

LESSON 5.6

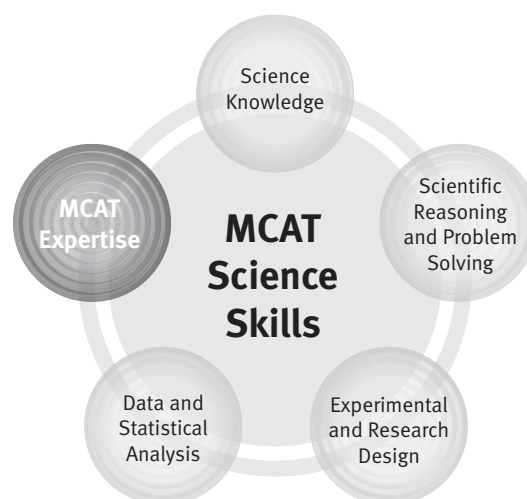
Strategic Guessing

In this lesson, you'll learn to:

- Choose the answer most likely to be correct when guessing the answer to a question

Science Topics:

- Alcohols
- Aldehydes and Ketones
- Carboxylic Acids
- Acid Derivatives
- Molecular Structure and Absorption Spectra





LESSON 5.6, LEARNING GOAL 1:

- Choose the answer most likely to be correct when guessing the answer to a question

Math Estimation

1. Simvastatin's concentration is measured and calculated by the following equation:

$$A = \varepsilon \times l \times c$$

The cuvette length, l , is 0.5 cm; ε is 18,000; and absorbance, A , is equal to $2 - \log(T)$, where T is the percent transmittance $\times 100$ found in the experiment. If the percent transmittance is 10 percent, what is simvastatin's concentration, c ?

- A. 5.7×10^{-4} M
- B. 1.1×10^{-4} M
- C. 8.2×10^{-5} M
- D. 2.5×10^{-5} M

How can you eliminate wrong answers in this question?

2. Specific rotation, $[\alpha]$ (units of $^{\circ} \cdot \text{dm}^{-1} \cdot \text{mL} \cdot \text{g}^{-1}$), for D-glucose is $+52.5$, and observed rotation, α , for D-glucose in an experiment is 7.80° . Using the equation:

$$[\alpha] = \frac{\alpha}{l \times c}$$

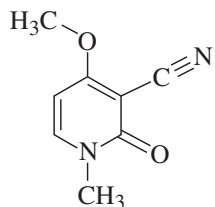
where l is the sample tube length (1 dm in this case), what is the concentration, c , of D-glucose?

- A. 1.49×10^{-1} g/mL
- B. 1.52×10^{-2} g/mL
- C. 3.78×10^{-2} g/mL
- D. 2.56×10^{-3} g/mL

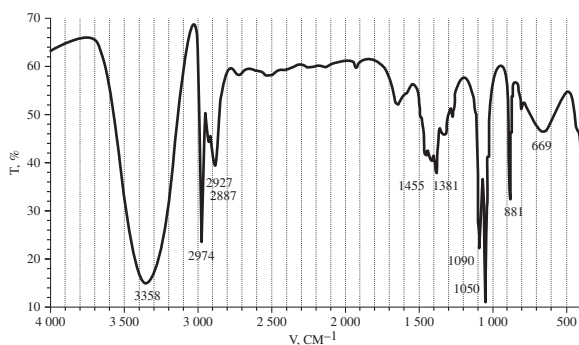
How can you eliminate wrong answers in this question?

Answer Implications

3. The following is the chemical composition of ricinine:



The following IR spectrum was obtained from an unknown compound:



Is this the IR spectrum for the alkaloid ricinine?

- A. Yes, as confirmed by the presence of the peak at 3300 cm^{-1} .
- B. Yes, as confirmed by the absence of the peak at 1750 cm^{-1} .
- C. No, as confirmed by the absence of the peak at 1750 cm^{-1} .
- D. Not enough information is given.

How can you eliminate wrong answers in this question?

Equivalent or Extreme Answers

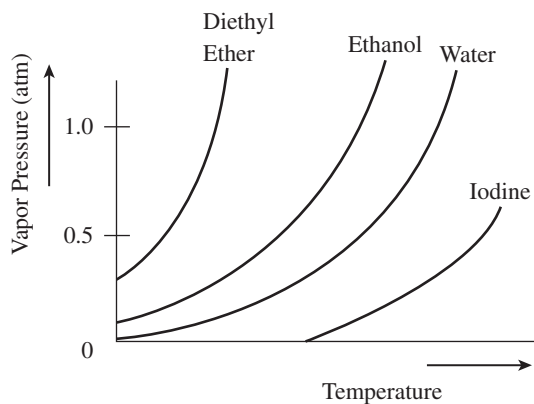
4. The rate of the first step in the cross-linking reaction will be increased by acidic conditions. This is because acidic conditions:
- A. cause lysine's amino group to protonate, making it more nucleophilic.
 - B. garner nucleophilic quality by attaching a hydrogen ion to the amino group of lysine.
 - C. decrease the rate at which imine intermediate is formed.
 - D. make the formation of an oxocarbenium intermediate more likely.
5. The mechanism of 4-aminobutanoic acid lactam synthesis proceeds through each of the following steps EXCEPT:
- A. nucleophilic addition to form a by-product.
 - B. condensation reaction involving an amine group.
 - C. loss of water from the product.
 - D. nucleophilic attack on the carbonyl carbon.

How can you eliminate wrong answers in this question?

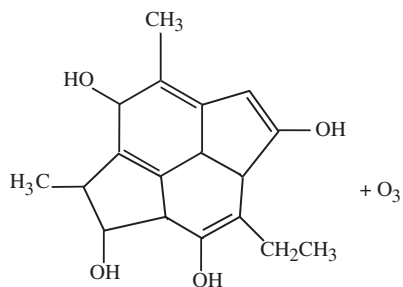
How can you eliminate wrong answers in this question?

Maximum and Minimum Questions

6. The figure below shows plots of the vapor pressure of several compounds as a function of temperature. Which of them has the lowest boiling point if the ambient pressure is 0.5 atm?



- A. Diethyl ether
B. Ethanol
C. Water
D. Iodine
7. How many ketone groups are found in the product of the following reaction?



- A. 0
B. 5
C. 8
D. 15

How can you eliminate wrong answers in this question?

How can you eliminate wrong answers in this question?



Roman Numeral Questions

8. Which of the following is/are true of compound A, the product of the student's first experiment?

- I. It has a conjugated pi system.
 - II. It has adjacent carbon atoms with unhybridized *p*-orbitals.
 - III. It is more stable than compound B.
- A. I only
 - B. I and II
 - C. II and III
 - D. I, II, and III

How can you eliminate wrong answers in this question?

KAPLAN TIP

Roman numeral questions, while rare on the MCAT, do have an advantage with strategic guessing because there are two rounds of elimination possible: first eliminating the Roman numerals and then eliminating answer choices containing those Roman numerals.





Questions in the CARS Section

Passage Excerpt:

Since nontherapeutic experimentation confers no benefit on the subject, it has been more controversial. While the need for nontherapeutic experimentation is now generally accepted, there is still controversy over how best to select or encourage volunteers. Finally, although those conducting both therapeutic and nontherapeutic experiments have attempted to take precautions by conducting their research on animals first, there remains an inevitable risk for human volunteers. To minimize possible hazards, certain traditional safeguards have been utilized.

Tone

9. In which of the following ways do therapeutic experimentation and nontherapeutic experimentation differ?
- A. Therapeutic experimentation offers volunteers improved health as an incentive.
 - B. Nontherapeutic experimentation is a relic of a bygone era in medical science.
 - C. Therapeutic experimentation is performed on healthy volunteers.
 - D. Nontherapeutic experimentation is not consistent with conventional medical ethics.

How can you eliminate wrong answers in this question?

Vague Language

10. On the subject of nontherapeutic experimentation, the scientific community has been:
- A. divided over the necessity of obtaining an informed consent from subjects' physicians.
 - B. somewhat more receptive of therapeutic research than of nontherapeutic research.
 - C. completely opposed to the sentiments expressed by other members of society on this issue.
 - D. appalled by the government's delayed acceptance of nontherapeutic testing.

How can you eliminate wrong answers in this question?

KAPLAN TIP

There's no such thing as a "best" Blind Guessing strategy, but the strategies from this lesson are a good way to approximate the answer if you're stuck.





LESSON 5.6 REVIEW

Strategic Guessing—Question and Answer Characteristics

Questions have...

- Math that will take too much time or is easy to estimate
- Aspects about tone in a CARS passage

Answers have...

- Obvious patterns
- Logic dictating some choices must be wrong
- Extreme choices
- Roman numerals

TEST-SPECIFIC SITUATIONS FOR STRATEGIC GUESSING

- When running out of time
- When you don't know the answer
- Anytime guessing is much easier or faster than answering a different way

Chemistry and Physics 3: Strategic Guessing

PASSAGE I (QUESTIONS 1–6)

Antibiotics are naturally derived substances released by microorganisms for defense against pathogens in their environment. Discovered in 1928, penicillin, a product of a genus of mold called *Penicillium*, instigated the recognition that antibacterial agents can be used within the body to combat human pathogens. Penicillin itself is a member of the lactam group, a type of cyclic amide. These molecules are most commonly formed through the reaction of an amino group with a carboxylic acid group of an amino acid.

An example of a general lactam formation reaction is the reaction of 4-aminobutanoic acid. The addition of heat results in 4-aminobutanoic acid lactam. The product is named by adding the word *lactam* to the IUPAC name of the acid. See Figure 1.

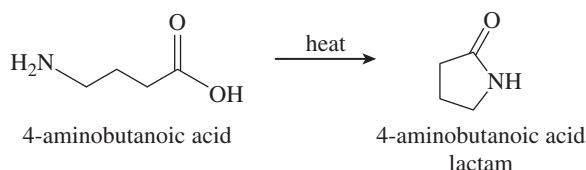


Figure 1. Lactam formation reaction.

In contrast to a lactam, a beta-lactam is unusually reactive. Due to considerable ring strain, the beta-lactam will acylate other nucleophiles. During the acylation reaction, opening of the ring allows the release of strain. See Figure 2.

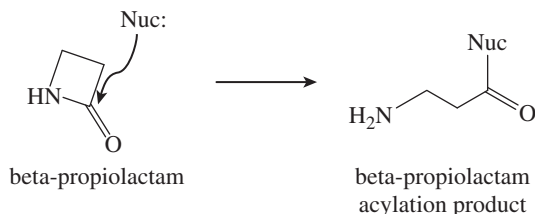


Figure 2. Beta-lactam acylation reaction.

The ring-opening acylation reaction provides the critical functionality of penicillin, which contains a beta-lactam ring coupled with a saturated pentane ring that contains a sulfur heteroatom. Antibiotics such as penicillin provide therapeutic action by acylating serine residues on essential bacterial enzymes located along the pathway for cell-wall synthesis. During the acylation, penicillin takes advantage of the hydroxyl group of serine to convert its amide to an ester, simultaneously freezing the conformation of the serine residue and thus inactivating the enzyme for cell-wall synthesis. Without a cell wall, the bacterium cannot survive.



- To synthesize 4-aminobutanoic acid, a primary amine must be added to butanoic acid. 4-Aminobutanoic acid can then form 4-aminobutanoic acid lactam. Rank the predicted boiling points of the three acids important for 4-aminobutanoic acid lactam synthesis.
 - butanoic acid > 4-aminobutanoic acid lactam > 4-aminobutanoic acid
 - 4-aminobutanoic acid lactam > 4-aminobutanoic acid > butanoic acid
 - 4-aminobutanoic acid > butanoic acid > 4-aminobutanoic acid lactam
 - 4-aminobutanoic acid lactam > butanoic acid > 4-aminobutanoic acid
- The mechanism of 4-aminobutanoic acid lactam synthesis involves the formation and breaking of bonds. Which of the following indicates the bonds formed, and bonds broken, respectively?
 - N—H, O—H; N—C, O—C
 - N—C, N—H; O—C, N—C
 - N—O, N—H; O—C, N—C
 - N—C, O—H; N—H, O—C
- The mechanism of 4-aminobutanoic acid lactam synthesis proceeds through each of the following steps EXCEPT:
 - nucleophilic addition to form a by-product.
 - condensation reaction involving an amine group.
 - loss of water from the product.
 - nucleophilic attack on the carbonyl carbon.
- A likely intermediate in beta-lactam synthesis is:
 - a carbanion.
 - a carbocation.
 - an oxygen anion.
 - a nitrogen anion.
- Which functional group is NOT present in penicillin?
 - ether
 - thiol
 - amide
 - amine
- Penicillin acts by acylating the hydroxyl group of a serine residue on a key bacterial biosynthetic enzyme. The reaction converts an amide to an ester, not what one would predict given the two functional groups' relative reactivities. The most plausible explanation for this reversal is that:
 - the energetic release of ester formation is overwhelmed by the energetic cost of amide-ring breakage.
 - the energetic cost of ester formation is overwhelmed by the energetic release of amide-ring breakage.
 - the energetic cost of amide formation is overwhelmed by the energetic release of ester-ring breakage.
 - the energetic release of amide formation is overwhelmed by the energetic cost of ester-ring breakage.

PASSAGE II (QUESTIONS 1–5)

Chemical fixation is a process by which biological tissues are preserved from decay. One of the most popular chemical fixatives is formaldehyde.

Formaldehyde preserves tissue by driving cross-linking reactions in the tissue. These are reactions that result in the fusion of proteins. From a molecular perspective, cross-linking preserves protein structure and anchors proteins to the cytoskeleton. In addition, other biological molecules associated with proteins may remain trapped within a “web” of cross-linked proteins. Cross-linking results in an increase in the mechanical strength, rigidity, and stability of the tissue, improving a specimen’s longevity.

Interestingly, when an aqueous formaldehyde solution is used as a chemical fixative, the molecule formaldehyde itself is not, strictly speaking, actually a reactant in cross-linking reactions. This is because formaldehyde spontaneously reacts with water to form methanediol ($K_{eq} = 2000$), which is the molecule that drives cross-linking reactions. Figures 1 and 2 show a cross-linking reaction between the amino acid lysine and the amino acid glutamine. Figure 1 shows the first step of this reaction. In this step, a hydroxyl group is eliminated from methanediol to form an oxocarbenium intermediate, which is then attacked by the amino group on lysine. The product of this reaction undergoes a second elimination step, forming an imine intermediate.

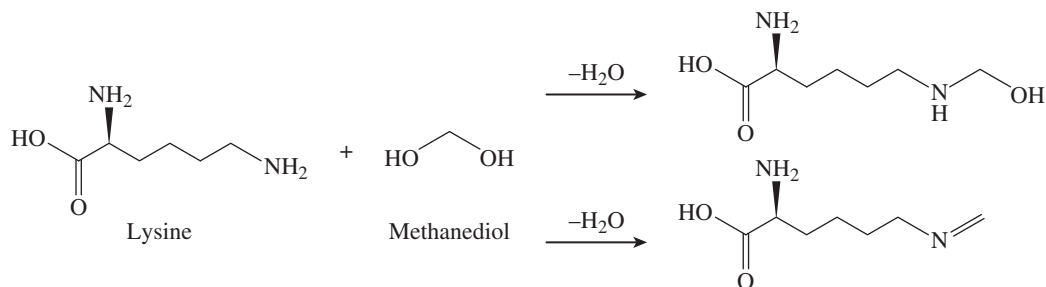


Figure 1. First step of the cross-linking reaction.

In the second and final step of the reaction, shown in Figure 2, this imine intermediate is attacked by the amide group on glutamine. This step completes the formation of the cross-link between lysine and glutamine. The mechanism for amino acid residues in gross proteins is similar.

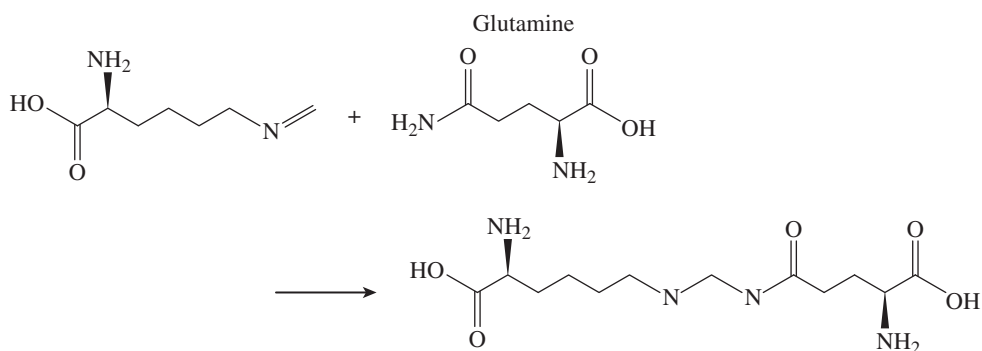
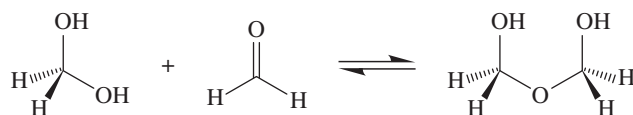


Figure 2. Last step of the cross-linking reaction.

1. Methanediol spontaneously polymerizes with formaldehyde, as shown below.



This reaction is an example of:

- A. nucleophilic addition.
 - B. hydration.
 - C. bimolecular substitution (S_N2).
 - D. unimolecular substitution (S_N1).
2. Formaldehyde spontaneously forms methanediol in aqueous solution. This reaction is an example of:
- A. hemiacetal formation.
 - B. hydration.
 - C. bimolecular substitution (S_N2).
 - D. unimolecular substitution (S_N1).
3. The first step in the cross-linking reaction is an example of what reaction type?
- A. Nucleophilic acyl substitution
 - B. Hydration
 - C. Aldol condensation
 - D. Ammonia derivative condensation
4. If 0.1 g formaldehyde is added to 100 mL of water and allowed to come to equilibrium, what will be the approximate methanediol concentration?
- A. 0.01 M
 - B. 0.1 M
 - C. 1 M
 - D. 10 M
5. The rate of the first step in the cross-linking reaction will be increased by acidic conditions. This is because acidic conditions:
- A. cause lysine's amino group to protonate, making it more nucleophilic.
 - B. hinder the conversion of formaldehyde to methanediol.
 - C. decrease the rate at which imine intermediate is formed.
 - D. make the formation of an oxocarbenium intermediate more likely.

PASSAGE III (QUESTIONS 1–5)

A young boy had been playing with his neighboring family's several children and two dogs during a party the previous day. The next day, the young boy was found to be suffering from vomiting and severe diarrhea. The boy's parents took immediate action and rushed the boy to the local hospital. Given the occupation of the family whose children and dogs this young boy had been playing with, a family friend suspected ricin poisoning. Clinicians performed experiments to investigate this possibility, given that the identification of ricin poisoning could affect treatment options.

The ricin protein is derived from castor beans. It is composed of two subunits, one with a MW of approximately 32 kDa (267 amino acids) and the other of 34 kDa (262 amino acids). It functions by blocking ribosome function. Signs of ricin poisoning are consistent with the symptoms displayed by the patient.

Another toxin found in castor beans, also known to cause diarrhea, is ricinine. Its structure is depicted in Figure 1. Ricinine's presence in urine is an indicator of ricin poisoning.

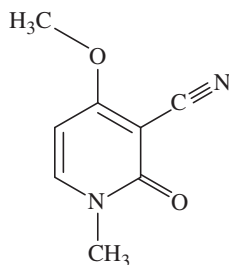
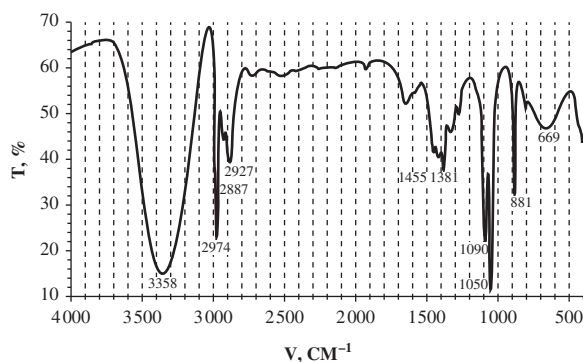


Figure 1. Ricinine.

There are no proven antidotes for either toxin. Treatment is limited to supportive care, including IVs and drugs to maintain blood pressure. Exposure is usually fatal.

- Which would be the easiest method to separate the two subunits of the ricin polypeptide?
 - Polyacrylamide gel electrophoresis
 - Distillation
 - Gas chromatography
 - Extraction in a 70% ethanol in water solution
- Is this the IR spectrum for the alkaloid ricinine?
- Which molecule could be used for the detection of the ricin protein in a sample?
 - Cholesterol
 - Theobromine
 - Acetyl-coenzyme A
 - Antibody
- The effects of ricin are not immediate. It can take several hours for its effects to be seen. What best explains this?

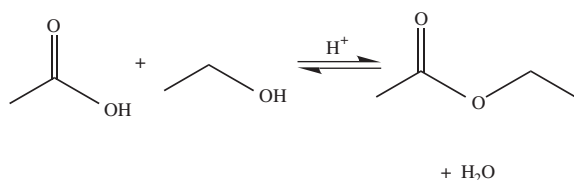


- Yes, as confirmed by the presence of the peak at 3300 cm^{-1}
 - Yes, as confirmed by the absence of the peak at 1750 cm^{-1}
 - No, as confirmed by the absence of the peak at 1750 cm^{-1}
 - Not enough information is given.
- Ricin, like all proteins, is poorly soluble in water and is not transported by the blood very well.
 - Ricin is polar, so it takes time for it to cross the nuclear membrane and bind to DNA.
 - Ricin shuts down new protein production but does not affect already synthesized proteins.
 - Ricin is immediately filtered from the blood by the kidneys and excreted in urine.
- Which is the most effective method for isolating benzoic acid from a solution also containing an alcohol?
 - Extraction with a strong acid
 - Extraction with a weak acid
 - Extraction with a strong base
 - Extraction with a weak base

PASSAGE IV (QUESTIONS 1–5)

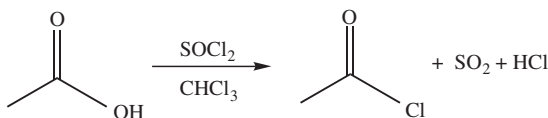
Esters are carboxylic acid derivatives that have a variety of industrial uses. Because they have pleasant odors, they are often used in fruit drinks, soaps, and perfumes. They are also used as solvents and softeners in the polymer industry. In alcoholic beverages, especially beer, ester usage has to be carefully monitored depending on whether the taste requirements of the beverage include a fruity flavor.

Esters can be synthesized by a process known as esterification, wherein a carboxylic acid and an alcohol are reacted with a catalytic amount of a mineral acid. The reaction is very slow, and the ester is produced in equilibrium concentrations. Formation of the ester can be favored by using an excess of one of the reactants, as shown in Reaction 1.

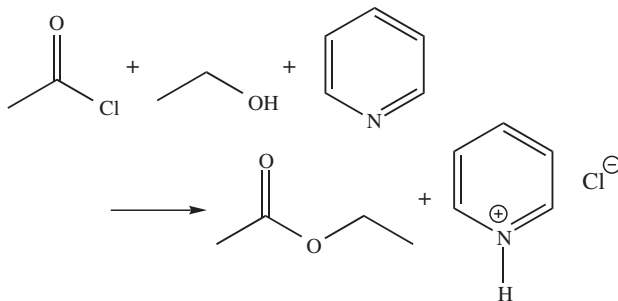


Reaction 1. Formation of the ester.

One way to avoid the rate and equilibrium problems of esterification is by reacting an acyl chloride with an alcohol. Ethanoyl chloride is synthesized by the reaction of acetic acid and thionyl chloride, as shown in Reaction 2. Ethanoyl chloride is then reacted with ethanol in the presence of pyridine, according to Reaction 3, to produce ethyl acetate. HCl is a by-product of this reaction.

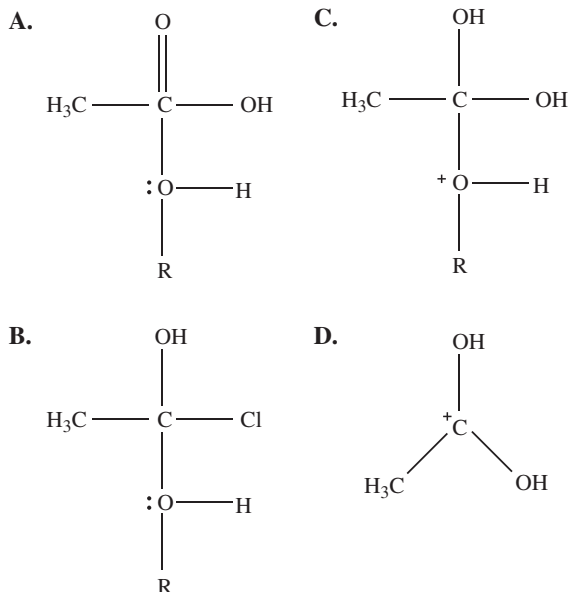


Reaction 2. Ethanoyl chloride formation



Reaction 3. Ethyl acetate formation.

1. Which of the following correctly represents the intermediate of the esterification after nucleophilic attack by the alcohol?

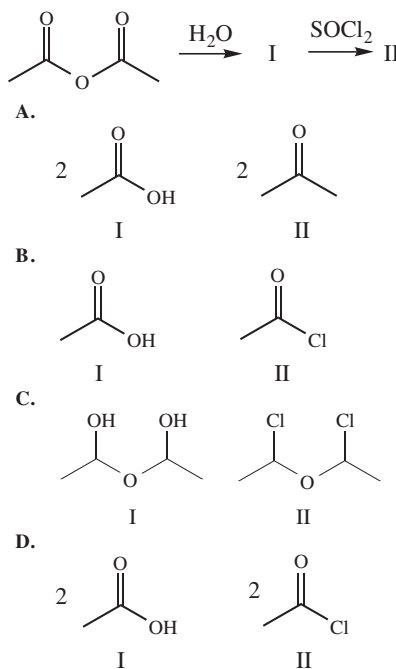


2. What is the role of pyridine in Reaction 3?
- To neutralize the inorganic acid product, preventing catalysis of ester hydrolysis upon aqueous workup
 - To neutralize the inorganic acid product, thereby preventing the formation of the ester product
 - To neutralize the organic acid product, preventing catalysis of ester hydrolysis upon aqueous workup
 - To neutralize the organic acid product, preventing catalysis of the reverse reaction
3. Why should esterification reactions not be carried out in water?
- Acetic acid is insoluble in water.
 - The polar nature of water overshadows the polar nature of the carboxyl group.
 - The extensive hydrogen bonding of water interferes with the S_N2 reaction mechanism.
 - Water molecules would hydrolyze useful products back to the parent carboxylic acid.

4. Which of the following represents an increasing order of acidity in organic compounds?

- CH_3OCH_3 , CH_3CHO , CH_3COOH , $\text{CH}_3\text{CH}_2\text{OH}$
- CH_3OCH_3 , CH_3CHO , $\text{CH}_3\text{CH}_2\text{OH}$, CH_3COOH
- CH_3CHO , CH_3OCH_3 , CH_3COOH , $\text{CH}_3\text{CH}_2\text{OH}$
- CH_3CHO , CH_3OCH_3 , $\text{CH}_3\text{CH}_2\text{OH}$, CH_3COOH

5. What are Compounds I and II in the following reaction?



PASSAGE V (QUESTIONS 1–4)

Cyclohexanol is used in a variety of industrial cases. It can be used as a precursor for various chemical processes, including the formation of nylons. It can also be used as a plasticizer or, in miniscule amounts, as a solvent. Because of this, many chemical companies keep cyclohexanol around as chemical reaction “feedstock.” Cyclohexanol undergoes the acid-catalyzed elimination of water to form cyclohexene. See Figure 1.

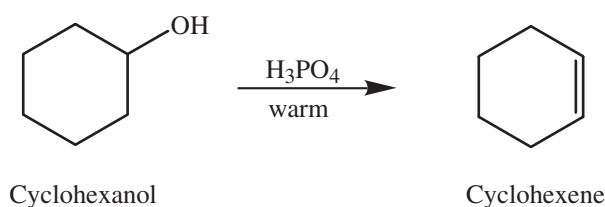


Figure 1. Acid-catalyzed formation of cyclohexene.

The reaction takes place via the conjugate acid of cyclohexanol, which loses a molecule of water in the rate-limiting step to form the secondary carbocation, which then transfers a proton to the solvent to give the alkene.

In contrast to the dehydration of cyclohexanol, which can give only a single alkene upon dehydration, a mixture of as many as four alkenes results from the dehydration of 2-methylcyclohexanol. See Figure 2.

A chemistry student wishing to investigate elimination reactions studied the dehydration of 2-methylcyclohexanol. In the reaction, the student heated 2-methylcyclohexanol with 85% phosphoric acid to produce a mixture of alkenes, which was subjected to gas chromatographic analysis. A summary of the starting materials used and the results obtained are shown in Table 1.

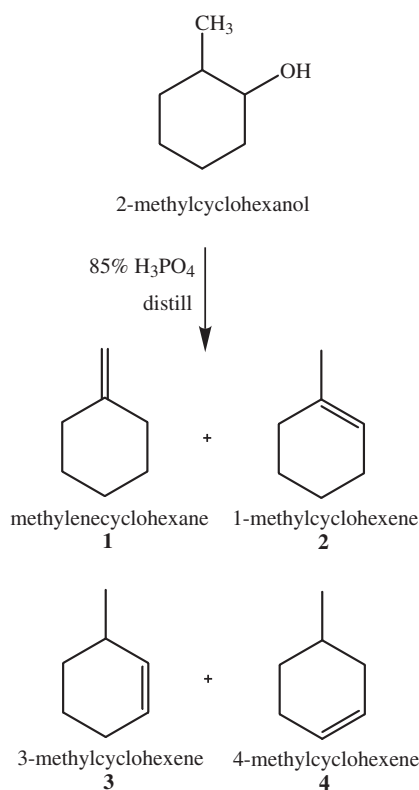


Figure 2. The dehydration of 2-methylcyclohexanol.

Compound	2-methylcyclohexanol	1	2	3	4
mmol used	50				
bp (°C)	161	103	110	103	102
% yield		5	73	20	3

Table 1. Results of the dehydration of 2-methylcyclohexanol.

- Compound 2, 1-methylcyclohexene, is the major product of the dehydration of 2-methylcyclohexanol because:
 - the secondary carbocation formed in the rate-determining step transfers a proton to the solvent.
 - the primary carbocation formed in the rate-determining step transfers a proton to the solvent.
 - the secondary carbocation formed in the rate-determining step rearranges to a more stable tertiary carbocation, which transfers a proton to the solvent.
 - the tertiary carbocation formed in the rate-determining step rearranges to a more stable secondary carbocation, which transfers a proton to the solvent.
- The 2-methylcyclohexanol used in this experiment is actually a mixture of two diastereomers, *cis*-2-methylcyclohexanol and *trans*-2-methylcyclohexanol. Does this fact make any difference in the product composition?
 - Yes, because the *cis* isomer will react preferentially over the *trans*.
 - Yes, because the *trans* isomer will react preferentially over the *cis*.
 - No, because the same intermediate carbocation is formed from either isomer.
 - No, because the intermediate carbocation will undergo rearrangement.

- The dehydration of 2-methylcyclohexanol illustrates Zaitsev's rule, which states that in a β -elimination reaction, the most highly substituted alkene will be the major product. Assuming the following reaction follows an E2 mechanism, predict the product distribution.

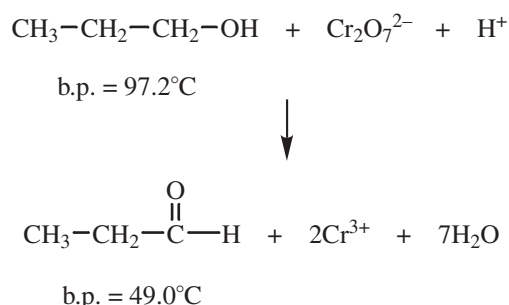
The reaction shows 2-iodo-2-methylbutane reacting with $\text{CH}_3\text{O}^\ominus \text{Na}^\oplus$ via an E2 mechanism to produce two alkenes: 2-methyl-2-butene (labeled 1) and 2-methyl-1-butene (labeled 2).

- Compound 1 will be the major product and Compound 2 will be the minor product.
 - Compound 2 will be the major product and Compound 1 will be the minor product.
 - Both products will be formed in equal amounts.
 - The product distribution is impossible to predict without experimental evidence.
- If Compound 2, 1-methylcyclohexene, were treated with Br_2 , the product of the reaction would be:
 -
 -
 -
 -



PASSAGE VI (QUESTIONS 1–5)

Two students attempted to oxidize 1-propanol to propionaldehyde (propanal) using chromic acid (H_2CrO_4), prepared *in situ* by mixing H_2SO_4 and $\text{K}_2\text{Cr}_2\text{O}_7$ (potassium dichromate). Because chromic acid is a strong oxidizing agent, both students decided to monitor the reaction by measuring the amount of chromic acid in the reaction mixture using UV-Vis spectroscopy. By recording the UV-Vis spectrum of the reaction mixture at intervals, the students hoped to prevent the 1-propanol from being oxidized beyond the aldehyde, propanal, to the carboxylic acid, propanoic acid. The equation for the oxidation of 1-propanol to propanal in the presence of chromic acid is shown below:



Equation 1. Oxidation of 1-propanol to propanal.

Student A used the following procedure. He combined 0.1 moles of potassium dichromate (0.5M $\text{K}_2\text{Cr}_2\text{O}_7$ solution in 1M H_2SO_4) and 0.25 moles of 1-propanol in a round-bottom flask. He then measured the UV-Vis absorption spectrum of the reaction mixture at 350 nm over 30-second intervals. When the peak at 350 nm disappeared, he distilled the reaction mixture under reduced pressure. In order to determine if he obtained the intended product, he recorded an IR spectrum of the distillate in CCl_4 .

Student B used a modification of Student A's procedure. She increased the amount of 1-propanol used to 0.40 moles and distilled the propionaldehyde off the reaction mixture as it was produced. Like Student A, she used the UV-Vis absorption spectrum of the reaction mixture at 350 nm to determine when the reaction was complete.

The IR data obtained from the distillates of both students is shown in Table 1.

Student	I.R. Data of Distillate (CCl_4) ν (cm^{-1})*	
A	3637(sh), 3333(br), 2963(mult), 1466(mult), 1383(mult), 1250(sh), 1090(sh)	*sh = sharp br = broad mult = multiple peaks w = weak
B	2900 (mult), 1730 (sh), 1450(mult), 1370(mult), 1270(mult), 1106(sh)	

Table 1. IR data obtained from distillates of Student A and Student B.



1. The distillate obtained by Student A is likely to be:
 - A. propanal.
 - B. propanal and water.
 - C. propionic acid.
 - D. 1-propanol.

2. The distillate obtained by Student B is likely to be:
 - A. propanal.
 - B. propanal and water.
 - C. propionic acid.
 - D. 1-propanol.

3. Why is UV-Vis a useful tool for monitoring the oxidation of 1-propanol to propanal using chromic acid?
 - I. The oxidation state of chromium changes during the reaction.
 - II. All of the dichromate ion is consumed during the reaction.
 - III. As 1-propanol is consumed, the absorption spectrum of the dichromate ion is shifted to another wavelength.
 - IV. The other compounds in the reaction mixture do not interfere with the absorption spectrum of dichromate.
 - A. I only
 - B. I and II only
 - C. III only
 - D. I, II, and IV only

4. If the students had been using proton NMR to confirm the identity of their products, what unique peak would they be looking for to confirm the presence of an aldehyde?
 - A. A peak at 1.2-ppm
 - B. A peak at 9.8-ppm
 - C. A peak at 39.3-ppm
 - D. A peak at 200.2-ppm

5. In a second experiment, Student A follows the same procedure using 2-propanol instead of 1-propanol. He measures the IR spectrum of the distillate and records the following data:

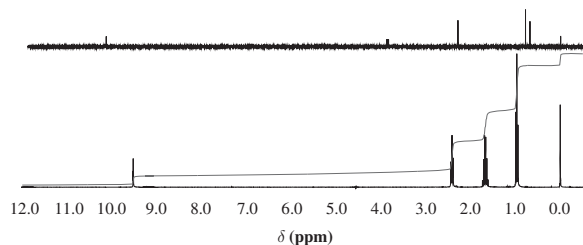
$\nu(\text{cm}^{-1})$: 2970 (w, mult), 2950 (mult), 1750 (sh), 1430 (mult), 1230 (sh), 1080 (sh)

What product does he obtain?

 - A. 2-Propanol
 - B. Propionic acid
 - C. 2-Propanone
 - D. Propanal

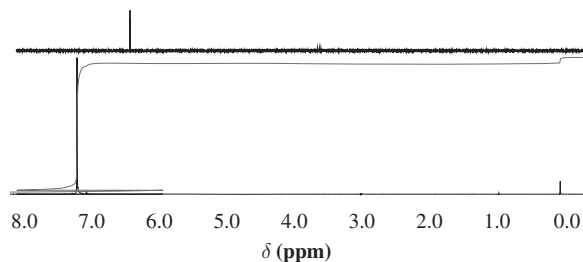
DISCRETE PRACTICE QUESTIONS (QUESTIONS 1–4)

1. Which of the following compounds will produce the given ^1H NMR spectrum?



- A. 2-Chloropentane
B. Butanal
C. Benzoic acid
D. Methanal

2. Which of the following compounds will produce the given ^1H NMR spectrum?



- A. Benzene
B. Benzoic acid
C. Acetone
D. Methane

3. What is the outcome of the reaction of acetone with methylmagnesium chloride followed by a workup with acid?

- A. 2-Chloro-2-propanol
B. 2-Chloro-2-methyl propane
C. 2-Methyl-2-propanol
D. Methyl ethanoate

4. Which of the following will undergo ester hydrolysis most rapidly?

