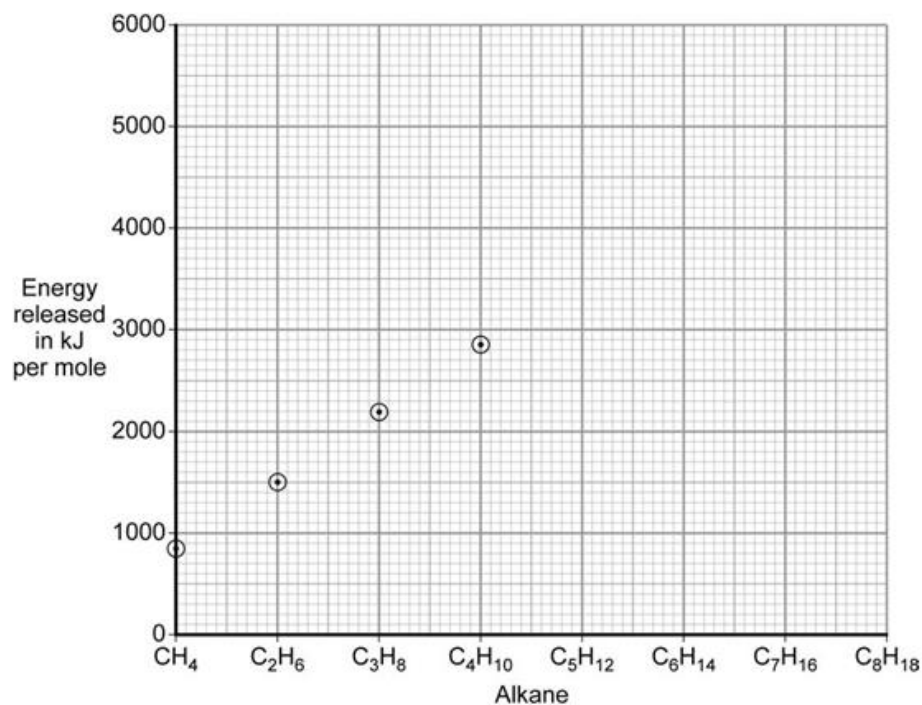


HYDROCARBONS

Q1. Alkanes are important hydrocarbon fuels. They have the general formula C_nH_{2n+2} .

The points on the graph show the amount of energy released when 1 mole of methane (CH_4), ethane (C_2H_6), propane (C_3H_8) and butane (C_4H_{10}) are burned separately.



(a)(i) Draw a line through the points and extend your line to the right-hand edge of the graph. (1 mark)

(a)(ii) Use the graph to estimate the amount of energy released when 1 mole of octane (C_8H_{18}) is burned.

Energy released= kJ

(1 mark)

(a)(iii) A student noticed that octane (C_8H_{18}) has twice as many carbon atoms as butane (C_4H_{10}), and made the following prediction:

“When burned, 1 mole of octane releases twice as much energy as 1 mole of butane.”

Use the graph to decide if the student’s prediction is correct. You **must** show your working to gain credit.

(2 marks)

(b) Look at the following table.

Fuel	Type	Heat released in kJ per g	Combustion products			Type of flame
			CO ₂	SO ₂	H ₂ O	
Bio ethanol	Renewable	29	✓		✓	Not smoky
Coal	Non-renewable	31	✓	✓	✓	Smoky
Hydrogen	Renewable	142			✓	Not smoky
Natural gas	Non-renewable	56	✓		✓	Not smoky

From this information a student made two conclusions.

For each conclusion, state if it is correct **and** explain your answer.

(b) (i) “Renewable fuels release more heat per gram than non-renewable fuels.”

(2 marks)

(b) (ii) "Non-renewable fuels are better for the environment than renewable fuels."

(2 marks)

Q2. Ethene causes bananas to ripen.

Unsaturated organic molecules such as ethene can be identified by a chemical test using bromine water.

Draw a ring around the correct answer to complete these sentences.

(i) Unsaturated means that the molecule

contains a carbon-carbon single bond.
contains a carbon-carbon double bond.
does not contain a carbon-carbon bond.

(1 mark)

(ii) The colour of bromine water is

blue.
green.
orange.

(1 mark)

(iii) When ethene is shaken with bromine water, the bromine water is

darkened.

decolourised.

denatured.

(1 mark)

Total marks (11)