

## Energetics Questions 2

The following bond energies will be needed in the questions

Bond	Bond energy / kJ/mol	Bond	Bond energy / kJ/mol	Bond	Bond energy / kJ/mol
C-H	412	C=O	805	H-Cl	431
C-C	348	C-Cl	338	C≡O	1070
C=C	612	Cl-Cl	242	O-H	463
C-O	360	O=O	496	H-H	436

1 Complete the following sentences by inserting appropriate words. [4]

Breaking covalent bonds is an ..... process, it .....energy.

Making covalent bonds is an ..... process, it .....energy.

2 Methane reacts with chlorine in to form chloromethane and hydrogen chloride.

(a) Write an equation using displayed formulae for this reaction. [3]

(b) Use the bond energies in the table to calculate the enthalpy change for this reaction. [3]

(c) Explain in terms of the number/strength of bond broken/made whether this reaction is exothermic/endothermic. [2]

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(d) Complete the energy level diagram for this reaction. [2]



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3 Ethene reacts with hydrogen to form ethane

(a) Write an equation using displayed formulae for this reaction. [3]

(b) Use the bond energies in the table to calculate the enthalpy change for this reaction. [3]

4 Propane is a hydrocarbon that is used as a fuel.

(a) Write an equation for the complete combustion of propane. [3]

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(b) Draw the displayed formulae of propane and carbon dioxide [2]

(c) Use the bond energies in the table to calculate the enthalpy change for this reaction. [3]

(d) If there is insufficient oxygen present, propane can undergo *incomplete combustion* to form carbon monoxide and water.

(i) Write an equation for this reaction. [3]

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(ii) The bond between C and O in carbon monoxide is a triple bond. Use the bond energies in the table to calculate the enthalpy change for the incomplete combustion of **1 mol** of propane. [3]