10.2 Functional Group Chemistry

Question Paper

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

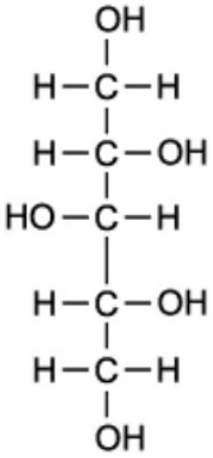
Time allowed: 20

Score: /12

Percentage: /100

Question 1

Xylitol is an artificial sweetener used in toothpastes and chewing gum to improve their taste without impairing dental hygiene.



Xylitol

Which functional groups could be produced if Xylitol is oxidised under suitable conditions?

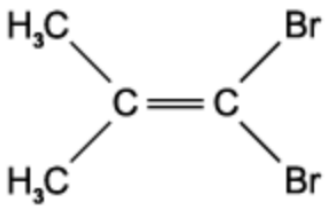
1	alkene
2	aldehyde
3	carboxylic acid
4	ketone

A 1 only **B** 2 only **C** 2, 3 and 4 **D** 2 and 4

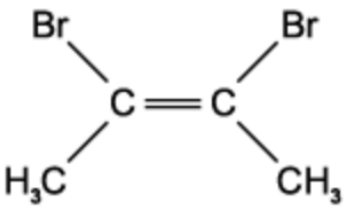
[1 mark]

Question 2

Isomers **X** and **Y** both react with HBr.



X



Y

A mixture of **X** and **Y** is reacted with HBr.

Which three structures represent three **different** possible products of this reaction?

A	$(CH_3)_2CHCBr_3$	$(CH_3)_2CBrCHBr_2$	$CH_3CHBrCHBrCH_3$
B	$(CH_3)_2CHCBr_3$	$(CH_3)_2CBrCHBr_2$	$CH_3CBr_2CHBrCH_3$
C	$(CH_3)_2CBrCBr_3$	$(CH_3)_2CHCBr_3$	$CH_3CBr_2CHBrCH_3$
D	$(CH_3)_2CBrCHBr_2$	$CHBr_2CBr(CH_3)CH_3$	$CH_3CHBrCBr_2CH_3$

[1 mark]

Question 3

In the presence of ultraviolet light, ethane and chlorine react to give a mixture of products.

Which compound could be present in the mixture of products?

A CH_3Cl

B $CH_3CH_2CH_2Cl$

C $CH_3CH_2CH_2CH_3$

D $CH_3CH_2CH_2CH_2CH_3$

[1 mark]

Question 4

Dichlorodifluoromethane, CCl_2F_2, has been used in aerosol propellants and as a refrigerant.

Which statement helps to explain why dichlorodifluoromethane is chemically inert?

A the carbon-fluorine bond energy is large

B the carbon-fluorine bond has a low polarity

C fluorine is highly electronegative

D fluorine compounds are non-flammable

[1 mark]

Question 5

In the hydrolysis of bromoethane by aqueous sodium hydroxide, what is the nature of the attacking group and of the leaving group?

	attacking group	leaving group
A	electrophile	electrophile
B	electrophile	nucleophile
C	nucleophile	electrophile
D	nucleophile	nucleophile

[1 mark]

Question 6

Which volume of oxygen measured at room temperature and pressure is needed for complete combustion of 0.1 mol of propane? (Molar volume = 24dm^3 at rtp)

A 12.0 dm^3 **B** 5.0 dm^3 **C** 20.0 dm^3 **D** 24.0 dm^3

[1 mark]

Question 7

2.30 g of ethanol were mixed with aqueous acidified potassium dichromate(VI) and the desired organic product was collected by immediate distillation under gentle warming. The yield of the product was 50.0%. (RAMs C= 12, H=1, O=16)

What mass of product was collected?

A 1.10 g **B** 1.15 g **C** 2.20 g **D** 2.30 g

[1 mark]

Question 8

Which alcohol gives only **one** possible oxidation product when warmed with dilute acidified potassium dichromate(VI)?

A butan-1-ol

B butan-2-ol

C 2-methylpropan-1-ol

D 2-methylpropan-2-ol

[1 mark]

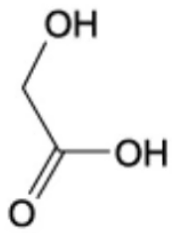
Question 9

Hydroxyethanal has the structural formula $HOCH_2CHO$.

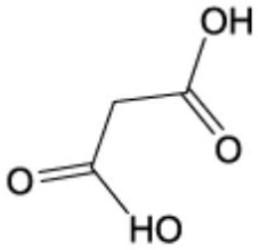
In an experiment hydroxyethanal is heated under reflux with an excess of acidified potassium dichromate(VI) until no further oxidation takes place.

What is the skeletal formula of the organic product formed in the experiment?

A



B



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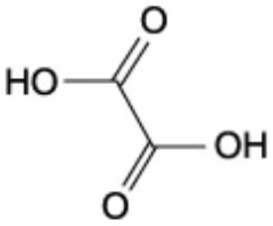

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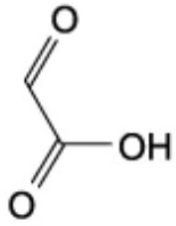
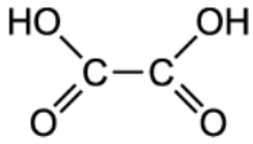


[1 mark]

Question 10

The diagram shows the structure of ethanedioic acid.



Ethanedioic acid reacts with ethanol in the presence of a few drops of concentrated sulfuric acid to form a diester. The molecular formula of the diester is $C_6H_{10}O_4$.

What is the structural formula of the diester?

A $CH_3CH_2CO_2CO_2CH_2CH_3$

B $CH_3CH_2OCOCO_2CH_2CH_3$

C $CH_3CH_2O_2CO_2CCH_2CH_3$

D $CH_3CO_2CH_2CH_2OCOCH_3$

[1 mark]

Question 11

Compound **Q** has the formula $CH_3CH_2CO_2CH_3$

What is the name of compound **Q** and how does its boiling point compare with that of butanoic acid?

	name of **Q**	boiling point compared to butanoic acid
A	methyl propanoate	lower
B	propyl methanoate	lower
C	methyl propanoate	higher
D	propyl methanoate	higher

[1 mark]

Question 12

How many ester compounds have the molecular formula $C_4H_8O_2$?

A 2 **B** 3 **C** 4 **D** 5

[1 mark]