AQA GCSE CHEMISTRY (HIGHER) · 8462

CHEMISTRY



EXAM QUESTION PACK

4.7.1 CARBON COMPOUNDS AS FUELS AND FEEDSTOCK (PACK 4)

SCORE	PERCENTAGE
/88	%

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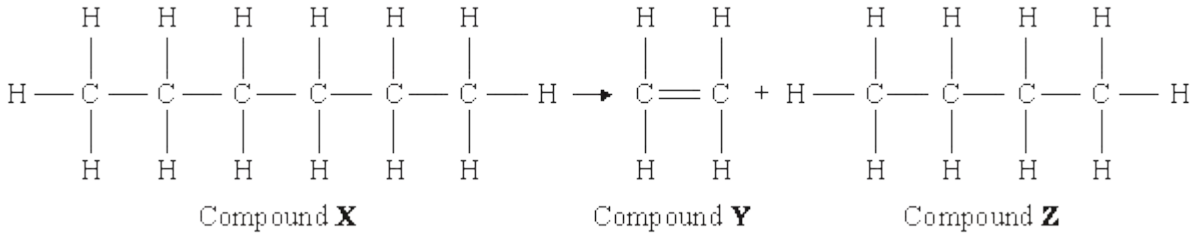
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Q1.

The diagram shows a reaction which takes place in an oil refinery.



(a) **X**, **Y** and **Z** are all examples of which type of compound?

_____

(1)

(b) What type of chemical reaction takes place when compound **X** is converted into compounds **Y** and **Z**?

_____

(1)

(c) Compounds **Y** and **Z** are both useful substances.

Compound **Y** is unsaturated. Compound **Z** is saturated.

(i) Suggest **one** use for compound **Y**.

_____

(1)

(ii) Suggest **one** use for compound **Z**.

_____

(1)

(Total 4 marks)

Q2.

Crude oil and natural gas are mixtures of hydrocarbons. They are obtained from wells drilled into rocks where they are trapped.

(a) (i) What is the name of the process used to separate the different hydrocarbons in crude oil?

_____

(1)

(ii) Methane is one of the gases obtained when crude oil is separated.

Give the name of another hydrocarbon gas obtained from this process.

_____

(1)

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(b) A fuel used in gas cookers is natural gas. It is mainly methane, CH_4.

(i) Complete the word equation for the complete combustion of methane.

methane + oxygen → _____ + _____

(2)

(ii) What different gas is produced by the incomplete combustion of methane?

_____

(1)

(Total 5 marks)

Q3.

The table shows some of the products which are obtained from the fractional distillation of crude oil.

Fraction	Nature of products
A	a mixture of gases
B	a mixture of low boiling point liquids
C	a mixture of high boiling point, yellow liquids

(a) For each of the fractions **A–C** give the name of an organic substance which could be part of the fraction and state a use for it.

A _____

Use _____

(2)

B _____

Use _____

(2)

C _____

Use _____

(2)

(b) When burned in excess air, all the substances in fractions **A–C** form the same two compounds.

Give the **formulae** of these two compounds.

_____ and _____

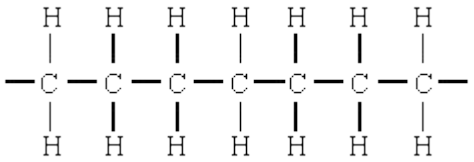
(1)

(Total 7 marks)

Q4.

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Poly(ethene) is a long-chain saturated hydrocarbon. The formula for part of the polymer chain is:



(a) Write the structural formula of the small molecule from which poly(ethene) is made.

(2)

(b) Saturated hydrocarbons, such as propane, are fuels.

Write a balanced equation for the complete combustion of propane, C_3H_8.

_____ + _____ → _____ + _____

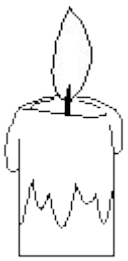
(3)

(Total 5 marks)

Q5.

Wax is a fuel.

A young child watched a candle burning and wondered where the wax had gone.



(a) Complete the sentence below.

When wax burns, energy is released as _____

(1)

(b) Why does the wax disappear as it burns?

_____

_____

(1)

(Total 2 marks)

Q6.

Petrol burns in oxygen from the air in a car engine.

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Two of the gases in the exhaust fumes are carbon dioxide and water vapour.

This indicates that petrol contains the elements _____ and

_____ .

(Total 2 marks)

Q7.

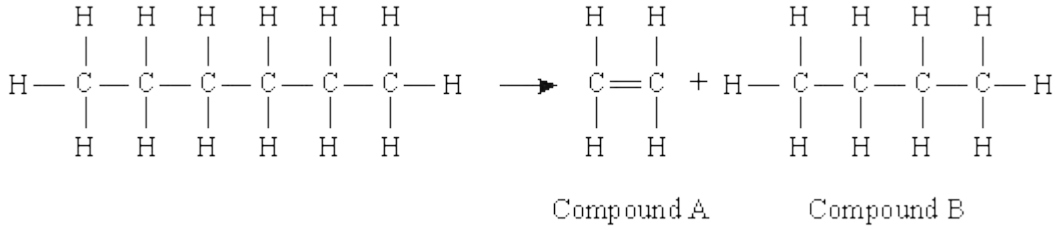
In a car engine petrol burns in oxygen from the air. Two of the gases in the exhaust fumes are carbon dioxide and water vapour.

This indicates that petrol contains the elements _____ and _____

(Total 2 marks)

Q8.

The equation below shows the cracking of a hydrocarbon compound into two different compounds, A and B.



(a) State **two** differences between the structures of compounds A and B.

_____

_____

_____

_____

(2)

(b) Why is compound A useful in industry?

_____

_____

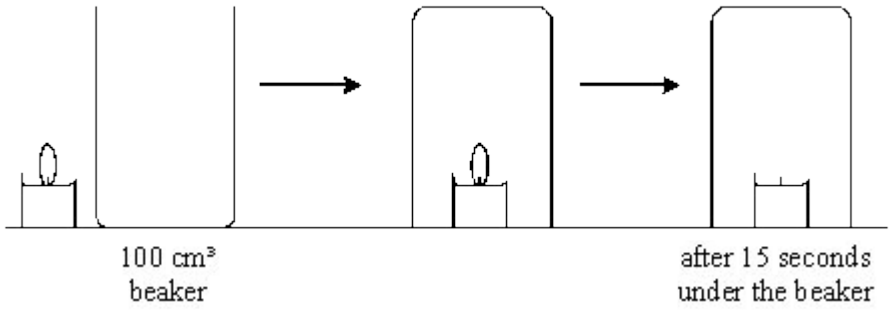
(1)

(Total 3 marks)

Q9.

This experiment shows a candle burning then going out.

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(a) Choose words from this list to complete the sentences in parts (i) and (ii) below.

air carbon dioxide hydrogen nitrogen oxygen

(i) When the candle wax is burning it is reacting with _____

from the _____ .

(2)

(ii) One product of the reaction is _____

(1)

(b) Complete the following sentence.

In another experiment a 200 cm^3 beaker is used. The candle will then burn

for about _____ seconds.

(1)

(Total 4 marks)

Q10.

Here is the word equation for a chemical reaction.

methane + oxygen → water + carbon dioxide

Write down everything that the word equation tells you about the reaction.

_____

_____

_____

_____

_____

_____

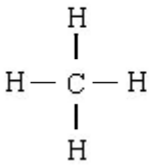
(Total 4 marks)

Q11.

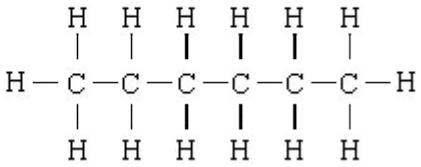
The structural formulae of two saturated hydrocarbons are shown below.

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compound A



compound B



Describe **two** ways in which they will differ in their physical properties.

1. _____

_____

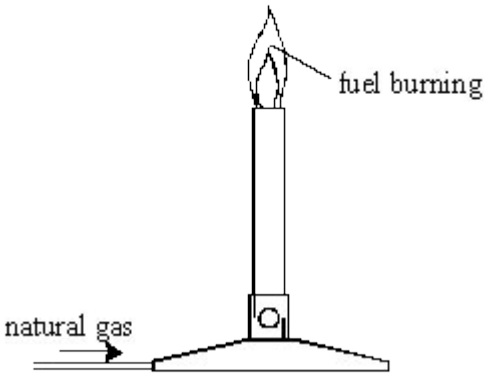
2. _____

_____

(Total 2 marks)

Q12.

Natural gas is a fuel.



(a) Complete these sentences.

When the fuel burns completely, we cannot see the new substances produced because

they are mainly colourless _____ .

The energy of the fuel is released as _____ .

(3)

(b) Choose words from this list to complete the sentence below.

carbon	carbon dioxide	hydrogen	nitrogen
oxygen	sulphur dioxide	water vapour	

Three gases which can be produced when fuels burn are:

1. _____

2. _____

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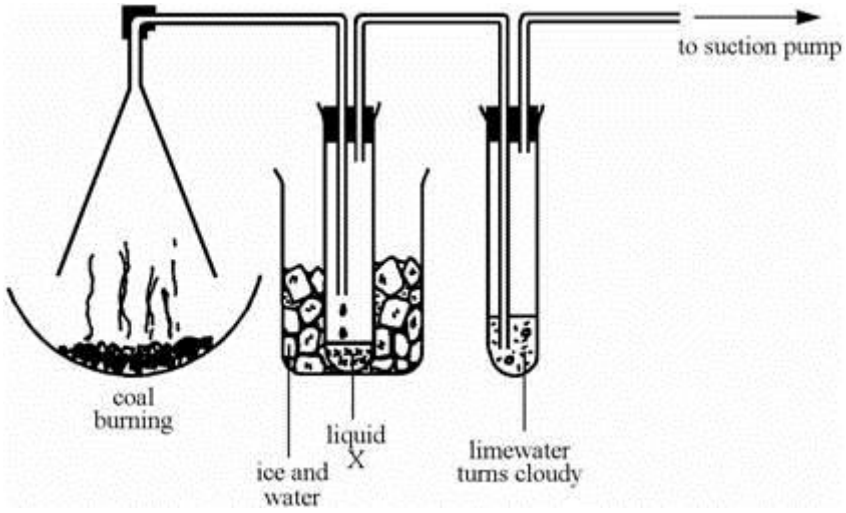
3. _____

(3)

(Total 6 marks)

Q13.

The gases produced when coal burns are cooled by ice and then bubbled through limewater.



(a) Complete these sentences.

(i) The coal is reacting with _____ when it burns.

(ii) During burning, elements in the coal are converted to compounds called _____.

(2)

(b) Choose words from this list to complete the sentences.

carbon **carbon dioxide** **sulphur** **sulphur dioxide**

sodium **water**

(i) Liquid X is a compound made from hydrogen and oxygen.

It is called _____

(ii) Sulphur dioxide is an acidic gas. It is given off when coal burns, because coal contains the element _____

(iii) Most fuels are compounds of hydrogen and _____

(3)

(c) Burning coal is an exothermic reaction.

Explain what “exothermic” means.

_____

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_____

(1)

(d) (i) Which gas turns limewater cloudy?

_____

(ii) Which element in the coal is oxidised to form this gas?

_____

(2)

(Total 8 marks)

Q14.

(a) The hydrocarbon $C_{16}H_{34}$ was heated strongly in the absence of air.

This is one of the reactions which took place:

$$C_{16}H_{34} \longrightarrow C_6H_{14} + C_6H_{12} + 2C_2H_4$$

This type of reaction is carried out because there is a greater demand for the products than for the original hydrocarbon.

Suggest **two** reasons for this.

1. _____

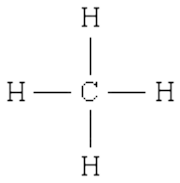
_____

2. _____

_____

(2)

(b) A molecule of the compound methane, CH_4, can be shown like this:



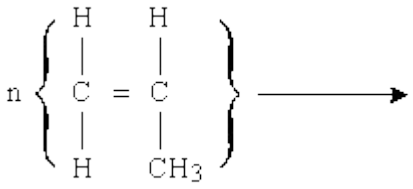
Draw a molecule of the compound ethene, C_2H_4.

(2)

(c) Small molecules of substances called monomers can be joined together in polymerisation, eg. ethene poly $\longrightarrow$ (ethene).

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(i) COMPLETE THE EQUATION BELOW TO SHOW FORMATION OF THE POLYMER FROM THE MONOMER PROPENE.



(1)

(ii) Suggest the name of the polymer formed.

_____

(1)

(Total 6 marks)

Q15.

Choose words from this list to complete the sentences,

ammonia	**carbon dioxide**	**hydrogen**	**nitrogen**
electrical	**heat**	**solar**	**sound**

(a) In air, the two most common gases are oxygen and _____ .

(b) When natural gas burns, energy is released mainly as _____ .

(c) When natural gas burns, a gas is produced which turns limewater milky.

The gas is _____ .

(Total 3 marks)

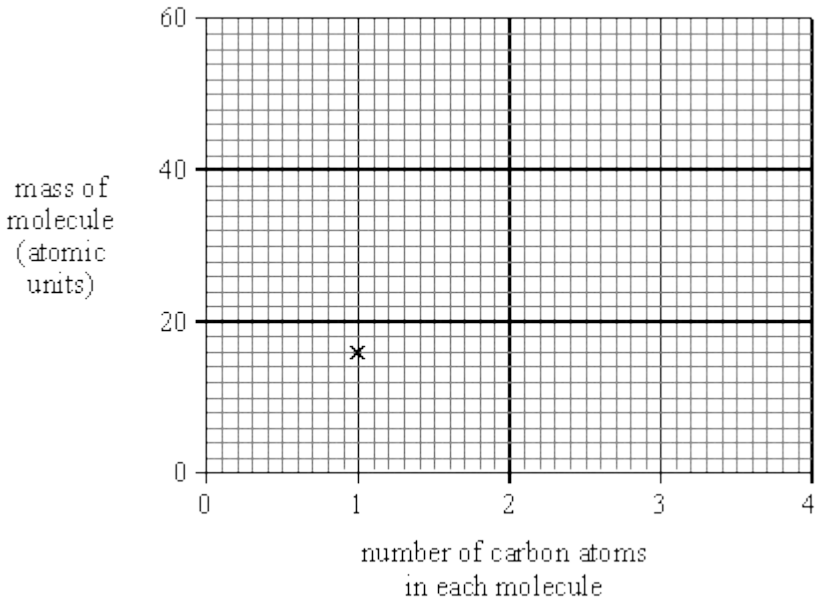
Q16.

The table gives some information about a family of molecules in crude oil.

NUMBER OF CARBON ATOMS IN MOLECULE	MASS OF MOLECULE (atomic units)
1	16
2	30
4	58

(a) Show information from the table in the most appropriate way on the grid.

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(3)

(b) What is the mass of a molecule with three carbon atoms?

_____

(1)

(c) The other atoms in each molecule are all hydrogen atoms.
What family of substances do all the molecules belong to?

_____

(1)

(d) The mass of a carbon atom is 12 atomic units.
The mass of a hydrogen atom is 1 atomic unit.

So the molecule with one carbon atom has four hydrogen atoms.
Its formula is CH_4.

Write down the formula:

(i) of the molecule with two carbon atoms _____

(ii) of a molecule from the same family with five carbon atoms _____

(2)

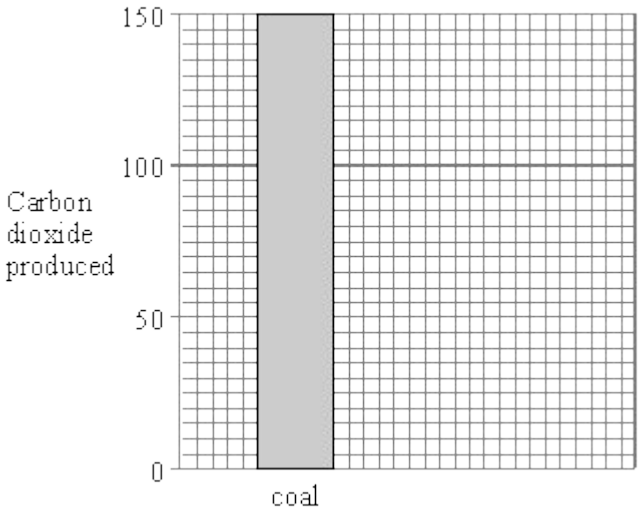
(Total 7 marks)

Q17.

The table shows how much carbon dioxide is produced when you transfer the same amount of energy by burning coal, gas and oil.

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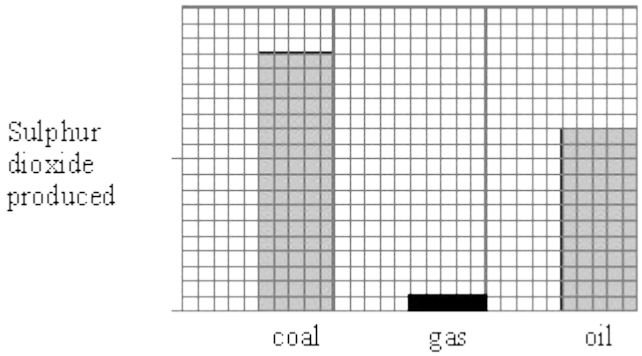
	Carbon dioxide (based on oil = 100)
coal	150
gas	75
oil	100



(a) Use the information from the table to complete the bar-chart.

(3)

(b) The second bar-chart shows how much sulphur dioxide is produced by burning the same three fuels.



Compare the amount of sulphur produced by burning gas with the amount produced by burning coal.

_____

_____

(2)

(c) (i) Coal and oil produce carbon dioxide and sulphur dioxide when they burn. What elements must they contain?

_____

_____

(2)

(ii) Burning fuels also produce nitrogen oxides, even though the fuels contain no nitrogen. Explain why this happens.

_____

_____

(2)

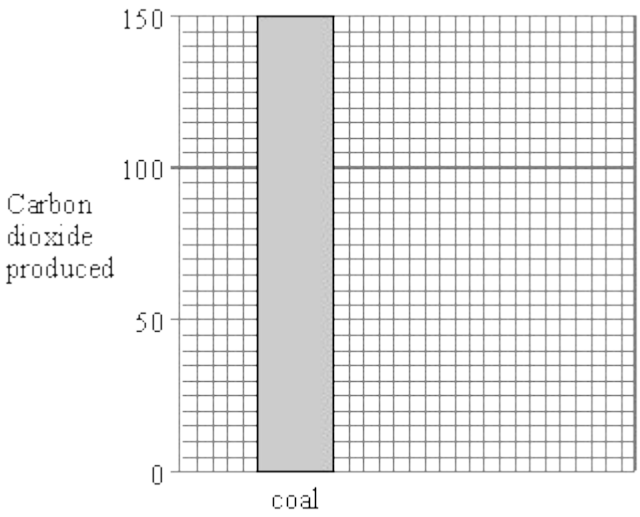
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(Total 9 marks)

Q18.

The table shows how much carbon dioxide is produced when you transfer the same amount of energy by burning coal, gas and oil.

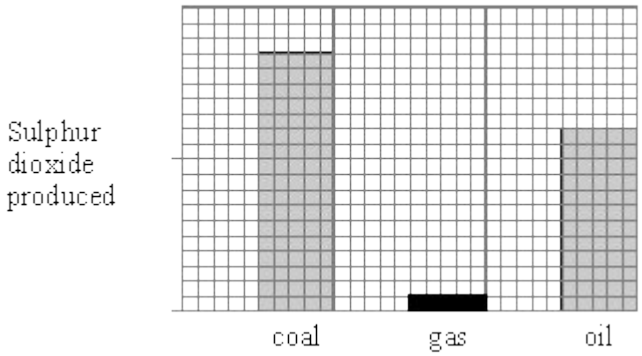
	Carbon dioxide (based on oil = 100)
coal	150
gas	75
oil	100



(a) Use the information from the table to complete the bar-chart.

(2)

(b) The second bar-chart shows how much sulphur dioxide is produced by burning the same three fuels.



Compare the amount of sulphur produced by burning gas with the amount produced by burning coal.

_____

_____

(1)

(c) Burning fuels also produces nitrogen oxides, even though the fuels contain no nitrogen. Explain why this happens.

_____

_____

(2)

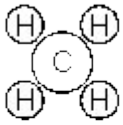
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(d) When you release the same amount of energy from coal, gas and oil, different amounts of carbon dioxide are produced.
Use the information below to explain why.

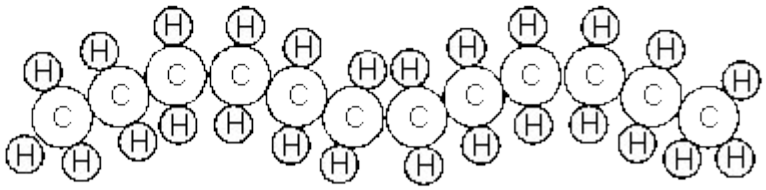
Coal is mainly carbon



North Sea gas is mainly methane



Oil is made from molecules similar to the one shown



(3)

(e) What other element do coal and oil usually contain?

_____

(1)

(Total 9 marks)

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