

Be sure to answer all parts.

The average C—H bond energy in CH₄ is 415 kJ/mol. Use the following data to calculate the average C—H bond energy in ethane (C₂H₆; C—C bond), in ethene (C₂H₄; C=C bond), and in ethyne (C₂H₂; C≡C bond).



Average C—H bond
energy in ethane = kJ/mol

Average C—H bond
energy in ethene = kJ/mol

Average C—H bond
energy in ethyne = kJ/mol

Average bond energies (kJ/mol)

Bond	Energy
H—H	432
C—H	413
C—C	347
C—N	305
C—O	358
C=C	614
C=O	745
C≡C	839
C≡O	1070
O ₂	498

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Average C—H bond energy in ethane =

kJ/mol

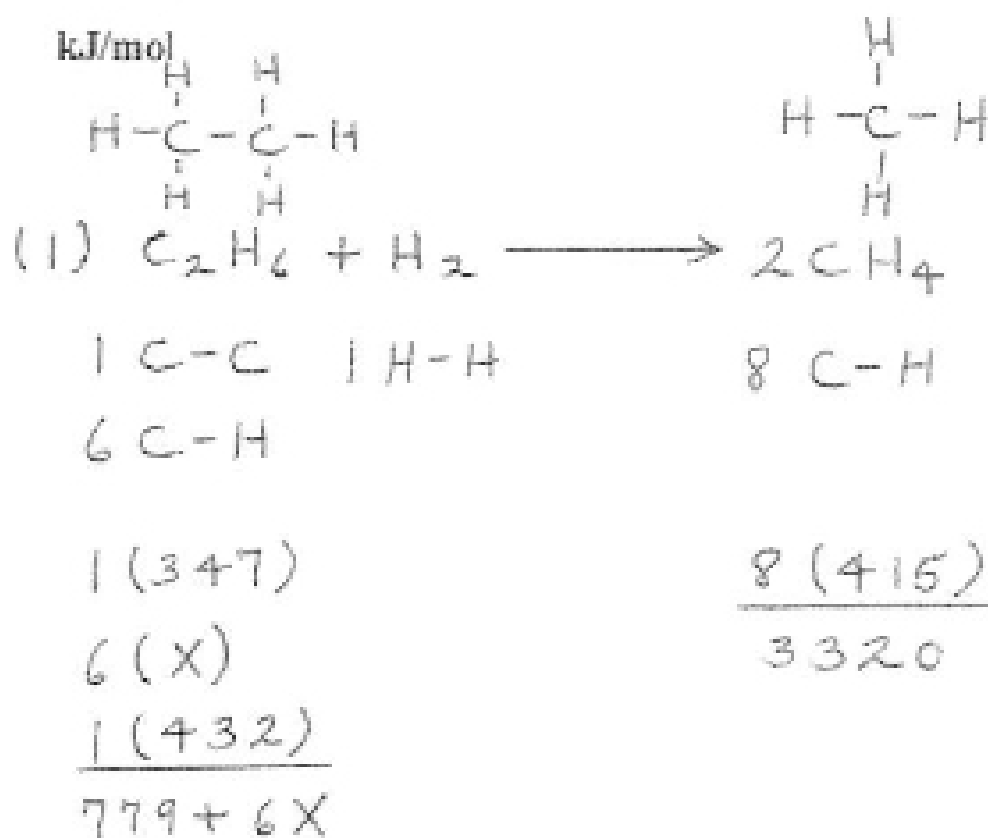
Average C—H bond energy in ethene =

kJ/mol

Average C—H bond energy in ethyne =

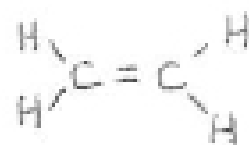
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$$779 + 6X - 3320 = -65.07$$

$$X = \underline{\underline{412.7 \text{ kJ/mol}}}$$



$$614 + 4X + 2(432) - 3320 = -202.21; X = \underline{\underline{409.9 \frac{\text{kJ}}{\text{mol}}}}$$



$$839 + 2X + 3(432) - 3320 = -376.74$$

$$X = \underline{\underline{404.1 \text{ kJ/mol}}}$$