Organic chemistry – 2022J O Level 5070

1. June/2022/Paper_11/No.34

Two statements are given.

statement 1 The percentage of carbon by mass is greater in methane than in butane.

statement 2 Butane is one of two isomers with the molecular formula C_4H_{10}.

Which statements are correct?

A both statement 1 and statement 2

B statement 1 only

C statement 2 only

D neither statement 1 nor statement 2

2. June/2022/Paper_11/No.35

One mole of each of the compounds shown is completely combusted.

$C_5H_{12}O$ C_6H_{12} C_6H_{14} $C_6H_{14}O$

How many of the compounds need exactly nine moles of oxygen for complete combustion?

A 1 **B** 2 **C** 3 **D** 4

3. June/2022/Paper_11/No.36

The reactants and products of two reactions are shown.

reaction 1 $C_3H_6 + H_2O \rightarrow X$

reaction 2 $X + O_2 \rightarrow CO_2 + H_2O$

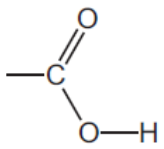
Which row correctly describes these two reactions?

	identity of compound X	conditions for reaction 1	reaction 2
A	butanol	high pressure and a catalyst	combustion
B	butanol	heat and a catalyst	decomposition
C	propanol	heat and a catalyst	decomposition
D	propanol	heat and a catalyst	combustion

4. June/2022/Paper_11/No.37

Which statement about carboxylic acids is correct?

A All carboxylic acids include the group:



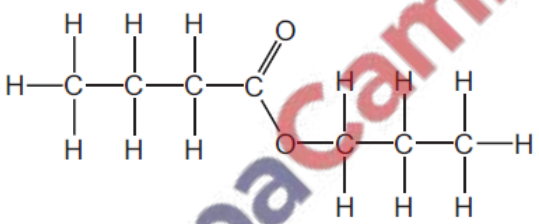
B Ethanoic acid reacts with both copper(II) oxide and copper.

C Methanoic acid, formed by bacterial oxidation, is present in vinegar.

D Propanoic acid decolourises acidified potassium manganate(VII).

5. June/2022/Paper_11/No.38

The structure of an ester is shown.



What is the name of this ester?

A butyl butanoate

B butyl propanoate

C propyl butanoate

D propyl propanoate

6. June/2022/Paper_11/No.39

Poly(ethene) is formed by .....1..... polymerisation of ethene.

The formation of nylon and *Terylene* are examples of .....2..... polymerisation.

Proteins contain the same .....3..... linkage as nylon.

Fats contain the same .....4..... linkage as *Terylene*.

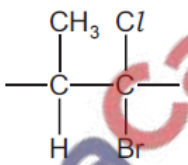
On hydrolysis, proteins form .....5..... .

Which words correctly complete gaps 1–5?

	1	2	3	4	5
A	addition	condensation	amide	ester	amino acids
B	addition	condensation	amide	ester	simple sugars
C	addition	condensation	ester	amide	amino acids
D	condensation	addition	ester	amide	simple sugars

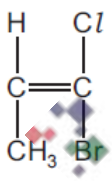
7. June/2022/Paper_11/No.40

The repeat unit of a polymer is shown.



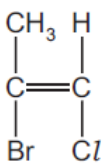
Which monomer would produce this polymer?

A

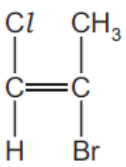


B

C



D



8. June/2022/Paper_12/No.34

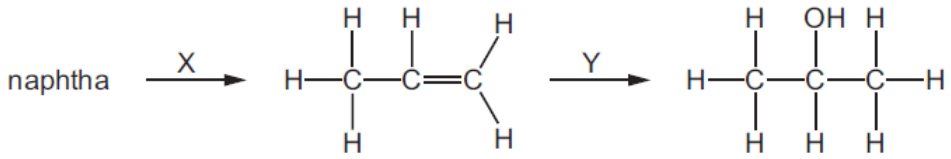
The addition reaction between a hydrocarbon X and bromine forms only one product.

Which compound is X?

A CH_4 **B** C_2H_4 **C** C_2H_6 **D** CH_3OH

9. June/2022/Paper_12/No.35

A series of reactions producing propanol from the naphtha fraction of petroleum (crude oil) is shown.

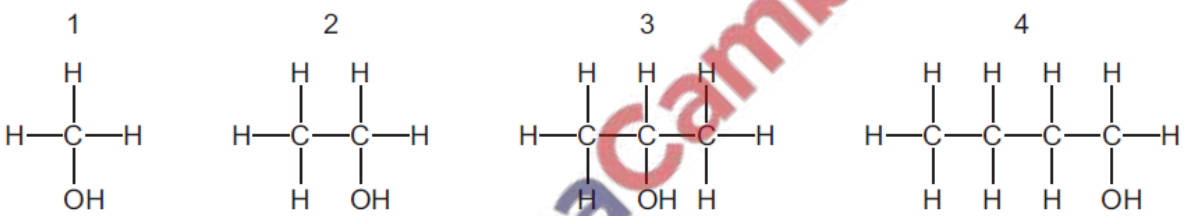


What are processes X and Y?

	X	Y
A	cracking	reaction with steam
B	cracking	fermentation
C	fractional distillation	reaction with steam
D	fractional distillation	fermentation

10. June/2022/Paper_12/No.36

The structures of four alcohols are shown.



Which statement is correct?

A Alcohol 1 can be made by the addition of steam to an alkene.

B Alcohol 2 can be made from glucose.

C Alcohol 3 is a renewable energy source.

D Alcohol 4 has only one other isomer.

11. June/2022/Paper_12/No.37

Which compounds have the molecular formula $C_3H_6O_2$?

1 methyl ethanoate

2 ethyl methanoate

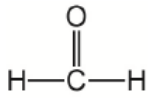
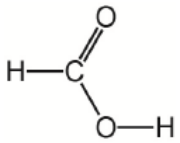
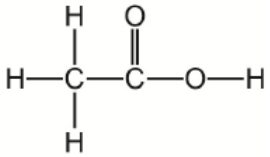
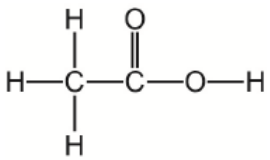
3 propanoic acid

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

12. June/2022/Paper_12/No.38

An organic compound has the empirical formula CH_2O.

Which row shows a possible correct name and structure for this compound?

	name	structure
A	methanol	
B	methanoic acid	
C	ethanol	
D	ethanoic acid	

13. June/2022/Paper_12/No.39

Which statement is correct?

A Complex carbohydrates, such as starch, are hydrolysed to give simple sugars.

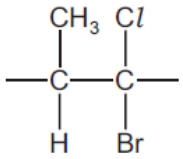
B Fats have the same amide linkages as *Terylene*.

C Proteins and nylon are polymers formed from the same monomers but with different linkages.

D Proteins are natural polymers and are also called polysaccharides.

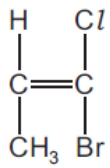
14. June/2022/Paper_12/No.40

The repeat unit of a polymer is shown.

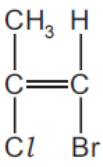


Which monomer would produce this polymer?

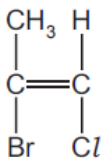
A



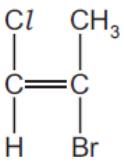
B



C

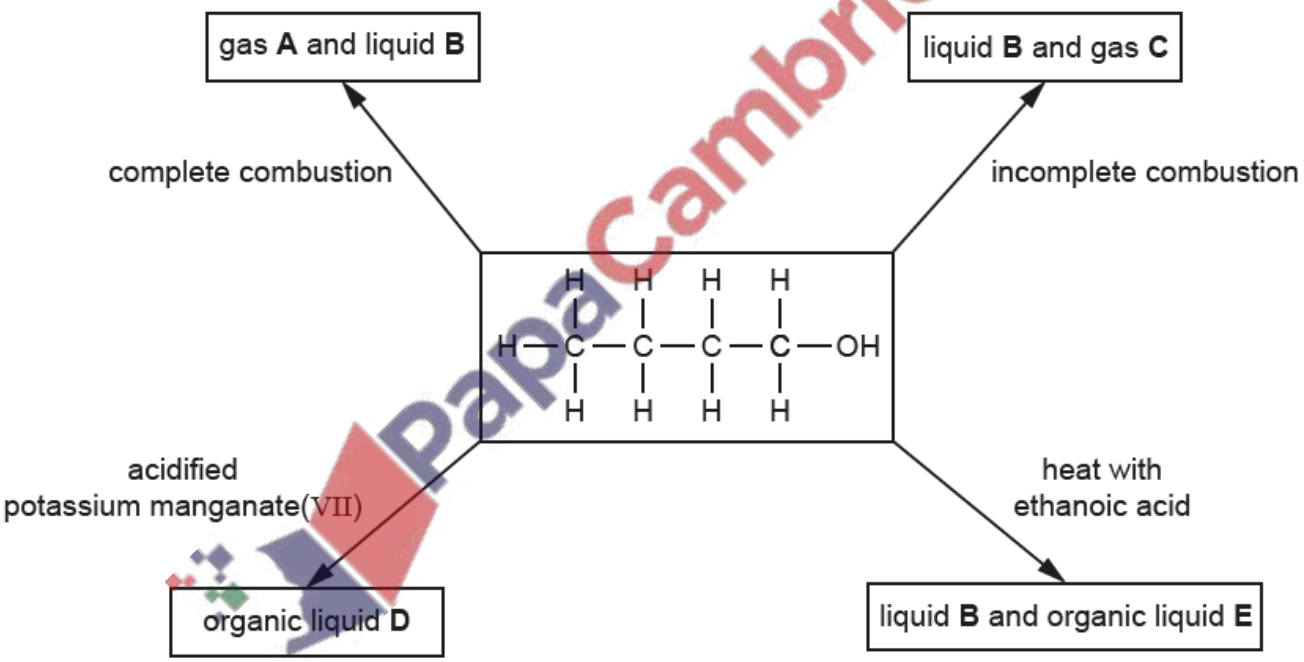


D



15. June/2022/Paper_21/No.3

The diagram shows some reactions of butanol.



(a) **A**, **B** and **C** are different compounds.

Identify by name **A**, **B** and **C**.

A .....

B .....

C .....

[3]

(b) Name and draw the structure of **D**.

name .....

structure

[2]

(c) Name and draw the structure of **E**.

name .....

structure

[2]

[Total: 7]

16. June/2022/Paper_21/No.8

Alkenes are a homologous series of unsaturated hydrocarbons.

(a) Name the alkene which has only three carbon atoms in its molecule.

..... [1]

(b) Draw the structure of an unbranched and of a branched alkene.

Show all of the atoms and all of the bonds in each structure.

unbranched alkene

branched alkene

[2]

(c) Describe a chemical test that distinguishes an alkene from an alkane.

chemical test .....

result with alkene .....

result with alkane .....

[2]

(d) Alkenes are manufactured by the cracking of long chain hydrocarbons.

The equation for the cracking of $C_{14}H_{30}$ is shown.

$$C_{14}H_{30} \rightarrow 2\mathbf{X} + C_8H_{18}$$

(i) Give **two** reasons why the cracking of long chain hydrocarbons is important.

.....

.....

..... [2]

(ii) Compound **X** contains 85.7% carbon by mass and 14.3% hydrogen by mass.

Calculate, using the percentage composition data, the empirical formula of **X**.

Show your working.

State the molecular formula of **X**.

empirical formula .....

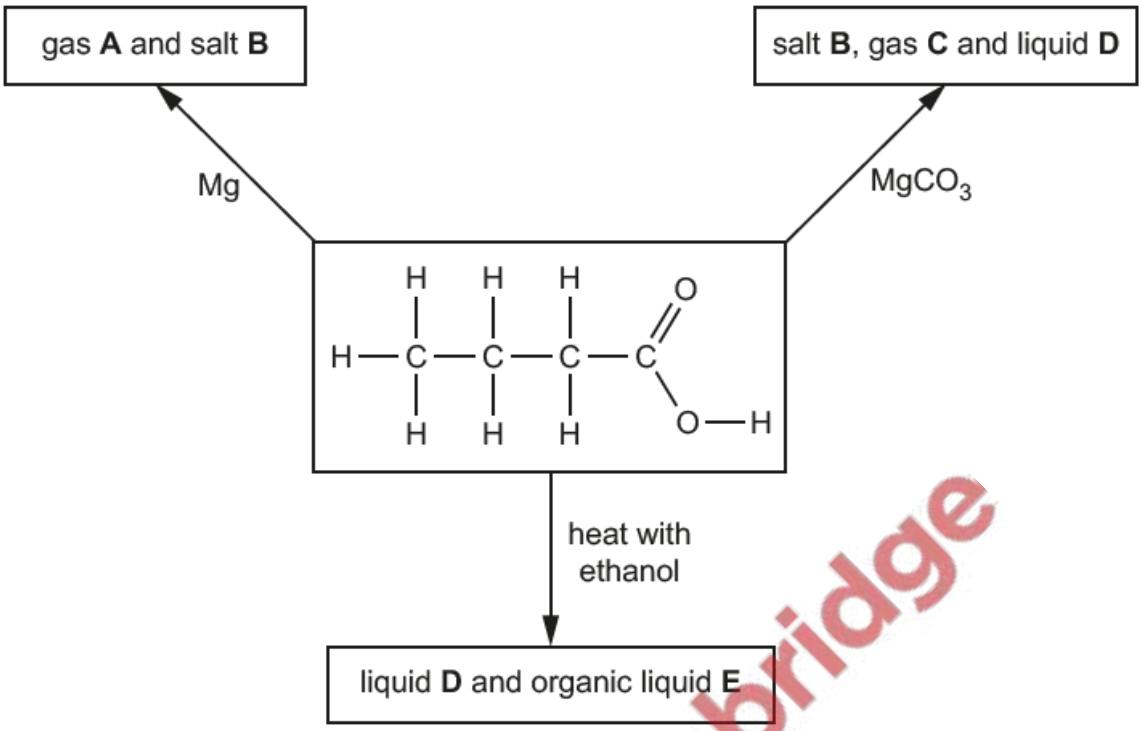
molecular formula .....

[3]

[Total: 10]

17. June/2022/Paper_22/No.3

The diagram shows some reactions of butanoic acid.



(a) **A**, **B**, **C** and **D** are different substances.

Identify by name **A**, **B**, **C** and **D**.

A .....

B .....

C .....

D .....

[4]

(b) Name and draw the structure of **E**.

name .....

structure

[2]

(c) Butanoic acid is a weak acid.

State what is meant by the term *weak* in weak acid.

.....

..... [1]

[Total: 7]

18. June/2022/Paper_22/No.5

Ethanol is manufactured by the reaction between ethene and steam.

The conditions used are 300 °C, a high pressure and a phosphoric acid catalyst.

(a) The reaction between ethene and steam is reversible.

The forward reaction is exothermic.

$$C_2H_4(g) + H_2O(g) \rightleftharpoons C_2H_5OH(g)$$

An equilibrium mixture is formed when the reversible reaction happens in a closed system.

(i) Predict what happens to the amount of ethanol in the equilibrium mixture if the temperature is decreased and the pressure remains constant.

Explain your answer.

prediction .....

explanation .....

.....

.....

[2]

(ii) Predict what happens to the amount of ethanol in the equilibrium mixture if the pressure is decreased and the temperature remains constant.

Explain your answer.

prediction .....

explanation .....

.....

.....

[2]

(b) Describe the manufacture of aqueous ethanol by the fermentation of glucose.

Include the equation and the essential conditions needed for this fermentation.

.....

.....

.....

..... [3]

[Total: 7]

19. June/2022/Paper_22/No.9

Alkanes are a homologous series of saturated hydrocarbons.

(a) Draw the structures of two different alkanes with the molecular formula C_4H_{10}.

Show all of the atoms and all of the bonds in each structure.

[2]

(b) State, using the general formula of alkanes, the molecular formula of an alkane which has only 12 carbon atoms in its molecule.

..... [1]

(c) Many alkanes are separated from petroleum (crude oil) by fractional distillation.

Describe the fractional distillation of petroleum (crude oil).

.....

.....

.....

.....

.....

.....

..... [3]

(d) Butane, C_4H_{10}, reacts with chlorine to give several products.

(i) State the condition needed for this substitution reaction.

..... [1]

(ii) One of these products contains 37.8% carbon by mass, 6.30% hydrogen by mass and 55.9% chlorine by mass.

Calculate the empirical formula of the product.

Deduce the molecular formula of the product.

empirical formula .....

molecular formula .....

[3]

[Total: 10]