PEARSON EDEXCEL GCSE CHEMISTRY · 1CH0

CHEMISTRY



EXAM QUESTION PACK

TOPIC 8: FUELS AND EARTH SCIENCE (PACK 2)

SCORE	PERCENTAGE
/88	%

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Q1.

Crude oil is a complex mixture of substances.

Most of the substances in crude oil are alkanes.

(i) Which of the following is the general formula of an alkane?

(1)

☒ **A** C_nH_{2n}

☒ **B** $C_nH_{2n + 1}$

☒ **C** $C_nH_{2n - 1}$

☒ **D** $C_nH_{2n + 2}$

(ii) Explain why alkanes are described as hydrocarbons.

(2)

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.....

(Total for question = 3 marks)

Q2.

Give the name of the most common gas in the Earth's **early** atmosphere.

(1)

.....

(Total for question = 1 mark)

Q3.

Figure 2 shows the percentage of different gases in the Earth's atmosphere.

gas	percentage of gas
nitrogen	78
oxygen	21
carbon dioxide	0.04
other gases	0.96

Figure 2

The gases carbon dioxide, methane and water vapour in the atmosphere help to keep the Earth warm.

Describe how these gases help to keep the Earth warm.

(2)

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(Total for question = 2 marks)

Q4.

Four gases were present in the Earth's early atmosphere.

Figure 1 shows the percentages of these gases thought to have been present.

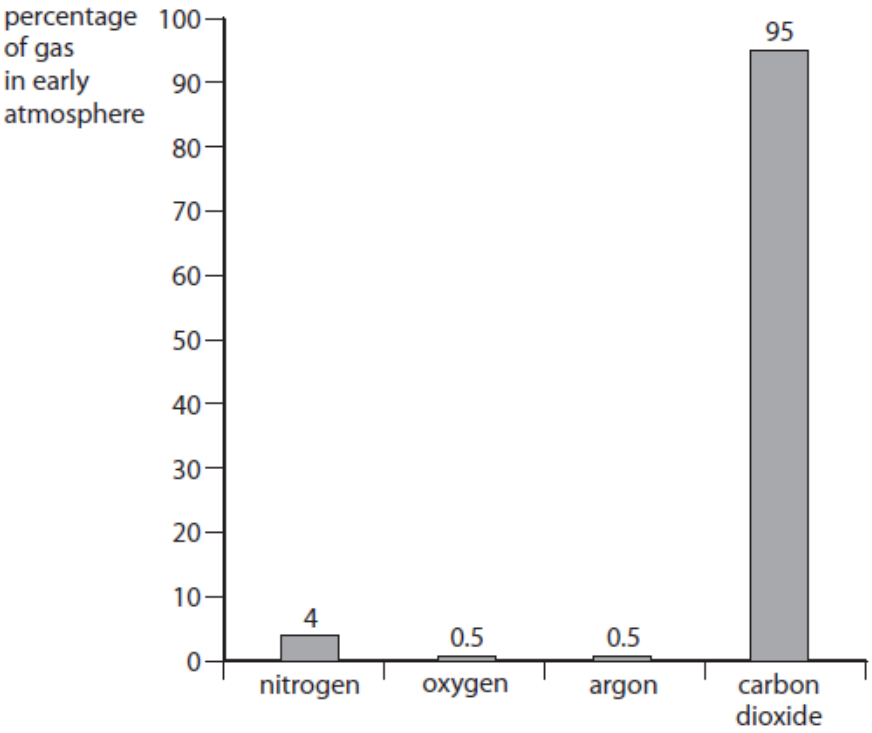


Figure 1

When primitive plants started to grow on the Earth's surface, the percentage of oxygen changed.

Explain how the growth of plants affected the percentage of oxygen in the Earth's atmosphere.

(2)

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.....

(Total for question = 2 marks)

Q5.

In industry, long chain hydrocarbon molecules are cracked to form shorter chain hydrocarbon molecules.

Explain why this process is important.

(2)

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.....

.....

Q6.

The photograph shows a Bunsen burner.



The burner uses methane as a fuel.

Methane is a hydrocarbon.
The formula of a molecule of methane is CH_4.

Explain what is meant by a **hydrocarbon**.

(2)

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Q7.

Answer the question with a cross in the box you think is correct ☒. If you change your mind about an answer, put a line through the box ☒ and then mark your new answer with a cross ☒.

When crude oil is fractionally distilled, the demand for some fractions is more than the amount produced.

Figure 11 shows the relative amounts of each fraction in a crude oil and the relative demand for each of these fractions.

fraction	relative amount	relative demand
gases	2	6
petrol	12	29
kerosene	16	11
diesel oil	24	29
fuel oil	37	21
bitumen	9	4

Figure 11

Which of the following shows the fractions where the relative demand is greater than the relative amount in the crude oil?

(1)

☒ **A** kerosene, diesel oil, bitumen

☒ **B** gases, petrol, diesel oil

☒ **C** gases, petrol, kerosene

☒ **D** petrol, diesel oil, fuel oil

(Total for question = 1 mark)

Q8.

Answer the question with a cross in the box you think is correct ☒. If you change your mind about an answer, put a line through the box ☒ and then mark your new answer with a cross ☒.

Diesel oil contains alkanes.
These alkanes are part of an homologous series.

Which statement about compounds in this homologous series is true?

(1)

☒ **A** they have the same chemical formula

☒ **B** they have the same empirical formula

☒ **C** they have the same general formula

☒ **D** they have the same molecular formula

(Total for question = 1 mark)

Q9.

Most of the fuels used today are obtained from crude oil.

Which statement about crude oil is correct?

(1)

☒ **A** crude oil is a compound of different hydrocarbons

☒ **B** crude oil is a mixture of hydrocarbons

☒ **C** crude oil contains different hydrocarbons, all with the same molecular formula

☒ **D** crude oil is an unlimited supply of hydrocarbons

(Total for question = 1 mark)

Q10.

Which of the following is the formula of a hydrocarbon?

(1)

☒ **A** C_6H_5OH

☒ **B** CH_2OHCH_2OH

☒ **C** $H_2C{=}CHCH_2CH_3$

☒ **D** $C_6H_{12}Cl_2$

(Total for question = 1 mark)

Q11.

Plants release oxygen into the atmosphere.

What is the name of the process that releases oxygen into the atmosphere?

(1)

☒ **A** combustion

☒ **B** oxidation

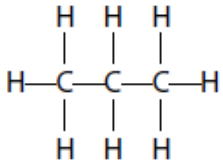
☒ **C** photosynthesis

☒ **D** polymerisation

(Total for question = 1 mark)

Q12.

The structure of a molecule of propane is shown as



Which product is formed when there is incomplete combustion of propane?

(1)

☒ **A** sulfur dioxide

☒ **B** oxygen

☒ **C** hydrogen

☒ **D** carbon monoxide

(Total for question = 1 mark)

Q13.

Which test shows a gas is oxygen?

(1)

☒ **A** a few drops of limewater will turn cloudy when shaken with the gas

☒ **B** a glowing splint will relight when placed in the gas

☒ **C** a lighted splint placed in the gas will cause a pop

☒ **D** a piece of damp red litmus paper will turn blue when placed in the gas

(Total for question = 1 mark)

Q14.

Answer the questions with a cross in the boxes you think are correct ☒. If you change your mind about an answer, put a line through the box ☒ and then mark your new answer with a cross ☒.

The two most common gases in today's atmosphere are nitrogen and oxygen.

(i) What is the third most common gas in today's atmosphere?

(1)

☒ **A** argon

☒ **B** butane

☒ **C** chlorine

☒ **D** hydrogen

(ii) What is the percentage of oxygen in today's atmosphere?

(1)

☒ **A** 0.04

☒ **B** 1

☒ **C** 21

☒ **D** 78

(Total for question = 2 marks)

Q15.

Answer the question with a cross in the box you think is correct ☒. If you change your mind about an answer, put a line through the box ☒ and then mark your new answer with a cross ☒.

Air contains several gaseous elements.

Which of these shows the three most common gaseous elements in air, listed in order from the most common to the least common?

(1)

☒ **A** oxygen, chlorine, nitrogen

☒ **B** nitrogen, oxygen, hydrogen

☒ **C** oxygen, nitrogen, helium

☒ **D** nitrogen, oxygen, argon

(Total for question = 1 mark)

Q16.

Most of the fuels used today are obtained from crude oil.

Which statement about crude oil is correct?

(1)

☒ **A** crude oil is a compound of different hydrocarbons

☒ **B** crude oil is a mixture of hydrocarbons

☒ **C** crude oil contains different hydrocarbons, all with the same molecular formula

☒ **D** crude oil is an unlimited supply of hydrocarbons

(Total for question = 1 mark)

Q17.

The Earth's atmosphere contains several gases.

The apparatus shown in Figure 2 is used to find the percentage of oxygen in dry air.

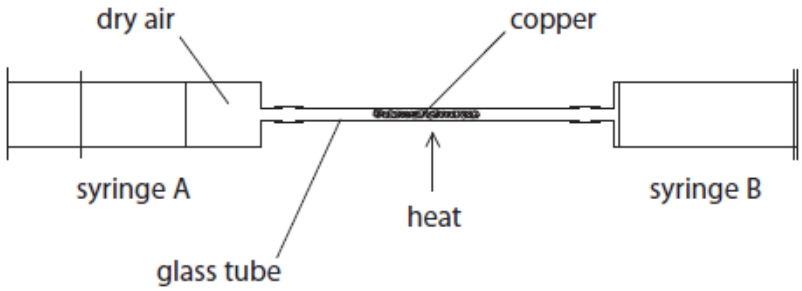


Figure 2

Syringe A contains 50 cm^3 of dry air and syringe B contains no air.
The copper in the glass tube is heated strongly.
The air in the apparatus is passed backwards and forwards over the copper until all the oxygen has been removed.

(i) The following results were obtained

initial volume of air in apparatus = 50 cm^3

final volume of gas in apparatus = 40 cm^3

Calculate the percentage of oxygen in this sample of dry air.

(2)

.....

.....

.....

percentage oxygen in the air = ...

(ii) At the end of the experiment, the apparatus and its contents are allowed to cool before the

final volume of gas is measured.

(1)

The apparatus and its contents must be allowed to cool because

☒ **A** reading the volume while the apparatus is hot is dangerous

☒ **B** the glass tube may crack when it is hot and allow air into the apparatus

☒ **C** the gas has expanded when it is hot

☒ **D** the copper reacts with other gases in the air when it is hot

(Total for question = 3 marks)

Q18.

Methane burns in oxygen to form carbon dioxide and water.
Write the balanced equation for this reaction.

(3)

.....

Q19.

The photograph shows a Bunsen burner.



The burner uses methane as a fuel.

Complete the sentence by putting a cross (☒) in the box next to your answer.

Methane is a useful fuel because, when it burns, it produces

(1)

☒ **A** carbon dioxide

☒ **B** carbon monoxide

☒ **C** heat energy

☒ **D** a yellow flame

Q20.

Crude oil is a complex mixture of hydrocarbons.
Crude oil can be separated into useful fractions by fractional distillation.

Figure 10 shows a fractional distillation column and the fractions produced when crude oil is distilled.

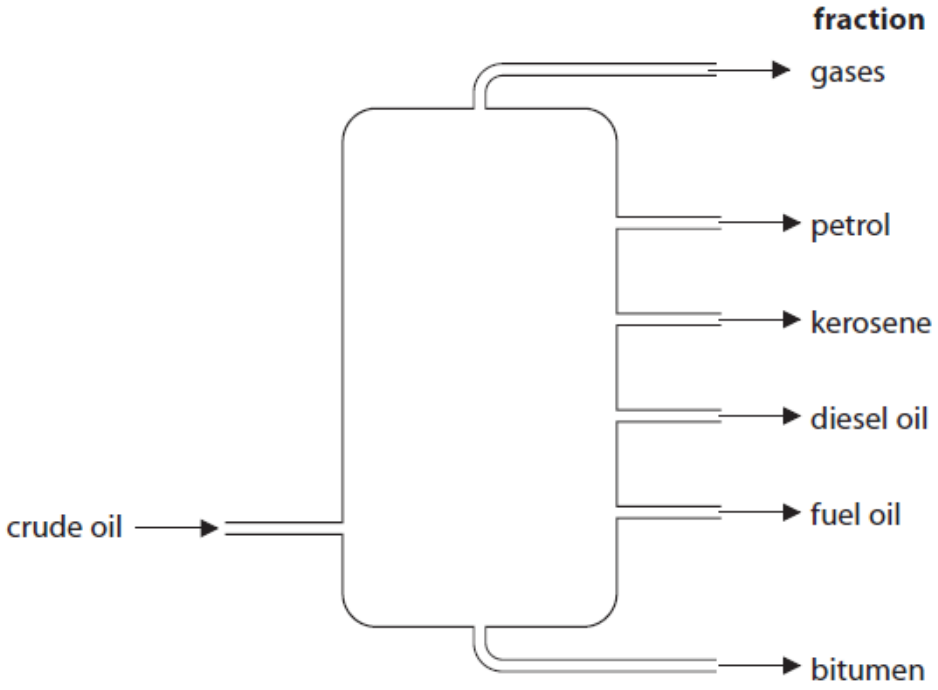


Figure 10

(i) Name the fraction in Figure 10 that is used to surface roads.

(1)

.....

(ii) Name the fraction in Figure 10 that contains hydrocarbons with the lowest boiling point.

(1)

.....

(Total for question = 2 marks)

Q21.

Hydrogen peroxide decomposes to form water and oxygen.

The rate of this reaction can be found by measuring the volume of oxygen formed after different time intervals.

Hydrogen peroxide solution is placed in a conical flask.
The apparatus is set up as shown in Figure 5.

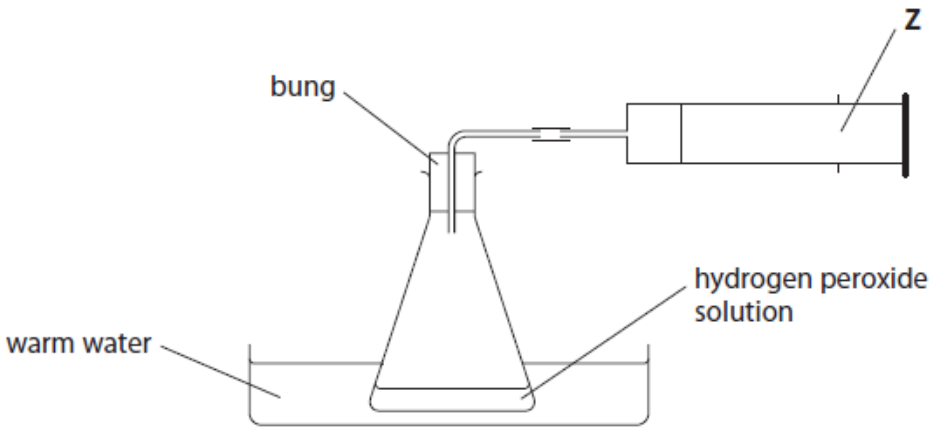


Figure 5

At the end of the reaction the bung is removed from the conical flask.
A glowing splint is put into the gas in the flask.

State what you would **see**.

(1)

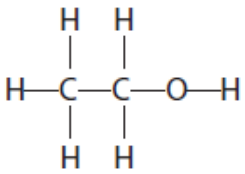
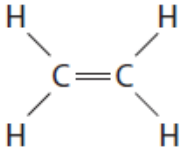
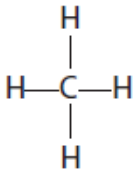
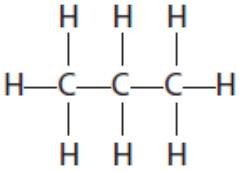
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(Total for question = 1 mark)

Q22.

The table shows the name and structure of four different organic molecules.

name	structure
ethanol	
ethene	
methane	
propane	

Use the information in the table to answer the following questions.
Each of the molecules can be used once, more than once, or not at all.

(i) Give the name of the molecule that is **not** a hydrocarbon.

(1)

.....

(ii) Give the name of the molecule that is unsaturated.

(1)

.....

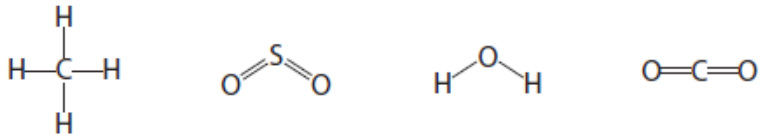
(iii) Give the name of the molecule that is used as a monomer in a polymerisation reaction.

(1)

.....

Q23.

Figure 8 shows one molecule of each of four different substances, **A**, **B**, **C** and **D**.



substance A substance B substance C substance D

Figure 8

The amount of oxygen in the atmosphere has increased since the Earth's early atmosphere was formed.

Explain what has caused this change.

(2)

.....

.....

.....

(Total for question = 2 marks)

Q24.

Crude oil is a complex mixture of substances.

Figure 8 shows a graph of the boiling points of some alkanes against the number of carbon atoms in one molecule of each alkane.

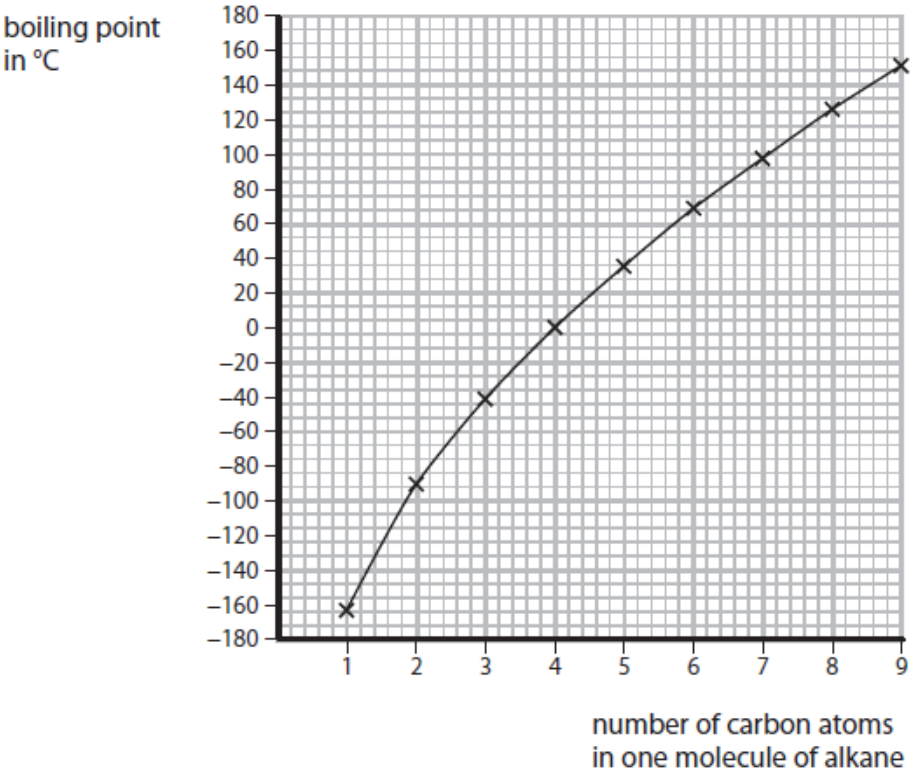


Figure 8

Explain the pattern shown by this graph.

(2)

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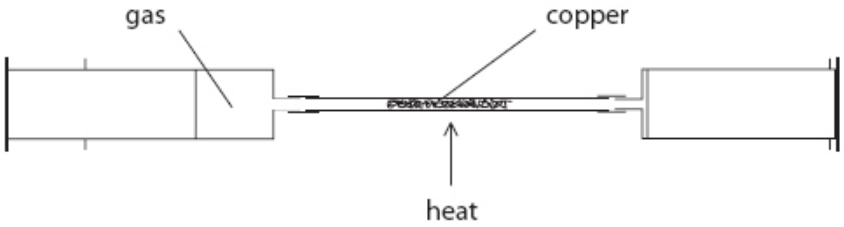
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(Total for question = 2 marks)

Q25.

This apparatus was used to find the percentage of oxygen in a sample of air.



Dry air was passed backwards and forwards over the hot copper.
The copper turned black.
The apparatus was allowed to cool.
The volume of gas in the apparatus had decreased.

(i) Explain why the volume of gas had decreased.

(2)

.....

.....

(ii) Complete the sentence by putting a cross (☒) in the box next to your answer.

The percentage of oxygen in dry air is

(1)

☒ **A** 0.1

☒ **B** 1.0

☒ **C** 21

☒ **D** 79

Q26.

Alcohols and carboxylic acids are important organic compounds.

Figure 8 shows the names and formulae of three alcohols in a homologous series.

name	formula
methanol	CH_3OH
ethanol	C_2H_5OH
propanol	C_3H_7OH

Figure 8

Predict the formula of the alcohol that has **five** carbon atoms in its molecule, using the information in Figure 8.

(1)

.....

(Total for question = 1 mark)

Q27.

Complete the sentence by putting a cross (☒) in the box next to your answer.

The equation for a reaction that occurs during cracking is

$$C_{12}H_{26} \rightarrow C_2H_6 + C_6H_{12} + X$$

In the balanced equation, X is

(1)

☒ **A** C_3H_8

☒ **B** C_4H_8

☒ **C** C_4H_{10}

☒ **D** C_6H_{14}

Q28.

The Earth's atmosphere contains several gases.

The Earth's earliest rocks contained iron sulfide and no iron oxide.
Later the rocks contained iron oxide as well as iron sulfide.

Explain what happened to allow this change to occur.

(2)

.....

.....

.....

.....

.....

(Total for question = 2 marks)

Q29.

The Earth's atmosphere contains several gases.

Figure 1 shows the relative amounts of gases thought to be in the Earth's early atmosphere.

gas	relative amount in Earth's early atmosphere
oxygen	small
carbon dioxide	large
nitrogen	small
water vapour	large

Figure 1

The amount of water vapour in today's atmosphere is much less than the amount in the Earth's early atmosphere.

Explain why the amount of water vapour in the atmosphere has decreased.

(2)

.....

.....

.....

.....

(Total for question = 2 marks)

Q30.

Crude oil is a mixture of hydrocarbons.
It is separated into useful fractions.

Give the name of the process used to separate crude oil into fractions.

(1)

.....

Q31.

Crude oil is found in the Earth's crust.

The substances ethane, C_2H_6, octane, C_8H_{18}, and pentadecane, $C_{15}H_{32}$, are all found in crude oil.

These substances

(1)

- ☒ **A** have the same formula
- ☒ **B** have the same boiling point
- ☒ **C** are in the same homologous series
- ☒ **D** form different products when completely combusted in air

(Total for question = 1 mark)

Q32.

Diesel oil is a mixture of hydrocarbons that can be obtained from crude oil.

State the name of the process used to separate diesel oil from crude oil.

(1)

.....

(Total for question = 1 mark)

Q33.

Diesel oil is a mixture of hydrocarbons that can be obtained from crude oil.

State the name of the process used to separate diesel oil from crude oil.

(1)

.....

(Total for question = 1 mark)

Q34.

Describe the test to show that a gas is oxygen.

(2)

.....

.....

Q35.

Figure 2 shows the percentage of different gases in the Earth's atmosphere.

gas	percentage of gas
nitrogen	78
oxygen	21
carbon dioxide	0.04
other gases	0.96

Figure 2

(i) Describe the test to show that a gas is oxygen.

(2)

.....

.....

.....

(ii) Some wet iron wool was placed in the bottom of a boiling tube.

The boiling tube was inverted over water to trap some air, as shown in Figure 3.

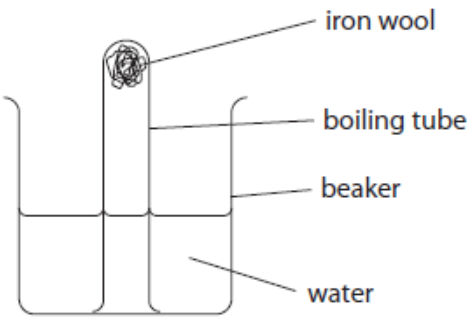


Figure 3

The apparatus was left to allow oxygen to react with the iron wool.

iron + oxygen → iron oxide

The volume of air in the boiling tube was measured at the beginning of the experiment and again at the end.

volume of gas at beginning of experiment = 49.7 cm^3
volume of gas at the end of the experiment = 42.5 cm^3

Calculate the percentage of air that reacted with the iron wool during the experiment.
Give your answer to three significant figures.

(3)

.....

.....

.....

.....

percentage of air reacted = ...

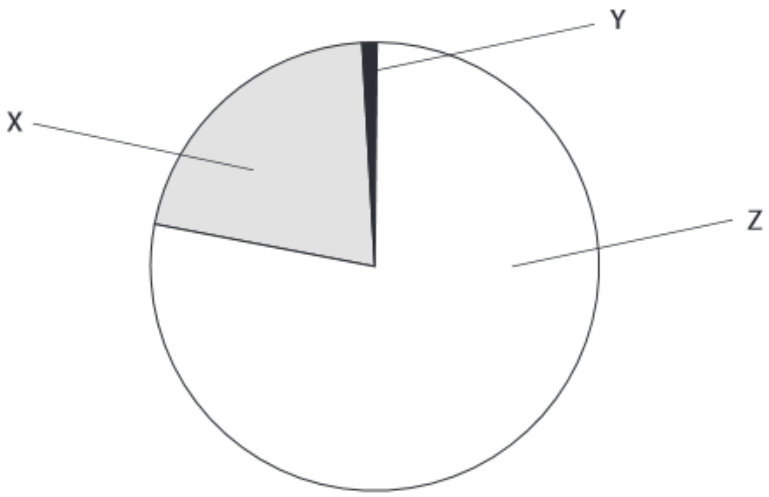
(Total for question = 5 marks)

Q36.

The Earth's atmosphere

The Earth's atmosphere today contains a mixture of different gases.

(a) The pie chart shows the percentages of nitrogen, oxygen and other gases in the atmosphere.



Which row of the table identifies X, Y and Z correctly?

Put a cross (☒) in the box next to your answer.

(1)

	X	Y	Z
☐ A	oxygen	nitrogen	other gases
☐ B	other gases	oxygen	nitrogen
☐ C	oxygen	other gases	nitrogen
☐ D	nitrogen	other gases	oxygen

(b) (i) The percentage of oxygen in the atmosphere has increased since the Earth's earliest

atmosphere.

Describe the process that has caused this change.

(2)

.....

.....

.....

(ii) Describe a test to show a gas is oxygen.

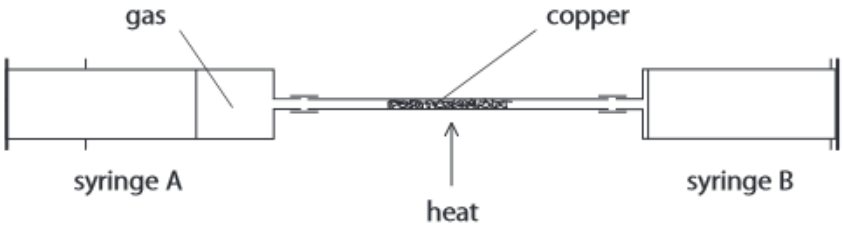
(2)

.....

.....

.....

(c) This apparatus is used to find the volume of oxygen in 100 cm^3 of air.



When heated, copper reacts with oxygen in the air to form copper oxide.

Syringe A contains 100 cm^3 of air, syringe B contains no air.
The hard glass tube contains excess copper.
The copper is heated strongly and the air is passed backwards and forwards over the copper until no more copper reacts.
The apparatus is then left to cool.

(i) State why an excess of copper must be used.

(1)

.....

.....

.....

(ii) Explain how this experiment can be used to find the volume of oxygen in 100 cm^3 of air.

(2)

.....

.....

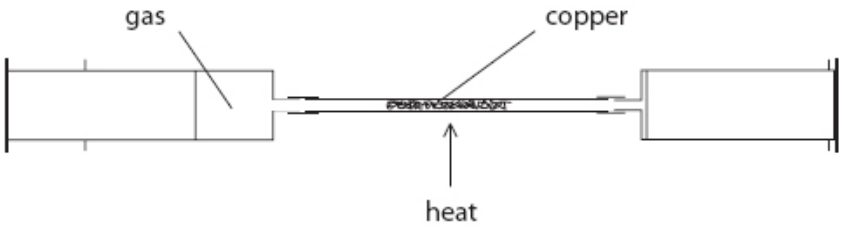
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(Total for question = 8 marks)

Q37.

(a) This apparatus was used to find the percentage of oxygen in a sample of air.



Dry air was passed backwards and forwards over the hot copper.
The copper turned black.
The apparatus was allowed to cool.
The volume of gas in the apparatus had decreased.

(i) Explain why the volume of gas had decreased.

(2)

.....

.....

(ii) Complete the sentence by putting a cross (☒) in the box next to your answer.

The percentage of oxygen in dry air is

(1)

☒ **A** 0.1

☒ **B** 1.0

☒ **C** 21

☒ **D** 79

(b) The composition of the Earth's earliest atmosphere was different to that of the present atmosphere.

(i) Which of these gases was present in large amounts in the Earth's earliest atmosphere?

Put a cross (☒) in the box next to your answer.

(1)

☒ **A** oxygen

☒ **B** carbon dioxide

☒ **C** ammonia

☒ **D** nitrogen

(ii) The Earth's early atmosphere contained a larger percentage of water vapour than the Earth's atmosphere today.

Explain what happened to cause the percentage of water vapour in the Earth's atmosphere to decrease.

(3)

.....

.....

.....

.....

(Total for Question = 7 marks)

Q38.

The composition of the Earth's earliest atmosphere was different to that of the present atmosphere.

(i) Which of these gases was present in large amounts in the Earth's earliest atmosphere?

Put a cross (☒) in the box next to your answer.

(1)

☒ **A** oxygen

☒ **B** carbon dioxide

☒ **C** ammonia

☒ **D** nitrogen

(ii) The Earth's early atmosphere contained a larger percentage of water vapour than the Earth's atmosphere today.

Explain what happened to cause the percentage of water vapour in the Earth's atmosphere to decrease.

(3)

.....

.....

.....

.....

Q39.

Ethanol is a member of the homologous series of alcohols.
The first three members of the series are

methanol CH_3OH

ethanol C_2H_5OH

propanol C_3H_7OH

Use the formulae of these molecules to explain why these alcohols are members of the same homologous series.

(2)

.....

.....

.....

.....

.....

.....

Q40.

* Methane is a fuel burnt in gas-fired boilers.
It is important that plenty of air is available as the fuel burns.

Explain why it is important that plenty of air is available as the fuel burns in gas-fired boilers.

(6)

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.....

.....

(Total for question = 6 marks)

Q41.

Figure 8 shows one molecule of each of four different substances, **A**, **B**, **C** and **D**.

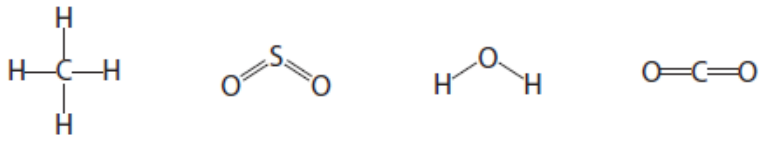


Figure 8

Figure 9 shows a graph of the amount of carbon dioxide in the Earth's atmosphere from 1985 to 2005.

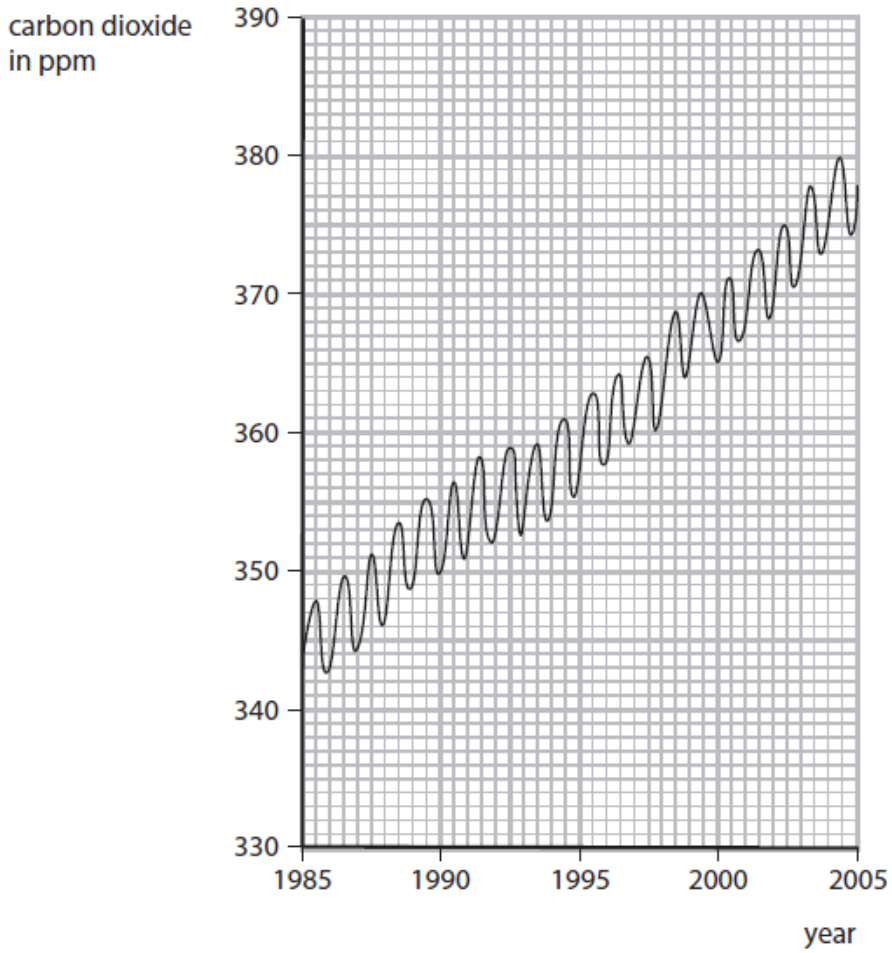


Figure 9

(i) Describe how the amount of carbon dioxide in the Earth's atmosphere varies within each year.

(1)

.....

.....

.....

(ii) Describe the overall trend in the amount of carbon dioxide in the Earth's atmosphere from 1985 to 2005.

(1)

.....

.....

.....

(iii) Calculate the change in the amount of carbon dioxide in the Earth's atmosphere from the beginning of 1990 to the beginning of 2000.

(2)

.....

.....

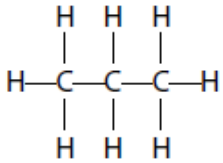
.....

change in amount = ... ppm

(Total for question = 4 marks)

Q42.

The structure of a molecule of propane is shown as



Propane can burn completely in oxygen to form carbon dioxide and water.

(i) Write the word equation for this reaction.

(2)

.....

(ii) Propane is a fuel.

Give the reason why fuels are burned.

(1)

.....

.....

(Total for question = 3 marks)

Q43.

The graph in Figure 13 shows the boiling points of some alkanes plotted against the number of carbon atoms in one molecule of each alkane.

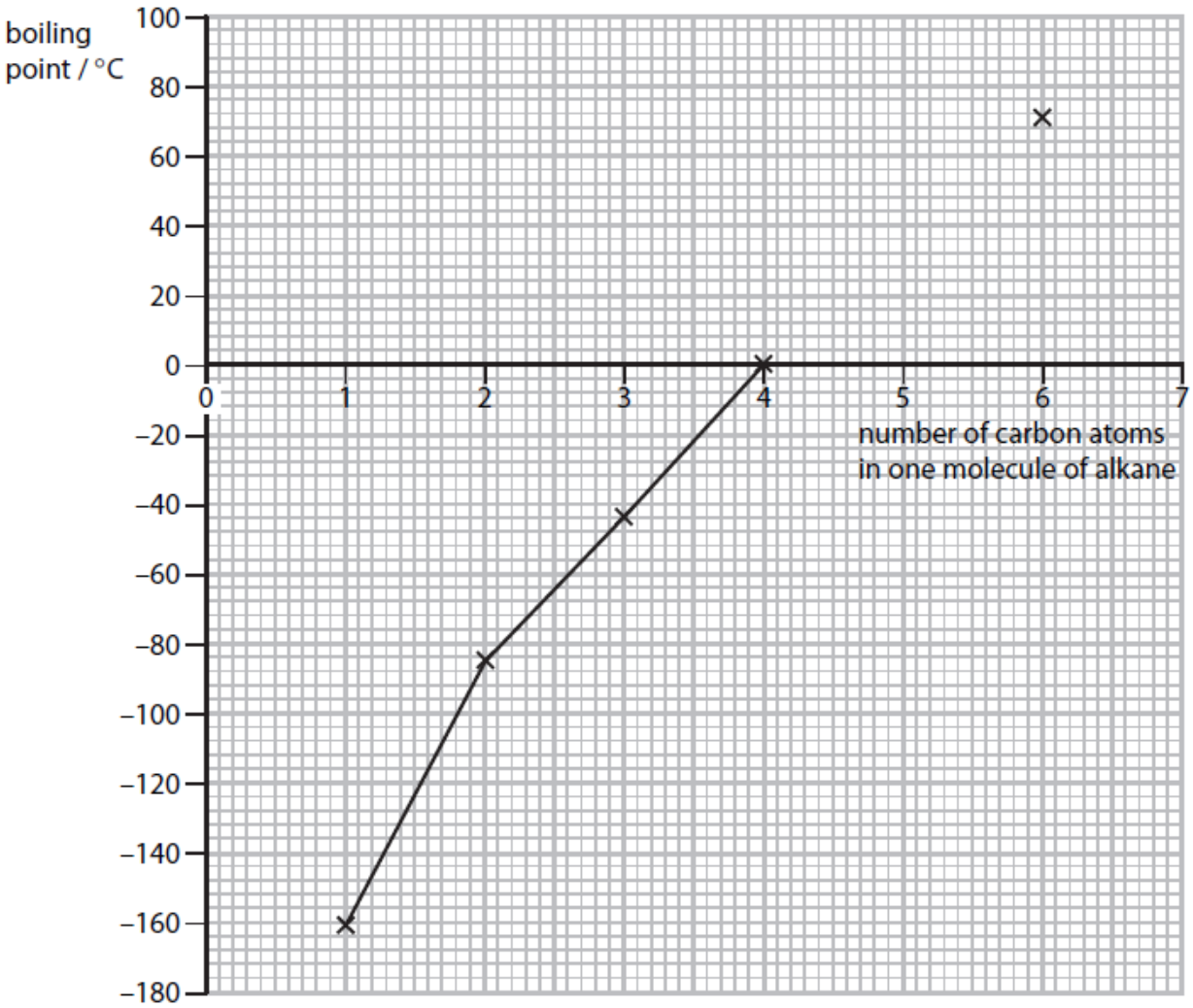


Figure 13

A molecule of pentane contains five carbon atoms.
Use the graph to estimate the boiling point of pentane.

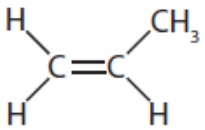
(1)

boiling point of pentane = ... °C

(Total for question = 1 mark)

Q44.

The structure of a molecule of propene is



Propene is an unsaturated hydrocarbon.

(i) Explain what is meant by **unsaturated hydrocarbon**.

(3)

.....

.....

.....

.....

(ii) Complete the sentence by putting a cross (☒) in the box next to your answer.

Propene can be made by using heat to decompose large alkane molecules into smaller, more useful molecules.

This process is known as

(1)

☒ **A** combustion

☒ **B** cracking

☒ **C** fractional distillation

☒ **D** polymerisation

(iii) Describe what is seen when a sample of propene is shaken with bromine water.

(2)

.....

.....

.....

.....

Q45.

Most of the fuels used today are obtained from crude oil.

Crude oil is separated into several fractions by fractional distillation.
Two of these fractions are kerosene and diesel oil.

(i) State a use for each of these fractions.

(2)

kerosene

.....

diesel oil

.....

(ii) Figure 1 shows where the fractions kerosene and diesel oil are produced in the fractionating column.

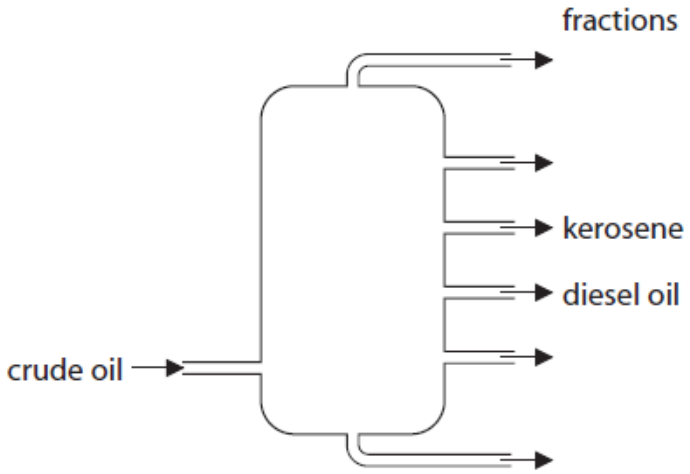


Figure 1

Kerosene is obtained higher up the column than diesel oil.
Kerosene and diesel oil fractions have slightly different properties.

Choose a property.
State how this property for kerosene compares with the property for diesel oil.

(1)

property

.....

comparison

.....

(Total for question = 3 marks)

Q46.

Most of the fuels used today are obtained from crude oil.

Crude oil is separated into several fractions by fractional distillation.
Two of these fractions are kerosene and diesel oil.

(i) State a use for each of these fractions.

(2)

kerosene

.....

diesel oil

.....

(ii) Figure 13 shows where the fractions kerosene and diesel oil are produced in the fractionating column.

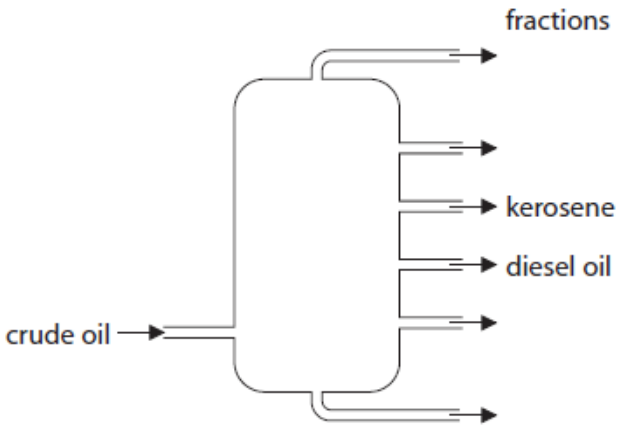


Figure 13

Kerosene is obtained higher up the column than diesel oil.
Kerosene and diesel oil fractions have slightly different properties.

Choose a property.
State how this property for kerosene compares with the property for diesel oil.

(1)

property

.....

comparison

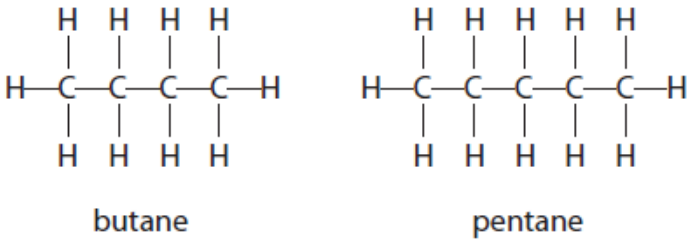
.....

(Total for question = 3 marks)

Q47.

Most of the fuels used today are obtained from crude oil.

Figure 2 shows the formulae of a molecule of butane and of a molecule of pentane.
Butane and pentane are neighbouring members of the same homologous series.



butane pentane

Figure 2

(i) Explain, using these formulae, why butane and pentane are neighbouring members of the same homologous series.

(2)

.....

.....

.....

.....

(ii) Butane has the formula C_4H_{10}.

Calculate the mass of carbon in 100 g of butane.

Give your answer to three significant figures.

(relative atomic masses: H = 1.00, C = 12.0;
relative formula mass: C_4H_{10} = 58.0)

You must show your working.

(3)

.....

.....

.....

mass of carbon = ... g

(Total for question = 5 marks)

Q48.

Carbon dioxide is one of the gases in the Earth's atmosphere.
The percentage of carbon dioxide in the Earth's atmosphere has changed over time.

(i) Which row of the table shows the approximate percentage of carbon dioxide thought to be in the Earth's early atmosphere and how this percentage changed to form the Earth's atmosphere today?

(1)

	approximate percentage of carbon dioxide in the Earth's early atmosphere	change in percentage carbon dioxide to form the Earth's atmosphere today.
☒ **A**	5	increased
☒ **B**	5	decreased
☒ **C**	95	increased
☒ **D**	95	decreased

(ii) The actual percentage of carbon dioxide in the Earth's atmosphere today varies.

Explain **two** factors that cause the percentage of carbon dioxide in today's atmosphere to vary.

(4)

factor 1

.....

.....

.....

.....

factor 2

.....

.....

.....

.....

(Total for question = 5 marks)

Q49.

Most of the fuels used today are obtained from crude oil.

Figure 14 shows the formulae of a molecule of butane and of a molecule of pentane. Butane and pentane are neighbouring members of the same homologous series.

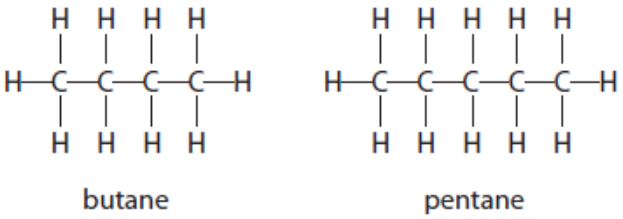


Figure 14

(i) Explain, using these formulae, why butane and pentane are neighbouring members of the same homologous series.

(2)

.....

.....

.....

.....

(ii) Butane has the formula C_4H_{10}.

Calculate the mass of carbon in 100 g of butane.

Give your answer to three significant figures.

(relative atomic masses: H = 1.00, C = 12.0;
relative formula mass: C_4H_{10} = 58.0)

You must show your working.

(3)

.....

.....

.....

mass of carbon = ... g

(iii) Butane burns completely in air to form carbon dioxide and water.

Write the word equation for this reaction.

(2)

.....

.....

(Total for question = 7 marks)

Q50.

Crude oil is a complex mixture of substances.

Crude oil can be separated into useful fractions by fractional distillation.

Figure 7 shows a fractional distillation column and the fractions produced when a sample of crude oil is distilled.

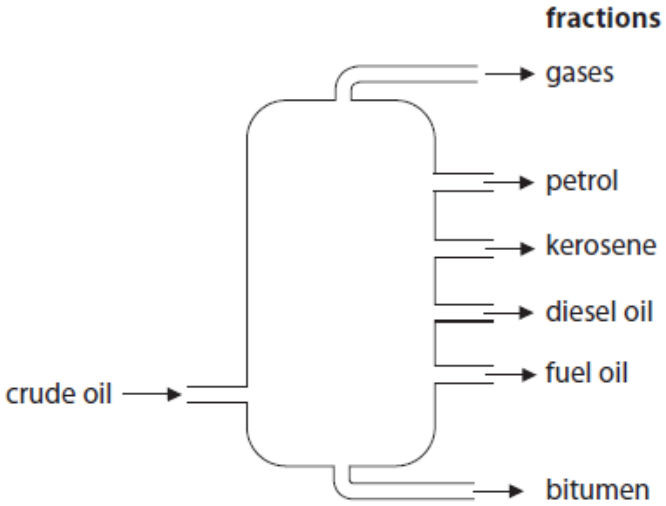


Figure 7

The properties of these fractions vary from the top of the column to the bottom of the column.

Which of the following is a trend in a property of the fractions obtained from the top of the column to those obtained from the bottom?

(1)

☒ **A** the average number of carbon atoms in molecules present decreases

☒ **B** the ease of ignition increases

☒ **C** the boiling points decrease

☒ **D** the viscosities increase

(Total for question = 1 mark)