

## Thermochemistry:



2. For the reaction,  $\text{C}_2\text{H}_6(\text{g}) + 5\text{O}_2(\text{g}) \rightarrow 3\text{CO}_2(\text{g}) + 4\text{H}_2\text{O}(\ell)$

at constant temperature,  $\Delta H = \Delta E$  is :

- (A)  $\pm 3RT$       (B)  $- RT$       (C)  $+ RT$       (D)  $- 3RT$

- 3.** Consider the following changes :



Which of the above does not represent  $\Delta H^\circ_{\text{formation}}$  of the product :



4. Given that  $S_{(s)} + \frac{3}{2}O_{2(g)} \longrightarrow SO_{3(g)} + 2x \text{ KCal}$ ;  $SO_{2(g)} + \frac{1}{2}O_{2(g)} \longrightarrow SO_{3(g)} + y \text{ KCal}$

What would be the enthalpy of formation of  $\text{SO}_2$  :

- (A)  $-2x + y$       (B)  $2x - y$       (C)  $-x + y$       (D)  $x - y$

5. The combustion of 0.2 mole of liquid carbon disulphide  $\text{CS}_2$  at constant pressure to give  $\text{CO}_2(\text{g})$  and  $\text{SO}_2(\text{g})$  releases 215 kJ of heat. What is  $\Delta H_f^\circ$  for  $\text{CS}_{2(\text{l})}$  in  $\text{kJ mol}^{-1}$ :

$\Delta H_f^\circ$	kJ mol <sup>-1</sup>
CO <sub>2(g)</sub>	-393.5
SO <sub>2(g)</sub>	-296.8



6. Calculate the heat of combustion of carbon monoxide at 17°C at constant volume from the given enthalpy of reactions at 17°C :



- (A) - 136000 Cal      (B) - 135420 Cal      (C) - 68000 Cal      (D) - 67710 Cal

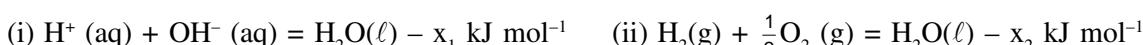
7. The enthalpy of neutralization of a strong base and strong acid is  $57.0 \text{ kJ eq}^{-1}$ . The heat evolved when 0.5 mole of  $\text{HNO}_3$  are added to 1 L of 0.2 M  $\text{NaOH}$  solution is :

- (A)  $\approx 20$  kJ      (B) 28.5 kJ      (C) 11.4 kJ      (D) 34.9 kJ

8. The heat evolved in neutralizing a solution containing 1 mole of HCN with a strong alkali is 3 KCal. The enthalpy of dissociation of HCN is :

- (A) 54.1 KCal/mol      (B) 60.1 KCal/mol      (C) 10.7 KCal/mol      (D) 16.7 KCal/mol

- 9.** Consider the following reactions :

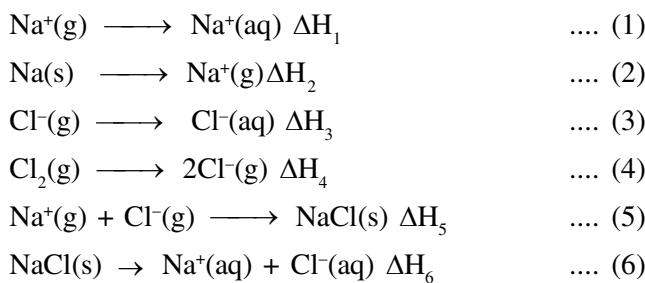


Enthalpy of formation of  $\text{H}_2\text{O}$  ( $\ell$ ) is :

- (A) + x, kJ mol<sup>-1</sup>      (B) + x, kJ mol<sup>-1</sup>      (C) - x, kJ mol<sup>-1</sup>      (D) + x, kJ mol<sup>-1</sup>

- 10.** The value of heat of formation of  $\text{SO}_2$  and  $\text{SO}_3$  are  $-298.2 \text{ kJ}$  and  $-98.2 \text{ kJ}$ . The heat of reaction of the following reaction will be  $\text{SO}_2 + \frac{1}{2} \text{O}_2 \rightarrow \text{SO}_3$
- (A)  $-200 \text{ kJ}$       (B)  $-356.2 \text{ kJ}$       (C)  $+200 \text{ kJ}$       (D)  $-396.2 \text{ kJ}$
- 11.** In the combustion of  $2.0 \text{ gm}$  of methane  $25 \text{ kcal}$  heat is liberated, heat of combustion of methane would be
- (A)  $100 \text{ kcal}$       (B)  $200 \text{ kcal}$       (C)  $300 \text{ kcal}$       (D)  $400 \text{ kcal}$
- 12.** For the equations :  $\text{C(diamond)} + 2\text{H}_2(\text{g}) \rightarrow \text{CH}_4(\text{g}) ; \Delta H_1$  and  $\text{C(g)} + 4\text{H(g)} \rightarrow \text{CH}_4(\text{g}) ; \Delta H_2$   
Select the correct option (Magnitude) :
- (A)  $\Delta H_1 = \Delta H_2$       (B)  $\Delta H_1 > \Delta H_2$       (C)  $\Delta H_1 < \Delta H_2$       (D) Nothing can be said with certainty.

- 13.** Consider the following changes :

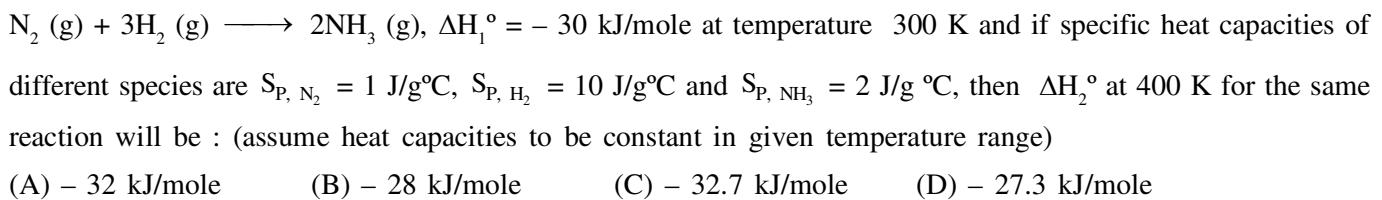


Hydration enthalpy of  $\text{NaCl}$  can be defined by sum of the following :

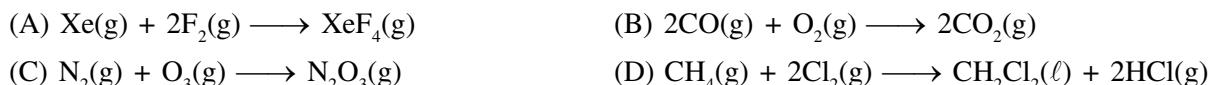
- (A)  $\Delta H_1 + \Delta H_2 + \Delta H_3 + \Delta H_4/2$       (B)  $\Delta H_6$  only  
 (C)  $\Delta H_1 + \Delta H_3$       (D)  $\Delta H_2 + \Delta H_4/2 + \Delta H_5 + \Delta H_6$
- 14.** Enthalpy of atomisation of  $\text{NH}_3$  and  $\text{N}_2\text{H}_4$  are  $x \text{ KCal mol}^{-1}$  and  $y \text{ KCal mol}^{-1}$  respectively. Calculate average bond energy of N—N bond :

(A)  $\frac{4y-3x}{3} \text{ KCal mol}^{-1}$     (B)  $\frac{2y-3x}{3} \text{ KCal mol}^{-1}$     (C)  $\frac{4y-3x}{4} \text{ KCal mol}^{-1}$     (D)  $\frac{3y-4x}{3} \text{ KCal mol}^{-1}$

- \*15.** If for reaction :



- 16.** For which one of the following equation  $\Delta H_r^\circ$  not equal to  $\Delta H_f^\circ$  for the product ?



- \*17.** For the process  $\text{H}_2\text{O}(\ell) \text{ (1 bar, 373 K)} \rightleftharpoons \text{H}_2\text{O(g)} \text{ (1 bar, 373 K)}$ , the correct set of thermodynamic parameters is :

(A)  $\Delta G = 0$       (B)  $\Delta S > 0$       (C)  $\Delta H > 0$       (D)  $\Delta G = -\text{ve}$

- 18.** At  $300 \text{ K}$ , the reaction which have the following values of thermodynamic parameter, occur spontaneously.

(A)  $\Delta G^\circ = -400 \text{ kJ mol}^{-1}$       (B)  $\Delta H^\circ = 200 \text{ kJ mol}^{-1}$ ,  $\Delta S^\circ = -4 \text{ JK}^{-1} \text{ mol}^{-1}$   
 (C)  $\Delta H^\circ = -200 \text{ kJ mol}^{-1}$ ,  $\Delta S^\circ = 4 \text{ JK}^{-1} \text{ mol}^{-1}$       (D)  $\Delta H^\circ = 200 \text{ kJ mol}^{-1}$ ,  $\Delta S^\circ = -40 \text{ JK}^{-1} \text{ mol}^{-1}$

# Answers

## RACE # 47

1. (B) 2. (D) 3. (D) 4. (A) 5. (B) 6. (D) 7. (C) 8. (C) 9. (A) 10. (C)  
11. (B) 12. (B) 13. (C) 14. (D) 15. (A) 16. (BCD) 17. (ABC) 18. (AC)