
HL Paper 1

Which would be the most effective method to distinguish between liquid propan-1-ol and propan-2-ol?

- A. Observation of colour change when warmed with acidified potassium dichromate
- B. Determination of m/z value of molecular ion in the mass spectrum
- C. Determination of percentage composition
- D. ^1H NMR spectroscopy

Markscheme

D

Examiners report

[N/A]

What structural feature must a molecule have in order to undergo addition polymerization?

- A. Two functional groups
- B. A carbon–carbon double bond
- C. Carbon atoms singly bonded together
- D. A polar covalent bond

Markscheme

B

Examiners report

[N/A]

What is the organic product of the reaction between butan-1-ol and ethanoic acid on heating using concentrated sulfuric acid?

- A. Butyl methanoate
- B. Butyl ethanoate
- C. Ethyl butanoate

D. Ethyl propanoate

Markscheme

B

Examiners report

[N/A]

Which reaction occurs via a free-radical mechanism?

- A. $\text{C}_2\text{H}_6 + \text{Br}_2 \rightarrow \text{C}_2\text{H}_5\text{Br} + \text{HBr}$
- B. $\text{C}_2\text{H}_4 + \text{Br}_2 \rightarrow \text{C}_2\text{H}_4\text{Br}_2$
- C. $\text{C}_4\text{H}_9\text{I} + \text{OH}^- \rightarrow \text{C}_4\text{H}_9\text{OH} + \text{I}^-$
- D. $(\text{CH}_3)_3\text{CI} + \text{H}_2\text{O} \rightarrow (\text{CH}_3)_3\text{COH} + \text{HI}$

Markscheme

A

Examiners report

[N/A]

What is the name of $(\text{CH}_3)_2\text{CHCOCH}_3$ applying IUPAC rules?

- A. 3,3-dimethylpropan-2-one
- B. 3-methylbutan-2-one
- C. 2-methylbutan-3-one
- D. 3-methylbutanal

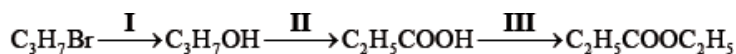
Markscheme

B

Examiners report

One respondent stated that choices B. 3-methylbutan-2-one and C. 2-methylbutan-3-one would lead to the same structure. However, according to the guide, candidates should be able to apply IUPAC rules to name compounds containing up to six carbon atoms involving a ketone. Hence, applying IUPAC rules, the only answer is in fact B as the compound will be numbered with the lowest number on the ketone. It was surprising that candidates had difficulty naming this compound, and the question proved to be the third most challenging question on the paper, with less than half getting it correct (47.50%). The question had an associated discrimination index of 0.45.

What is the correct order of reaction types in the following sequence?



	I	II	III
A.	substitution	oxidation	condensation
B.	addition	substitution	condensation
C.	oxidation	substitution	condensation
D.	substitution	oxidation	substitution

Markscheme

A

Examiners report

[N/A]

Which compound is produced in the reaction between but-2-ene and steam?

- A. $\text{CH}_3\text{CHOHCHOHCH}_3$
- B. $\text{CH}_2\text{OHCH}_2\text{CH}_2\text{CH}_2\text{OH}$
- C. $\text{CH}_3\text{CH}_2\text{CHOHCH}_3$
- D. $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{OH}$

Markscheme

C

Examiners report

[N/A]

Which compounds can be reduced?

- I. C_2H_4
- II. CH_3COOH
- III. CH_3CHO

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

Markscheme

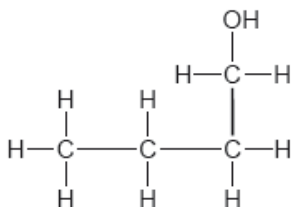
D

Examiners report

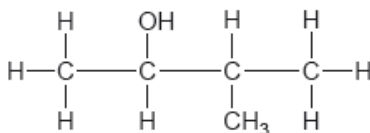
[N/A]

Which is a secondary alcohol?

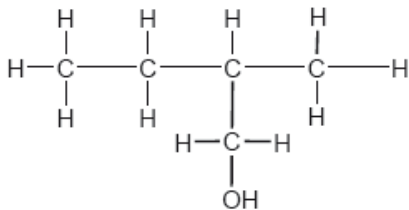
A.



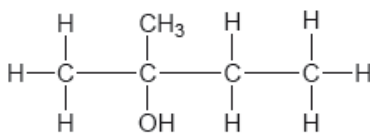
B.



C.



D.



Markscheme

B

Examiners report

[N/A]

What is the IUPAC name of the compound $\text{CH}_3\text{CH}_2\text{COOCH}_2\text{CH}_3$?

- A. Ethyl ethanoate
- B. Propyl ethanoate
- C. Ethyl propanoate
- D. Pentyl propanoate

Markscheme

C

Examiners report

[N/A]

Which functional groups are present in $\text{C}_6\text{H}_5\text{CONHC}_6\text{H}_5$?

- A. Benzene ring (phenyl), amine
- B. Benzene ring (phenyl), ketone, amine
- C. Benzene ring (phenyl), amide
- D. Alkene, amide

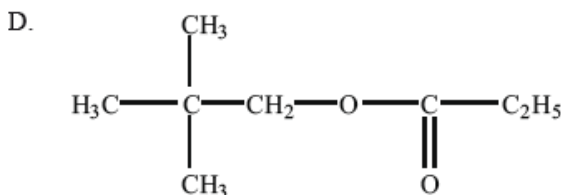
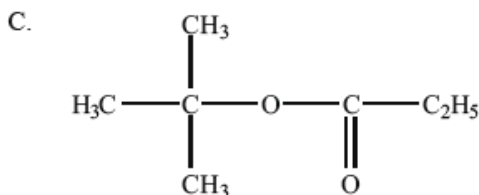
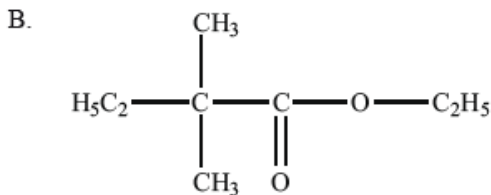
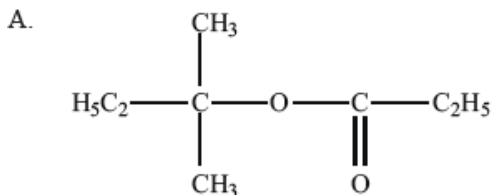
Markscheme

C

Examiners report

[N/A]

What is the structural formula of the ester formed by reacting propanoic acid with 2-methylbutan-2-ol under appropriate conditions?



Markscheme

A

Examiners report

[N/A]

What is the name of $(\text{CH}_3)_3\text{CCOCH}_3$, applying IUPAC rules?

- A. 2,2-dimethylbutan-3-one
- B. 3,3-dimethylbutan-2-one
- C. 2,2-dimethylbutanal
- D. 3,3-dimethylbutanal

Markscheme

B

Examiners report

One respondent commented that “very few IB specific textbooks highlight the role of priority of naming functional groups”. It was the seventh hardest question; nearly 65% gave the correct answer with close to 28% opting for A (as expected).

Which compound is the major product of the reaction when 1-bromobutane is heated with concentrated sodium hydroxide in ethanol?

- A. $\text{CH}_3\text{CHOHCH}_2\text{CH}_3$
- B. $\text{CH}_3\text{CHCHCH}_3$
- C. $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{OH}$

D. $\text{CH}_2\text{CHCH}_2\text{CH}_3$

Markscheme

D

Examiners report

[N/A]

What is the IUPAC name for $\text{HCOOCH}_2\text{CH}_2\text{CH}_3$?

- A. Butanoic acid
- B. Butanal
- C. Methyl propanoate
- D. Propyl methanoate

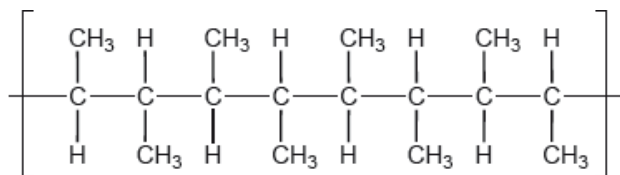
Markscheme

D

Examiners report

[N/A]

Which monomer could create this polymer?



- A. But-2-ene
- B. But-1-ene
- C. Propene
- D. 2-Methylprop-1-ene

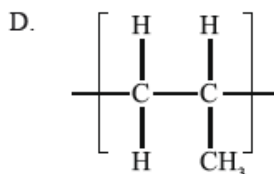
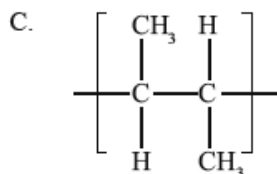
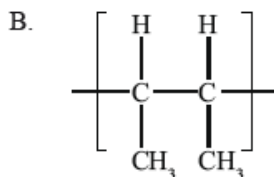
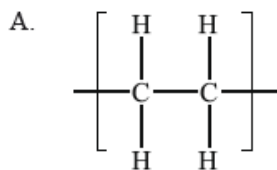
Markscheme

A

Examiners report

[N/A]

Which of these repeating units is present in the polymer poly(propene)?



Markscheme

D

Examiners report

[N/A]

What is the IUPAC name for $(\text{CH}_3)_2\text{COH}(\text{CH}_2)_2\text{CH}_3$?

- A. Hexan-3-ol
- B. 2-methylpentan-2-ol
- C. 2-methylpentan-3-ol
- D. Dimethylpentan-1-ol

Markscheme

B

Examiners report

[N/A]

Which product is formed when bromine water is added to propene, CH_3CHCH_2 ?

- A. $\text{CH}_3\text{CBr}_2\text{CH}_3$

- B. $\text{CH}_2\text{BrCH}_2\text{CH}_2\text{Br}$
- C. $\text{CH}_3\text{CHBrCH}_2\text{Br}$
- D. $\text{CH}_3\text{CH}_2\text{CH}_2\text{Br}$

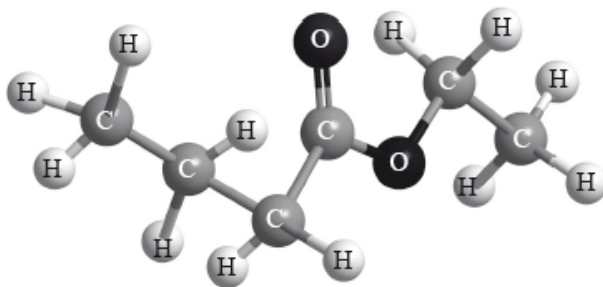
Markscheme

C

Examiners report

Although 65.41% gave the correct answer, nearly a quarter chose D.

Which reactants could be used to form the compound below?



- A. Butanoic acid and ethanol
- B. Propanoic acid and ethanol
- C. Ethanoic acid and propan-1-ol
- D. Ethanoic acid and butan-1-ol

Markscheme

A

Examiners report

[N/A]

Which compound is an amide?

- A. $\text{CH}_3\text{COOCH}_3$
- B. CH_3CONH_2
- C. CH_3NH_2
- D. $\text{CH}_2(\text{NH}_2)\text{COOH}$

Markscheme

B

Examiners report

[N/A]

What is the name of the ester formed when $\text{CH}_3\text{CH}_2\text{COOH}$ and CH_3OH react together?

- A. Ethyl methanoate
- B. Methyl ethanoate
- C. Propyl methanoate
- D. Methyl propanoate

Markscheme

D

Examiners report

[N/A]

What is the product of the addition of chlorine, Cl_2 , to propene, C_3H_6 ?

- A. 1,1-dichloropropane
- B. 2,2-dichloropropane
- C. 1,2-dichloropropane
- D. 1,3-dichloropropane

Markscheme

C

Examiners report

[N/A]

Identify the functional group present in $\text{HCOCH}_2\text{CH}_3$.

- A. Ester
- B. Ketone
- C. Aldehyde
- D. Alcohol

Markscheme

C

Examiners report

[N/A]

What are possible products of the incomplete combustion of propan-2-ol?

- A. carbon monoxide, hydrogen and carbon
- B. carbon dioxide, carbon and hydrogen
- C. carbon, carbon monoxide and water
- D. carbon dioxide and water only

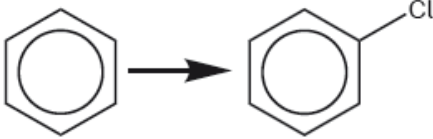
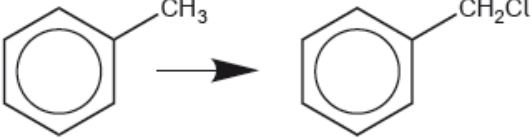
Markscheme

C

Examiners report

[N/A]

Which is the correct combination of substitution reaction mechanisms?

 <p>reaction mechanism</p>	 <p>reaction mechanism</p>
A. electrophilic	free radical
B. nucleophilic	nucleophilic
C. free radical	electrophilic
D. free radical	nucleophilic

Markscheme

A

Examiners report

[N/A]

In which order should the reagents be used to convert benzene into phenylamine (aniline)?

	1st reagent	2nd reagent	3rd reagent
A.	NaOH	Sn / conc. HCl	conc. HNO ₃ / conc. H ₂ SO ₄
B.	Sn / conc. HCl	NaOH	conc. HNO ₃ / conc. H ₂ SO ₄
C.	conc. HNO ₃ / conc. H ₂ SO ₄	Sn / conc. HCl	NaOH
D.	NaOH	conc. HNO ₃ / conc. H ₂ SO ₄	Sn / conc. HCl

Markscheme

C

Examiners report

[N/A]

What is the major product of the reaction between 2-methylbut-2-ene and hydrogen bromide?

- A. 3-bromo-2-methylbutane
- B. 3-bromo-3-methylbutane
- C. 2-bromo-3-methylbutane
- D. 2-bromo-2-methylbutane

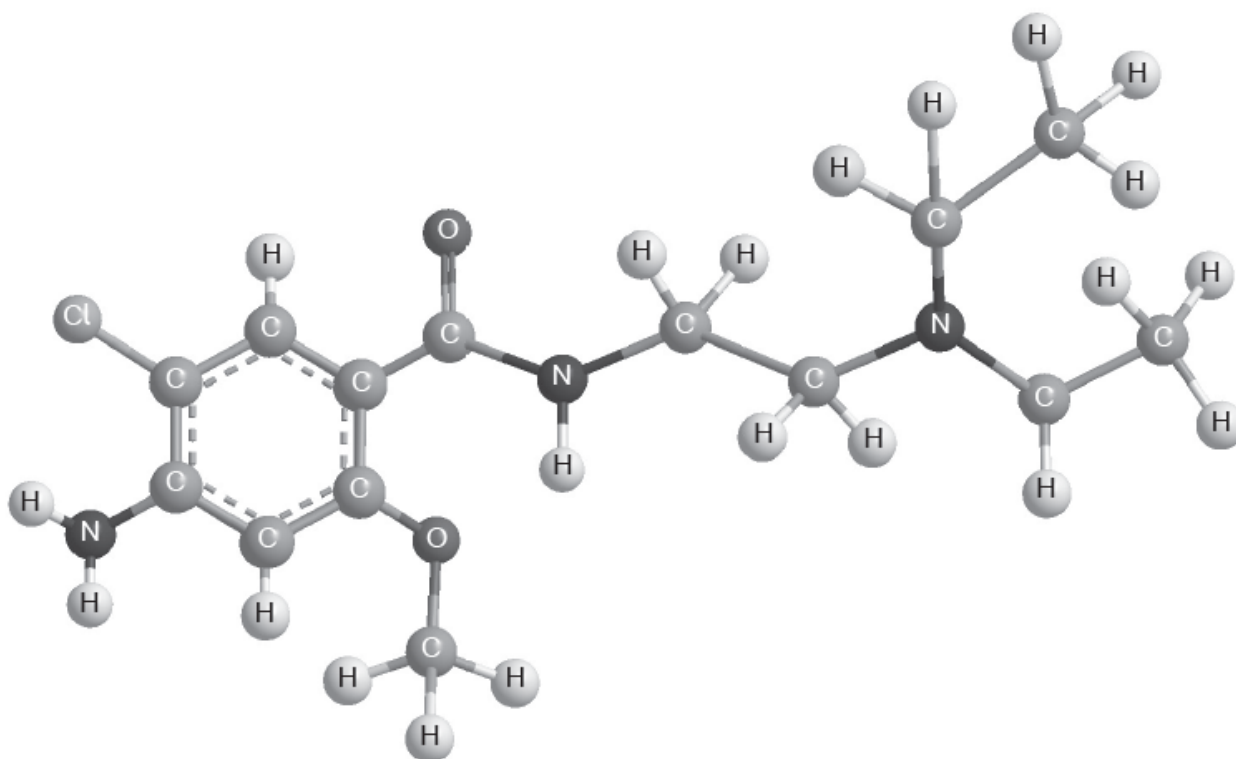
Markscheme

D

Examiners report

[N/A]

Which functional group is responsible for the pK_b of 4.1 in this compound?



- A. Amido
- B. Amino
- C. Chloro
- D. Ether

Markscheme

B

Examiners report

[N/A]