DPP-3 [Enthalpy of Formation]

Jo apne sapno ke liye ladhte hain, unhe duniya kitni bhi bar rokne ki koshish kare... woh rukte nahi.

Q1. **Since enthalpy of elements in their natural state is taken as zero, the value of ΔH_f of compounds :**

(A) is always negative
(B) is always positive
(C) may be positive or negative
(D) is zero

Q2. **The enthalpy of formation of ammonia at 298 K is given as $\Delta H_f^\circ = -46.11$ kJ per mol of $NH_3(g)$. To which of the following equation does this value apply?**

(A) $\frac{1}{2}\ N_2(g) + \frac{3}{2}\ H_2(g) \rightarrow NH_3(g)$
(B) $N(g) + 3H(g) \rightarrow NH_3(g)$
(C) $N_2(g) + 3H_2(g) \rightarrow 2NH_3(g)$
(D) $\frac{1}{2}\ N_2(g) + \frac{3}{2}\ H_2(g) \rightarrow NH_3(l)$

Q3. **Which of the following equation represents the standard heat of formation?**

(A) $C(diamond) + 2H_2(g) \rightarrow CH_4(g)$
(B) $C(graphite) + 2H_2(g) \rightarrow CH_4(g)$
(C) $C(diamond) + 4H(g) \rightarrow CH_4(g)$
(D) $C(graphite) + 4H(g) \rightarrow CH_4(g)$

Q4. **Which of the following reaction defines ΔH_f° ?**

(A) $C_{diamond}(s) + O_2(g) \rightarrow CO_2(g)$
(B) $\frac{1}{2}\ H_2(g) + \frac{1}{2}\ F_2(g) \rightarrow HF(g)$
(C) $N_2(g) + 3H_2(g) \rightarrow 2NH_3(g)$
(D) $CO(g) + \frac{1}{2}\ O_2(g) \rightarrow CO_2(g)$

Q5. **Calculate the enthalpy change where the standard heat of formation for gaseous NH_3 is –11.02 kcal mol^{-1} at 298 K. The reaction given is :**
$\frac{1}{2}\ N_2(g) + \frac{3}{2}\ H_2(g) \rightarrow NH_3(g)$

(A) –11.02 kcal mol^{-1}
(B) –22.04 kcal mol^{-1}
(C) –5.51 kcal mol^{-1}
(D) –44.08 kcal mol^{-1}

Q6. **Heat of formation, ΔH_f° of an explosive compound like NCl_3 is –**

(A) Positive
(B) Negative
(C) Zero
(D) Positive or negative

Q7. **Reaction $H_2(g) + I_2(g) \rightarrow 2HI$; $\Delta H = 12.40$ kcal. According to this, heat of formation of HI will be –**

(A) 12.40 kcal
(B) –12.40 kcal
(C) –6.20 kcal
(D) +6.20 kcal

Q8. **The heat of formation of the compound in the following reaction is :** $H_2(g) + Cl_2(g) \rightarrow 2HCl(g) + 44$ kcal

(A) –44 kcal mol^{-1}
(B) –22 kcal mol^{-1}
(C) +11 kcal mol^{-1}
(D) –88 kcal mol^{-1}

Q9. **The ΔH_f° (N_2O_5, g) in kJ mol^{-1} on the basis of the following data is :**

$2NO(g) + O_2(g) \rightarrow 2NO_2(g)$ $\quad \Delta H_r^\circ = -114$ kJ mol^{-1}

$4NO_2(g) + O_2(g) \rightarrow 2N_2O_5(g)$ $\quad \Delta H_r^\circ = -102.6$ kJ mol^{-1}

ΔH_f° (NO, g) = 90.2 kJ mol^{-1}

(A) 15.1
(B) 30.2
(C) –36.2
(D) none of these

Q10. **Calculate ΔH° for $2Al + Fe_2O_3 \rightarrow 2Fe + Al_2O_3$, given that standard enthalpy of Fe_2O_3 and Al_2O_3 are –196.5 and –399.1 kcal respectively.**

(A) –202.6 kcal
(B) –399.1 kcal
(C) –196.5 kcal
(D) –602.5 kcal

Q11. **How much heat will be required at constant pressure to form 1.28 kg of CaC_2 from CaO(s) & C(s)?** Given : ΔH_f°(CaO, s) = –152 kcal mol^{-1} ΔH_f°(CaC_2, s) = –14 kcal mol^{-1} ΔH_f°(CO, g) = –26 kcal mol^{-1}

(A) +112 kcal
(B) 224 kcal
(C) 3840 kcal
(D) 2240 kcal

Q12. **At 300 K the standard enthalpies of formation of C_6H_5COOH, CO_2(g) and H_2O(l) are –408, –393 and –286 kJ mol^{-1} respectively. Calculate the heat of combustion of benzoic acid at constant volume :**

(A) +3201 kJ
(B) +3199.75 kJ
(C) –3201 kJ
(D) –3199.75 kJ

Q13. **The enthalpies of combustion of carbon and carbon monoxide are –393.5 kJ and –283 kJ respectively, the enthalpy of formation of carbon monoxide is :**

(A) –676.5 kJ
(B) –110.5 kJ
(C) 110.5 kJ
(D) 676.5 kJ

Q14. **The standard heat of formation of CS_2(l) will be; given that the standard heat of combustion of C (graphite), S (rhombic) and CS_2(l) are –393.3, –293.72 and –1108.76 kJ mol^{-1} respectively is –**

(A) –12.802 kJ mol^{-1}
(B) +12.802 kJ mol^{-1}
(C) +128.02 kJ mol^{-1}
(D) –128.02 kJ mol^{-1}

Q15. **The heat of combustion of CH_4(g), C(s)and H_2(g) at 25°C are –212.4 kcal, –94.0 kcal and –68.4 kcal respectively, the heat of formation of CH_4 will be :**

(A) +54.4 kcal
(B) –18.4 kcal
(C) –375.2 kcal
(D) +212.8 kcal

Q16. **Enthalpy of a compound is equal to its – (When it is formed from constituent particles)**

(A) Heat of combustion
(B) Heat of formation
(C) Heat of reaction
(D) Heat of solution

Q17. Which of the following equations represents standard heat of formation of CH_4 ?

(A) $C_{diamond} + 2H_2(g) \rightarrow CH_4(g)$
(B) $C_{graphite} + 2H_2(g) \rightarrow CH_4(g)$
(C) $C_{diamond} + 4H(g) \rightarrow CH_4(g)$
(D) $C_{graphite} + 4H(g) \rightarrow CH_4(g)$

Q18. The enthalpy of formation of ammonia is –46.0 kJ mol^{-1}. The enthalpy change for the reaction $2NH_3(g) \rightarrow N_2(g) + 3H_2(g)$ is :

(A) 46.0 kJ mol^{-1}
(B) 92.0 kJ mol^{-1}
(C) 23.0 kJ mol^{-1}
(D) –92.0 kJ mol^{-1}

Q19. Given enthalpy of formation of CO(g) and CaO(s) are –94.0 kJ and –152 kJ respectively and the enthalpy of the reaction : $CaCO_3(s) \rightarrow CaO(s) + CO_2(g)$ is 42 kJ. The enthalpy of formation of $CaCO_3(s)$ is :

(A) –42 kJ
(B) –202 kJ
(C) +202 kJ
(D) –288 kJ

Q20. Given that standard heat enthalpies of CH_4, C_2H_4 and C_2H_6 are –17.9, 12.5, –24.8 kcal mol^{-1}. The ΔH for $CH_4 + C_2H_2 \rightarrow C_2H_6$ is :

(A) –55.2 kcal
(B) –30.2 kcal
(C) 55.2 kcal
(D) –19.4 kcal

Q21. The standard molar heat of formation of ethane, CO_2 and water(l) are respectively –21.1, –94.1 and –68.3 kcal. The standard molar heat of combustion of ethane will be :

(A) –372 kcal
(B) –162 kcal
(C) –240 kcal
(D) –183.5 kcal

Q22. The ΔH_f° for $CO_2(g)$, CO(g) and $H_2O(g)$ are –393.5, –110.5 and –241.8 kJ mol^{-1} respectively the standard enthalpy change (in kJ) for the reaction $CO(g) + H_2(g) + \frac{1}{2}O_2(g) \rightarrow CO_2(g) + H_2O(g)$ is :

(A) 524.1
(B) 41.2
(C) –262.5
(D) –41.2

Q23. Standard enthalpy of formation is zero for :

(A) $C_{diamond}$
(B) $Br_2(l)$
(C) $C_{graphite}$
(D) $O_2(g)$

Q24. The standard heats of formation of $NO_2(g)$ and $N_2O_4(g)$ are 8.0 and 2.0 kcal mol^{-1} respectively. The heat of dimerization of NO_2 in kcal is :

(A) 10.0
(B) –6.0
(C) –12.0
(D) –14.0

Q25. **M is a metal that forms an oxide M_2O**

$\frac{1}{4}M_2O \rightarrow M + \frac{1}{4} O_2$, $\Delta H = 120$ kcal. When a sample of metal M reacts with one mole of oxygen what will be the ΔH in that case :

(A) 240 kcal
(B) –240 kcal
(C) 480 kcal
(D) –480 kcal

Q26. **The enthalpy of formation of CO(g), CO_2(g), N_2O(g) and N_2O_5(g) are –110, –393, +81 and 10 kJ mol^{-1} respectively. For the reaction $N_2O_5(g) + 3CO(g) \rightarrow N_2O(g) + 3CO_2(g)$, ΔH is :**

(A) –212
(B) +212
(C) –778
(D) +778

Q27. **The heat of combustion of C_4H_{10} is –2878 kJ mol^{-1}. If the heats of formation of CO_2 and H_2O are –393.5 kJ mol^{-1} and –285.8 kJ mol^{-1} then the heat of formation of C_4H_{10} is :**

(A) –125.0 kJ mol^{-1}
(B) 126.75 kJ mol^{-1}
(C) –402.5 kJ mol^{-1}
(D) 402.5 kJ mol^{-1}

Q28. **Enthalpy of formation of NO_2, SO_2, CO_2 and NH_3 are 33.18, –296, –393 and –46 kJ mol^{-1} respectively. The order of their increasing stabilities are :**

(A) $NO_2 < NH_3 < SO_2 < CO_2$
(B) $NH_3 < SO_2 < CO_2 < NO_2$
(C) $NO_2 < SO_2 < CO_2 < NH_3$
(D) $SO_2 < CO_2 < NH_3 < NO_2$

Q29. **In the reaction : S + 3/2 $O_2 \rightarrow SO_3$ + 2x kcal and SO_2 + 1/2 $O_2 \rightarrow SO_3$ + y kcal, the heat of formation of SO_2 is :**

(A) (x + y)
(B) (x – y)
(C) (y – x)
(D) (y – 2x)

Q30. **The enthalpy of formation of ammonia is –46.0 kJ mol^{-1}. The enthalpy for the reaction $2N_2(g) + 6H_2(g) \rightarrow 4NH_3(g)$ is :**

(A) –46 kJ
(B) 46 kJ
(C) 184 kJ
(D) –184 kJ

Q31. **At 298 K the standard enthalpies of formation of H_2O(l) and H_2O_2(l) are –286.0 kJ mol^{-1} and –188.0 kJ mol^{-1}. The enthalpy change for reaction $2H_2O_2(l) \rightarrow 2H_2O(l) + O_2(g)$ will be :**

(A) –948 kJ mol^{-1}
(B) –196 kJ mol^{-1}
(C) +196 kJ mol^{-1}
(D) +948 kJ mol^{-1}

Q32. **Given that $C + O_2 \rightarrow CO_2$, $\Delta H^\circ = -x$ kJ $2CO + O_2 \rightarrow 2CO_2$, $\Delta H^\circ = -y$ kJ What is heat of formation of CO ?**

(A) $\frac{y-2x}{2}$
(B) 2x – y
(C) y – 2x
(D) 2y – x

Q33. **Change in enthalpy for reaction $2H_2O_2(l) \rightarrow 2H_2O(l) + O_2(g)$ if heat of formation of $H_2O_2(l)$ and $H_2O(l)$ are –188 and –286 kJ mol^{-1} respectively, is :**

(A) –196 kJ mol^{-1}
(B) +196 kJ mol^{-1}
(C) +948 kJ mol^{-1}
(D) –948 kJ mol^{-1}

Q34. **For which one of the following equations is ΔH°_{react} equal to ΔH°_f for the product ?**

(A) $N_2(g) + O_2(g) \rightarrow N_2O_3(g)$
(B) $CH_4(g) + 2Cl_2(g) \rightarrow CH_2Cl_2(l) + 2HCl(g)$
(C) $Xe(g) + 2F_2(g) \rightarrow XeF_4(g)$
(D) $2CO(g) + O_2(g) \rightarrow 2CO_2(g)$

Q35. **Which of the following correctly represents the standard enthalpy of formation of CCl_4 (g) ?**

(A) $C_{graphite} + 2Cl_2(g) \rightarrow CCl_4(g)$
(B) $C_{graphite} + 4Cl(g) \rightarrow CCl_4(g)$
(C) $C_{diamond} + 2Cl_2(g) \rightarrow CCl_4(g)$
(D) $C_{graphite} + 2Cl_2(g) \rightarrow CCl_4(l)$

Q36. **In which of the following both species have zero standard enthalpy of formation?**

(A) $H_2(g)$, $H^+(aq)$
(B) $D_2(g)$, $D_2O(l)$
(C) P_2(s, white), $I_2(g)$
(D) $O_2(g)$, $O_3(g)$

Q37. **Incorrect among the following is :**

(A) $C(s) + \frac{1}{2}O_2(g) \rightarrow CO(g)$, $\Delta H^\circ_f = H^\circ_f$ CO
(B) $C(s) + O_2(g) \rightarrow CO_2(g)$, $\Delta H^\circ_f = H^\circ_f$ CO_2 = H°_c C(s)
(C) $CO(g) + \frac{1}{2}O_2(g) \rightarrow CO_2(g)$, $\Delta H^\circ_f = H^\circ_f$ CO_2 = H°_c CO(g)
(D) Both (1) & (2)

Q38. **The value of ΔH° in kJ for the reaction will be**

$CS_2(l) + 4NOCl(g) \rightarrow CCl_4(l) + 2SO_2(g) + 2N_2(g)$ if
$\Delta H^\circ_f(CS_2) = -x$, $\Delta H^\circ_f(NOCl) = -y$
$\Delta H^\circ_f(CCl_4) = +z$, $\Delta H^\circ_f(SO_2) = -r$

(A) x + 4y – z – 2r
(B) r + z + 4y – x
(C) 2r + z + 4y + x
(D) x + 4y + z – 2r

Q39. **The standard heat of formation of $NO_2(g)$ and $N_2O_4(g)$ are 8.0 and 4.0 kcal mol^{-1} respectively. The heat of dimerisation of NO_2 in kcal is :**

(A) –12 kcal
(B) 12 kcal
(C) 4 kcal
(D) 16 kcal

Q40. **Which of the following equations represent standard heat of formation of CH_4 ?**

(A) $C_{diamond} + 2H_2(g) \rightarrow CH_4(g)$
(B) $C_{graphite} + 2H_2(g) \rightarrow CH_4(g)$
(C) $C_{diamond} + 4H(g) \rightarrow CH_4(g)$
(D) $C_{graphite} + 4H(g) \rightarrow CH_4(g)$

Q41. **The enthalpy changes for the following processes are listed below :**

$Cl_2(g) \rightarrow 2Cl(g)$ **242.3 kJ mol^{-1}**

$I_2(g) \rightarrow 2I(g)$ **151.0 kJ mol^{-1}**

$ICl(g) \rightarrow I(g) + Cl(g)$ **211.3 kJ mol^{-1}**

$I_2(s) \rightarrow I_2(g)$ **62.76 kJ mol^{-1}**

Given that the standard states for iodine and chlorine are $I_2(s)$ and $Cl_2(g)$, the standard enthalpy of formation for $ICl(g)$ is :-

(A) –16.8 kJ mol^{-1}
(B) +16.8 kJ mol^{-1}
(C) +244.8 kJ mol^{-1}
(D) –14.6 kJ mol^{-1}

Q42. **On the basis of the following thermochemical data : (Δ_f° $H^+_{(aq)} = 0$)**
$H_2O(l) \rightarrow H^+(aq) + OH^-$ (aq) ; $\Delta H = 57.32$ kJ
$H_2(g) + \frac{1}{2}\ O_2(g) \rightarrow H_2O(l)$; $\Delta H = -286.20$ kJ
The value of enthalpy of formation of OH^- ion at 25°C is :-

(A) +228.88 kJ
(B) –343.52 kJ
(C) –22.88 kJ
(D) –228.88 kJ

Q43. **If $H_2 + \frac{1}{2}O_2 \rightarrow H_2O$; $\Delta H = -68.39$ kcal**

$K + H_2O +$ water $\rightarrow KOH(aq) + \frac{1}{2}\ H_2$; $\Delta H = -48.0$ kcal

$KOH +$ water $\rightarrow KOH(aq)$; $\Delta H = -14.0$ kcal

The heat of formation of KOH is :

(A) –68.39 + 48 – 14.0
(B) –68.39 – 48.0 + 14.0
(C) +68.39 – 48.0 + 14.0
(D) +68.39 + 48.0 – 14.0

Q44. **Given $C(s) + O_2(g) \rightarrow CO_2(g) + 94.2$ kcal**

$H_2(g) + \frac{1}{2}O_2(g) \rightarrow H_2O(l) + 68.3$ kcal

$CH_4(g) + 2O_2(g) \rightarrow CO_2(g) + 2H_2O(l) + 210.8$ kcal

The heat of formation of methane in kcal will be :

(A) –45.9
(B) –20.0
(C) –47.8
(D) –47.3

Q45. **(i) $S(s) + \frac{3}{2}\ O_2(g) \rightarrow SO_3(g) + 2x$ kcal**

(ii) $SO_2(g) + \frac{1}{2}\ O_2(g) \rightarrow SO_3(g) + y$ kcal

Calculate the heat of formation of SO_2 :

(A) (2x + y)
(B) (2x – y)
(C) x + y
(D) 2x / y

Q46. **If $S + O_2 \rightarrow SO_2$; $\Delta H = -298.2$**

$SO_2 + \frac{1}{2}\ O_2 \rightarrow SO_3$; $\Delta H = -98.7$

$SO_3 + H_2O \rightarrow H_2SO_4$; $\Delta H = -130.2$

$H_2 + \frac{1}{2} O_2 \rightarrow H_2O$; $\Delta H = -287.3$

Then the enthalpy of formation of H_2SO_4 at 298 K is :

(A) –814.4 kJ
(B) –650.3 kJ
(C) –320.5 kJ
(D) –433.5 kJ

Q47. **Given that** – $2C(s) + O_2(g) \rightarrow 2CO_2(g)$; $\Delta H = -787$ **kJ**

$H_2(g) + \frac{1}{2} O_2(g) \rightarrow H_2O(l)$; $\Delta H = -286$ **kJ**

$C_2H_2(g) + \frac{5}{2} O_2(g) \rightarrow 2CO_2(g) + H_2O(l)$; $\Delta H = -1310$ **kJ**

Heat of formation of acetylene is :

(A) +1802 kJ
(B) –1802 kJ
(C) –800 kJ
(D) +237 kJ