

شرح الدرس الرابع Compounds Organic of Reactions Other من وحدة Substituted Hydrocarbons and Their Reactions انسباير منهج



تم تحميل هذا الملف من موقع المناهج الإماراتية

موقع المناهج ← المناهج الإماراتية ← الصف الحادي عشر المتقدم ← كيمياء ← الفصل الثالث ← ملفات متنوعة ← الملف

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المزيد من مادة
كيمياء:

إعداد: Mouad

التواصل الاجتماعي بحسب الصف الحادي عشر المتقدم



صفحة المناهج
الإماراتية على
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المزيد من الملفات بحسب الصف الحادي عشر المتقدم والمادة كيمياء في الفصل الثالث

شرح الدرس الثالث Compounds Carbonyl من وحدة Reactions Their and Hydrocarbons Substituted
منهج انسباير

1

شرح الدرس الثاني Amines and Ethers ,Alcohols من وحدة Their and Hydrocarbons Substituted
انسباير منهج Reactions

2

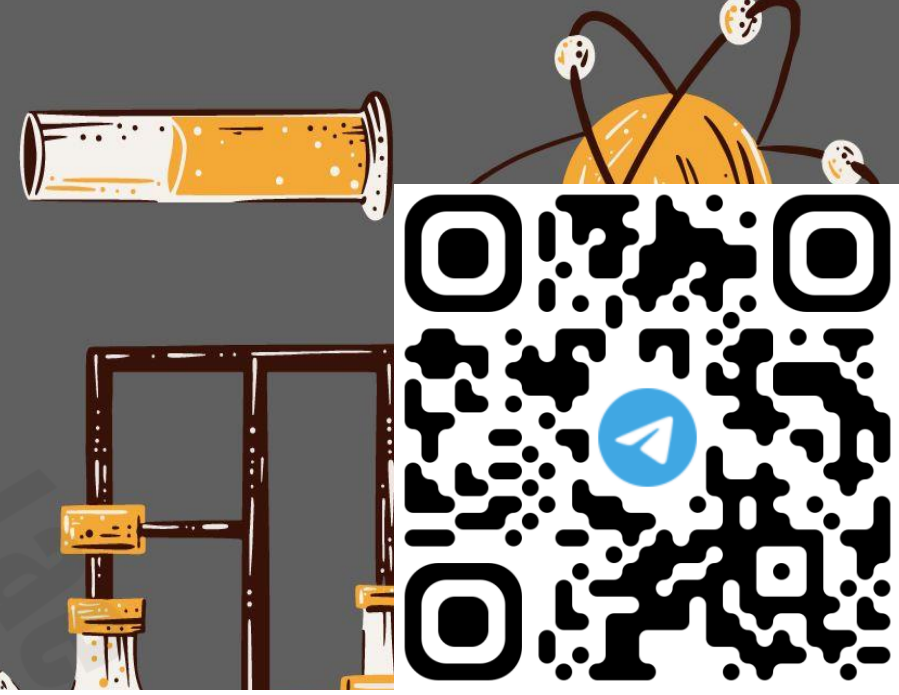
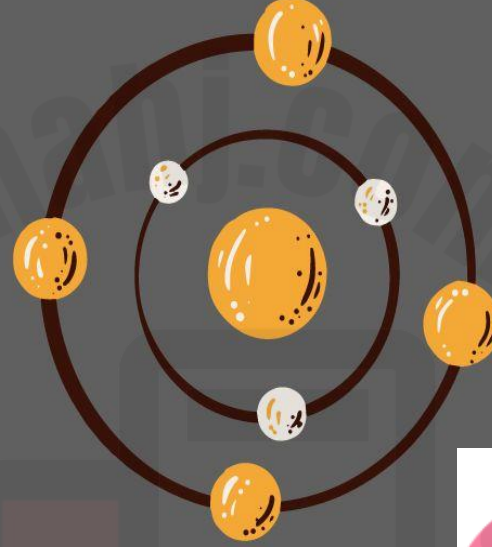
شرح الدرس الأول Halides Aryl and Halides Alkyl من وحدة Their and Hydrocarbons Substituted
انسباير منهج Reactions


3


قوانين الفصل الدراسي الثاني والثالث للوحدات (4+5+6+7)

4

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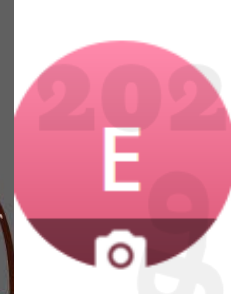
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Mr. Mouad

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Module 21

“Substituted Hydrocarbons & Their Reactions”

Other Reactions of Organic Compounds

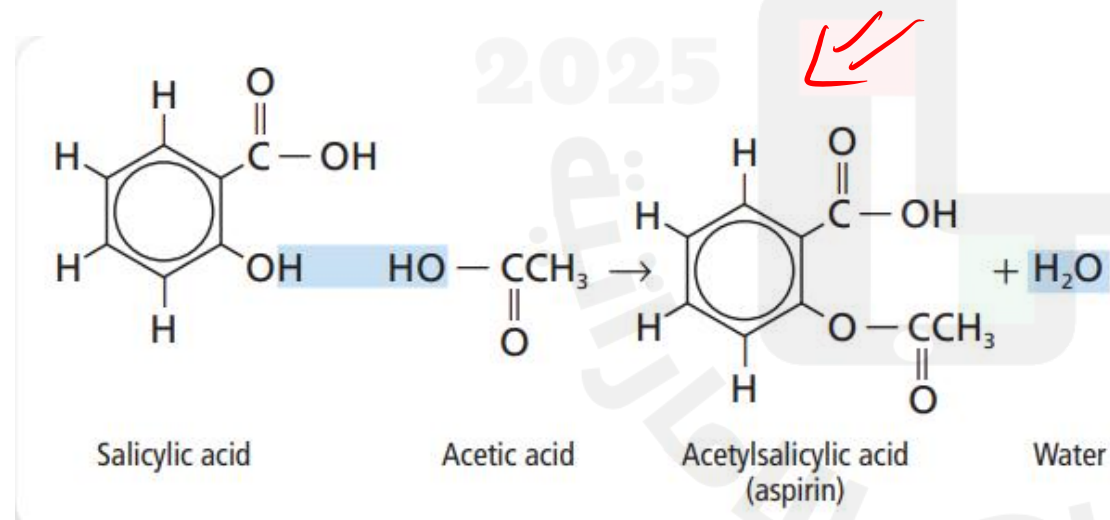
Learning Objectives:

- ▶ **Classify** an organic reaction into one of five categories: substitution, addition, elimination, oxidation reduction, or condensation.
- ▶ **Use** structural formulas to write equations for reactions of organic compounds.
- ▶ **Predict** the products of common types of organic reactions.

Previous Lesson *Section 3*

Condensation Reactions

- In a **condensation reaction**, two smaller organic molecules combine to form a more complex molecule, accompanied by the loss of a small molecule such as water. *H₂O*
- In essence, a **condensation reaction** is an **elimination reaction** in which a bond is formed between two atoms not previously bonded to each other.

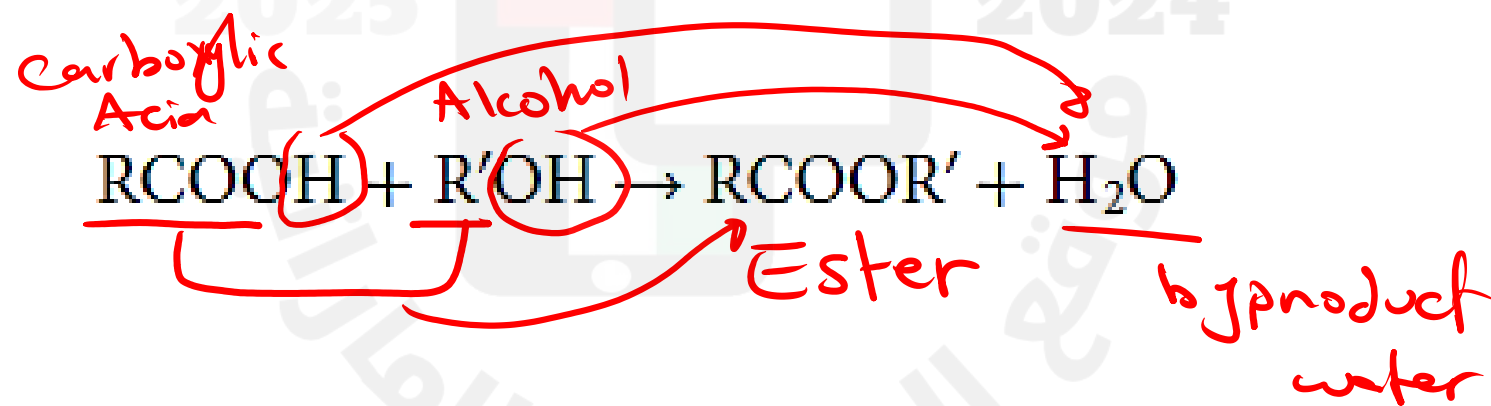


■ **Figure 22.12** To synthesize aspirin, two organic molecules are combined in a condensation reaction to form a larger molecule.

Previous Lesson

Condensation Reactions

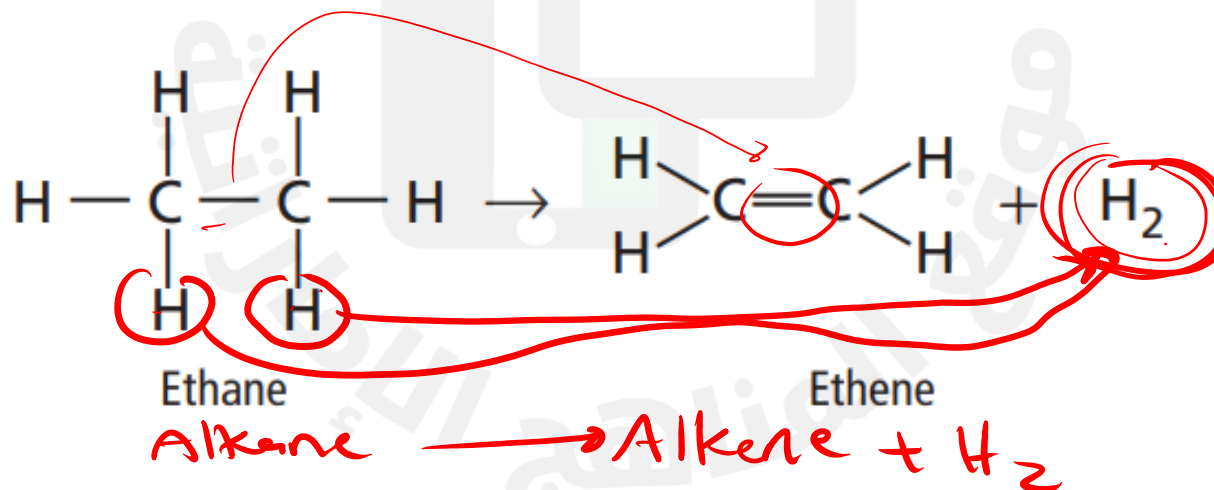
- The most common **condensation** reactions involve the combining of **carboxylic acids** with other organic molecules.
- A common way to synthesize an ester is by a **condensation** reaction between a **carboxylic acid** and an **alcohol**.
- Such a reaction can be represented by the following general equation.



Classifying Reactions of Organic Substances

- Two other important types of organic reactions are elimination and addition.

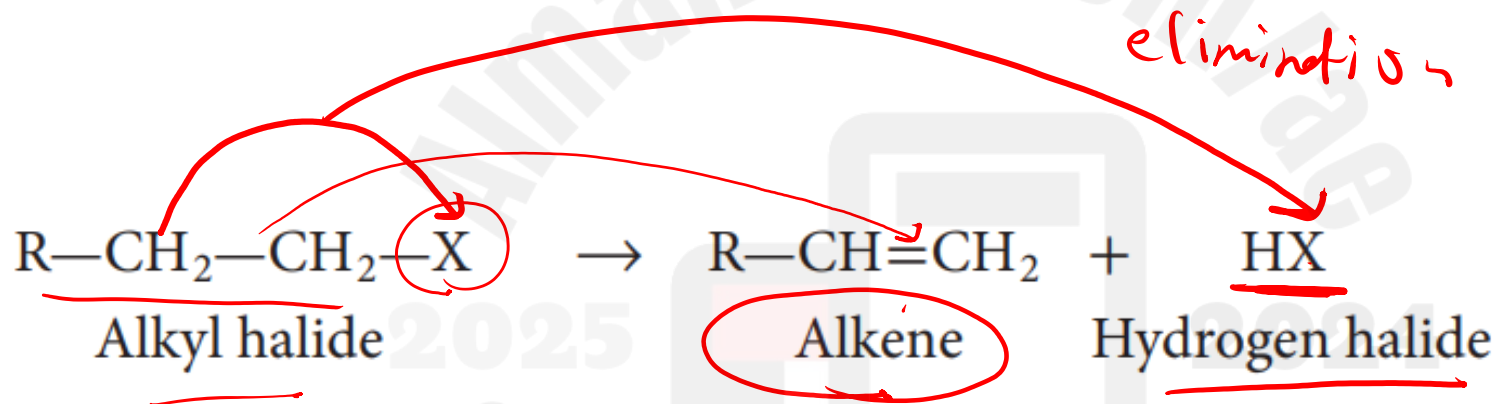
- Elimination reactions: The formation of alkenes from alkanes.
product = reactant
- The atoms that are eliminated usually form stable molecules, such as H₂O, HCl, or H₂.
Types of products
↑
HX ← halogen 17
- Ethene is produced by the elimination of two hydrogen atoms from ethane.
goes out product
- A reaction that eliminates two hydrogen atoms is called a dehydrogenation reaction.
- Note that the two hydrogen atoms form a molecule of hydrogen gas.



Elimination reactions

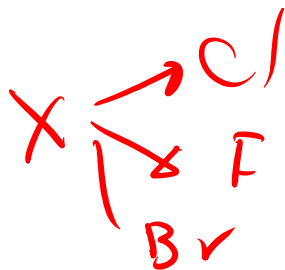


- Alkyl halides can undergo elimination reactions to produce an alkene and a hydrogen halide. HX



Product

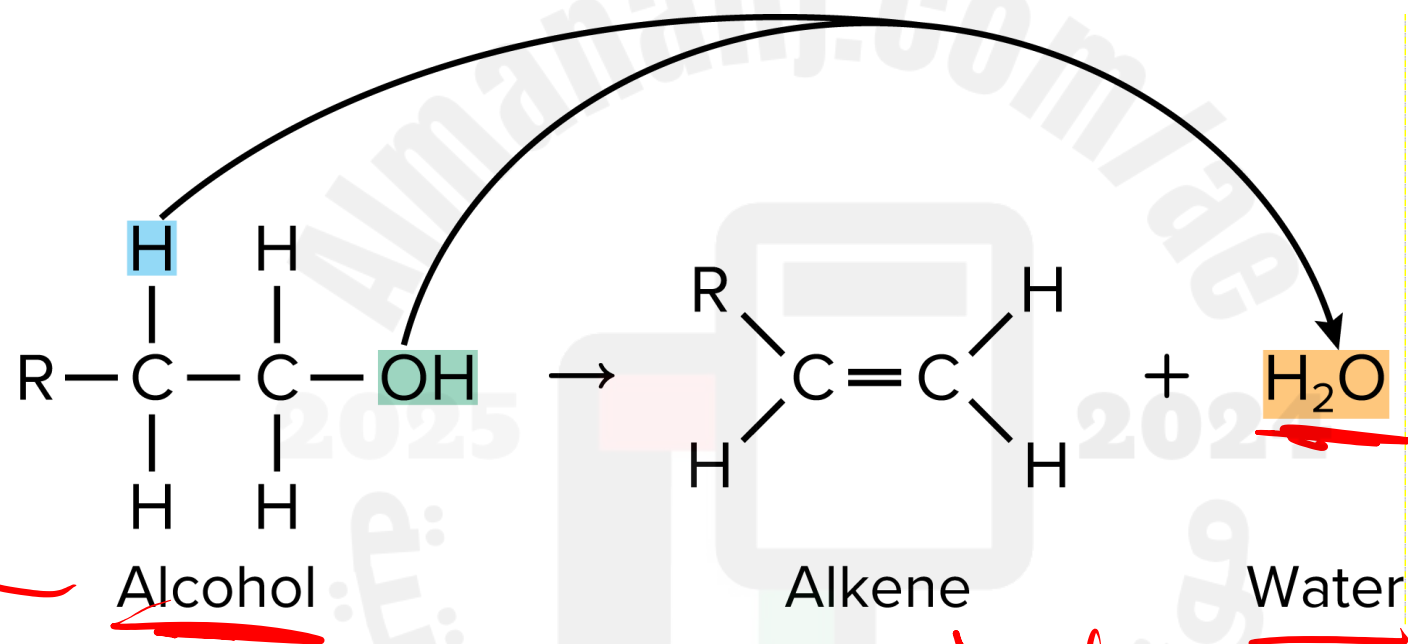
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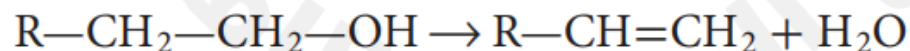
Elimination reactions (Alkene) product

Remove H₂O

- Dehydration reactions: reaction in which the atoms removed form water.



The generic form of this dehydration reaction can be written as follows.



Alcohol → Alkene + water

Addition reactions

opposite

- **Addition reactions:** atoms bond to each of two atoms bonded by double or triple covalent bonds.



- Addition reactions are like elimination reactions in reverse.

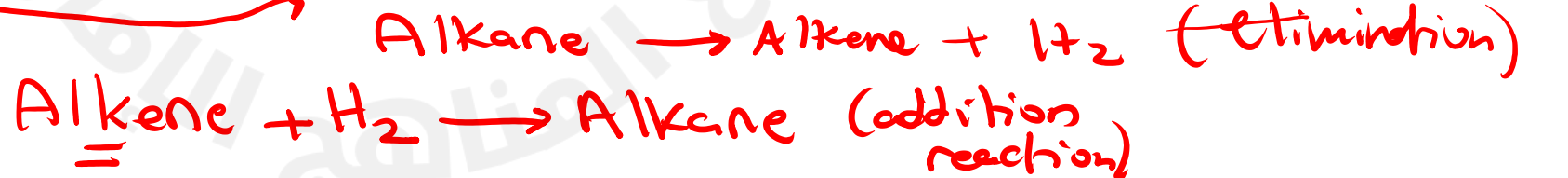
Adding H_2O

- **Hydration reaction:** is an addition reaction in which a ^Hhydrogen atom and ^{OH}hydroxyl group from a water molecule add to a double or triple bond.
- A hydration reaction is the opposite of a dehydration reaction.

adding H_2

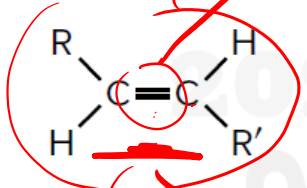
- **Hydrogenation reaction:** a reaction that involves the addition of ^Hhydrogen to atoms in a double or triple bond.

- When H_2 adds to the double bond of an alkene, the alkene is converted to an alkane.



Addition reactions

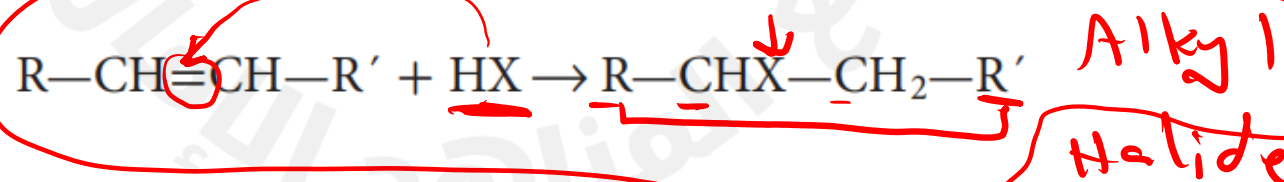
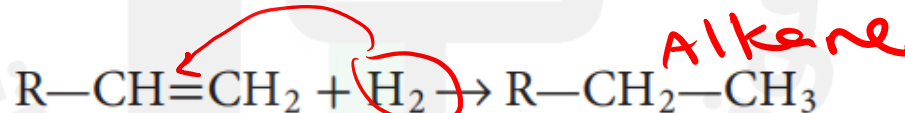
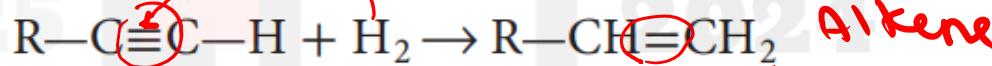
Table 12 Summary of Addition Reactions

Reactant Alkene	Addition Reactant	Product
	<u>Water (hydration)</u> $\begin{array}{c} \text{H} \\ \\ \text{H}-\text{O} \end{array}$	<u>Alcohol</u> $\begin{array}{cc} \text{H} & \text{OH} \\ & \\ \text{R}-\text{C} & -\text{C}-\text{R}' \\ & \\ \text{H} & \text{H} \end{array}$
	<u>Hydrogen (hydrogenation)</u> $\begin{array}{c} \text{H} & \text{H} \\ & \\ \text{H}-\text{H} \end{array}$	<u>Alkane</u> $\begin{array}{cc} \text{H} & \text{H} \\ & \\ \text{R}-\text{C} & -\text{C}-\text{R}' \\ & \\ \text{H} & \text{H} \end{array}$
	<u>Hydrogen halide</u> $\begin{array}{c} \text{H} & \text{X} \\ & \\ \text{H}-\text{X} \end{array}$ <p><i>Cl, Br, F</i></p>	<u>Alkyl halide</u> $\begin{array}{cc} \text{H} & \text{X} \\ & \\ \text{R}-\text{C} & -\text{C}-\text{R}' \\ & \\ \text{H} & \text{H} \end{array}$ <p><i>R-X</i></p>
	<u>Halogen</u> X_2 $\begin{array}{c} \text{X} & \text{X} \\ & \\ \text{X}-\text{X} \end{array}$	<u>Alkyl dihalide</u> $\begin{array}{cc} \text{X} & \text{X} \\ & \\ \text{R}-\text{C} & -\text{C}-\text{R}' \\ & \\ \text{H} & \text{H} \end{array}$

Addition reactions

الحفازات → lower activation energy

- Catalysts [such as powdered platinum or palladium] are usually needed in hydrogenation reactions because the reaction's activation energy is too large without them.
- Hydrogenation reactions are used to convert liquid unsaturated fats into saturated fats that are solid.
 adding H
 alkane C-C C=C C≡C
- Alkynes can also be hydrogenated to produce alkenes or alkanes.
- One molecule of H₂ must be added to each triple bond in order to convert an alkyne to an alkene.

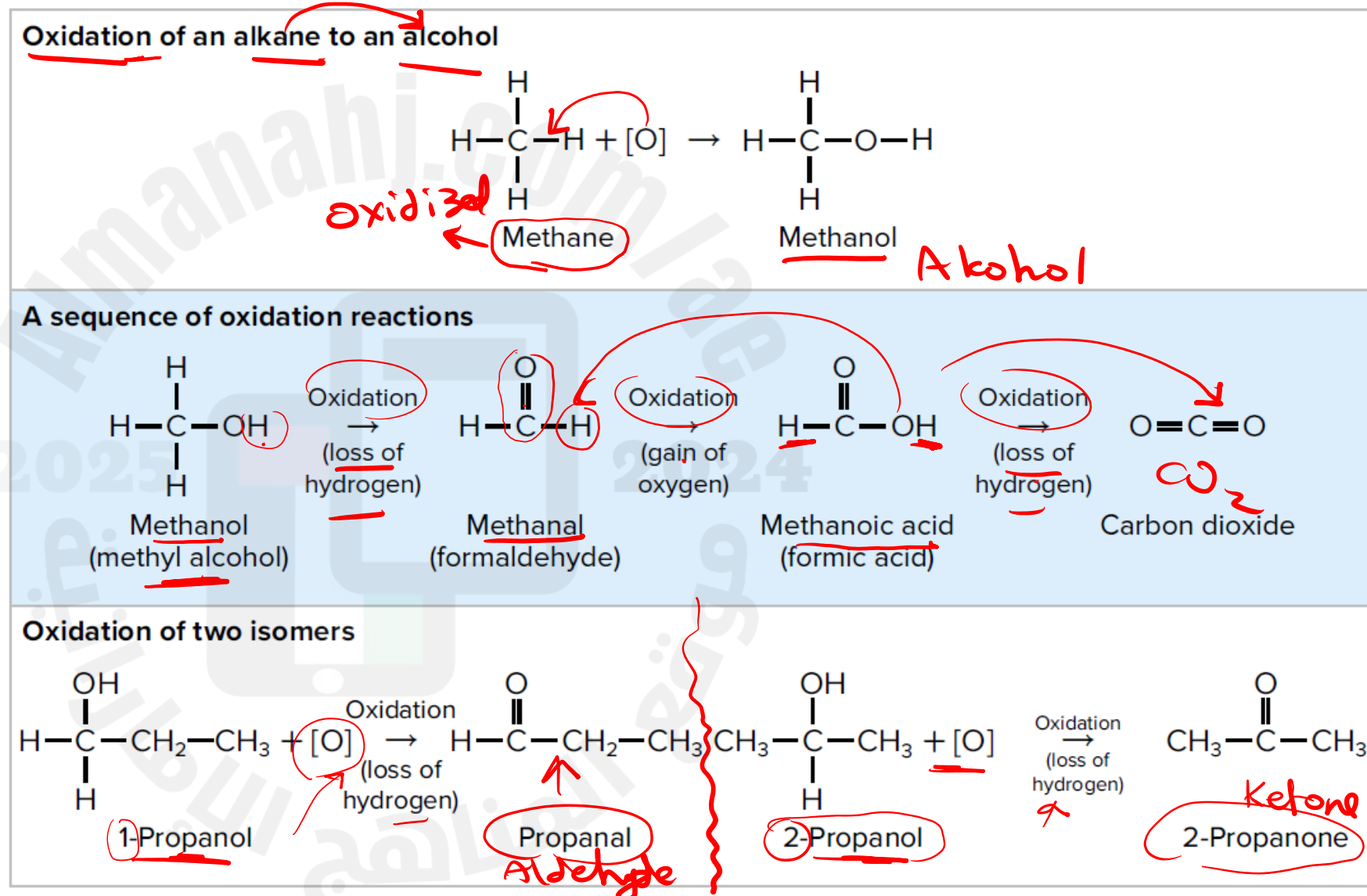


Oxidation-reduction reaction

Term 2

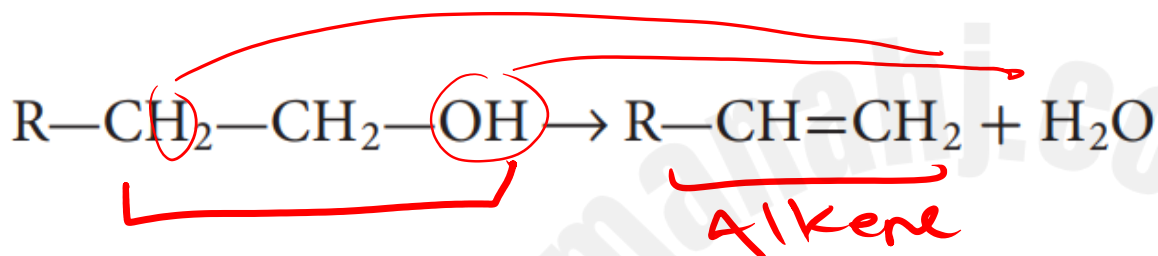
- Many organic compounds can be converted to other compounds by oxidation and reduction reactions.
- Oxidation** is the **loss** of **electrons**, and a substance is oxidized when it **gains oxygen** or **loses hydrogen**.
- Reduction** is the **gain** of **electrons**, and a substance is reduced when it **loses oxygen** or **gains hydrogen**.
- Thus, methane is oxidized as it gains oxygen and is converted to methanol.

Table 13 Oxidation-Reduction Reactions

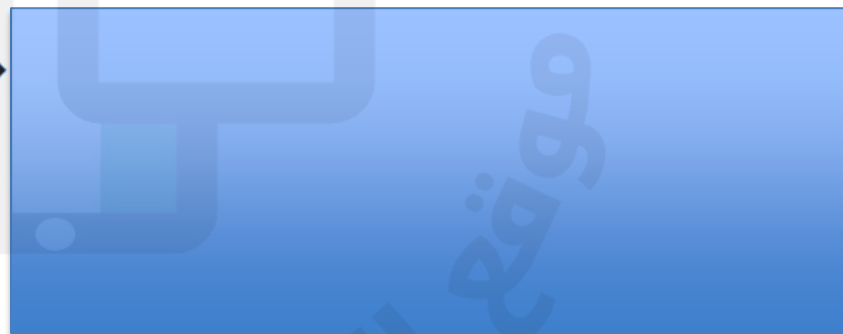
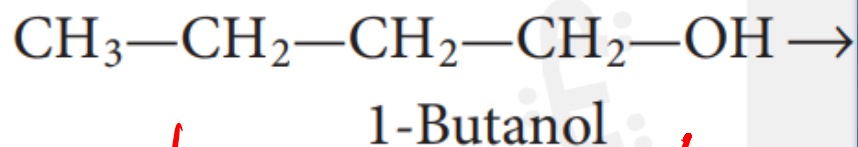


Predicting Products of Organic Reactions

- The generic equation for the dehydration of an alcohol is as follows:

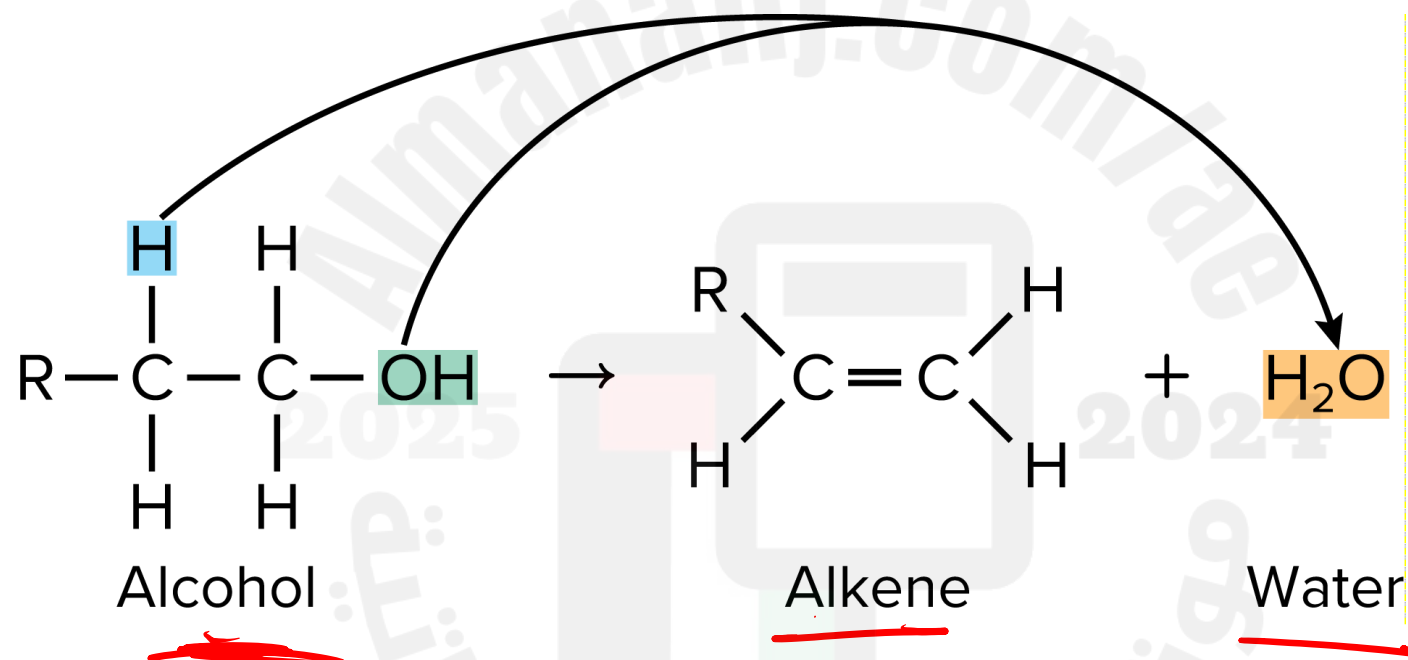


- The generic reaction shows that the —OH and a H— are removed from the carbon chain

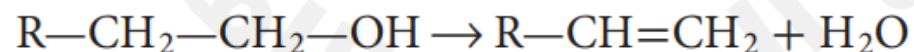


Elimination reactions

- **Dehydration reactions:** reaction in which the atoms removed form water.

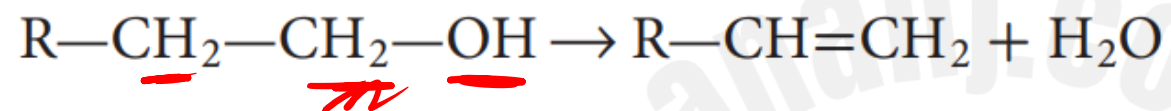


The generic form of this dehydration reaction can be written as follows.

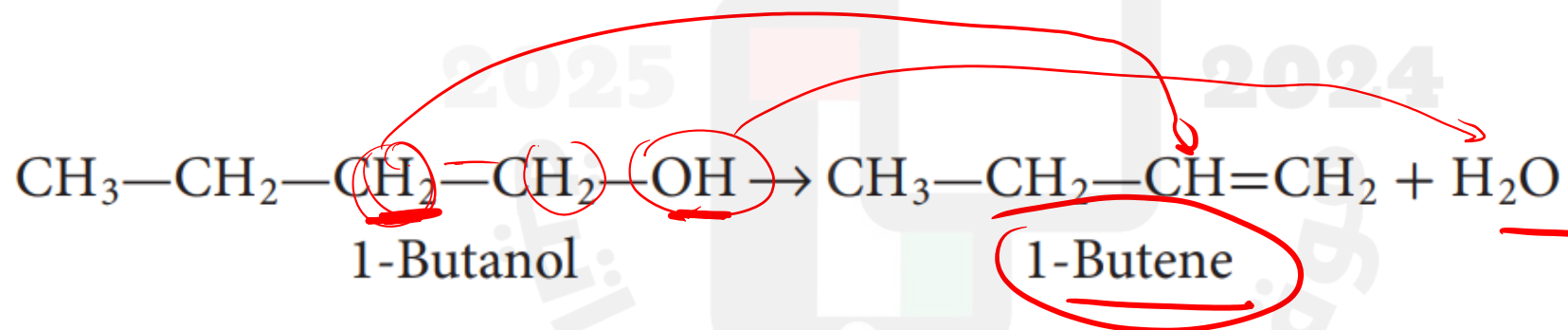


Predicting Products of Organic Reactions

- The generic equation for the dehydration of an alcohol is as follows:

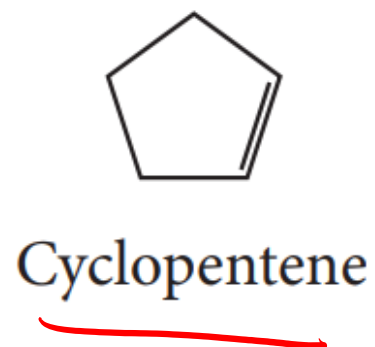
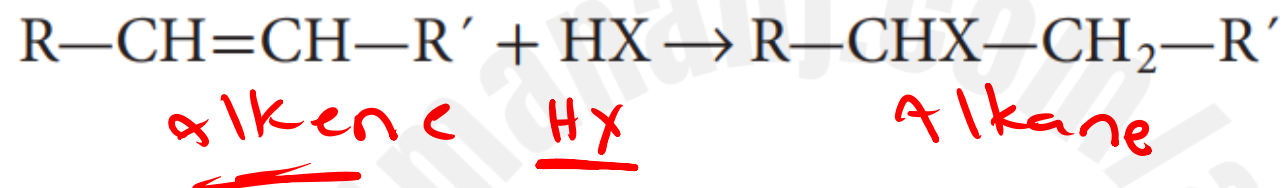


- The generic reaction shows that the —OH and a H— are removed from the carbon chain



Predicting Products of Organic Reactions

- Suppose that you wish to predict the product of the reaction between cyclopentene and hydrogen bromide



+

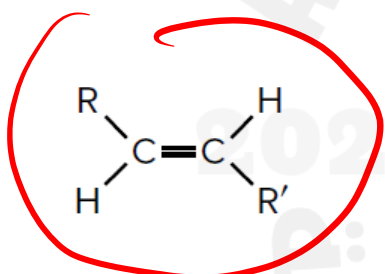
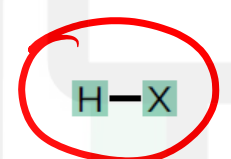

HBr



Hydrogen bromide

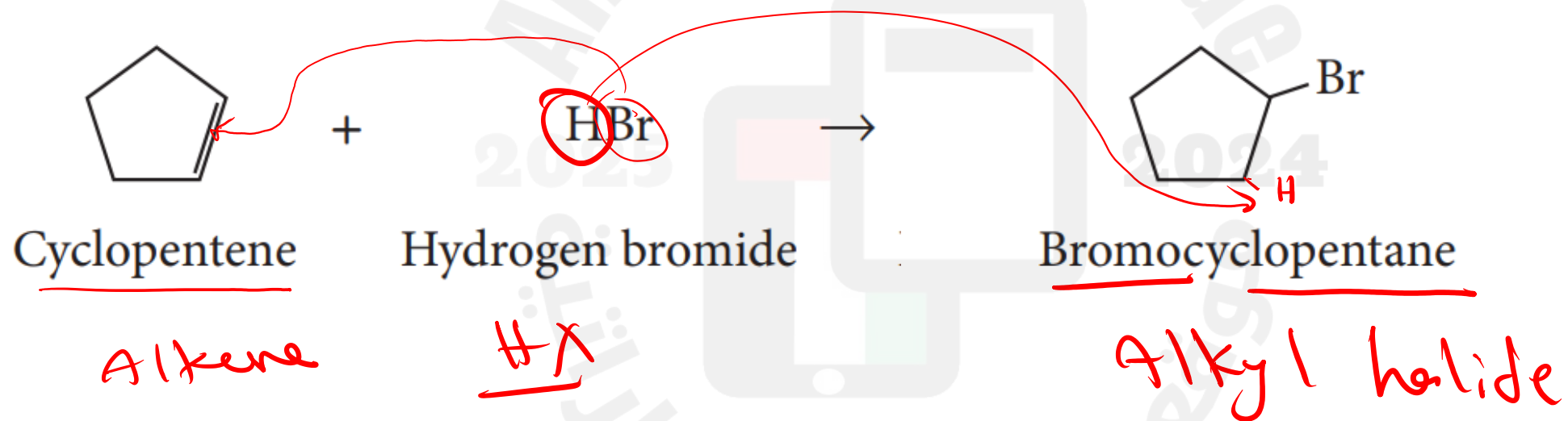
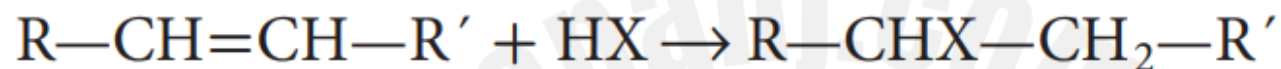
Addition reactions

Table 12 Summary of Addition Reactions

Reactant Alkene	Addition Reactant	Product
	Water (hydration)	Alcohol $\begin{array}{c} \text{H} \quad \text{OH} \\ \quad \\ \text{R}-\text{C}-\text{C}-\text{R}' \\ \quad \\ \text{H} \quad \text{H} \end{array}$
	Hydrogen (hydrogenation)	Alkane $\begin{array}{c} \text{H} \quad \text{H} \\ \quad \\ \text{R}-\text{C}-\text{C}-\text{R}' \\ \quad \\ \text{H} \quad \text{H} \end{array}$
	Hydrogen halide 	Alkyl halide  $\begin{array}{c} \text{H} \quad \text{X} \\ \quad \\ \text{R}-\text{C}-\text{C}-\text{R}' \\ \quad \\ \text{H} \quad \text{H} \end{array}$
	Halogen $\text{X}-\text{X}$	Alkyl dihalide $\begin{array}{c} \text{X} \quad \text{X} \\ \quad \\ \text{R}-\text{C}-\text{C}-\text{R}' \\ \quad \\ \text{H} \quad \text{H} \end{array}$

Predicting Products of Organic Reactions

- Suppose that you wish to predict the product of the reaction between cyclopentene and hydrogen bromide



Quiz

dehydration

1. What kind of reaction has water as a product?



hydration



hydrogenation



dehydration

CORRECT

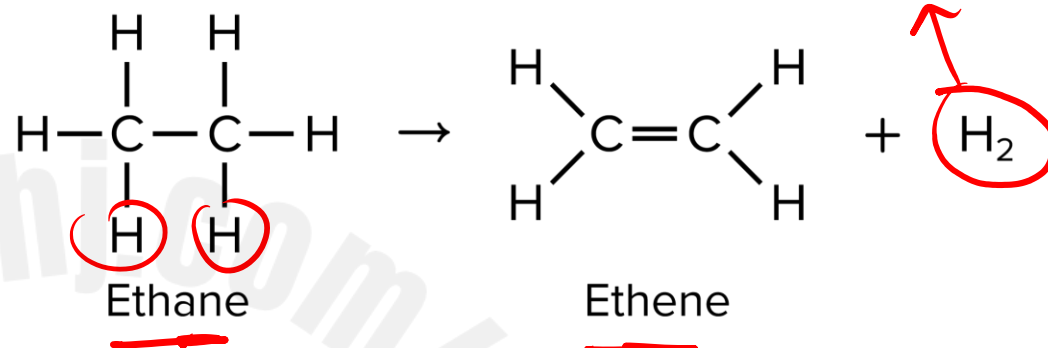


dehydrogenation

Quiz

elimination dehydrogenation

2. What kind of reaction is shown at right?



☒ hydration

☒ hydrogenation

☒ dehydration

☒ D dehydrogenation

CORRECT

Quiz

3. What kind of reaction is used to convert liquid unsaturated fats into saturated fats that are solid at room temperature?

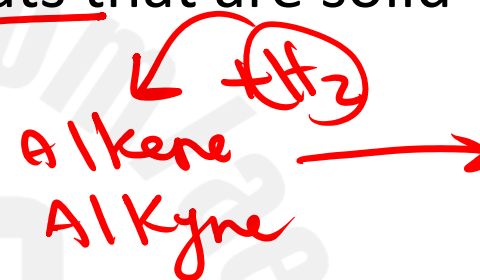
☒ hydration

☒ **B** hydrogenation

☒ dehydration

☒ dehydrogenation

CORRECT



Addition

Alkane



Quiz

4. The combustion of fuel to power cars is an example of a(n) reaction.

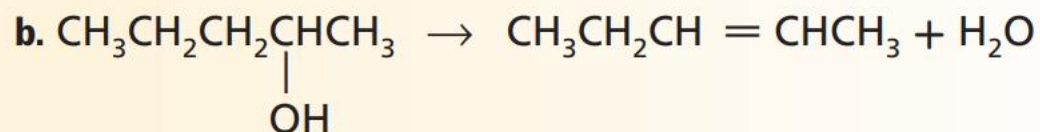
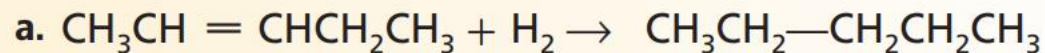
 addition

 elimination

 hydration

 oxidation-reduction **CORRECT**

18. MAIN Idea Classify each reaction as substitution, elimination, addition, or condensation.



19. Identify the type of organic reaction that would best accomplish each conversion

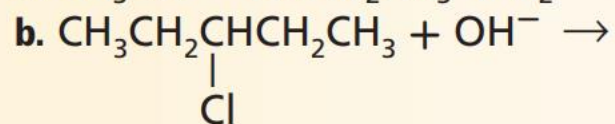
a. alkyl halide \rightarrow alkene

c. alcohol + carboxylic acid \rightarrow ester

b. alkene \rightarrow alcohol

d. alkene \rightarrow alkyl dihalide

20. Complete each equation by writing the condensed structural formula for the product that is most likely to form.



21. Predicting Products Explain why the hydration reaction involving 1-butene might yield two distinct products, whereas the hydration of 2-butene yields only one product.

18. a. addition

b. elimination

19. a. elimination

b. addition

c. condensation

d. addition

20. a. $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_3$

b. $\text{CH}_3\text{CH}_2\text{CH}(\text{OH})\text{CH}_2\text{CH}_3$

21. Hydrating 1-butene might yield 1-butanol and/or 2-butanol because hydroxyl groups might bond to carbons 1 and/or 2 of the 4-carbon chain. Hydrating 2-butene, however, yields only 2-butanol because the hydroxyl group must be on carbon 2.