Practice Question Set For A-Level
Subject : Chemistry
Paper-2 Topic: Alkanes

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Name of the Student:_____
Max. Marks : 19 Marks **Time : 19 Minutes**

Q1.

This question is about the reactions of alkanes.

(a) Alkanes can be used as fuels.

Give an equation for the combustion of heptane (C_7H_{16}) in an excess of oxygen.

_____

(1)

(b) Heptane can be obtained from the catalytic cracking of hexadecane ($C_{16}H_{34}$) at a high temperature.

Identify a suitable catalyst for this process.
Give **one** condition other than high temperature.
Give an equation for the catalytic cracking of one molecule of hexadecane to produce one molecule of heptane, one molecule of cyclohexane and one other product.

Catalyst _____

Condition _____

Equation _____

_____

(3)

(c) Alkanes can be used in free-radical substitution reactions to produce halogenoalkanes.

Give equations for the propagation steps in the reaction of butane to form 2-chlorobutane.

_____

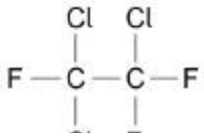
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(2)

(d) Chlorofluorocarbons (CFCs) are a group of halogenoalkanes currently banned in many countries. They cannot be used as solvents or refrigerants because of their effect on the environment.

The structure of a CFC is shown.

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Identify the radical produced from this CFC that is responsible for the depletion of ozone in the atmosphere.

Explain, with the aid of equations, why a single radical can cause the decomposition of many molecules of ozone.

Radical _____

Explanation _____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

(4)

(Total 10 marks)

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Q2.

When alkanes are burned in an excess of oxygen they produce carbon dioxide and water.

(a) Write an equation for the complete combustion of propane in oxygen.

_____

(1)

(b) An expression can be derived using bond enthalpy data to estimate the enthalpy of combustion ($\Delta_c H$) of an alkane.

For an alkane with ***n*** carbon atoms: $\Delta_c H = -(496\boldsymbol{n} + 202)$ kJ mol^{-1}

The enthalpy of combustion of an alkane was calculated to be −6650 kJ mol^{-1} using this expression.

Deduce the molecular formula of this alkane.

Show your working.

Molecular formula of alkane _____

(2)

(c) Suggest **one** reason, other than the use of mean bond enthalpies, why a value for the enthalpy of combustion of a liquid alkane is different from the value obtained using the expression in part (b)

_____

_____

(1)

(d) Values of the enthalpy change for combustion of 1 g of some alkanes are shown in the table.

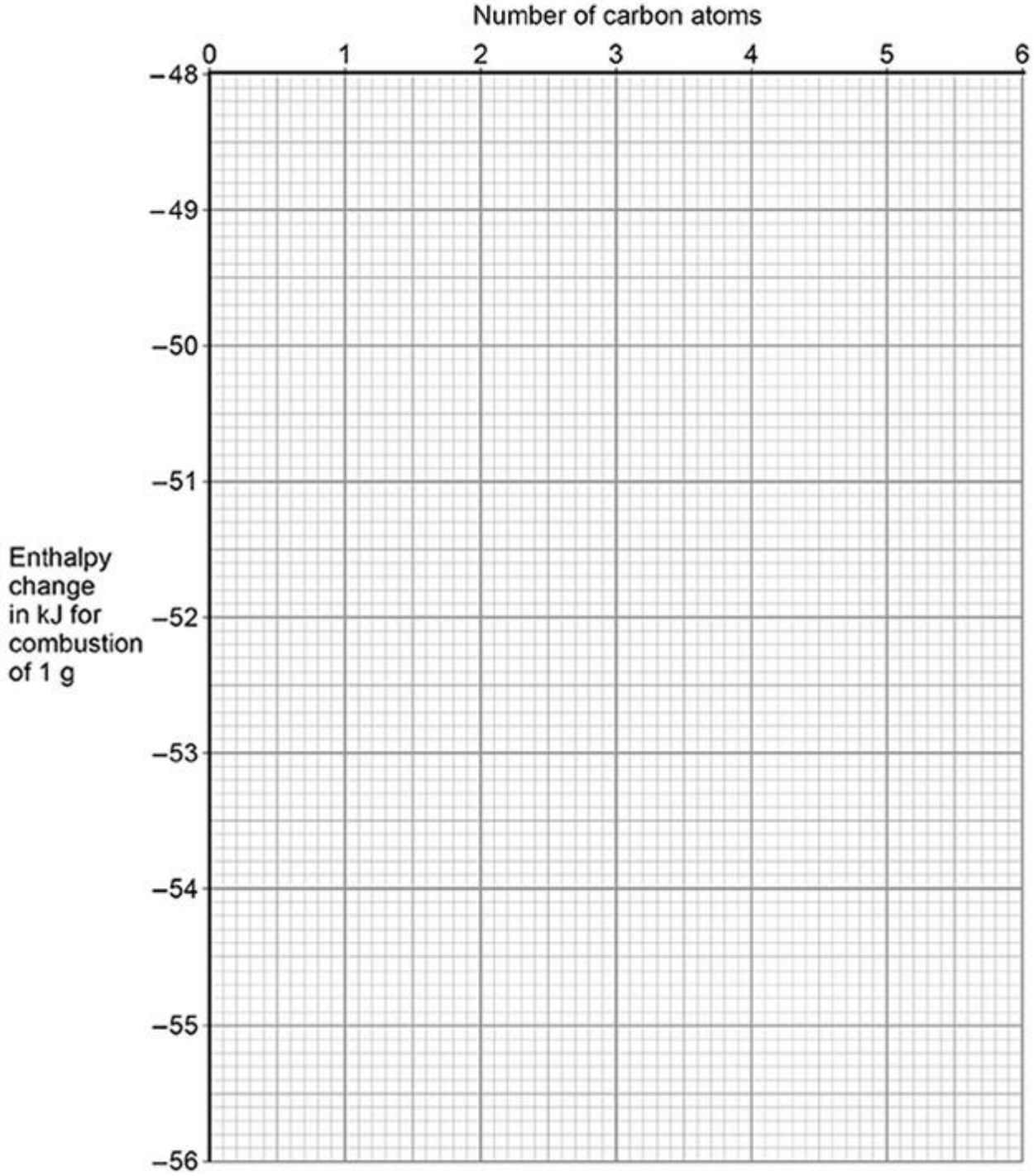
	methane	**ethane**	**propane**	**butane**	**pentane**
Enthalpy change in kJ for combustion of 1 g	−55.6	−52.0		−49.6	−48.7

Plot the enthalpy change for the combustion of 1 g against the number of carbon atoms in the alkanes in the table.

Draw a best fit line and use this to estimate the enthalpy change for combustion of 1 g of propane.

Write your answer in the table.

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(3)

(e) Isooctane (2,2,4-trimethylpentane) is an important component of petrol used in cars.

When isooctane is burned, the enthalpy change is −47.8 kJ g^{-1}

Isooctane is a liquid at room temperature with a density of 0.692 g cm^{-3}

Calculate the heat energy released, in kJ, when 1.00 dm^3 of isooctane burns in excess oxygen.

Give your answer to the appropriate number of significant figures.

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Heat energy released _____ kJ

(2)

(Total 9 marks)

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