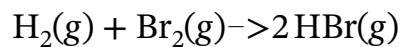


Worksheet: Hess Cycles Using Bond Energies



Q1: What is the approximate enthalpy change for the reaction shown?

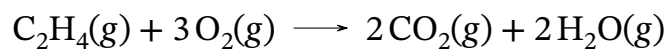


Use the bond enthalpies from the table.

Bond	Br–Br	H–Br	H–H
Bond Enthalpy (kJ/mol)	190	370	436

- A 322 kJ/mol
- B 76 kJ/mol
- C –114 kJ/mol
- D –56 kJ/mol
- E 256 kJ/mol

Q2: What is the approximate enthalpy change for the reaction shown?

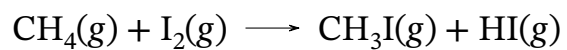


Use the bond enthalpies from the table.

Bond	C-H	C=C	C=O	H-O	O=O
Bond Enthalpy (kJ/mol)	415	611	741	464	498

- A -1,885 kJ/mol
- B -467 kJ/mol
- C -2,051 kJ/mol
- D -319 kJ/mol
- E -1,055 kJ/mol

Q3: What is the approximate enthalpy change for the reaction shown?



Use the bond enthalpies from the table.

Bond	C-H	C-I	H-I	I-I
Bond Enthalpy (kJ/mol)	415	240	295	150

- A 30 kJ/mol
- B 270 kJ/mol
- C -120 kJ/mol
- D -385 kJ/mol
- E 445 kJ/mol

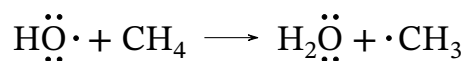
Q4: When a mole
the stronger bonds
values listed in the
molecule.

B	119	
Bond Enth	390	

A

B

Q5: Given that the energy of a CH₃-H bond is 104 kcal/mol and that of an HO-H bond is 119 kcal/mol, what is the reaction enthalpy for the following reaction?

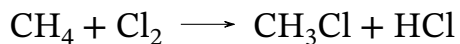


- A 15 kcal/mol
- B -15 kcal/mol
- C -223 kcal/mol
- D 223 kcal/mol

Q6: The energies of selected bonds are shown in the table.

Bond	C-H	C-Cl	H-Cl	Cl-Cl
Bond Energy (kcal/mol)	104	85	103	58

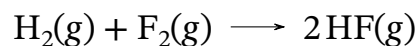
The chlorination of methane is described by the equation shown.



Using the values in the table, calculate the energy change in this reaction per mole of methane reacted.

- A -166 kcal/mol
- B -26 kcal/mol
- C 28 kcal/mol
- D -64 kcal/mol
- E 189 kcal/mol

Q7: Hydrogen fluoride gas is formed by the reaction of hydrogen with fluorine, as shown.



The standard enthalpy change for this reaction is -535 kJ/mol. The molar bond energies of H_2 and F_2 are 436 kJ/mol and 159 kJ/mol respectively. Calculate the energy of one H-F bond.

- A 1.43×10^{-18} J
- B 8.06×10^{-19} J
- C 1.38×10^{-18} J
- D 6.74×10^{-19} J
- E 9.38×10^{-19} J