_2Br ;

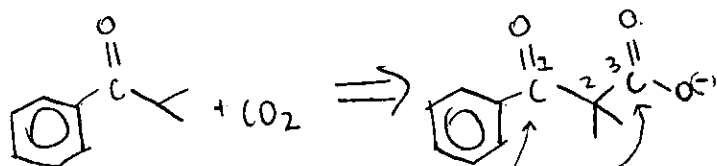
3) $\text{H}_3\text{O}^+, \Delta$



Question 4: When compound X is heated, $\text{PhCOCH}(\text{CH}_3)_2$ and CO_2 are produced. Offer a structure for compound X.



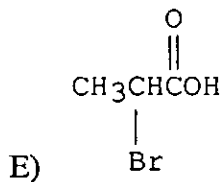
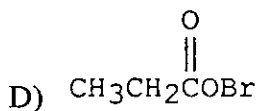
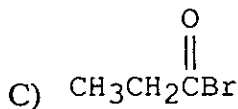
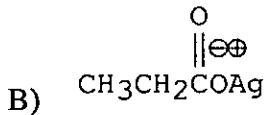
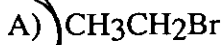
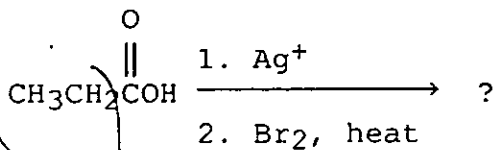
in its protonated form



must be 1,3

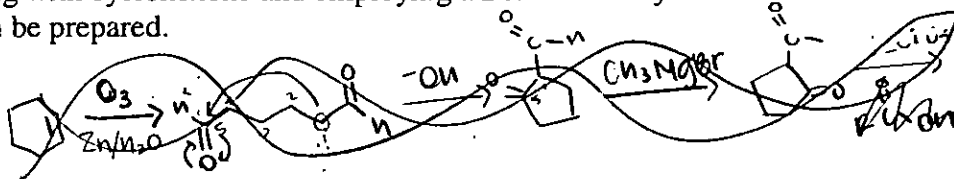
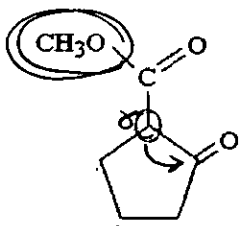
15

Question 5: What is the major organic product of the following reaction?



just know this happens...

Question 6: Starting with cyclohexene and employing a Dieckmann cyclization show how the compound below can be prepared.



Answer:

break C=C) $\text{O}_3, \text{Zn}/\text{H}_2\text{O}$

wkup 2) K_2CO_3

alkylate 3) $-\text{OMe}$; remove $-\text{OH}$

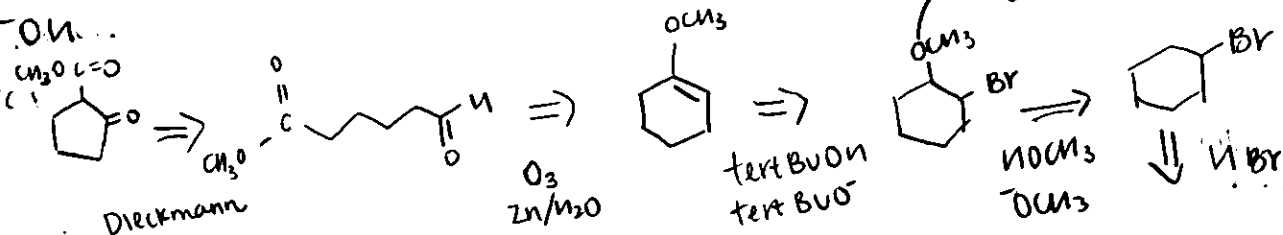
oxidize back 4) CH_3Br , 1:1 ratio

add O... 5) $-\text{OH}$

Dieckmann 6)

7)

8)



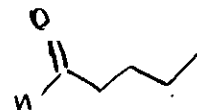
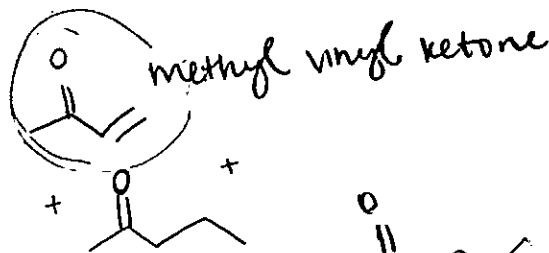
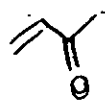
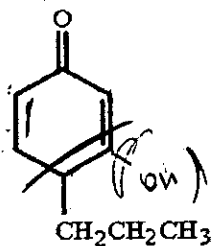
I dont know!

15

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Question 7: Which of the following compounds will react with methyl vinyl ketone in a Robinson annulation to generate the cyclic enone below?



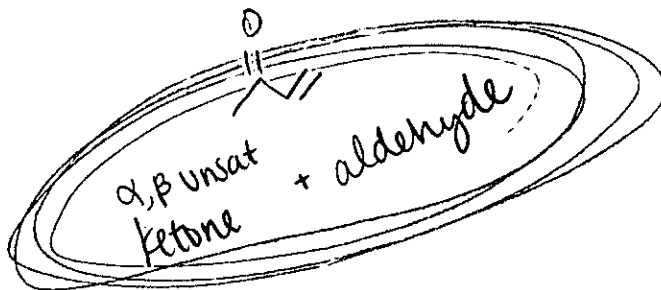
A) 1-pentene

B) cyclohexanone

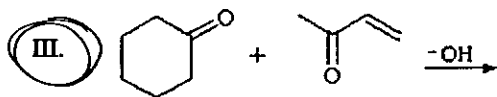
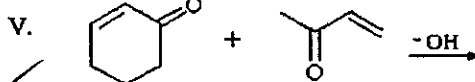
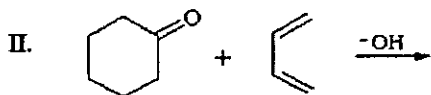
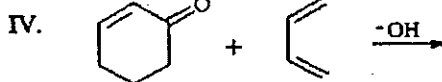
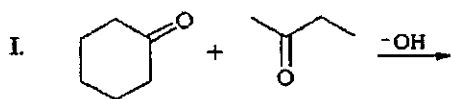
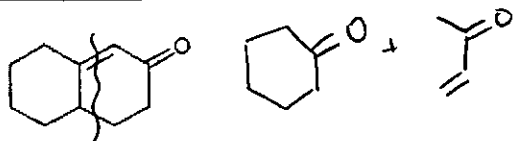
C) 2-pentanone

D) pentanal

E) none of the above



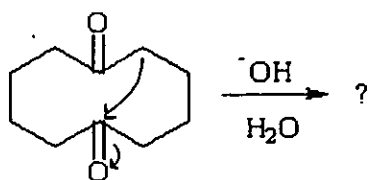
Question 8: What materials would you use to prepare the following compound using a Robinson Annulation?



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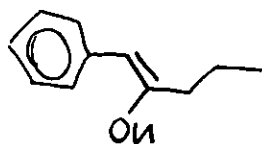
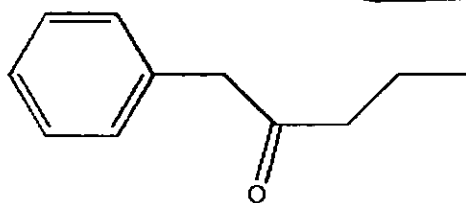
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Question 9: What is the major organic product of the following reaction?



- I.
- II.
- III.
- IV.
- V.

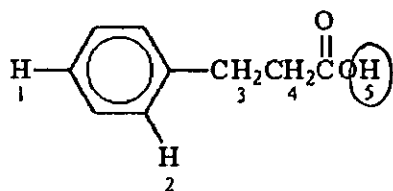
Question 10: Draw the most stable enol tautomer of the ketone shown below.



conjugate double bonds

25

Question 11: Which of the labeled hydrogen atoms in the following structure is the most acidic?



1)

2)

3)

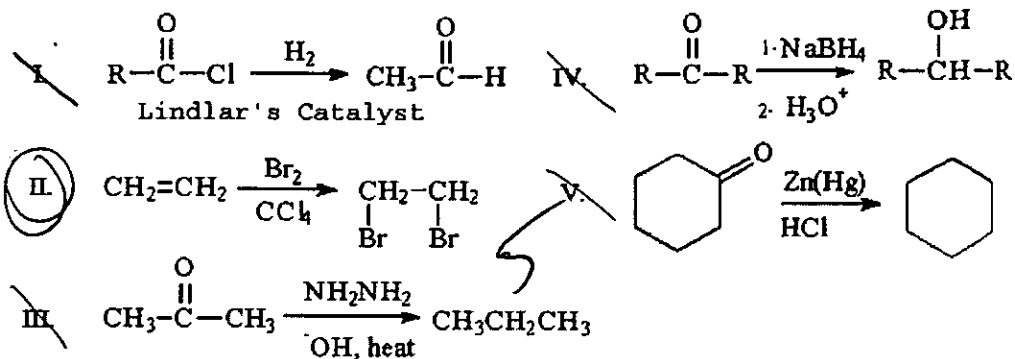
4)

5)

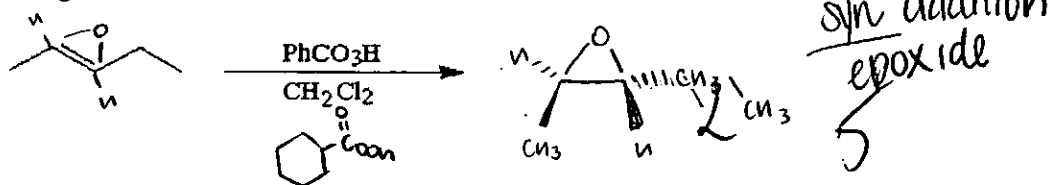
5

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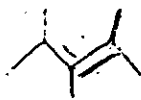
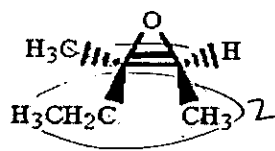
Question 12: Which of the following is not a reduction reaction?



Question 13: Draw the major organic product generated in the reaction below. Pay particular attention to regio- and stereochemical detail.

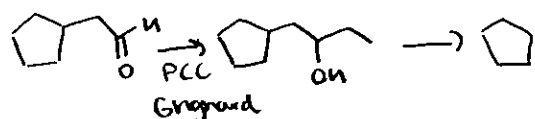
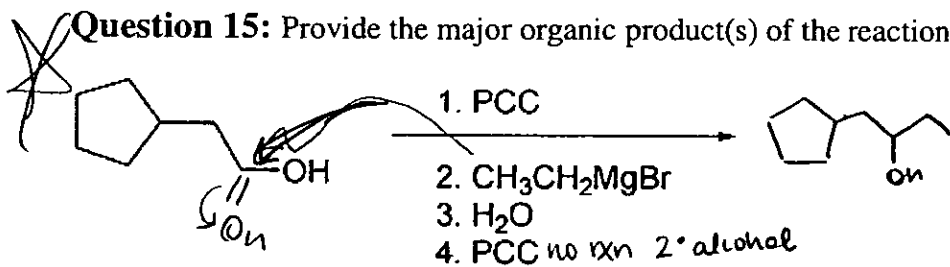


Question 14: What alkene would you treat with RCO_3H in order to obtain the compound below and its enantiomer?



- A) (Z)-2-methyl-2-pentene
 B) (E)-2-methyl-2-pentene
 C) (Z)-3-methyl-2-pentene
 D) (E)-3-methyl-2-pentene
 E) 3-methyl-1-pentene

Question 15: Provide the major organic product(s) of the reaction below.

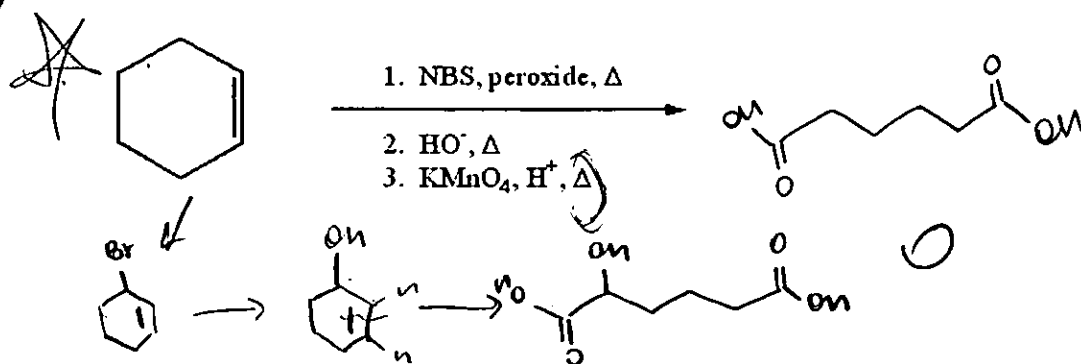


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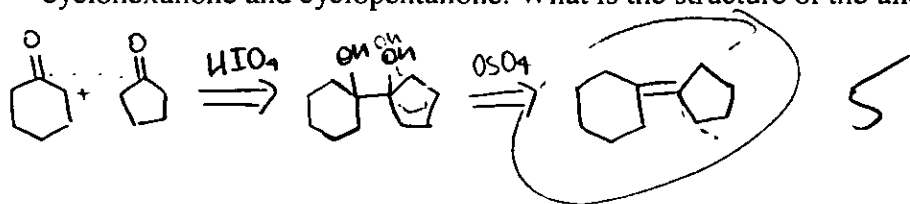
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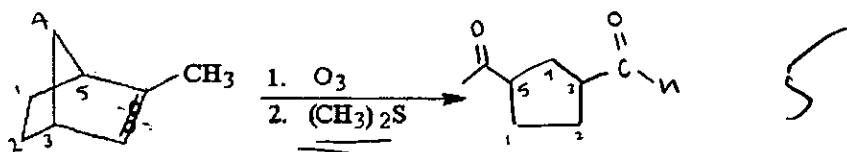
Question 16: Provide the major organic products of the following.



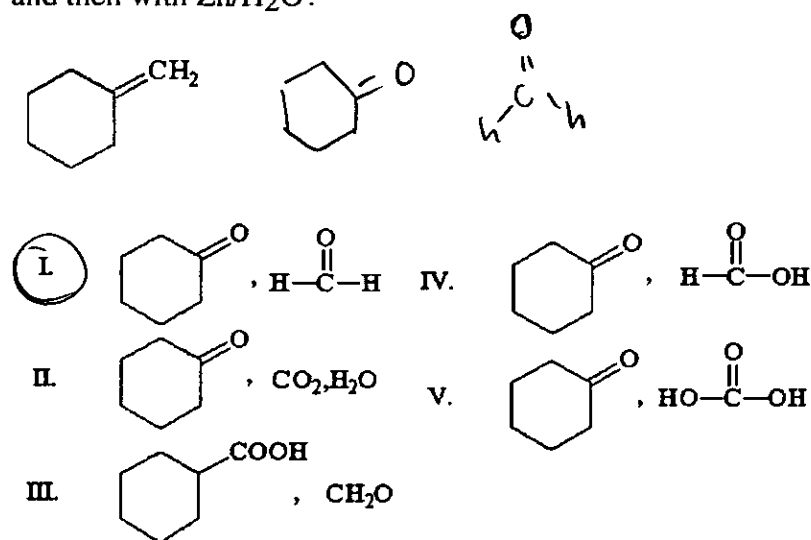
Question 17: An alkene is treated with OsO_4 followed by aqueous NaHSO_3 and the resulting product is treated with periodic acid. The product mixture of this sequence contains an equimolar mixture of cyclohexanone and cyclopentanone. What is the structure of the alkene?



Question 18: Draw the major organic product generated in the reaction below. Pay particular attention to regio- and stereochemical detail.

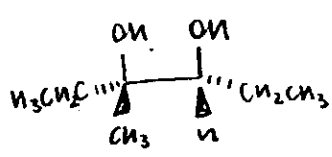
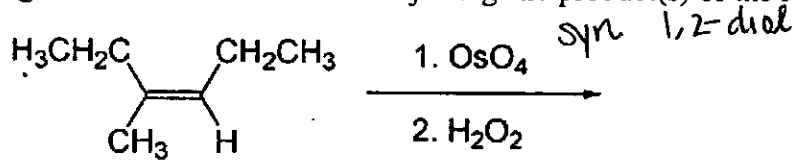


Question 19: What are the major organic products when the following molecule is treated with ozone, and then with $\text{Zn}/\text{H}_2\text{O}$?

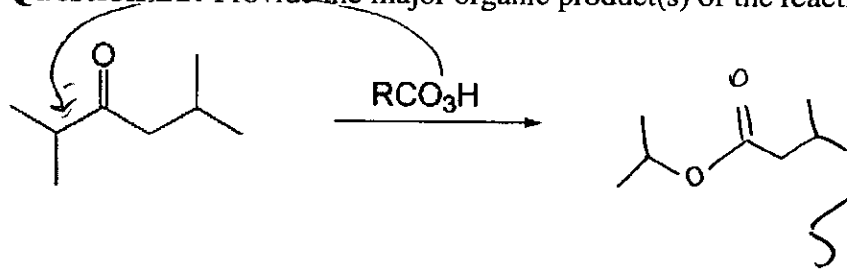


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Question 20: Provide the major organic product(s) of the reaction below.



Question 21: Provide the major organic product(s) of the reaction below.



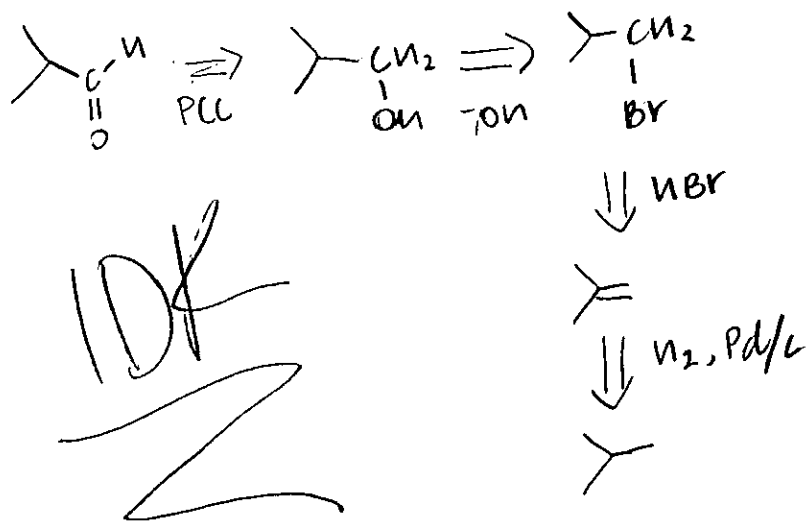
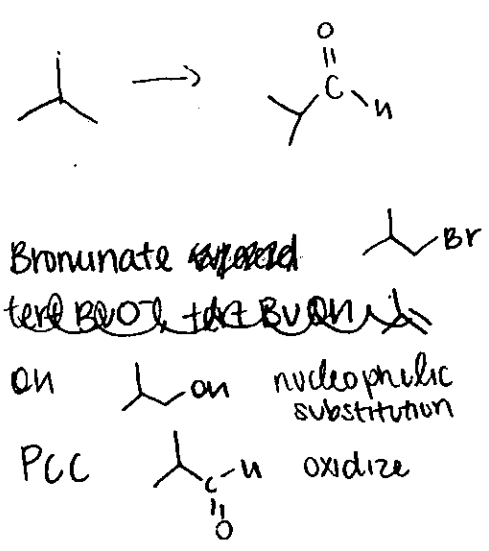
Baeyer-Villiger
921

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Question 22: What series of synthetic steps could be used to prepare $(CH_3)_2CHCHO$ from isobutane?

- 1) Br_2, hv, Δ
- 2) ^-OH
- 3) PCC
- 4)
- 5)

0 10/80

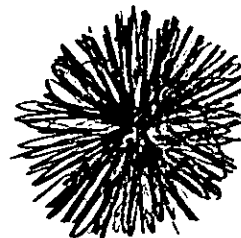
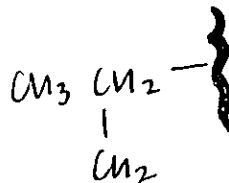


Exam 5

Question 1: Which of the following terms best describes the side chain of valine?

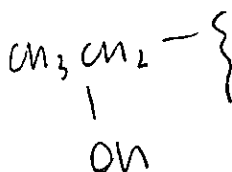
HON Chem 3152 Soloshonok

- A) acidic
- B) basic
- C) charged, polar
- D) uncharged, polar
- E) nonpolar

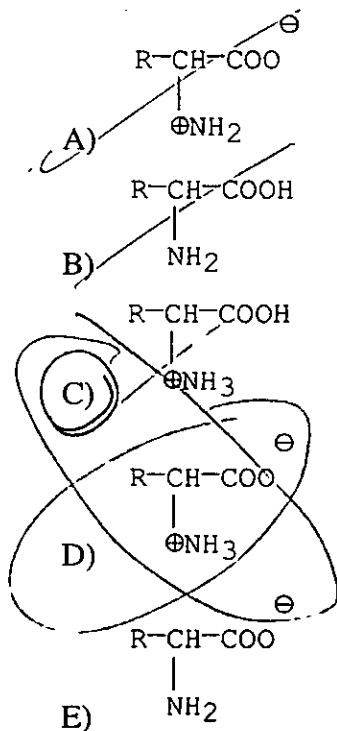


Question 2: Which of the following amino acids is not an aromatic compound?

- A) phenylalanine
- B) threonine
- C) histidine
- D) tryptophan
- E) tyrosine



Question 3: Which of the following is a zwitterion?



10

for final:
GO over past exams,
especially 1st 3
14 questions on test
book: notes allowed

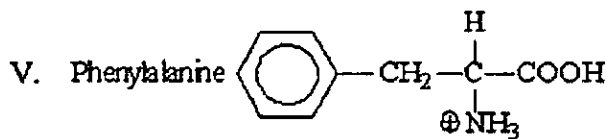
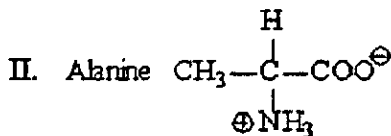
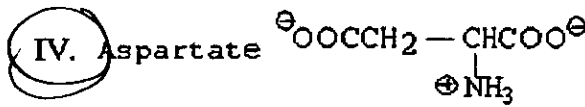
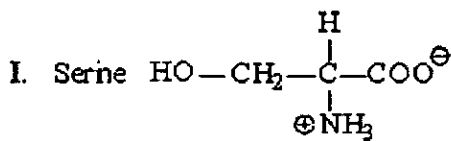
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Question 4: What is electrophoresis?

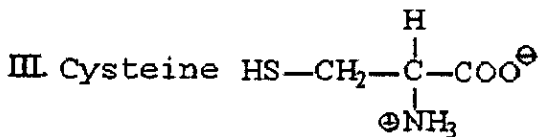
- A) a technique that separates amino acids on the basis of their polarity
- B) a technique that separates amino acids on the basis of their solubility in water
- C)** a technique that separates amino acids on the basis of their pI values
- D) a technique that separates amino acids on the basis of pKa of α -COOH values
- E) a technique that separates amino acids on the basis of pKa of α -NH₃ values

Question 5: Which of the following amino acids will be closest to the origin when separated by thin-layer chromatography?

most polar

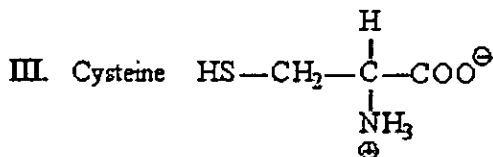
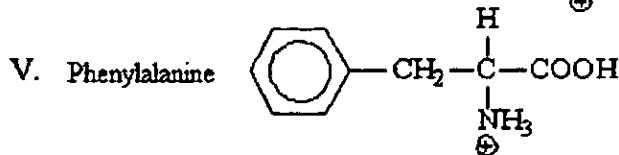
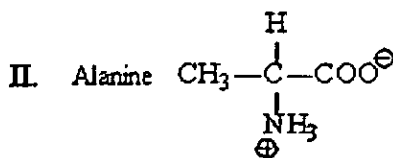
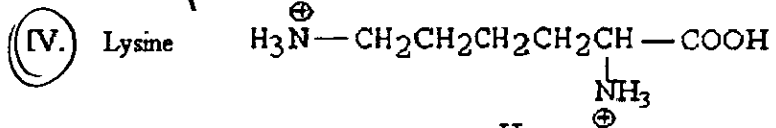
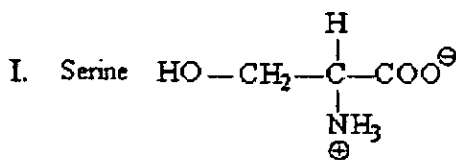


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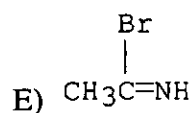
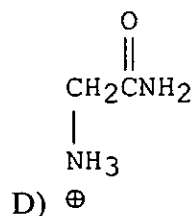
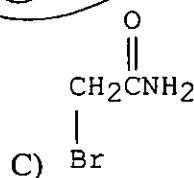
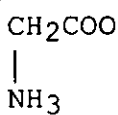
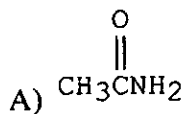
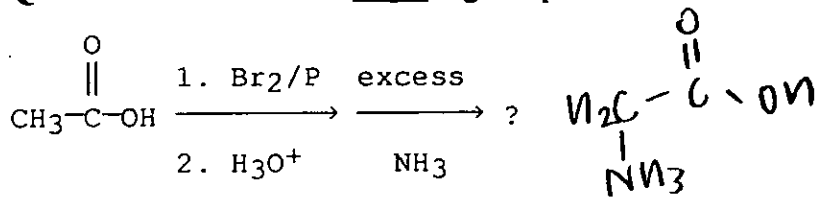
Question 6: Which of the following amino acids will be retained longest in the column when separated by cation-exchange chromatography?

most positive



15/25

Question 7: What is the major organic product of the following reaction?

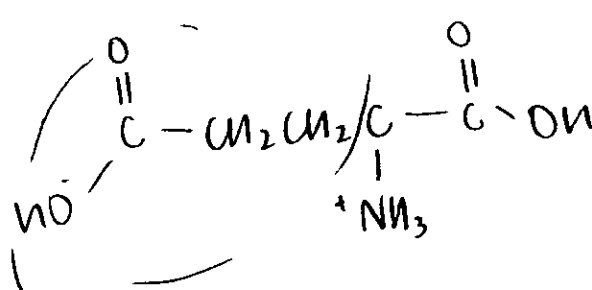


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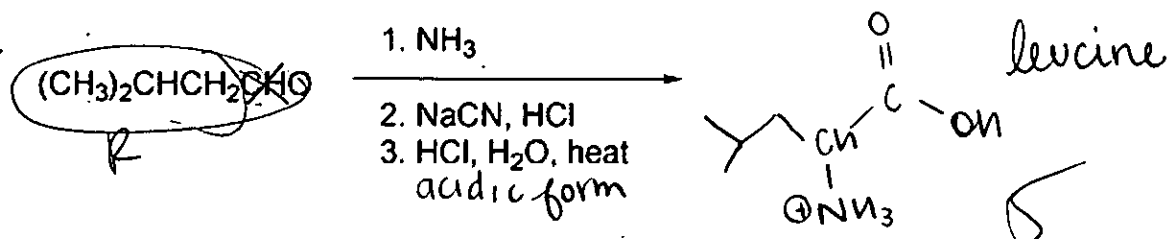
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Question 8: What amino acid can be obtained by the reductive amination of γ -ketoglutaric acid, $\text{HO}_2\text{CCH}_2\text{CH}_2\text{COCOO}_2\text{H}$?

- A) glycine
- B) serine
- C) lysine
- D) aspartic acid
- E) glutamic acid**



Question 9: Provide the major organic product(s) of the reaction below.



Question 10: Explain what is meant by kinetic resolution and give an example.

kinetic resolution is using an enzyme to synthesize only one isomer of an amino acid: only the L, instead of D, for example. usually a biological enzyme is used b/c in nature, majority of amino acids are in the L configuration

Question 11: In conventional peptide synthesis, the nitrogen of a given amino acid must be deactivated or blocked while the carboxyl group is activated. Which of the following reagents is used to protect the amino group of an amino acid?

- 1) di-tert-butyl dicarbonate t-BOC
 - 2) dicyclohexylcarbodiimide
 - 3) ninhydrin
 - 4) trifluoroacetic acid
 - 5) Phenylisothiocyanate
- 5* *35*

Question 12: Which type of protein, globular or fibrous, tends to function primarily as structural parts of an organism?

- A) globular
 - B) fibrous
- 6*

Question 13: Which of the following is the first step in the determination of the primary structure of proteins?

- A) determining the number and kind of amino acids in the peptide
 - B) reducing the disulfide bridges in the protein
 - C) protecting the N-terminal of the peptide
 - D) protecting the C-terminal of the peptide
 - E) hydrolyzing the protein with dilute acid
- 25/60*

Question 14: Draw vertical lines through the peptide bonds in the decapeptide below that will be cleaved by cyanogen bromide.

Try-Ser-Ala-Met-Ser-Pro-Met-Gly-Gly-Asp

Question 15: What is the major force responsible for the formation of an α -helix in protein secondary structure?

hydrogen bonding

Question 16: Which of the following is the quaternary structure of proteins concerned with?

- A) sequence of amino acids in the peptide chain
- B) description of the way the peptide chains are arranged with respect to each other
- C) location of the disulfide bridges in the peptide chain
- D) conformation of the protein backbone
- E) three-dimensional arrangement of all atoms in the protein

Question 17: Which of the following protein structures does denaturation destroy?

- A) primary and secondary structures
- B) secondary and tertiary structures
- C) tertiary and quaternary structures
- D) secondary, tertiary, and quaternary structures

Question 18: Which of the following are capable of denaturing proteins?

- A) organic solvents
- B) detergents
- C) extreme pH
- D) Heat
- E) all of the above

Question 19: The monomeric units that make up peptides and protein polymers are:

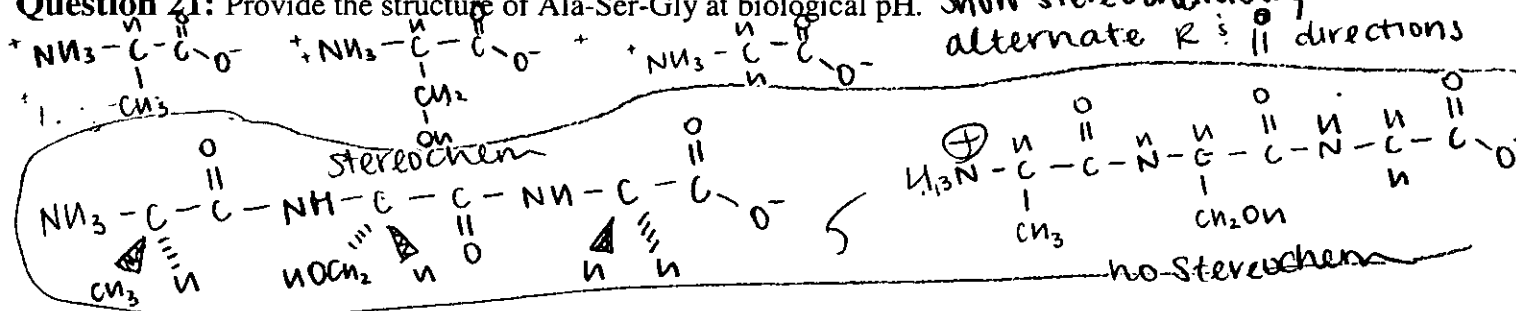
- A) nucleic acids.
- B) amino acids.**
- C) oligosaccharides.
- D) amylopectins.
- E) celluloses.

Question 20: What are enzymes?

- A) saccharides that catalyze chemical reactions
- B) nucleic acids that catalyze chemical reactions
- C) unsaturated fats that catalyze chemical reactions
- D) DNA molecules that catalyze chemical reactions
- E) proteins that catalyze chemical reactions**

85

Question 21: Provide the structure of Ala-Ser-Gly at biological pH. Show stereochemistry



Question 22: Please synthesize an amino acid starting from benzaldehyde, hydrogen cyanide and ammonia – all these molecules were credibly detected in dust clouds in Andromeda constellation.

