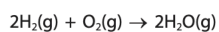


Energy-change

Q1. (2018)

10 (a) Hydrogen reacts with oxygen to form steam.



Bond energies are shown in Figure 14.

bond	bond energy in kJ mol^{-1}
H—H	435
O=O	500
O—H	460

Figure 14

Calculate the energy change for the reaction of 2 mol of hydrogen gas, H_2 , with 1 mol of oxygen gas, O_2 , to give 2 mol of steam, H_2O .

(4)

Q2. (2020) – 9b

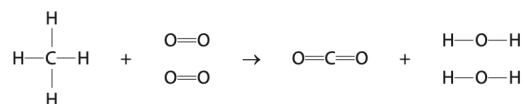
(b) The energies of some bonds are shown in Figure 8.

bond	bond energy in kJ mol^{-1}
C—H	435
O=O	496
C=O	805
H—O	463

Figure 8

Methane burns in oxygen to form carbon dioxide and water.

The equation shows the structures of the molecules.



Calculate the energy change, in kJ mol^{-1} , for this reaction.

(4)

Q3. (2021) – 9c

(c) Figure 11 shows the reaction of propene, C_3H_6 , with water.

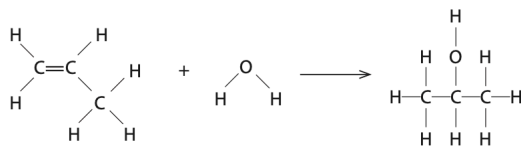


Figure 11

Figure 12 shows some bond energies.

bond	bond energy in kJ mol^{-1}
C—C	347
C—O	358
C—H	413
O—H	464
C=C	612

Figure 12

Use the bond energies in Figure 12 to calculate the energy change of the reaction in Figure 11.

(4)

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energy change of reaction = ... kJ mol^{-1}

Q4. (2022) – 9a (ii)

- 9 (a) In some chemical reactions, bonds are broken in the reactant molecules and new bonds are formed to make the product molecules.

(ii) Hydrogen reacts with fluorine.

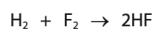


Figure 12 shows the bond energies for the bonds in the three molecules in the equation.

bond	bond energy in kJ mol^{-1}
H—H	436
F—F	158
H—F	562

Figure 12

Calculate the energy change for this reaction.

(4)

.....

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.....

.....

energy change = ... kJ mol^{-1}

Q5. (2023) – 8b (iii)

8 Ammonia can be produced from the reaction of hydrogen with nitrogen.

(b) The reaction between hydrogen and nitrogen is exothermic.

Figure 13 shows the reaction profile of this exothermic reaction.

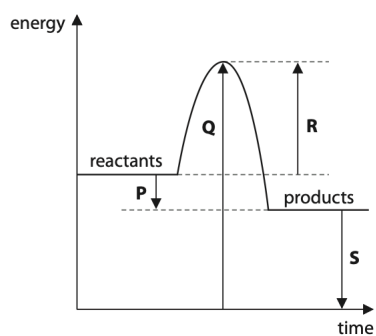


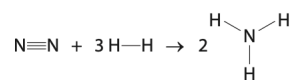
Figure 13

(iii) Figure 14 shows the energies of some bonds.

bond	bond energy in kJ mol^{-1}
$\text{N}\equiv\text{N}$	944
$\text{H}-\text{H}$	436
$\text{H}-\text{N}$	388

Figure 14

The equation for the reaction between nitrogen and hydrogen to form ammonia is



Calculate the energy change, in kJ mol^{-1} , for this reaction.

(4)

Q6. (2024) – 7d

(d) Ethene reacts with hydrogen chloride.

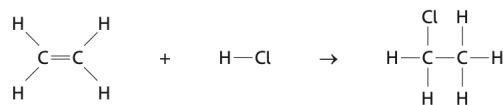


Figure 10 shows the bond energies for the different bonds in the three molecules in the reaction.

bond	bond energy in kJ mol^{-1}
C—H	412
C=C	612
C—C	348
H—Cl	431
C—Cl	338

Figure 10

Calculate the energy change for this reaction.

(4)