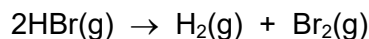


ENTHALPY CHANGE CALCULATION

- 1 Hydrogen bromide decomposes to form hydrogen and bromine. The equation is shown.

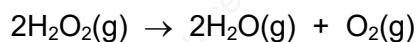


The bond energies are shown in the table. The reaction is endothermic.

bond	bond energy in kJ/mol
Br-Br	+1
H-Br	+3
H-H	+4

What is the energy change for the reaction?

- A** +263 kJ/mol **B** +103 kJ/mol **C** -103 kJ/mol **D** -263 kJ/mol
- 2 Hydrogen peroxide, H-O-O-H, decomposes to form water and oxygen.



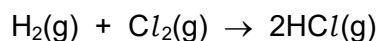
The bond energies are shown in the table. The reaction is exothermic.

bond	bond energy in kJ/mol
O-H	+460
O-O	+150
O=O	+496

What is the energy change for the reaction?

- A** -346 kJ/mol **B** -196 kJ/mol **C** +196 kJ/mol **D** +346 kJ/mol

- 3 The equation for the reaction between hydrogen and chlorine is shown.



The reaction is exothermic.

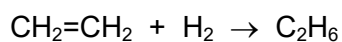
The bond energies are shown in the table.

bond	bond energy in kJ/mol
Cl-Cl	+2
H-Cl	+4
H-H	+4

What is the energy change for the reaction?

- A -1536 kJ/mol
- B -184 kJ/mol
- C +184 kJ/mol
- D +246 kJ/mol

- 4 Ethene reacts with hydrogen. The equation is shown.



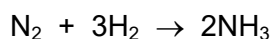
The bond energies are shown in the table. The reaction is exothermic.

bond	bond energy in kJ/mol
C-C	+350
C=C	+610
C-H	+410
H-H	+436

What is the energy change for the reaction?

- A -560 kJ/mol
- B -124 kJ/mol
- C +486 kJ/mol
- D +5496 kJ/mol

- 5 Nitrogen reacts with hydrogen to produce ammonia.

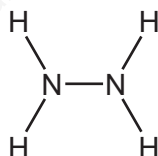


The reaction is exothermic. The bond energies are shown in the table.

bond	bond energy in kJ/mol
N≡N	945
H-H	436
N-H	390

What is the energy change for this reaction?

- A -1473 kJ/mol
B -87 kJ/mol
C 87 kJ/mol
D 1473 kJ/mol
- 6 The compound hydrazine is used as a rocket fuel. It has the structural formula shown.



One of the reactions of hydrazine is shown. This reaction is exothermic.



The bond energies are shown in the table.

	bond energy in kJ/mol
H-H	+
N-H	+
N-N	+
N≡N	+

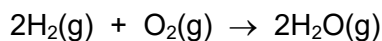
What is the energy change for this reaction?

- A -339 kJ/mol B -97 kJ/mol C +97 kJ/mol D +339 kJ/mol

7 Some bond energies are shown in the table.

bond	bond energy in kJ/mol
H-H	+
O=O	+
H-O	+

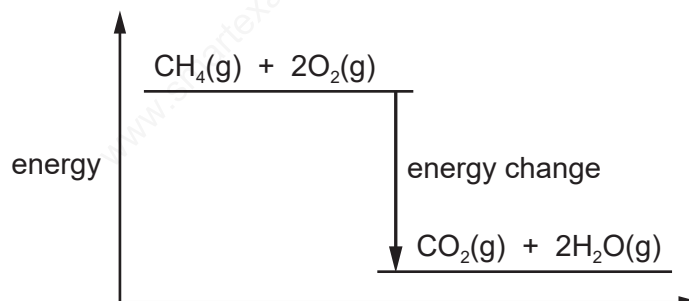
Hydrogen reacts with oxygen. The reaction is exothermic.



What is the energy change for the reaction?

- A -3208 kJ/mol
- B -908 kJ/mol
- C -472 kJ/mol
- D -448 kJ/mol

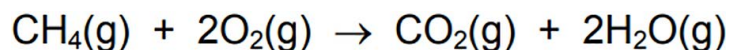
8 The energy level diagram for the combustion of methane is shown.



Which row gives the equation and energy change for this reaction?

	equation	energy change in kJ/mol
A	$\text{CH}_4(\text{g}) + 2\text{O}_2(\text{g}) \rightarrow \text{CO}_2(\text{g}) + 2\text{H}_2\text{O}(\text{g})$	+891
B	$\text{CH}_4(\text{g}) + 2\text{O}_2(\text{g}) \rightarrow \text{CO}_2(\text{g}) + 2\text{H}_2\text{O}(\text{g})$	-891
C	$\text{CH}_4(\text{g}) + 2\text{O}_2(\text{g}) \rightarrow \text{CO}_2(\text{g}) + 2\text{H}_2\text{O}(\text{l})$	+891
D	$\text{CH}_4(\text{g}) + 2\text{O}_2(\text{g}) \rightarrow \text{CO}_2(\text{g}) + 2\text{H}_2\text{O}(\text{l})$	-891

- 9 The equation for the complete combustion of methane gas is shown.



Bond energies are shown.

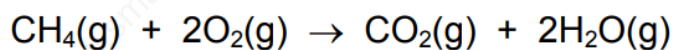
bond	bond energy in kJ/mol
C–H	412
H–O	463
C=O	743
O=O	498

What is the overall energy change, in kJ/mol, for the above reaction?

- A** –1192 **B** –694 **C** +694 **D** +1192

- 10 Methane burns in excess oxygen.

The equation is shown.



Bond energies are shown.

bond	bond energy /kJ mol ⁻¹
C=O	805
C–H	410
O=O	496
O–H	460

What is the energy change for the reaction?

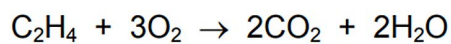
A $(4 \times 410 + 2 \times 496) - (2 \times 805 + 4 \times 460)$

B $(2 \times 805 + 2 \times 460) - (410 + 2 \times 496)$

C $(410 + 2 \times 496) - (805 + 2 \times 460)$

D $(410 + 496) - (805 + 460)$

- 11 Ethene gas, C₂H₄, is completely burned in excess oxygen to form carbon dioxide and water. The equation for this exothermic reaction is shown.



The table shows the bond energies involved in the reaction.

bond	bond energy (kJ/mol)
C=C	614
C-H	413
O=O	495
C=O	799
O-H	467

What is the total energy change in this reaction?

- A -954 kJ/mol
- B -1010 kJ/mol
- C -1313 kJ/mol
- D -1369 kJ/mol