5.3 Bond Enthalpy

Question Paper

Course	DP IB Chemistry
Section	5. Energetics / Thermochemistry
Topic	5.3 Bond Enthalpy
Difficulty	Easy

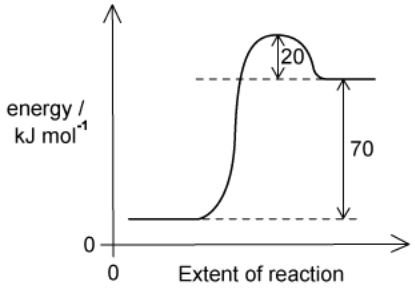
Time allowed: 20

Score: /10

Percentage: /100

Question 1

The reaction pathway for a reversible reaction is shown below:



Which statement is correct?

A. The activation energy of the reverse reaction is +90 kJ mol^{-1}

B. The activation energy of the forward reaction is +20 kJ mol^{-1}

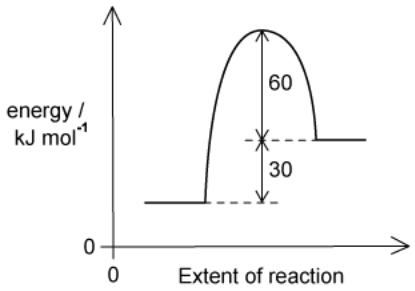
C. The activation of the reverse reaction is +20 kJ mol^{-1}

D. The enthalpy change of forwards reaction is - 70 kJ mol^{-1}

[1 mark]

Question 2

The reaction pathway for a reversible reaction is shown below.



Which statements are correct?

I. The forward reaction is endothermic

II. The enthalpy change for the backward reaction is −30 kJ mol^{-1}

III. The activation energy for the forward reaction is +90 kJ mol^{-1}

A. I and II only

B. I and III only

C. II and III only

D. I, II and III

[1 mark]

Question 3

Hydrogen atoms bond covalently to iodine atoms to form hydrogen iodide as shown in the equation below:

$$H_2(g) + I_2(g) \rightarrow 2HI(g)$$

Which statement best describes what is meant by the average HI bond enthalpy?

A. The energy stored in a covalent bond.

B. The energy required to break one covalent bond in the gas phase.

C. The energy required to break one mole of the HI bonds in the gas phase.

D. The energy released when two atoms form a covalent bond.

[1 mark]

Question 4

The enthalpy of atomisation of a compound can be calculated using a range of different enthalpy changes.

Which statement below correctly describes the enthalpy change of atomisation?

A. The energy stored in a covalent bond

B. The energy required to break one covalent bond in the gas phase

C. The energy required to break all bonds in an element

D. The energy released when two atoms form a covalent bond

[1 mark]

Question 5

Which quantity gives the best indication of the relative strength of the hydrogen bonds between water molecules in the liquid state?

A. Enthalpy changes of vaporisation

B. Bond dissociation energies

C. Enthalpy of formation

D. Activation energy

[1 mark]

Question 6

When a sample of calcium oxide, CaO, is added to dilute hydrochloric acid the temperature rises. Which of the following statements is correct?

A. More bonds are broken than are formed in the reaction

B. More bonds are formed than are broken in the reaction

C. The energy of the bonds broken is greater than of the bonds formed

D. The energy of the bonds broken is less than of the bonds formed

[1 mark]

Question 7

Which is the correct definition of mean bond enthalpy?

A. The amount of energy required to break a specific covalent bond in the gas phase

B. The energy required to break one mole of a specific covalent bond with all chemicals in their standard states

C. The amount of energy required to break a specific covalent bond with all chemicals in their standard states

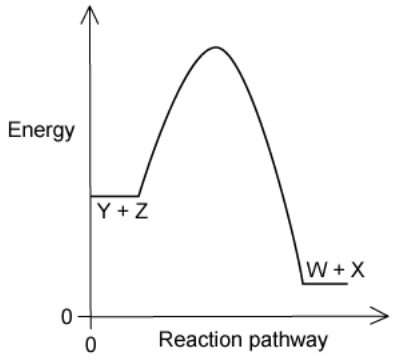
D. The energy required to break one mole of a specific covalent bond in the gas phase, with all chemicals in their standard states

[1 mark]

Question 8

This energy profile diagram represents the reaction pathway for the following reaction:

$$Y(g) + Z(g) \rightarrow W(g) + X(g)$$



Which statement is true about the reverse reaction, $W(g) + X(g) \rightarrow Y(g) + Z(g)$?

A. It will have a negative ΔH

B. It will have a positive ΔH

C. It will have a smaller activation energy

D. The temperature of the surroundings increase

[1 mark]

Question 9

Which of the following statements about oxygen and ozone are correct?

I. Ozone contains delocalised π bonds
II. The bond orders of oxygen and ozone are not the same
III. The bond in oxygen requires radiation of higher energy and longer wavelength than the bond in ozone to break

A. I and II only

B. I and III only

C. II and III only

D. I, II and III

[1 mark]

Question 10

The reaction of hydrogen with iodine to form hydrogen iodide is shown below:

$$H_2 + I_2 \rightarrow 2HI$$

Use the bond energy data given to calculate the enthalpy of reaction, $\Delta H^{\ominus}_r$.

Bond	Energy, kJ mol^{-1}
H-H	432
I-I	149
H-I	295

A. $\Delta H^{\ominus}_r = 432 + 149 + 295$

B. $\Delta H^{\ominus}_r = 432 + 149 + (2 \times 295)$

C. $\Delta H^{\ominus}_r = 432 + 149 - (2 \times 295)$

D. $\Delta H^{\ominus}_r = 432 + 149 - 295$

[1 mark]