

Exercise 4.42 – Bond enthalpy

Q442-01 Which of the following is correct about the energy changes during bond breaking and bond formation?

- | bond breaking | bond formation |
|----------------------|-----------------------|
| A. exothermic | endothermic |
| B. exothermic | exothermic |
| C. endothermic | exothermic |
| D. endothermic | endothermic |

Q442-02 Which statement about bond enthalpies is correct?

- A. Bond enthalpies have positive values for strong bonds and negative values for weak bonds
- B. Bond enthalpy values are greater for ionic bonds than for covalent bonds
- C. Bond breaking is endothermic and bond making is exothermic
- D. The carbon-carbon bond enthalpy values are the same in ethane and ethene.

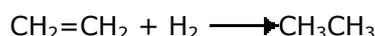
Q442-03 The average bond enthalpy of the C-H bond is 412 kJ mol^{-1} . Which process has an enthalpy change closest to this value?

- A. $\text{CH}_4(\text{g}) \longrightarrow \text{C}(\text{s}) + 2\text{H}_2(\text{g})$
- B. $\text{CH}_4(\text{g}) \longrightarrow \text{C}(\text{g}) + 2\text{H}_2(\text{g})$
- C. $\text{CH}_4(\text{g}) \longrightarrow \text{C}(\text{s}) + 4\text{H}(\text{g})$
- D. $\text{CH}_4(\text{g}) \longrightarrow \text{CH}_3(\text{g}) + \text{H}(\text{g})$

Q442-04 What energy changes occur when chemical bonds are formed and broken?

- A. Energy is absorbed when bonds are formed and when they are broken
- B. Energy is released when bonds are formed and when they are broken
- C. Energy is absorbed when bonds are formed and released when they are broken
- D. Energy is released when bonds are formed and absorbed when they are broken

Q442-05 What is the value of ΔH in kJ mol^{-1} for the reaction below?

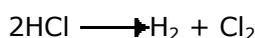


Bond	H-H	C-C	C=C	C-H
bond energies / kJ mol^{-1}	436	348	612	412

- A. 124
- B. 101
- C. -101
- D. -124

Q442-06 Some average bond enthalpies in kJ mol^{-1} are as follows: H - H = 436, Cl - Cl = 242, H - Cl = 431

What is the enthalpy change (in kJ) for the decomposition of hydrogen chloride?

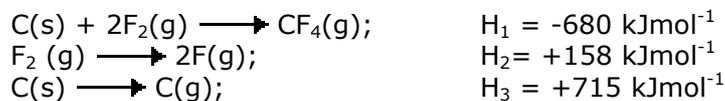


- A. -184
- B. +184
- C. +247

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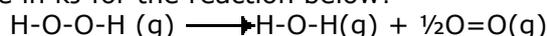
D. -247

Q442-07 Given the following data:



Calculate the average bond enthalpy (in kJmol^{-1}) for the C-F bond. [4]

Q442-08 The average bond enthalpies for O-O and O=O are 146 and 496 kJ mol^{-1} respectively. What is the enthalpy change in kJ for the reaction below?



- A. -102
- B. +102
- C. +350
- D. +394

Q442-09 Consider the following reaction:



Bond enthalpies (in kJ mol^{-1}) involved in the reaction are:

$\text{N} \equiv \text{N}$	x
H - H	y
N - H	z

Which calculation will give the value of ΔH^\ominus ?

- A. $x + 3y - 6z$
- B. $6z - x + 3y$
- C. $x - 3y + 6z$
- D. $x + 3y - 2z$

Q442-10 Enthalpy change may be calculated using bond enthalpies, some values of which (in kJmol^{-1}) are provided below:

C=C 612; C-H 412; O-H 463; C=O 743; O=O 496.

The balanced equation for the complete combustion of one mole of ethene, C_2H_4 , in oxygen is shown below. Use this data to calculate the enthalpy of combustion of ethene:

