SL Paper 1

What is the product of the reaction between hex-3-ene and steam?

A. Hexan-1-ol

B. Hexan-2-ol

C. Hexan-3-ol

D. Hexan-4-ol

Applying IUPAC rules, what is the name of $CH_3CH(CH_3)CH_2COOH$?

A. 2,3-dimethylpropanoic acid

B. Pentanoic acid

C. 3-methylbutanoic acid

D. 2-methylbutanoic acid

Which organic molecule is **not** a structural isomer of pentan-1-ol?

A. pentan-2-ol

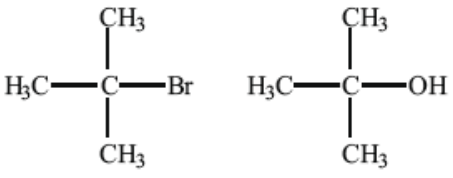
B. 2-methylpentan-2-ol

C. 2-methylbutan-2-ol

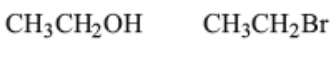
D. pentan-3-ol

In which pair are both compounds secondary?

A.



B.



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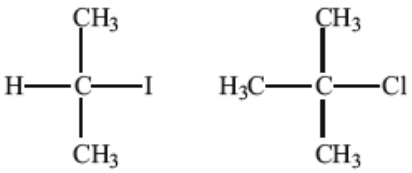

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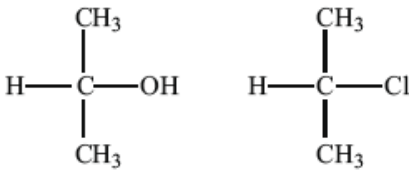


Which of the following pairs are members of the same homologous series?

A. $CH_3CH_2CH_2OH$ and CH_3CH_2CHO

B. $CH_3CH(OH)CH_3$ and $CH_3CH_2CH(OH)CH_3$

C. CH_3COCH_3 and CH_3CH_2COOH

D. $CH_3COCH_2CH_3$ and CH_3CH_2CHO

Which properties are features of a homologous series?

I. Same general formula

II. Similar chemical properties

III. Gradation in physical properties

A. I and II only

B. I and III only

C. II and III only

D. I, II and III

Some methane gas is burned in a limited supply of oxygen. Which products could form?

I. C(s)

II. CO(g)

III. CO_2(g)

A. I and II only

B. I and III only

C. II and III only

D. I, II and III

How many **structural** isomers exist with the formula $C_3H_5Cl_3$?

A. 3

B. 4

C. 5

D. 6

What are possible products of the incomplete combustion of propane?

A. carbon monoxide, hydrogen and carbon

B. carbon dioxide, carbon and hydrogen

C. carbon, carbon monoxide and water

D. carbon dioxide and water only

Which equation represents a propagation step in the reaction of methane with bromine?

A. $\mathrm{CH_4} \rightarrow \mathrm{CH_3}\bullet + \mathrm{H}\bullet$

B. $\mathrm{CH_4} + \mathrm{Br}\bullet \rightarrow \mathrm{CH_3}\bullet + \mathrm{HBr}$

C. $\mathrm{CH_4} + \mathrm{Br}\bullet \rightarrow \mathrm{CH_3Br} + \mathrm{H}\bullet$

D. $\mathrm{CH_3}\bullet + \mathrm{Br}\bullet \rightarrow \mathrm{CH_3Br}$

Which species can oxidize ethanol to ethanoic acid?

A. $\mathrm{I^-}$

B. Fe

C. $\mathrm{O^{2-}}$

D. Acidified $\mathrm{K_2Cr_2O_7}$

What is the major product of the reaction between HCl and but-2-ene?

A. 1,2-dichlorobutane

B. 2,3-dichlorobutane

C. 1-chlorobutane

D. 2-chlorobutane

What is the mechanism for the reaction of propene with iodine in the dark?

A. electrophilic addition

B. electrophilic substitution

C. free radical substitution

D. nucleophilic substitution

What happens when a few drops of bromine water are added to excess hex-1-ene and the mixture is shaken?

I. The colour of the bromine water disappears.

II. The organic product formed does not contain any carbon-carbon double bonds.

III. 2-bromohexane is formed.

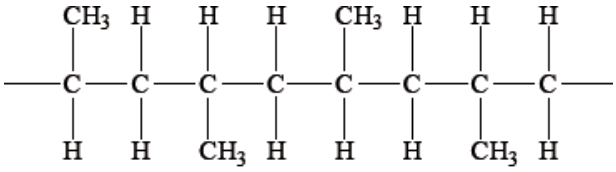
A. I and II only

B. I and III only

C. II and III only

D. I, II and III

Which substance can be polymerized to produce the polymer below?



A. But-1-ene

B. But-2-ene

C. Propene

D. 2-methylpropene

Which of the structures below is an aldehyde?

A. $CH_3CH_2CH_2CH_2OH$

B. $CH_3CH_2COCH_3$

C. $CH_3CH_2COOCH_3$

D. $CH_3CH_2CH_2CH\ O$

Which order is correct when the following substances are arranged in order of **increasing** boiling point?

A. $CH_3CH_3 < CH_3CHO < CH_3CH_2OH$

B. $CH_3CHO < CH_3CH_2OH < CH_3CH_3$

C. $CH_3CH_2OH < CH_3CH_3 < CH_3CHO$

D. $CH_3CH_3 < CH_3CH_2OH < CH_3CHO$

Which of the following are isomers of pentane?

I. 2-methylpentane

II. methylbutane

III. dimethylpropane

A. I and II only

B. I and III only

C. II and III only

D. I, II and III

Which compound is **not** an isomer of hexane?

A. $CH_3CH(CH_3)CH_2CH_2CH_3$

B. $CH_3CHCHCH_2CH_2CH_3$

C. $(CH_3)_3CCH_2CH_3$

D. $CH_3CH_2CH(CH_3)CH_2CH_3$

Which steps are involved in the free-radical mechanism of the bromination of ethane in the presence of ultraviolet radiation?

I. $C_2H_6 + Br\bullet \rightarrow C_2H_5\bullet + HBr$

II. $C_2H_5\bullet Br_2 \rightarrow C_2H_5Br + Br\bullet$

III. $C_2H_5\bullet + Br\bullet \rightarrow C_2H_5Br$

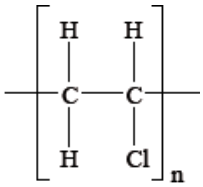
A. I and II only

B. I and III only

C. II and III only

D. I, II and III

Which monomer could be used to form a polymer with the following repeating unit?



A. CH_3CH_2Cl

B. CH_2ClCH_2Cl

C. CH_2CHCl

D. CHClCHCl

Which organic product forms in the following reaction?

$$(CH_3)_2CHOH \xrightarrow[\text{reflux}]{K_2Cr_2O_7/H^+}$$

A. Ethanoic acid

B. Propanal

C. Propanone

D. Propanoic acid

Which compound contains a secondary carbon atom?

A. $CH_3CH(Cl)CH(CH_3)_2$

B. $(CH_3)_2CHCH_2Cl$

C. $(CH_3)_3CCl$

D. CH_3CH_2Cl

How many structural isomers of C_6H_{14} exist?

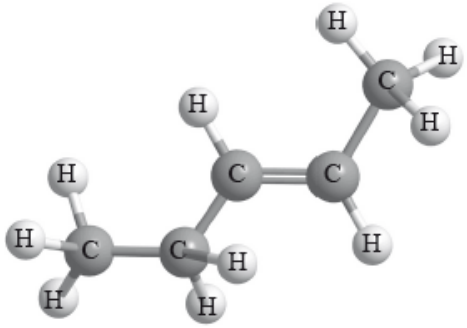
A. 4

B. 5

C. 6

D. 7

Consider the compound $(CH_3CH_2)CH{=}CH(CH_3)$. Which statements are correct?



I. A suitable name is pent-2-ene.

II. The empirical formula is CH_2.

III. An isomer of the compound is pentane.

A. I and II only

B. I and III only

C. II and III only

D. I, II and III

Which of these reactions proceeds by a free radical mechanism in the presence of UV light?

A. $C_6H_6 + Cl_2 \rightarrow C_6H_5Cl + HCl$

B. $C_6H_6 + 3H_2 \rightarrow C_6H_{12}$

C. $CH_2CH_2 + HBr \rightarrow CH_3CH_2Br$

D. $CH_3CH_3 + Cl_2 \rightarrow CH_3CH_2Cl + HCl$

Which is a tertiary halogenoalkane?

A. $\mathrm{CH_3CH_2CH_2Br}$

B. $\mathrm{CH_3CH_2CH(CH_3)Cl}$

C. $\mathrm{C(CH_3)_3Br}$

D. $\mathrm{CH_3CHClCH_2CH_3}$

Which statement is correct about the polymerization of ethene to poly(ethene)?

A. The polymer is an alkene.

B. The monomer ethene and the repeating unit have the same empirical formula.

C. The monomer ethene is less reactive than the polymer.

D. The polymer contains C–C single and C=C double bonds.

Which structural formula represents a secondary halogenoalkane?

A. $\mathrm{CH_3CHBrCH_2CH_3}$

B. $\mathrm{(CH_3)_3CBr}$

C. $\mathrm{CH_3(CH_2)_3Br}$

D. $\mathrm{(CH_3)_2CHCH_2Br}$

What is the order of increasing boiling point?

A. $C_4H_{10} < CH_3COOH < CH_3CH_2CHO < CH_3CH_2CH_2OH$

B. $C_4H_{10} < CH_3CH_2CHO < CH_3CH_2CH_2OH < CH_3COOH$

C. $CH_3COOH < CH_3CH_2CH_2OH < CH_3CH_2CHO < C_4H_{10}$

D. $C_4H_{10} < CH_3CH_2CH_2OH < CH_3CH_2CHO < CH_3COOH$

What is the organic product of the reaction between 2-chlorobutane and sodium hydroxide solution?

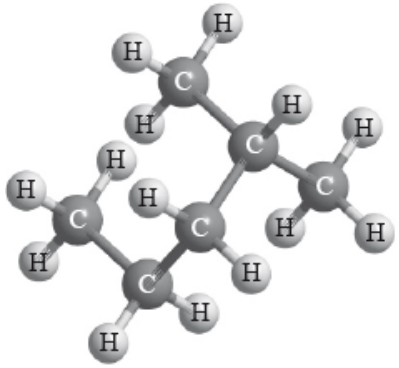
A. Butan-1-ol

B. Butan-2-ol

C. Butanal

D. Butanone

What is the name of the following molecule applying IUPAC rules?



A. 1,1-dimethylbutane

B. Hexane

C. 2-methylpentane

D. 4-methylpentane

Which equation represents the initiation reaction when methane reacts with chlorine in the presence of ultraviolet light?

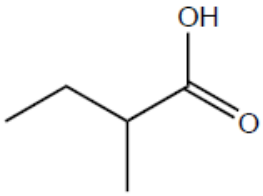
A. $CH_4 \rightarrow CH_3\bullet + H\bullet$

B. $Cl_2 \rightarrow 2Cl\bullet$

C. $Cl_2 \rightarrow Cl^+ + Cl^-$

D. $CH_3\bullet + Cl_2 \rightarrow CH_3Cl + Cl\bullet$

What is the name of the compound with this molecular structure applying IUPAC rules?



A. 1-methylpropanoic acid

B. 2-methylpropanoic acid

C. 2-methylbutanoic acid

D. 3-methylbutanoic acid

Which statements about the chlorine free radical are correct?

I. It has 18 electrons.

II. It is an uncharged species.

III. It is formed by homolytic fission.

A. I and II only

B. I and III only

C. II and III only

D. I, II and III

What is the general formula of the alkyne series?

A. C_nH_n

B. C_nH_{2n-2}

C. C_nH_{2n}

D. C_nH_{2n+2}

Which compound can be oxidized when heated with an acidified solution of potassium dichromate(VI)?

A. $CH_3C(O)CH_2CH_3$

B. $CH_3CH_2CH(OH)CH_3$

C. $(CH_3)_3COH$

D. $CH_3(CH_2)_2COOH$

Which conditions are used to convert ethanol to ethanal?

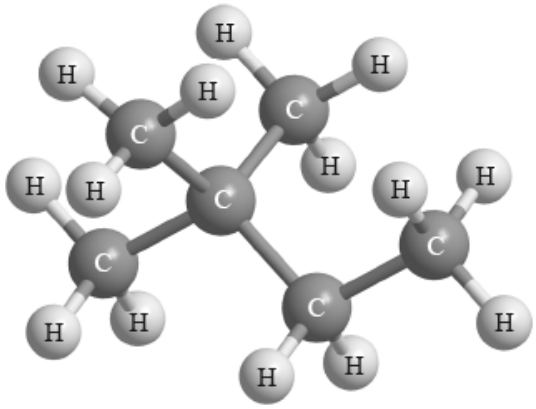
A. Excess oxidizing agent and reflux

B. Excess oxidizing agent and distillation

C. Excess ethanol and reflux

D. Excess ethanol and distillation

What is the name of the alkane shown in the diagram below, applying IUPAC rules?



A. Hexane

B. 1,1,1-trimethylpropane

C. Ethylmethylpropane

D. 2,2-dimethylbutane

Which compound could be **X** in the two-stage reaction pathway?

$$\mathrm{C_2H_4} \rightarrow \mathbf{X} \rightarrow \mathrm{C_2H_5OH}$$

A. $\mathrm{C_2H_6}$

B. $\mathrm{C_2H_3OH}$

C. $\mathrm{C_2H_5Br}$

D. $\mathrm{C_2H_4Cl_2}$

What is the product of the oxidation of butan-2-ol?

A. But-2-ene

B. Butanoic acid

C. Butanal

D. Butanone

What is the mechanism of the reaction between ethane and chlorine in sunlight?

A. Free radical substitution
B. Free radical addition
C. Electrophilic substitution
D. Electrophilic addition

What is the name of $(CH_3)_3CCOCH_3$, applying IUPAC rules?

A. 2,2-dimethylbutan-3-one

B. 3,3-dimethylbutan-2-one

C. 2,2-dimethylbutanal

D. 3,3-dimethylbutanal

Which substance is **not** produced during the combustion of alkanes?

A. CO_2

B. CO

C. C

D. H_2

Which conditions are required to obtain a good yield of a carboxylic acid when ethanol is oxidized using potassium dichromate(VI), $K_2Cr_2O_7(aq)$?

I. Add sulfuric acid

II. Heat the reaction mixture under reflux

III. Distil the product as the oxidizing agent is added

A. I and II only

B. I and III only

C. II and III only

D. I, II and III

Which are structural isomers?

I. CH_3CH_2OH and CH_3OCH_3

II. $HOCH_2CH_3$ and CH_3CH_2OH

III. CH_3COOH and $HCOOCH_3$

A. I and II only

B. I and III only

C. II and III only

D. I, II and III

What is the IUPAC name for $CH_3CH_2CH(CH_3)CH_3$?

A. 1,1-dimethylpropane

B. 2-ethylpropane

C. 2-methylbutane

D. 3-methylbutane

Which statement about a homologous series is correct?

A. Members of the series differ by CH_3.

B. Members of the series have the same physical properties.

C. Members of the series have the same empirical formula.

D. Members of the series have similar chemical properties.

Which three compounds can be considered to be a homologous series?

A. CH_3OH, CH_3CH_2OH, $CH_3CH_2CH_2OH$

B. CH_3CH_2OH, CH_3CHO, CH_3COOH

C. $CH_3CH_2CH(OH)CH_3$, $CH_3CH_2CH_2CH_2OH$, $(CH_3)_3COH$

D. $CH_3CH_2CH_2CH_2OH$, $CH_3CH_2OCH_2CH_3$, $(CH_3)_2CH_2CHO$

Which type of reaction occurs between an alcohol and a carboxylic acid?

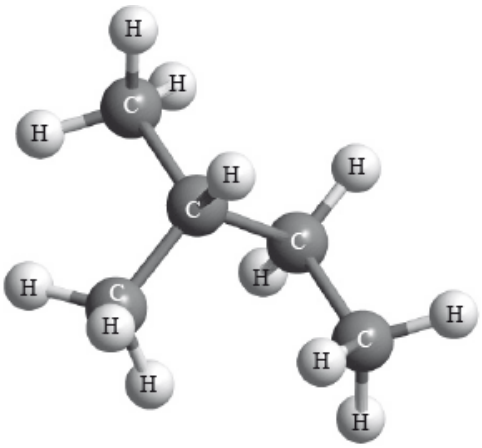
A. Addition

B. Oxidation

C. Esterification

D. Polymerization

What is the IUPAC name of the following compound?



A. 2-methylbutane

B. Ethylpropane

C. 3-methylbutane

D. Pentane

Which equations represent the incomplete combustion of methane?

I. $\mathrm{CH_4(g) + 2O_2(g) \rightarrow CO_2(g) + 2H_2O(g)}$

II. $\mathrm{CH_4(g) + 1\frac{1}{2}O_2(g) \rightarrow CO(g) + 2H_2O(g)}$

III. $\mathrm{CH_4(g) + O_2(g) \rightarrow C(s) + 2H_2O(g)}$

A. I and II only

B. I and III only

C. II and III only

D. I, II and III

What product is formed when $\mathrm{CH_3CH(OH)CH_3}$ is reacted with acidified potassium dichromate(VI)?

A. $\mathrm{CH_3COOCH_3}$

B. $\mathrm{CH_3CH_2CHO}$

C. $\mathrm{CH_3CH_2COOH}$

D. $\mathrm{CH_3COCH_3}$

When bromine water is shaken with a liquid organic compound, it is rapidly decolourized. What can be determined from this test?

A. The compound is an alcohol.

B. The compound is an alkane.

C. The compound is an alkene.

D. The compound is an iodoalkane.

Which of the following statements about alkenes is **not** correct?

A. They have reactive double bonds.

B. They can form addition polymers.

C. They react mainly by substitution.

D. They can react with water to form alcohols.

Which compound would decolourize bromine water in the dark?

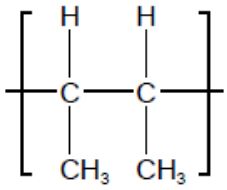
A. $CH_3COCH_2CH_3$

B. $CH_3(CH_2)_4OH$

C. $CH_3CHCHCH_3$

D. $CH_3(CH_2)_3CH_3$

Which monomer is used to form the polymer with the following repeating unit?



A. $CH_3CH{=}CHCH_3$

B. $CH_3CH_2CH{=}CH_2$

C. $CH_3CH_2CH_2CH_3$

D. $(CH_3)_2C{=}CH_2$

Which compound could be formed when $CH_3CH_2CH_2OH$ is heated with acidified potassium dichromate(VI)?

I. CH_3CH_2CHO

II. CH_3CH_2COOH

III. CH_3COCH_3

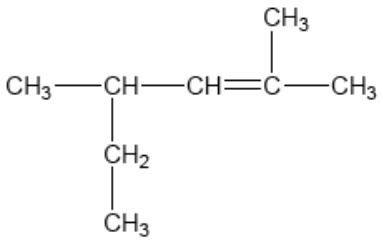
A. I and II only

B. I and III only

C. II and III only

D. I, II and III

Applying IUPAC rules, what is the name of the compound?



A. 1-ethyl-1,3-dimethylbut-2-ene

B. 2-ethyl-4-methylpent-3-ene

C. 2-methyl-4-ethylpent-3-ene

D. 2,4-dimethylhex-2-ene

Which compound is an isomer of octane, C_8H_{18}?

A. $(CH_3)_2CH(CH_2)_2CH(CH_3)_2$

B. $(CH_3)_2CHCH_2CHCHCH_2CH_3$

C. $CH_3(CH_2)_5CH_3$

D. $(CH_3)_2CH(CH_2)_2CHCHCH_3$

Which statement is correct for members of the same homologous series?

A. They have the same empirical formula and a gradual change in chemical properties.

B. They have the same empirical formula and a gradual change in physical properties.

C. They have the same general formula and a gradual change in chemical properties.

D. They have the same general formula and a gradual change in physical properties.

Which compounds belong to the same homologous series?

A. $CHCCH_2CH_3$, $CHCCH_2CH_2CH_3$

B. $CH_3CH_2CH_2CH_2OH$, $CH_3CH_2OCH_2CH_3$

C. CH_2CHCH_3, $CH_3CH_2CH_2CH_3$

D. CH_3COCH_3, $CH_3CH_2OCH_3$

Which molecule contains an ester group?

A. CH_3CH_2COOH

B. CH_3COOCH_3

C. $CH_3COCH_2CH_2OH$

D. $OHCCH_2CHO$

Which three compounds can be considered to be a homologous series?

A. CH_3NH_2 $CH_3CH_2NH_2$ $CH_3CH_2CH_2NH_2$

B. $CH_3CH_2CH_2NH_2$ $CH_3CH(NH_2)CH_3$ $CH_3(NH)CH_2CH_3$

C. $C(CH_3)_4$ $CH_3CH_2CH_2CH_2CH_3$ $(CH_3)_2CHCH_2CH_3$

D. CH_3CH_2COOH CH_3COOCH_3 $HCOOCH_2CH_3$

Which type of reaction occurs when methanol and propanoic acid react together in the presence of a catalyst?

A. Addition

B. Condensation

C. Redox

D. Neutralization

What is the structural formula of 2,3-dibromo-3-methylhexane?

A. $CH_3CHBrCHBrCH(CH_3)CH_2CH_3$

B. $CH_3CHBrCBr(CH_3)CH_2CH_2CH_3$

C. $CH_3CH_2CHBrCBr(CH_2CH_3)_2$

D. $CH_3CHBrCHBrCH(CH_2CH_3)_2$

What is the function of the ultraviolet light used in the reaction between ethane and bromine?

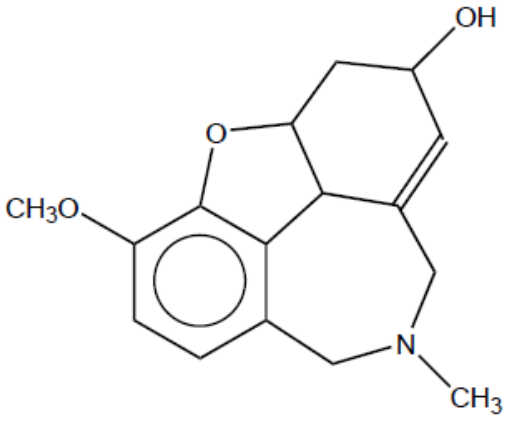
A. It causes bromine free radicals to form bromine molecules.

B. It causes bromide ions to form bromine molecules.

C. It causes bromine molecules to form bromide ions.

D. It causes bromine molecules to form bromine free radicals.

The structure of a drug used to treat symptoms of Alzheimer's disease is shown below. Which functional groups are present in this molecule?



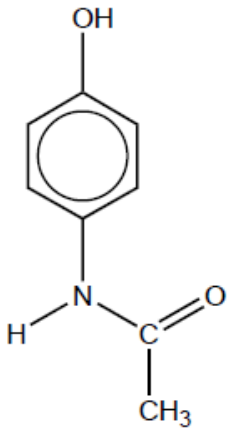
A. Hydroxyl and ester

B. Hydroxide and ether

C. Hydroxyl and ether

D. Hydroxide and ester

Which functional group is present in paracetamol?



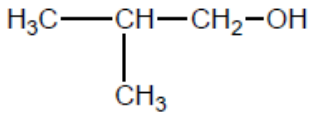
A. Carboxyl

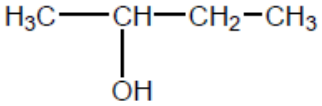
B. Amino

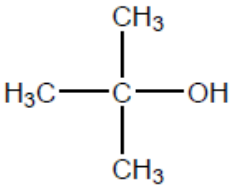
C. Nitrile

D. Hydroxyl

Which alcohols are oxidized by acidified potassium dichromate(VI) solution when heated?

I. 

II. 

III. 

A. I and II only

B. I and III only

C. II and III only

D. I, II and III

How many non-cyclic structural isomers exist with the molecular formula C_5H_{10}?

A. 2

B. 3

C. 4

D. 5

Which molecule has a tertiary nitrogen?

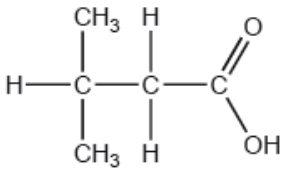
A. $(CH_3)_2NH$

B. $(C_2H_5)_4N^+I^-$

C. $C_3H_7N(CH_3)_2$

D. $C_6H_5NH_2$

What is the name of this compound, using IUPAC rules?



A. 1,1-dimethylpropanoic acid

B. 3,3-dimethylpropanoic acid

C. 2-methylbutanoic acid

D. 3-methylbutanoic acid

Which compound can both be esterified and turn acidified potassium dichromate(VI) solution green?

A. $(CH_3)_3COH$
B. $CH_3CH_2CO_2H$
C. $(CH_3)_2CHOH$
D. $CH_3CH_2COCH_3$

Which of the following substances are structural isomers of each other?

I. $CH_3(CH_2)_3CH_3$

II. $(CH_3)_2CHCH_3$

III. $CH_3CH(CH_3)CH_2CH_3$

A. I and II only

B. I and III only

C. II and III only

D. I, II and III

For the reaction pathway below, what are the names for the first and second steps?

$$CH_2CHCH_3 \rightarrow CH_3CHClCH_3 \rightarrow CH_3CHOHCH_3$$

	First step	Second step
A.	nucleophilic substitution	oxidation
B.	addition	nucleophilic substitution
C.	nucleophilic substitution	nucleophilic substitution
D.	addition	oxidation

Which statements are correct for the reaction of ethene with bromine in the absence of ultraviolet light?

I. It is an addition reaction.

II. The organic product is colourless.

III. The organic product is saturated.

A. I and II only

B. I and III only

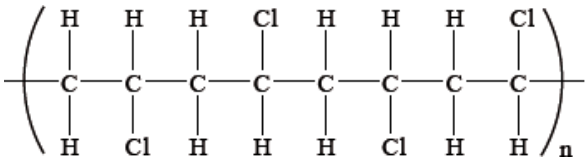
C. II and III only

D. I, II and III

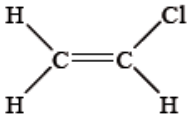
How many alcohols have the general formula $C_4H_{10}O$?

A. 3
B. 4
C. 5
D. 6

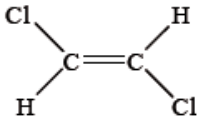
From which monomer is this polymer made?



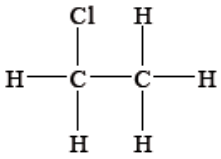
A.



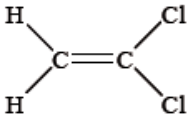
B.



C.



D.



Which describes the reaction between a halogen and ethane?

	Mechanism	Bond fission in halogen
A.	free radical	homolytic
B.	free radical	heterolytic
C.	addition	homolytic
D.	addition	heterolytic

What are possible names of a molecule with molecular formula $C_4H_{10}O$?

I. 1-Methoxypropane

II. 2-Methylpropan-2-ol

III. Butanal

A. I and II only

B. I and III only

C. II and III only

D. I, II and III

Which equation represents a propagation step in the mechanism for the reaction between ethane, C_2H_6, and chlorine, Cl_2, in the presence of sunlight/UV?

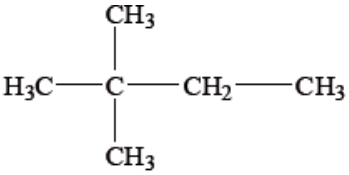
A. $C_2H_6 + Cl\bullet \rightarrow C_2H_5\bullet + HCl$

B. $C_2H_6 + Cl\bullet \rightarrow C_2H_5Cl + H\bullet$

C. $Cl_2 \rightarrow 2Cl\bullet$

D. $C_2H_5\bullet + Cl\bullet \rightarrow C_2H_5Cl$

What is the name of the following compound applying IUPAC rules?



A. 1,1,1-trimethylpropane

B. 2,2-dimethylbutane

C. 3,3-dimethylbutane

D. 2-methyl-2-ethylpropane

What is the product of the following reaction?

$$CH_3CH(OH)CH_3 \xrightarrow{Cr_2O_7^{2-}/H^+}$$

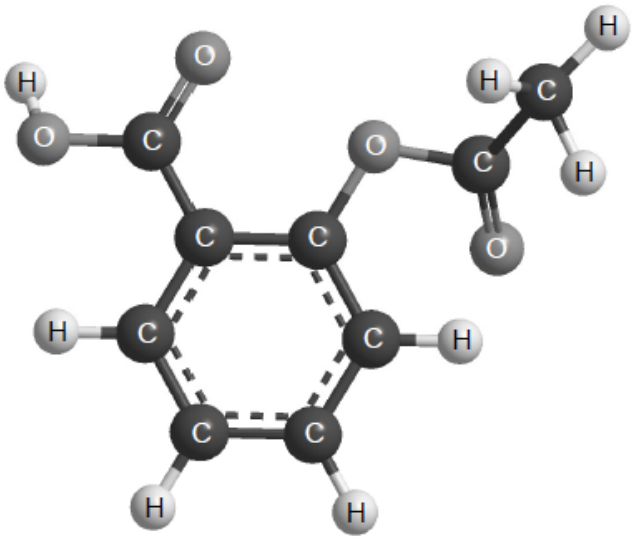
A. CH_3COOH

B. CH_3COCH_3

C. CH_3CH_2COOH

D. $CH_3CH_2CH_3$

What are the functional groups in the aspirin molecule?



I. Ether
II. Carboxyl
III. Ester

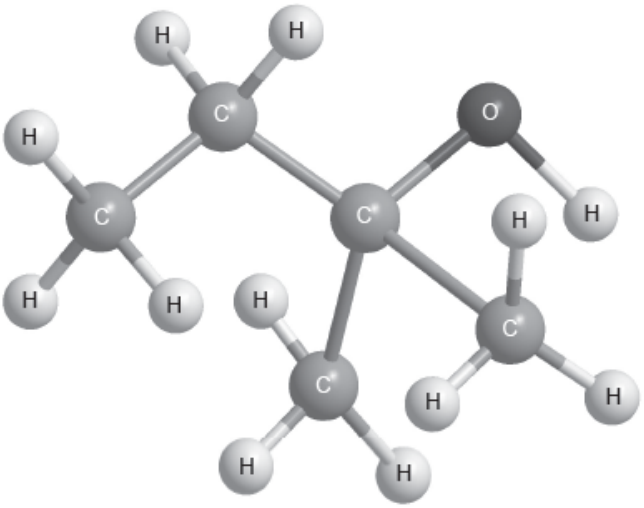
A. I and II only

B. I and III only

C. II and III only

D. I, II and III

What is the name of this compound, using IUPAC rules?



A. 3-methylbutan-3-ol

B. 2-ethylpropan-2-ol

C. 2-methylbutan-2-ol

D. 3-methylbutan-2-ol