

Crude Oil

Question Paper

Level	GCSE
Subject	Chemistry
Exam Board	Edexcel IGCSE
Module	Single Award (Paper 2C)
Topic	Chemistry in Industry
Sub-Topic	Crude Oil
Booklet	Question Paper

Time Allowed: 58 minutes

Score: /48

Percentage: /100

Grade Boundaries:

A*	A	B	C	D	E	U
>85%	75%	70%	60%	55%	50%	<50%

- 1 The table shows percentage by mass of the fractions obtained from a sample of crude oil and the percentage market demand for these fractions.

Fraction	Percentage by mass in crude oil	Market demand (%)
refinery gases	3	5
gasoline	12	28
kerosene	9	20
diesel	15	25
fuel oil	51	20
bitumen	10	2

- (a) Why is the market demand for the gasoline fraction greater than that for the fuel oil fraction?

(1)

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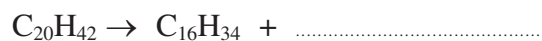
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- (b) Cracking is used to make long-chain hydrocarbon molecules into shorter-chain hydrocarbon molecules.

- (i) Complete the equation to show the other hydrocarbon molecule formed when $C_{20}H_{42}$ is cracked.

(1)



- (ii) Give the name of a catalyst used in industry to crack long-chain hydrocarbons and state a temperature at which cracking is carried out.

(2)

Catalyst

Temperature

(c) Ethene (C_2H_4) can be produced by cracking long-chain hydrocarbon molecules obtained from crude oil. The ethene produced can then be used to make ethanol.

Ethanol can also be made by the fermentation of sugars.

(i) Give **two** advantages of making ethanol from ethene, rather than by fermentation.

(2)

1

.....

2

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(ii) Suggest **two** reasons why ethanol is sometimes made by fermentation, rather than from ethene.

(2)

1

.....

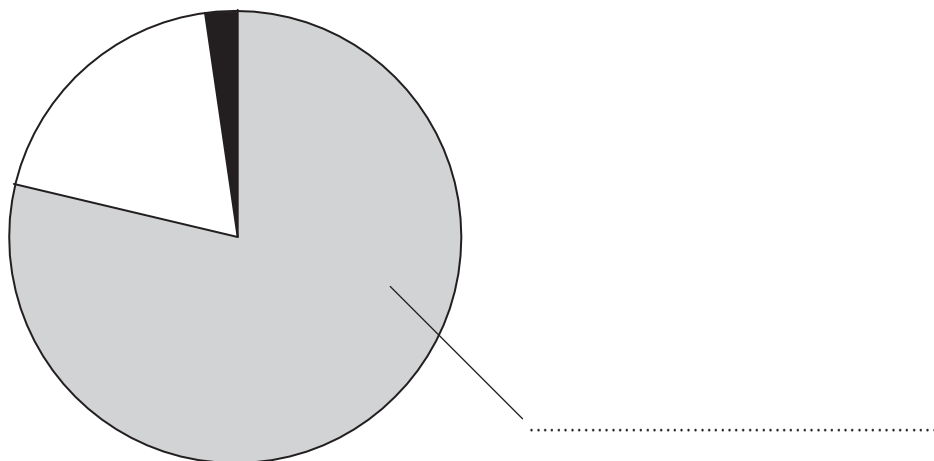
2

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(Total for Question 1 = 8 marks)

2 Many chemical reactions occur in the atmosphere.

(a) The pie chart shows the relative amounts of some gases in air.



(i) Label the pie chart with the name of the gas that makes up most of the air. (1)

(ii) What is the approximate percentage of oxygen in air?

Place a cross (☒) in one box.

(1)

- 1
- 20
- 25
- 78

(iii) Use words from the box to complete the sentences about some of the other gases in air.

Each word may be used once, more than once or not at all.

(2)

diatomic	dense	neon	nitrogen	unreactive	water
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One of the gases in air is argon. It is called a noble gas because it is very

The percentage of vapour in air varies with the weather.

(b) Rain water is naturally slightly acidic because carbon dioxide dissolves in it.
The word equation for the reaction that occurs is:



Acid rain is more acidic because pollutant gases in the atmosphere also dissolve in water.

(i) Identify the acid formed when sulfur dioxide reacts with water. (1)

.....

(ii) Identify another pollutant gas that forms acid rain. (1)

.....

(iii) State **two** problems caused by acid rain. (2)

1

.....

2

.....

(Total for Question 2 = 8 marks)

3 Fractional distillation and cracking are important steps in processing crude oil.

(a) Place ticks (✓) in the columns to show which statements apply to each step.
You may place a tick in one column, in both columns or in neither column.

The first one has been done for you.

(5)

Statement	Fractional distillation	Cracking
Crude oil is heated	✓	
A catalyst may be used		
Alkenes are formed		
Decomposition reactions occur		
Fuels are obtained		
Separation is the main purpose		

(b) The formula $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_3$ represents one of the compounds in crude oil.

(i) Give the molecular formula of this compound.

(1)

(ii) Give the displayed formula of this compound.

(1)

(iii) Give the empirical formula of this compound.

(1)

(iv) Give the name of this compound.

(1)

(v) Give the general formula of the homologous series that contains this compound.

(1)

(c) The products of the complete combustion of hydrocarbons are carbon dioxide and water.

(i) Balance the equation to show the complete combustion of ethene (C₂H₄).

(2)

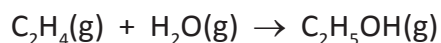


(ii) Draw a dot and cross diagram to show the bonding in an ethene molecule.

Show only the outer electrons in each atom.

(2)

(d) Ethanol can be manufactured by the hydration of ethene. The equation for this reaction is



(i) Identify the catalyst and state the temperature used in this process.

(2)

Catalyst.....

Temperature.....

(ii) A 20 mol sample of ethanol was produced using this reaction.

Deduce the amount, in moles, of ethene needed and the volume, in dm^3 , that this amount of ethene would occupy at room temperature and pressure.

Assume that all of the ethene is converted into ethanol and that the molar volume of ethene is 24 dm^3 at rtp.

(3)

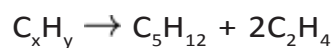
Amount of ethene mol

Volume of ethene

Volume = dm^3

(Total for Question 3 = 19 marks)

(c) The equation for one reaction that could occur in process 2 is



(i) Deduce the formula of C_xH_y (1)

(ii) Give the name of the compound C_5H_{12} (1)

(iii) Draw the displayed formula of C_2H_4 (1)

(d) The structural formula of chloroethene formed in process 3 is $\text{CH}_2=\text{CHCl}$

The polymer formed in process 4 is poly(chloroethene).

Draw the **displayed** formula for the repeat unit of poly(chloroethene). (2)

(e) Poly(chloroethene) is formed by addition polymerisation.

Nylon is formed by condensation polymerisation.

(i) How does condensation polymerisation differ from addition polymerisation?

(1)

.....

.....

(ii) Poly(chloroethene) and nylon do not biodegrade easily.

What is meant by the term **biodegrade**?

(2)

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.....

.....

.....

(iii) What feature of addition polymers makes it difficult for them to biodegrade?

(1)

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(Total for Question 4 = 13 marks)