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CHEMISTRY

ORGANIC CHEMISTRY

Level & Board	AQA (A-LEVEL)
TOPIC:	ALKANES
PAPER TYPE:	QUESTION PAPER - 2
TOTAL QUESTIONS	10
TOTAL MARKS	28

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Alkanes - 2

1. Many hydrocarbon compounds burn readily in air.

(a) Write an equation to show the complete combustion of $C_{15}H_{32}$

(2)

(b) One of the gaseous products of the incomplete combustion of methane in gas fires is known to be poisonous.

Identify this product and write an equation for the reaction in which it is formed from methane.

(3)

2. Which statement is correct about the fractional distillation of crude oil?

- A. A zeolite catalyst is used.
- B. Each fraction contains a mixture of hydrocarbons.
- C. Gaseous fractions are formed by breaking covalent bonds.
- D. The fractionating column is hottest at the top.

(1)

3. Ethene and other important hydrocarbons can be produced industrially from decane, $C_{10}H_{22}$.

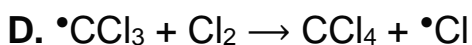
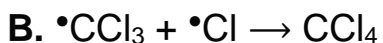
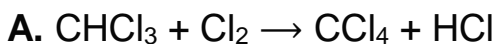
Name the process involved. Write two equations for reactions in which ethene is formed from decane by this process.

Explain the economic importance of the process.



(6)

4. Which equation is a propagation step in the conversion of trichloromethane into tetrachloromethane by reaction with chlorine in the presence of ultraviolet light?



(1)

5. A catalytic converter in the exhaust system of a car contains a ceramic honeycomb covered with a thin coating of the catalyst. When hot gases containing nitrogen monoxide and unburnt octane are passed over the catalyst, they react to form nitrogen, carbon dioxide and water.

(a) Explain why the catalyst is coated on a honeycomb.

(2)

(b) Write an equation for the reaction of octane with nitrogen monoxide to form nitrogen, carbon dioxide and water.

(2)

6. Which catalyst is used in the catalytic cracking of alkanes?

- A. Concentrated phosphoric acid
- B. Iron
- C. Nickel
- D. Zeolite

(1)

7. Write an equation for the incomplete combustion of C_8H_{18} to form carbon monoxide and water only.

A catalytic converter is used to remove carbon monoxide from the exhaust gases in a car.

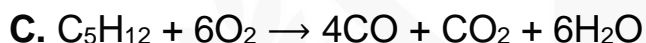
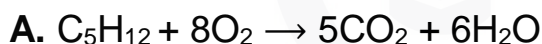
Identify a catalyst used in the catalytic converter.

Write an equation to show how carbon monoxide is removed in a catalytic converter.

State why the water produced in the exhaust gases may contribute to global warming.

(4)

8. Which correctly represents an incomplete combustion of pentane?



(1)

9. This question is about fossil fuels.

(a) The petrol fraction from crude oil contains octane (C_8H_{18}).

Give an equation for the complete combustion of octane.

(1)

(b) The combustion of petrol in car engines produces the pollutant nitrogen monoxide.

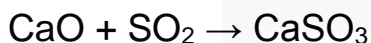
Give an equation for a reaction that removes nitrogen monoxide in a catalytic converter.

(1)

(c) Sulfur dioxide is produced in the combustion of fossil fuels.

The total emissions of sulfur dioxide in the UK have fallen dramatically since 1970.

Sulfur dioxide is now removed from the flue gases in power stations by reaction with calcium oxide.



In 1970, the total UK emissions of sulfur dioxide were 6.49 million tonnes (1 tonne = 1000 kg).

Calculate the mass, in kilograms, of calcium oxide needed to react with this mass of sulfur dioxide.

Give your answer in standard form.

(2)

10. Which species is produced in a propagation step during the reaction of propane with an excess of chlorine in the presence of UV light?

- A. H^\cdot
- B. $\text{C}_3\text{H}_5\text{Cl}$
- C. $\text{C}_3\text{H}_6\text{Cl}_2$
- D. C_6H_{14}

(1)



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