10.2 Functional Group Chemistry

Question Paper

Course	DP IB Chemistry
Section	10. Organic Chemistry
Topic	10.2 Functional Group Chemistry
Difficulty	Hard

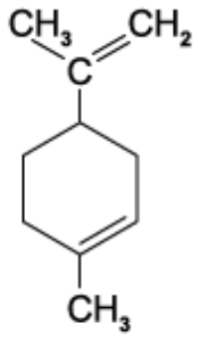
Time allowed: 20

Score: /10

Percentage: /100

Question 1

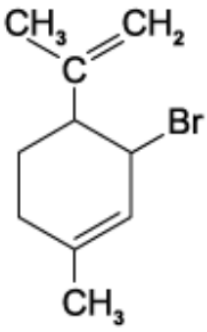
Limonene is an oil formed in the peel of citrus fruits.



Limonene

Which product is formed when an excess of bromine, $Br_2(l)$, reacts with limonene at room temperature in the dark?

A



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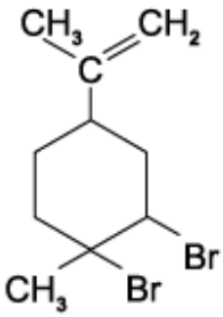

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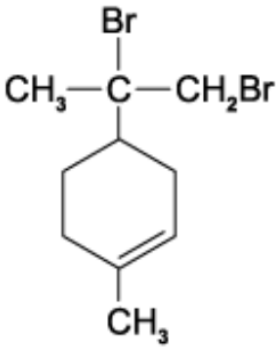
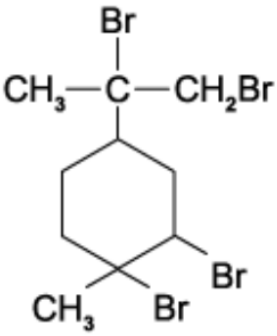


D



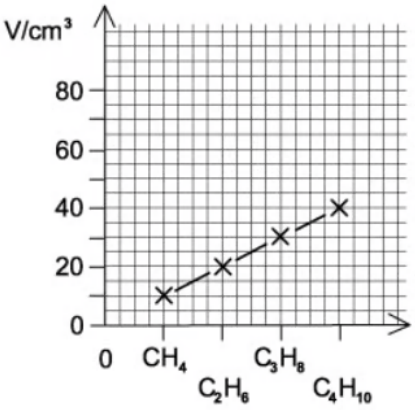
[1 mark]

Question 2

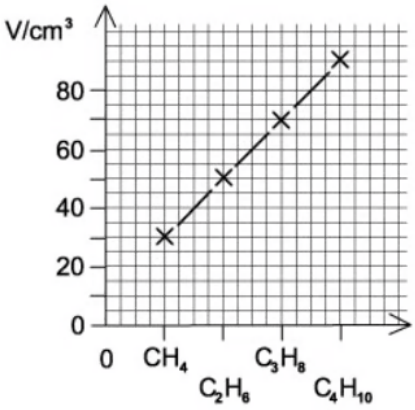
Samples of 10 cm^3 of each of the first four members of the alkane series are separately mixed with 70 cm^3 of oxygen. Each is then burned and the total volume, *V*, of residual gas measured again at room temperature and pressure.

Which graph represents the results that would be obtained?

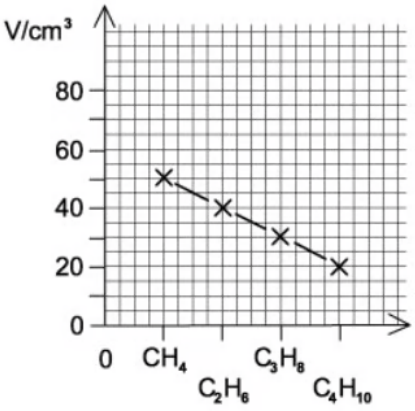
A



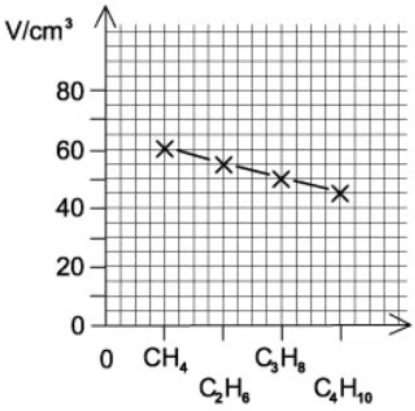
B



C



D

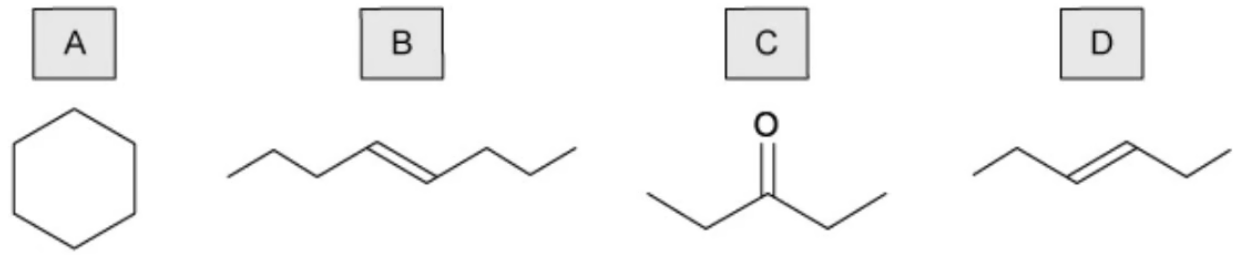


[1 mark]

Question 3

A periodic table is needed for this question

Which compound has an M_r of 84.18 and will react with HBr to give a product with an M_r of 165.09?



[1 mark]

Question 4

An organic compound **Y** with molecular formula $C_5H_{12}O$, is oxidised to compound **Z** with molecular formula $C_5H_{10}O_2$.

What could be the structural formula of **Y**?

1 $CH_3(CH_2)_4OH$

2 $CH_3CH_2CH(CH_2OH)CH_3$

3 $CH_3C(CH_3)_2CH_2OH$

A 1, 2 and 3 **B** 1 and 3 only **C** 2 and 3 only **D** 3 only

[1 mark]

Question 5

A periodic table is needed to answer this question

A number of alcohols with the formula $C_4H_{10}O$ are separately oxidised. Using 7.41 g of the alcohols a 50% yield of organic product is achieved.

What mass of product could be obtained?

1 4.41 g of butanoic acid

2 4.41 g of 2-methylpropanoic acid

3 3.61 g of butanone

A 1, 2 and 3 **B** 1 and 2 only **C** 2 and 3 only **D** 1 only

[1 mark]

Question 6

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

A $(CH_3)_2CHCH_2CH_2OH$

B $CH_3CH(OH)CH_2CH_2CH_2CH_3$

C $CH_3CH_2CH_2CH_2CH_2OH$

D $CH_3CH_2CH_2CH(OH)CH_3$

[1 mark]

Question 7

When compound **T** reacts with its own oxidation product, a sweet-smelling liquid is produced.
What is the identity of compound **T**?

A butanal

B butanone

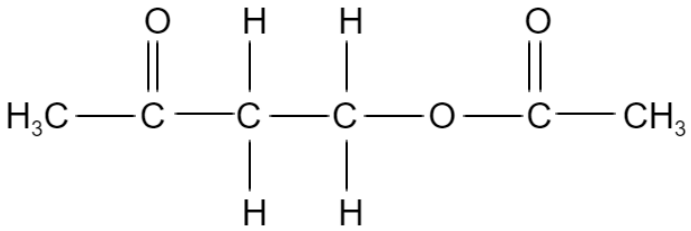
C butan-1-ol

D butanoic acid

[1 mark]

Question 8

In the presence of an H^+ catalyst, compound X reacts with ethanoic acid to produce the compound below.



What is the molecular formula of compound X?

A C_4H_8O **B** $C_4H_8O_2$ **C** $C_2H_6O_2$ **D** $C_2H_6O_3$

[1 mark]

Question 9

Compound **K**, $C_5H_{12}O$, is oxidised by acidified sodium dichromate(VI) to compound **L**.

Compound **L** reacts with butan-2-ol in the presence of a little concentrated sulfuric acid to give liquid **M**.

What could be the formula of liquid **M**?

A $(CH_3)_2CHCH_2CO_2C(CH_3)_3$

B $CH_3(CH_2)_3CO_2(CH_2)_3CH_3$

C $CH_3(CH_2)_3CO_2CH(CH_3)CH_2CH_3$

D $CH_3(CH_2)_2CO_2CH_2CH_2(CH_3)_2$

[1 mark]

Question 10

Shown below is a reaction sequence starting with 1-chlorobutane.

$$C_4H_9Cl \xrightarrow{I} C_4H_9OH \xrightarrow{II} C_3H_7COOH \xrightarrow{III} C_3H_7COOC_3H_7$$

What is the correct classification of the types of reactions shown?

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

[1 mark]