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TARGET : NEET (UG) 2024

Course : SARANSH (Youtube Live CRASH COURSE)

CHEMISTRY DPP DAILY PRACTICE PROBLEMS

DPP NO. 2

CHEMISTRY: Thermchemistry

DPP No. : 2

1. The enthalpy change for a reaction does not depend upon the :

(1) physical state of reactants and products

(2) use of different reactants for the same product

(3) nature of intermediate reaction steps

(4) difference in initial or final temperatures of involved substances

2. Which of the reaction defines molar $\Delta H_f°$?

(1) $CaO(s) + CO_2(g) \longrightarrow CaCO_3(s)$

(2) $\frac{1}{2} Br_2(g) + \frac{1}{2} H_2(g) \longrightarrow HBr(g)$

(3) $N_2(g) + 2H_2(g) + \frac{3}{2} O_2(g) \longrightarrow NH_4NO_3(s)$

(4) $I_2(s) + H_2(g) \longrightarrow 2HI(g)$

3. Which of the following equations corresponds to the enthalpy of combustion at 298 K ?

(1) $C_2H_6(g) + \frac{7}{2} O_2(g) \longrightarrow 2CO_2(g) + 3H_2O(g)$

(2) $2C_2H_6(g) + 7O_2(g) \longrightarrow 4CO_2(g) + 6H_2O(g)$

(3) $C_2H_6(g) + \frac{7}{2} O_2(g) \longrightarrow 2CO_2(g) + 3H_2O(\ell)$

(4) $2C_2H_6(g) + 7O_2(g) \longrightarrow 4CO_2(g) + 6H_2O(\ell)$

4. A solution is 500 ml of 2 M KOH is added to 500 ml of 2 M HCl and the mixture is well shaken. The rise in temperature T_1 is noted. The experiment is then repeated using 250 ml of each solution and rise in temperature T_2 is again noted. Assume all heat is taken by the solution

(1) $T_1 = T_2$ (2) T_1 is 2 times as large as T_2

(3) T_2 is twice of T_1 (4) None of these

5. Calculate the enthalpy change when 50 mL of 0.01 $Ca(OH)_2$ reacts with 25 mL of 0.01 M HCl. Given that $\Delta H°_{neut}$ of a strong acid and strong base is 140 kcal equivalent -

(1) 14.0 cal (2) 35 cal (3) 10.0 cal (4) 7.5 cal

6. In which of the following thermochemical changes is $\Delta H°$ always negative ?

(1) Enthalpy of solution (2) Enthalpy of hydrogenation

(3) Enthalpy of combustion (4) Enthalpy of transition

7. Heat of hydrogenation of ethene is x_1 and that of benzene is x_2. Hence resonance energy is -

(1) $x_1 - x_2$ (2) $x_1 + x_2$ (3) $3x_1 - x_2$ (4) $x_1 - 3x_2$

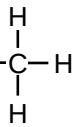
Theory

Mean/average bond enthalpy :

It is defined for hetronuclear polyatomic species as well as homonuclear polyatomic species.

E.g. $CH_4(9)$, NH_3 (9), $PCl_5(g)$ S_8 (g)

e.g. CH_4



(i) $CH_4\ (g) \longrightarrow H(g) + CH_3\ (g)\ \Delta H_1 = +427\ \frac{kj}{mol}$

(ii) $CH_3\ (g) \longrightarrow H(g) + CH_2\ (g)\ \Delta H_2 = +439\ \frac{kj}{mol}$

(iii) $CH_2\ (g) \longrightarrow H(g) + CH\ (g)\ \Delta H_3 = +452\ \frac{kj}{mol}$

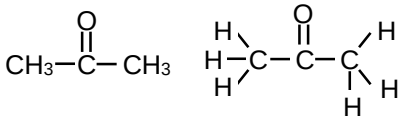
(iv) CH_2 (g) $\longrightarrow$ H(g) + CH (g) $\Delta H_3 = +347 \ \frac{kj}{mol}$

(i) + (ii) + (iii) + (iv)

CH_4 (g) $\longrightarrow$ C (g) + 4 H (g)

$\Delta H_{Total} = \Delta H_1 + \Delta H_2 + \Delta H_3 + \Delta H_4 = 1665 \ \frac{KJ}{mol}$

$\Delta H_{avB.E.}[C–H] = \frac{1665}{4} = 416.5 \ \frac{kj}{mol}$

E.g. 

Enthalpy of atmisation :

Atoms / elements : Enthalpy change when one mole isolated gaseous atom are formed by thermodynamically most stable allotrope of elements.

C(irabhite) (s) $\longrightarrow$ C(g) $\qquad \Delta H = + \frac{xkJ}{mol}$

$\Delta H_{atomisation}$ [C(grabnite), s] = ΔH sublimation

1. Find average P–P bond enthalpy of P_4 (s) at room temperature.

Given : ΔHsublimation of P_4 (s) = 59 $\frac{kj}{mol}$

ΔHatomisation of P_4 (s) = 1265 kj/mol.

2. Given the bond energies N $\equiv$ N, H – H and N – H bonds are 945, 436 and 391 kJ mole^{-1} respectively, the enthalpy of the following reaction $N_2(g) + 3H_2(g) \rightarrow 2NH_3(g)$ is-

(1) – 93 kJ (2) 102 kJ (3) 90 kJ (4) 105 kJ

3. The dissociation energy of CH_4 and C_2H_6 are respectively 360 and 620 kcal /mole. The bond energy of C – C is

(1) 260 kcal/mole (2) 180 kcal/mole (3) 130 kcal/mole (4) 80 kcal/mole

4. If $H_2(g) = 2H(g)$; ΔH =104 kcal, then heat of atomisation of hydrogen is :

(1) 52 kcal (2) 104 kcal (3) 208 kcal (4) none of these

5. Heat evolved in the reaction $H_2 + Cl_2 \rightarrow 2HCl$ is 182 kJ. Bond energies of H – H and Cl – Cl are 430 and 242 kJ/mol respectively. The H – Cl bond energy is

(1) 245 kJmol^{-1} (2) 427 kJ mol^{-1} (3) 336 kJ mol^{-1} (4) 154 kJ mol^{-1}