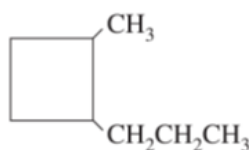


# Organic Chemistry Review Booklet

Use the following information to answer the next two questions.

A student drew the structural diagram shown below.

Cycloalkane  
C<sub>n</sub>H<sub>2n</sub>

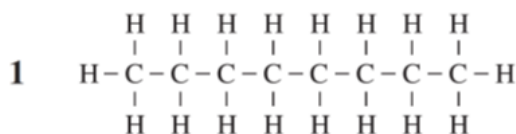


C<sub>8</sub>H<sub>16</sub>

17. The compound represented by the structural diagram that the student drew can be described as an
- aliphatic alkane containing a ~~three-carbon parent~~
  - ~~aromatic compound~~ containing a four-carbon ring structure
  - alkane containing a ~~double bonded four-carbon ring structure~~
  - alkane containing a four-carbon parent with only single bonds

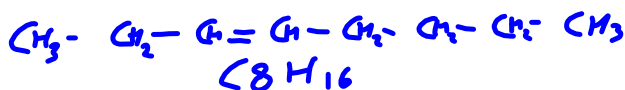
Use the following additional information to answer the next question.

### Compounds that Contain Eight Carbons

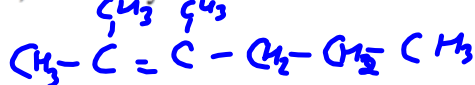


C<sub>8</sub>H<sub>18</sub>

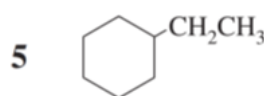
2 oct-3-ene



3 2,3-dimethylhex-2-ene

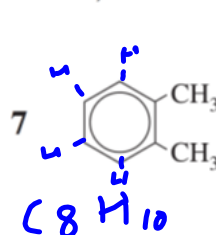


4 3,3-dimethylhexane C<sub>8</sub>H<sub>18</sub>



C<sub>8</sub>H<sub>16</sub>

6 2,3-dimethyl-1-propylcyclopropane



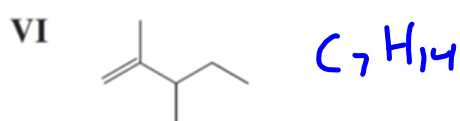
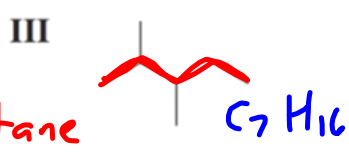
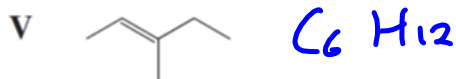
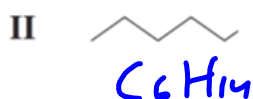
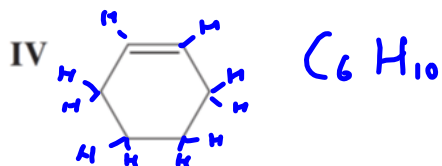
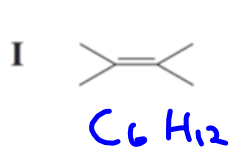
### Numerical Response

12. The compounds above that are isomers of the structural diagram that the student drew are numbered 2, 3, 5, and 6.

isomers - compounds that have the same molecular formula but diff. structure/name

Use the following information to answer the next three questions.

Line Diagrams for Selected Organic Compounds



22. The line diagrams above that represent structural isomers are

- A. I and V only  
 B. I, IV, V, and VI  
 C. II and III  
 D. III and VI

23. The IUPAC name for compound III is

- A. 3,4-dimethylpentane  
 B. 2,3-dimethylpentane  
C. 3-ethyl-2-methylbutane  
D. 1,1-dimethyl-2-ethylpropane

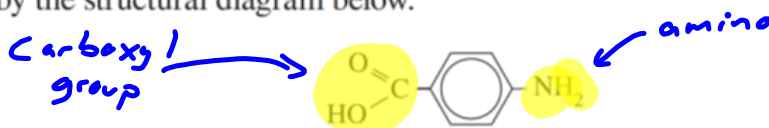
24. If aqueous bromine is added, in the absence of light, to samples of the compounds in the diagrams above, the compounds that would cause the bromine solution to lose its colour are

- A. I, IV, V, and VI  
 B. I, V, and VI only  
 C. II and III  
 D. IV only

addition reaction  
which compounds would react with Br<sub>2</sub>

Use the following information to answer the next question.

Sunscreens may contain para-aminobenzoic acid (PABA). The PABA in the sunscreen absorbs ultraviolet (UV) radiation from the Sun, which can cause damage to the skin. After swimming, a person must reapply a sunscreen containing PABA because PABA is water soluble. PABA is represented by the structural diagram below.



18. PABA can be classified as an   i   organic compound that is   ii  .

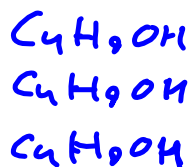
The statement above is completed by the information in row

Row	<i>i</i>	<i>ii</i>
A.	<del>aliphatic</del>	an alcohol
B.	<del>aliphatic</del>	a carboxylic acid
C.	aromatic	<del>an alcohol</del>
<b>D.</b>	aromatic	a carboxylic acid

hydroxyl group -OH

Use the following information to answer the next question.

The following table gives the boiling points of three alcohols.



Alcohol	Boiling Point (°C)
butan-1-ol	117.7
butan-2-ol	99.0
2-methyl-propan-2-ol	82.4

physical property

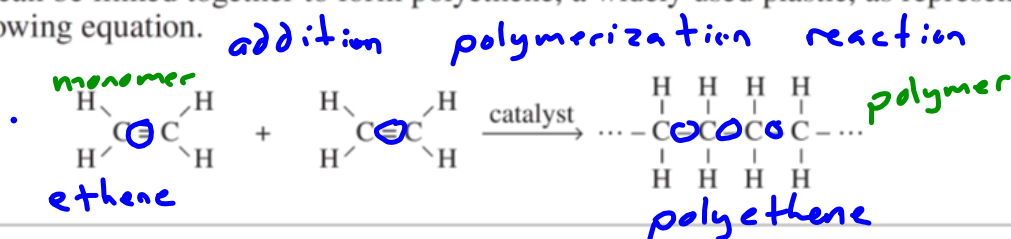
19. Using **only** information contained in the table above, when the alcohols in the table are compared, they have the same   i   formula, but different   ii   properties.

The statement above is completed by the information in row

Row	<i>i</i>	<i>ii</i>
A.	molecular	<del>chemical</del>
B.	molecular	physical
C.	<del>structural</del>	chemical
D.	<del>structural</del>	physical

Use the following information to answer the next two questions.

Ethene is produced in the petrochemical industry and is used as an intermediate in the manufacture of other chemicals, especially plastics. With the use of a catalyst, ethene molecules can be linked together to form polyethene, a widely used plastic, as represented by the following equation.



20. Ethene is classified as

- A. ~~aromatic~~
- B. saturated - no double/triple bonds b/w carbons
- C.** unsaturated - double/triple bonds b/w carbons
- D. halogenated - a halogen atom in the compound

↳ group 17

21. Ethene is a i and is converted to polyethene by ii reaction.

The statement above is completed by the information in row

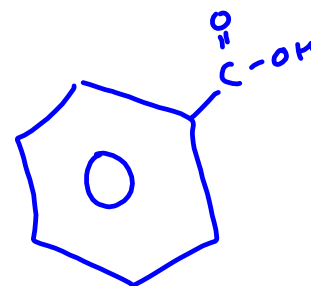
Row	<i>i</i>	<i>ii</i>
A.	monomer	an <del>esterification</del>
<b>B.</b>	monomer	a polymerization
C.	<del>polymer</del>	an esterification
D.	<del>polymer</del>	a polymerization

Two properties that cyclopentanol and pentanoic acid have in common are that they have the same number of   i   and that they are both   ii  .

The statement above is completed by the information in row

Row	<i>i</i>	<i>ii</i>
A.	<del>oxygen atoms</del>	aliphatic
B.	<del>oxygen atoms</del>	aromatic
<b>C.</b>	carbon atoms in their parent chain	aliphatic
D.	carbon atoms in their parent chain	<del>aromatic</del>

*carboxylic acid*  
Benzoic acid contains a   i   group, and is   ii  .

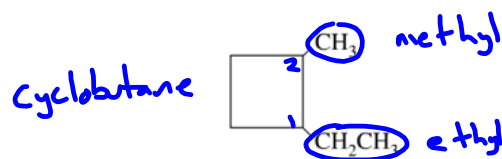


The statement above is completed by the information in row

Row	<i>i</i>	<i>ii</i>
<b>A.</b>	carboxyl	aromatic
B.	carboxyl	<del>aliphatic</del>
C.	<del>hydroxyl</del>	aromatic
D.	<del>hydroxyl</del>	aliphatic

*alcohols*

A student drew the structural diagram shown below.



The IUPAC name for the structural diagram the student drew is 1-   i   -2-   ii  .

The statement above is completed by the information in row

Row	<i>i</i>	<i>ii</i>
A.	methyl	ethylbutane
B.	methyl	ethylcyclobutane
C.	ethyl	methylbutane
<b>D.</b>	ethyl	methylcyclobutane

### Organic Compounds

	1	2-methylcyclobut-1-ene <span style="color: green; font-size: small;">double bond</span>		4	5-methylhept-3-yne <span style="color: green; font-size: small;">triple bond</span>
organic halide	2	1,2-dibromohexane	5	cycloheptane <span style="color: green; font-size: small;">alkane</span>	
	3	2,2-dimethylpentane <span style="color: green; font-size: small;">alkane</span>	6	pentan-1-ol <span style="color: green; font-size: small;">alcohol</span>	

The organic compound numbered above that

is an alkene is 1 (Record as the **first** digit)

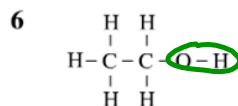
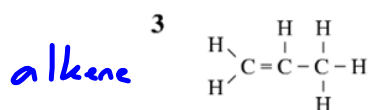
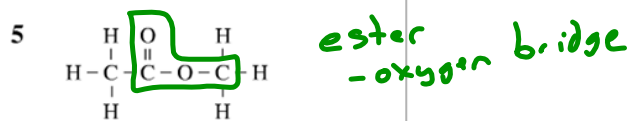
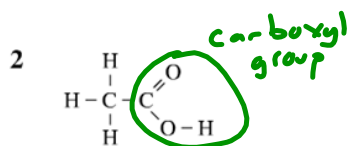
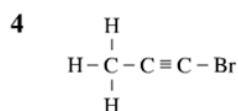
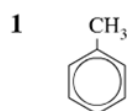
is an alcohol is 6 (Record as the **second** digit)

contains a triple bond is 4 (Record as the **third** digit)

is cyclic and saturated is 5 (Record as the **fourth** digit)

↳ cycle    ↳ no double/triple bonds

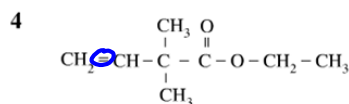
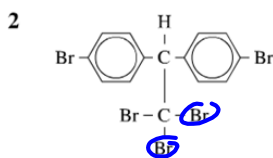
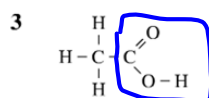
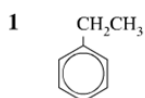
### Organic Compounds



Match four of the organic compounds numbered above with their classifications below.

- |                 |          |                                     |                  |
|-----------------|----------|-------------------------------------|------------------|
| Alkyne          | <u>4</u> | (Record as the <b>first</b> digit)  | - triple bond    |
| Alcohol         | <u>6</u> | (Record as the <b>second</b> digit) | - hydroxyl group |
| Aromatic        | <u>1</u> | (Record as the <b>third</b> digit)  | - benzene ring   |
| Carboxylic acid | <u>2</u> | (Record as the <b>fourth</b> digit) | - carboxyl group |

The following are structural diagrams for four organic compounds with common industrial uses.



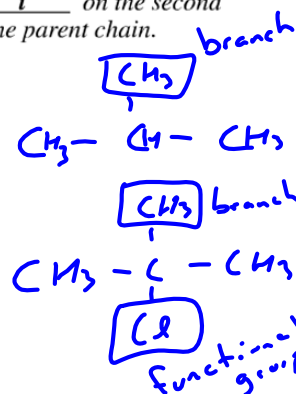
Match each of the structural diagrams above with its classification below.

Aromatic 1 or 2 (Record as the **first** digit)  
 Carboxylic acid 3 (Record as the **second** digit)  
 Unsaturated and aliphatic 4 (Record as the **third** digit)  
 Halogenated hydrocarbon 2 (Record as the **fourth** digit)

Both 2-methylpropane and 2-chloro-2-methylpropane contain a i on the second carbon in the parent chain, and both have ii carbons in the parent chain.

The statement above is completed by the information in row

Row	<i>i</i>	<i>ii</i>
A.	<del>functional group</del>	two
B.	<del>functional group</del>	three
C.	branch	<del>two</del>
<b>D.</b>	branch	three

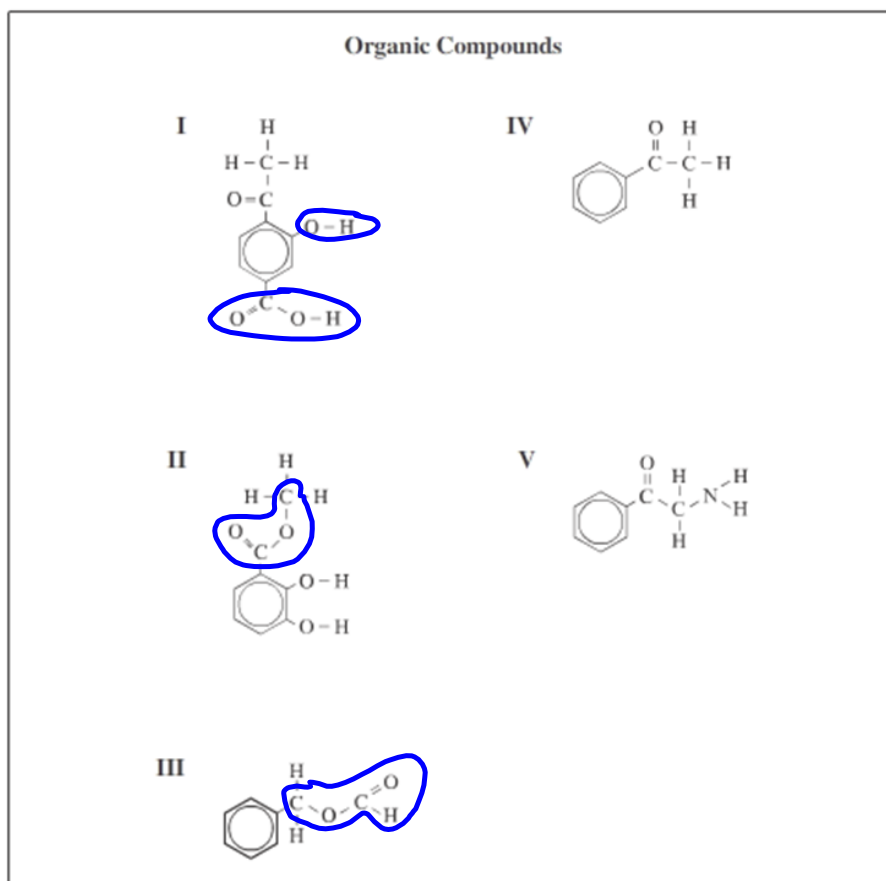


Cyclohexene and benzene have a different number of i, but both are ii.

The statement above is completed by the information in row

Row	<i>i</i>	<i>ii</i>
A.	<del>carbon atoms</del>	cyclic
B.	<del>carbon atoms</del>	alkanes
<b>C.</b>	double bonds	cyclic
D.	double bonds	<del>alkanes</del>





An ester functional group is found in

- A. compounds II and III only
- B. compounds II, III, and IV
- C. compound III only
- D. compound V

<b>Carbon-Containing Compounds</b>			
1	CCl <sub>4</sub> (l)	<del>5</del>	CO(g)
<del>2</del>	Fe <sub>3</sub> C(s)	6	C <sub>3</sub> H <sub>8</sub> (g)
3	C <sub>2</sub> H <sub>2</sub> (g)	<del>7</del>	NaCN(s)
4	C <sub>2</sub> H <sub>5</sub> OH(l)	<del>8</del>	MgCO <sub>3</sub> (s)

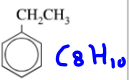
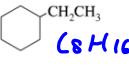
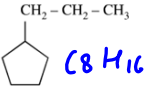
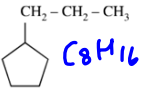
The compounds numbered above that can be classified as organic are

1, 3, 4, and 6.

organic compound - contains carbon, except

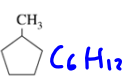
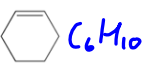
- ionic compounds
- oxides of carbon (CO, CO<sub>2</sub>)
- inorganic acids (start with H)  
HCN H<sub>2</sub>CO<sub>3</sub>

Which of the following rows identifies the structural diagram and the corresponding IUPAC name of the compound with the chemical formula  $C_8H_{16}(l)$ ?

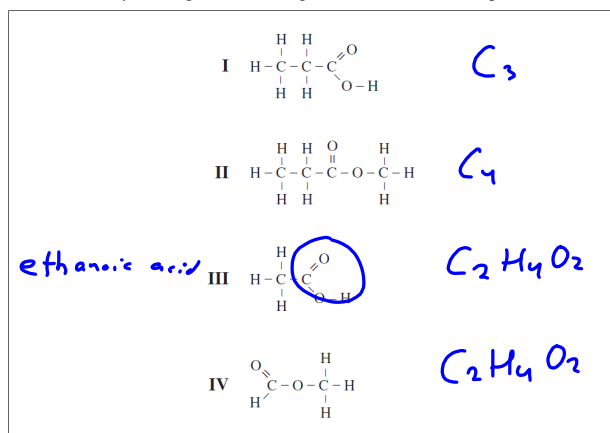
Row	Structural Diagram	IUPAC Name
<del>A.</del>		Ethylbenzene
<u>B.</u>		Ethylcyclohexane
<del>C.</del>		<del>Cyclopentylpropane</del>
<del>D.</del>		Propylcyclopentane

propylcyclopentane

Which of the following rows identifies the condensed structural diagram or line diagram and the IUPAC name of an isomer of  $C_6H_{12}$ ?

Row	Condensed Structural Diagram or Line Diagram	IUPAC Name
<u>A.</u>		Methylcyclopentane
<del>B.</del>		Cyclohexene
<del>C.</del>	$CH \equiv C - \underset{\substack{  \\ CH_3}}{CH} - CH_2 - CH_3$ Handwritten formula $C_6H_{10}$	4-methylpentyne
<del>D.</del>	$CH_3 - CH_2 - C \equiv C - CH_2 - CH_3$ Handwritten formula $C_6H_{10}$	Hex-3-yne

Use the following structural diagrams to answer the next question.



Which of the structural diagrams numbered above represent isomers?

- A. I and II
- B. I and IV
- C. II and III
- D. III and IV

Use the following information to answer the next two questions.

Hexane and hex-1-ene are both colourless liquids. One method used to differentiate between hexane and hex-1-ene is to add a few drops of orange-coloured aqueous bromine to samples of each organic compound.

Hexane is i hydrocarbon, and hex-1-ene is ii hydrocarbon.

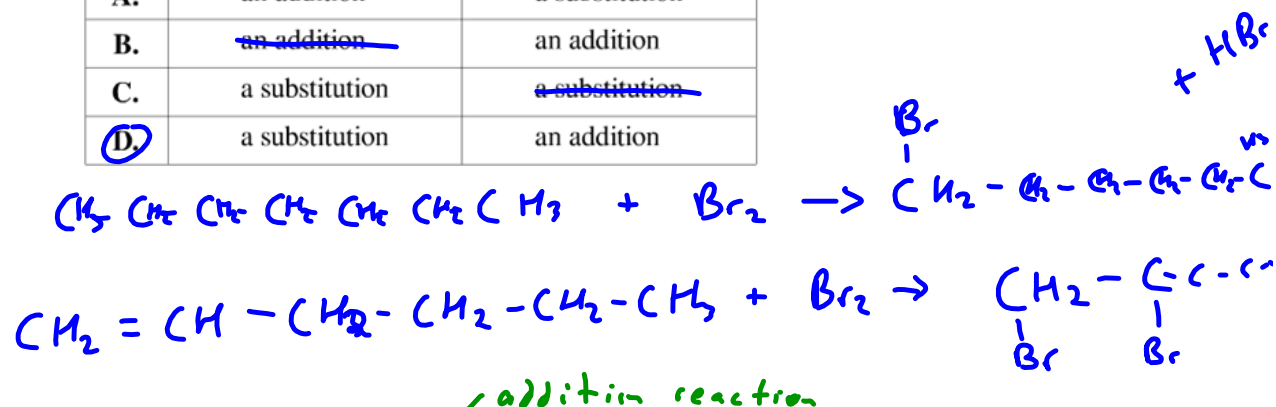
The statement above is completed by the information in row

Row	i	ii
A.	a saturated	<del>a saturated</del>
<b>B.</b>	a saturated	an unsaturated
C.	<del>an unsaturated</del>	a saturated
D.	<del>an unsaturated</del>	an unsaturated

When aqueous bromine is added to hexane and hex-1-ene in the presence of light, the hexane undergoes i reaction and the hex-1-ene undergoes ii reaction.

The statement above is completed by the information in row

Row	i	ii
A.	<del>an addition</del>	a substitution
B.	<del>an addition</del>	an addition
C.	a substitution	<del>a substitution</del>
<b>D.</b>	a substitution	an addition

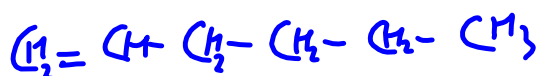
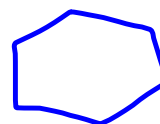


A student added a bromine solution to a hydrocarbon sample that contained an isomer of  $\text{C}_6\text{H}_{12}(\text{l})$  in the absence of light. After shaking the sample, the student observed that the colour of the bromine solution changed from orange to colourless.

An interpretation that could be made from the student's observation is that the hydrocarbon sample is i and the IUPAC name of the sample could be ii.

The statement above is completed by the information in row

Row	i	ii
A.	<del>saturated</del>	hex-2-ene
B.	saturated	<del>cyclopentane</del>
<b>C.</b>	unsaturated	hex-2-ene
D.	unsaturated	<del>cyclopentane</del>

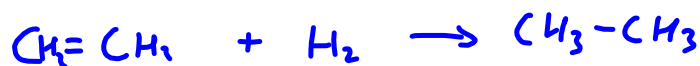


During an organic reaction, an unsaturated reactant becomes a saturated product. This is an example of

double / triple bond

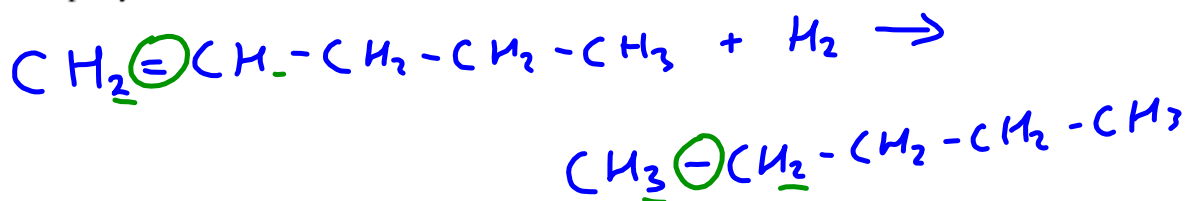
single bonds

- A. an addition reaction
- B. a substitution reaction
- C. an elimination reaction
- D. an esterification reaction



When pentene and hydrogen gas undergo an addition reaction, the resulting product

- A. is a ~~halogenated~~ hydrocarbon
- B. contains a ~~double bond~~
- C. is an alkane
- D. is ~~pentyne~~



The type of reaction that occurs when ethene gas and chlorine gas react is i, and the name of the organic compound produced is ii.

The statement above is completed by the information in row

Row	<i>i</i>	<i>ii</i>
A.	<del>substitution</del>	1,2-dichloroethane
B.	<del>substitution</del>	1-chloroethene
<input checked="" type="radio"/> C.	addition	1,2-dichloroethane
D.	addition	<del>1-chloroethene</del>



**Reaction Equation**

**esterification**

**I**

Carboxylic acid

$$\begin{array}{c} \text{O} \\ \parallel \\ \text{H}-\text{C} \\ | \\ \text{O}-\text{H} \end{array}$$

methanoic acid

+

**alcohol**

$$\begin{array}{c} \text{H} \\ | \\ \text{H}-\text{C}-\text{O}-\text{H} \\ | \\ \text{H} \end{array}$$

methanol

**II**

$$\begin{array}{c} \text{O} \quad \text{H} \\ \parallel \quad | \\ \text{H}-\text{C}-\text{O}-\text{C}-\text{H} \\ | \quad | \\ \text{H} \quad \text{H} \end{array}$$

methyl methanoate

+

H-O-H

**Names and Terms**

1 Methane	6 Ester
2 Methanol	7 Polymer
3 Ethanoate	8 Esterification
4 Methanoic acid	9 Polymerization
5 Methyl methanoate	

ester name

1. change alcohol name to     yl  
ex. methanol → methyl

2. change acid name to     anoate

Match a name or a term from the list above with each descriptor given below.

Name of reactant (I)        4   (Record as the **first** digit)

Name of product (II)       5   (Record as the **second** digit)

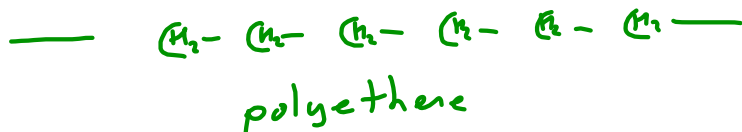
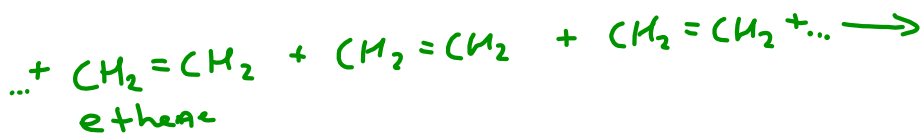
Type of reaction            8   (Record as the **third** digit)

Classification of product (II)   6   (Record as the **fourth** digit)

## Polymers

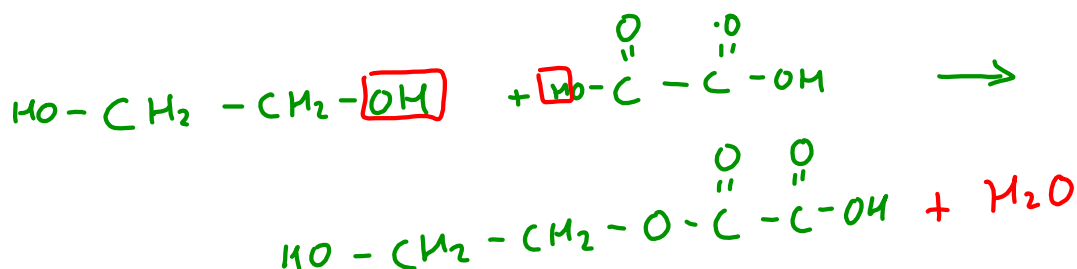
### 1. Addition polymers

- created by adding monomers containing double or triple bonds

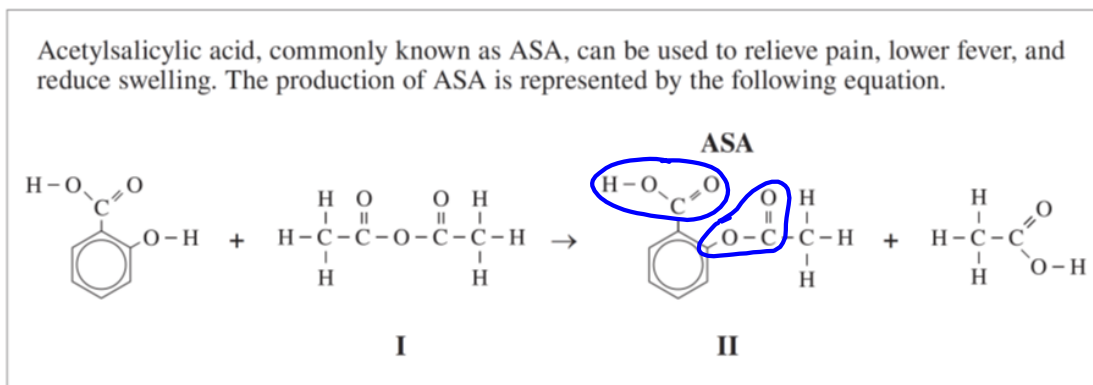


### 2. Condensation polymerization

- monomers have parts of functional groups removed to be joined together.



Use the following information to answer the next question.



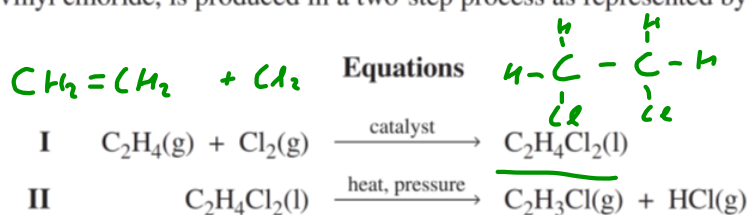
25. In the production of ASA represented by the equation above, molecule I is i, and molecule II can be classified as an ii.

The statement above is completed by the information in row

Row	<i>i</i>	<i>ii</i>
<b>A.</b>	aliphatic	ester
<b>B.</b>	aliphatic	<del>alcohol</del>
<b>C.</b>	<del>aromatic</del>	ester
<b>D.</b>	<del>aromatic</del>	alcohol

Use the following information to answer the next question.

PVC, polyvinyl chloride, is a hard plastic used to make sewage pipes and vinyl siding. The monomer, vinyl chloride, is produced in a two-step process as represented by the following equations.



26. The reaction represented by Equation I is i reaction and the product is an ii.

The statement above is completed by the information in row

Row	<i>i</i>	<i>ii</i>
<b>A.</b>	an addition	<del>alkene</del>
<b>B.</b>	an addition	alkyl halide
<b>C.</b>	<del>a substitution</del>	alkene
<b>D.</b>	<del>a substitution</del>	alkyl halide

- organic halide  
- halogenated hydrocarbon

