



Thermochemistry
DPP-6 [Other Enthalpies]

“Pehla step lena sabse mushkil hota hai—lekin wahi jeet ki shuruaat hoti hai.”

===== I. Combustion Hydrogenation =====

Q1. The heat of combustion of C_2H_4 , C_2H_6 and H_2 are -1409.5 kJ, -1558.3 kJ and -285.6 kJ. The heat of hydrogenation of ethene is -

- (1) -136.8 kJ
- (2) -13.68 kJ
- (3) 273.6 kJ
- (4) 1.368 kJ

Q2. The enthalpy of combustion of cyclohexane, cyclohexene and H_2 , are respectively -3920 , -3800 and -241 kJ mol $^{-1}$. The heat of hydrogenation of cyclohexane is :-

- (1) -121 kJ mol $^{-1}$
- (2) 121 kJ mol $^{-1}$
- (3) -242 kJ mol $^{-1}$
- (4) 242 kJ mol $^{-1}$

===== II. Atomisation / Transition =====

Q3. $Cl_2(g) \rightarrow 2Cl(g)$, In this process value of ΔH will be -

- (1) Positive
- (2) Negative
- (3) Zero
- (4) Nothing can be predicted

Q4. If $H_2(g) = 2H(g)$; $\Delta H = 104$ kCal, then heat of atomisation of hydrogen is :

- (1) 52 kCal
- (2) 104 kCal
- (3) 208 kCal
- (4) None of these

Q5. ΔH for the reaction, $I(g) + I(g) \rightarrow I_2(g)$ will be

- (1) zero
- (2) -ve
- (3) +ve
- (4) ∞

Q6. The vapourisation process is always :

- (1) exothermic
- (2) endothermic
- (3) can be exothermic or endothermic

(4) none of these

Q7. Fusion of ice is :

- (1) exothermic change
- (2) endothermic change
- (3) a process that does not involve any heat change
- (4) unpredictable

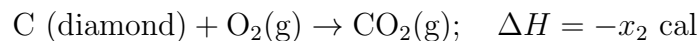
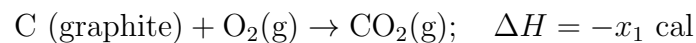
Q8. The enthalpy change for the process $C_{(s)} \rightarrow C_{(g)}$ corresponds to the enthalpy of:

- (1) fusion
- (2) vapourization
- (3) combustion
- (4) sublimation

Q9. The heat of combustion of yellow phosphorous and red phosphorous are -9.91 kJ and -8.78 kJ respectively. The heat of transition of yellow phosphorous to red phosphorous is

- (1) -18.69 kJ
- (2) $+1.13$ kJ
- (3) $+18.69$ kJ
- (4) -113 kJ

Q10. Consider the following reactions:



What is the heat of transition of graphite into diamond?

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

Ans. (2)

Q11. For the change $\text{C (diamond)} \rightarrow \text{C (graphite)}$; $\Delta H = -1.89$ kJ, if 6 g of diamond and 6g of graphite are separately burnt to yield CO_2 the heat liberated in first case is :

- (1) Less than in the second case by 1.89 kJ
- (2) Less than in the second case by 11.34 kJ
- (3) Less than in the second case by 14.34 kJ
- (4) More than in the second case by 0.945 kJ

Q12. $\text{S (rhombic)} + \text{O}_2(\text{g}) \rightarrow \text{SO}_2$; $\Delta H = -297.5$ kJ $\text{S (monoclinic)} + \text{O}_2(\text{g}) \rightarrow \text{SO}_2$; $\Delta H = -300$ kJ The data can predict that -

- (1) Rhombic sulphur is yellow in colour
- (2) Monoclinic sulphur has metallic lustre
- (3) Monoclinic sulphur is more stable
- (4) ΔH transition of S_R to S_M is endothermic

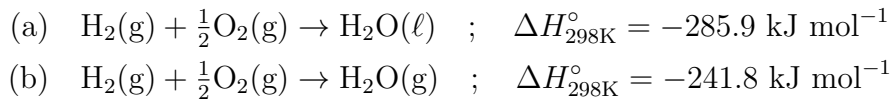
Q13. Given that : $\text{A (s)} \rightarrow \text{A (l)}$; $\Delta H = x$, $\text{A (l)} \rightarrow \text{A (g)}$; $\Delta H = -y$ The heat of sublimation of A will be

- (1) $x + y$
- (2) $x - y$

- (3) y or x
 (4) $(x \pm y)$

Q14. Given:

[JEE-MAINS (Online) 2013]



The molar enthalpy of vapourisation of water will be:

- (1) $241.8 \text{ kJ mol}^{-1}$ (3) 44.1 kJ mol^{-1}
 (2) $527.7 \text{ kJ mol}^{-1}$ (4) 22.0 kJ mol^{-1}

Ans. (3)

===== III. Enthalpy of hydration and solution =====

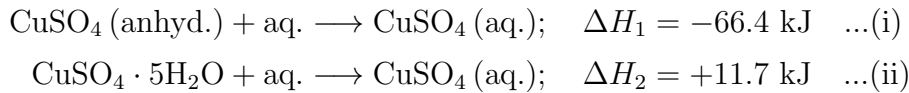
Q15. When 1 mole of anhydrous CuSO_4 is dissolved in excess of water, -66.4 kJ heat is evolved. When one mole of $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$ is dissolved in water, the heat change is $+11.7 \text{ kJ}$. Calculate enthalpy of hydration of CuSO_4 (anhydrous).

Solution:

We have to calculate enthalpy of reaction for:



Given that:



On the basis of two equations:

$$\begin{aligned} \Delta H &= \Delta H_1 - \Delta H_2 \\ &= -66.4 - (+11.7) \\ &= -78.1 \text{ kJ} \end{aligned}$$

Hence, the enthalpy of hydration of $\text{CuSO}_4 = -78.1 \text{ kJ}$.

Q16. $\text{CuSO}_4(\text{s}) + 5\text{H}_2\text{O}(\text{l}) \longrightarrow \text{CuSO}_4 \cdot 5\text{H}_2\text{O}(\text{s}); \quad \Delta H = -x \text{ kJ}$

The value of ΔH represents:

- (1) enthalpy of solution of copper (II) sulphate
 (2) enthalpy of hydration of copper (II) sulphate
 (3) enthalpy of hydrolysis of copper (II) sulphate
 (4) lattice energy of copper (II) sulphate

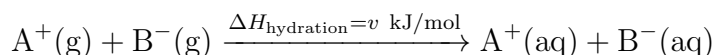
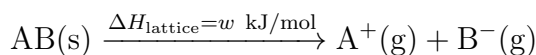
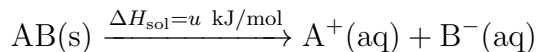
Q17. The magnitude of heat of solution ... on addition of solvent to solution:

- (1) Decreases (3) Remains constant
 (2) Increases (4) Increases or decreases

Q18. Which of the following reactions represents ΔH (hydration):

- (1) $\text{CuSO}_4(\text{s}) + (\text{aq}) \rightarrow \text{CuSO}_4(\text{aq}); \quad \Delta H = -x \text{ kJ}$
 (2) $\text{BaCl}_2(\text{s}) + 2\text{H}_2\text{O}(\text{l}) \rightarrow \text{BaCl}_2 \cdot 2\text{H}_2\text{O}(\text{s}); \quad \Delta H = -x' \text{ kJ}$
 (3) $\text{CuSO}_4(\text{s}) + 5\text{H}_2\text{O}(\text{l}) + (\text{aq}) \rightarrow \text{CuSO}_4 \cdot 5\text{H}_2\text{O}(\text{aq}); \quad \Delta H = -y \text{ kJ}$
 (4) None of the above

Q19. Consider the following:



The correct relation between u , v and w is:

- (1) $w = v + u$ (2) $u = w + v$ (3) $v = 2(u + w)$ (4) $w = u + v$

Ans. (2)

[NCERT Pg. 180]

Q20. Enthalpy of solution of BaCl_2 and $\text{BaCl}_2 \cdot 2\text{H}_2\text{O}$ are $-x$ and y kJ/mol respectively. The enthalpy of hydration of BaCl_2 to $\text{BaCl}_2 \cdot 2\text{H}_2\text{O}$ is:

- (1) $-(x + y)$ kJ (2) $(x - y)$ kJ (3) $-(x + y)$ kJ (4) $(x + y)$ kJ

Ans. (3)

===== IV. Resonance Energy =====

Q21. The enthalpy of hydrogenation of cyclohexene is $-119.5 \text{ kJ mol}^{-1}$. If resonance energy of benzene is $-150.4 \text{ kJ mol}^{-1}$, its enthalpy of hydrogenation would be:

- (1) $-508.9 \text{ kJ mol}^{-1}$ (3) $-269.9 \text{ kJ mol}^{-1}$
 (2) $-208.1 \text{ kJ mol}^{-1}$ (4) $-358.5 \text{ kJ mol}^{-1}$

Ans. (2) ===== V. Born-Haber Cycle =====

Q22. Given:

[JEE-MAINS (Online) 2013]

Reaction	Energy Change (in kJ)
$\text{Li}(\text{s}) \rightarrow \text{Li}(\text{g})$	161
$\text{Li}(\text{g}) \rightarrow \text{Li}^+(\text{g})$	520
$\frac{1}{2}\text{F}_2(\text{g}) \rightarrow \text{F}(\text{g})$	77
$\text{F}(\text{g}) + \text{e}^- \rightarrow \text{F}^-(\text{g})$	(Electron gain enthalpy)
$\text{Li}^+(\text{g}) + \text{F}^-(\text{g}) \rightarrow \text{LiF}(\text{s})$	-1047
$\text{Li}(\text{s}) + \frac{1}{2}\text{F}_2(\text{g}) \rightarrow \text{LiF}(\text{s})$	-617

Based on the data provided, the value of electron gain enthalpy of fluorine would be:

(1) -300 kJ mol^{-1}

(2) -328 kJ mol^{-1}

(3) -350 kJ mol^{-1}

(4) -228 kJ mol^{-1}

Ans. (2)