InkChemistry

QUESTION WORKBOOK

Mean bond enthalpies

Energetics · Unit C04

AQA 3.1.4.4 · OCR A 3.2.1

13 questions · 43 marks

NAVY SCREEN EDITION

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SECTION A · Short, 1 to 2 marks

A1 MBE-Q12

Explain why ΔH for $H_2(g) + Cl_2(g) \rightarrow 2HCl(g)$ calculated from bond enthalpies agrees with the data-book value. [2]

A2 MBE-Q14

Suggest why ΔH for the combustion of liquid hexane calculated from mean bond enthalpies is less exothermic than its standard enthalpy of combustion, apart from the use of mean values. [2]

SECTION B · Standard, 3 to 5 marks

B1 MBE-Q6

Calculate the mean N–H bond enthalpy from $\frac{1}{2}N_2(g) + 1\frac{1}{2}H_2(g) \rightarrow NH_3(g)$, ΔH = -46 kJ mol^{-1}. Bond enthalpies / kJ mol^{-1}: N≡N 945, H–H 436. [4]

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B2 MBE-Q10 Explain, in terms of bonds, why the combustion of methane is exothermic, stating the sign of the enthalpy change for breaking a bond and for making one. [4]

B3 MBE-Q15 Compare a bond dissociation enthalpy with a mean bond enthalpy, explaining why the C–H value in a data table is a mean. [4]

B4 MBE-Q1 Give the meaning of the term mean bond enthalpy. [3]

B5 MBE-Q4 Calculate ΔH for $H_2(g) + Cl_2(g) \rightarrow 2HCl(g)$. Bond enthalpies / kJ mol^{-1}: H–H 436, Cl–Cl 243, H–Cl 432. [3]

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B6 MBE-Q11 Explain why ΔH for the combustion of ethane calculated from mean bond enthalpies, -1436 kJ mol^{-1}, differs from the standard enthalpy of combustion of ethane, -1560 kJ mol^{-1}. [3]

B7 MBE-Q13 Suggest why breaking the first O–H bond in a water molecule takes 498 kJ mol^{-1} but breaking the second takes 428 kJ mol^{-1}, and calculate the value that would be used as the O–H bond enthalpy for water. [3]

B8 MBE-Q17 Describe what happens to energy, step by step, in an enthalpy level diagram for a reaction calculated from bond enthalpies. [3]

B9 MBE-Q19 Explain, in terms of bond length and bond enthalpy, why nitrogen gas reacts with very few substances at room temperature. [3]

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B10 MBE-Q20 Suggest why ΔH for $CH_4(g) + Cl_2(g) \rightarrow CH_3Cl(g) + HCl(g)$ calculated from mean bond enthalpies, -122 kJ mol^{-1}, is more exothermic than the measured value of -99 kJ mol^{-1}, given that the first C–H bond broken in methane takes 439 kJ mol^{-1}. [3]

SECTION C · Long, 6 marks or more

C1 MBE-Q16 Evaluate the use of mean bond enthalpies, rather than standard enthalpies of formation in a Hess cycle, to find the enthalpy change of a reaction. [6]

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