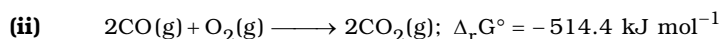
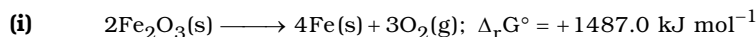


Date Planned : __ / __ / __	Daily Tutorial Sheet - 1	Expected Duration : 90 Min
Actual Date of Attempt : __ / __ / __	JEE Main (Archive)	Exact Duration : _____

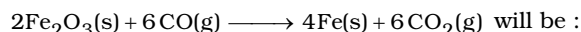
- For the reaction, (2002)  
 $C + O_2 \rightarrow CO_2; \Delta H = -393 \text{ J}$ ,  $2Zn + O_2 \rightarrow 2 ZnO; H = -412 \text{ J}$   
 Which one is correct ?  
 (A) Carbon can reduce ZnO to Zn  
 (B) Oxidation of carbon is not feasible  
 (C) Oxidation of Zn is not feasible  
 (D) Zn liberates more heat than carbon during oxidation
- The enthalpies of combustion of carbon and carbon monoxide are  $-393.5$  and  $-283.5 \text{ kJ mol}^{-1}$  respectively. The enthalpy of formation of carbon monoxide per mole is : (2004)  
 (A)  $-110 \text{ kJ}$  (B)  $676.5 \text{ kJ}$  (C)  $-676.5 \text{ kJ}$  (D)  $110.5 \text{ kJ}$
- The standard enthalpy of formation ( $\Delta_f H^\circ$ ) at  $298 \text{ K}$  for methane,  $CH_4(g)$ , is  $-74.8 \text{ kJ mol}^{-1}$ . The additional information required to determine the average energy for C-H bond formation would be (2006)  
 (A) The dissociation energy of hydrogen molecule,  $H_2$   
 (B) The dissociation energy of  $H_2$  and enthalpy of sublimation of carbon  
 (C) Latent heat of vaporization of methane  
 (D) The first four ionization energies of carbon and electron gain enthalpy of hydrogen
- The enthalpy change states for the following processes are listed below : (2006)  
 $Cl_2(g) = 2Cl(g); \quad 242.3 \text{ kJ mol}^{-1}$   
 $I_2(g) = 2I(g); \quad 151.0 \text{ kJ mol}^{-1}$   
 $ICl(g) = I(g) + Cl(g); \quad 211.3 \text{ kJ mol}^{-1}$   
 $I_2(s) = I_2(g); \quad 62.76 \text{ kJ mol}^{-1}$   
 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)  $+244.8 \text{ kJ mol}^{-1}$  (B)  $-14.6 \text{ kJ mol}^{-1}$  (C)  $-16.8 \text{ kJ mol}^{-1}$  (D)  $+16.8 \text{ kJ mol}^{-1}$
- Standard entropy of  $X_2$ ,  $Y_2$  and  $XY_3$  are  $60$ ,  $40$  and  $50 \text{ J K}^{-1} \text{ mol}^{-1}$ , respectively. For the reaction,  $1/2 X_2 + 3/2 Y_2 \rightarrow XY_3$ ,  $\Delta H = -30 \text{ kJ}$ , to be at equilibrium, the temperature will be (2008)  
 (A)  $1250 \text{ K}$  (B)  $500 \text{ K}$  (C)  $750 \text{ K}$  (D)  $1000 \text{ K}$
- In a fuel cell, methanol is used as fuel and oxygen gas is used as an oxidizer. The reaction is : (2009)  
 $CH_3OH(l) + \frac{3}{2} O_2(g) \rightarrow CO_2(g) + 2H_2O(l)$   
 At  $298 \text{ K}$  standard Gibbs energies of formation for  $CH_3OH(l)$ ,  $H_2O(l)$ , and  $CO_2(g)$  are  $-166.2$ ,  $-237.2$ , and  $-394.4 \text{ kJ mol}^{-1}$ , respectively. If standard enthalpy of combustion of methanol is  $-726 \text{ kJ mol}^{-1}$ , efficiency of the fuel cell will be  
 (A)  $80\%$  (B)  $87\%$  (C)  $90\%$  (D)  $97\%$

7. On the basis of the following thermochemical data [ $\Delta_f G^\circ H^+(aq) = 0$ ] (2009)
- $$H_2O(l) \rightarrow H^+(aq) + OH^-(aq); \Delta H = 57.32 \text{ kJ}$$
- $$H_2(g) + \frac{1}{2} O_2(g) \rightarrow H_2O(l); \Delta H = -286.20 \text{ kJ}$$
- The value of enthalpy of formation of  $OH^-$  ion at  $25^\circ C$  is
- (A)  $-22.88 \text{ kJ}$  (B)  $-228.88 \text{ kJ}$  (C)  $+228.88 \text{ kJ}$  (D)  $-343.52 \text{ kJ}$
8. The standard enthalpy of formation of  $NH_3$  is  $-46.0 \text{ kJ mol}^{-1}$ . If the enthalpy of formation of  $H_2$  from its atoms is  $-436 \text{ kJ mol}^{-1}$  and that of  $N_2$  is  $-712 \text{ kJ mol}^{-1}$ , the average bond enthalpy of N-H bond in  $NH_3$  is: (2010)
- (A)  $-964 \text{ kJ mol}^{-1}$  (B)  $+352 \text{ kJ mol}^{-1}$   
 (C)  $+1056 \text{ kJ mol}^{-1}$  (D)  $-1102 \text{ kJ mol}^{-1}$
9. The value of enthalpy change ( $\Delta H$ ) for the reaction (2011)
- $$C_2H_5OH(l) + 3O_2(g) \rightarrow 2CO_2(g) + 3H_2O(l) \text{ at } 27^\circ C \text{ is } -1366.5 \text{ kJ mol}^{-1}.$$
- The value of internal energy change for the above reaction at this temperature will be
- (A)  $-1371.5 \text{ kJ}$  (B)  $-1369.0 \text{ kJ}$  (C)  $-1364.0 \text{ kJ}$  (D)  $-1361.5 \text{ kJ}$
10. Consider the reaction, (2011)
- $$4NO_2(g) + O_2(g) \rightarrow 2N_2O_5(g), \Delta_r H = -111 \text{ kJ}.$$
- If  $N_2O_5(s)$  is formed instead of  $N_2O_5(g)$  in the above reaction, the  $\Delta_r H$  value will be
- (Given,  $\Delta H$  of sublimation for  $N_2O_5$  is  $54 \text{ kJ mol}^{-1}$ )
- (A)  $-165 \text{ kJ}$  (B)  $+54 \text{ kJ}$  (C)  $+219 \text{ kJ}$  (D)  $-219 \text{ kJ}$
11. For the complete combustion of ethanol,  $C_2H_5OH(l) + 3O_2(g) \rightarrow 2CO_2(g) + 3H_2O(l)$  the amount of heat produced as measured in bomb calorimeter is  $1364.47 \text{ kJ mol}^{-1}$  at  $25^\circ C$ . Assuming ideality, the enthalpy of combustion,  $\Delta_c H$  for the reaction will be (2014)
- [ $R = 8.314 \text{ JK}^{-1} \text{ mol}^{-1}$ ]
- (A)  $-1366.95 \text{ kJ mol}^{-1}$  (B)  $-1361.95 \text{ kJ mol}^{-1}$   
 (C)  $-1460.50 \text{ kJ mol}^{-1}$  (D)  $-1350.50 \text{ kJ mol}^{-1}$
12. The combustion of benzene ( $\ell$ ) gives  $CO_2(g)$  and  $H_2O(\ell)$ . Given that heat of combustion of benzene at constant volume is  $-3263.9 \text{ kJ mol}^{-1}$  at  $25^\circ C$ , heat of combustion (in  $\text{kJ mol}^{-1}$ ) of benzene at constant pressure will be : ( $R = 8.314 \text{ JK}^{-1} \text{ mol}^{-1}$ ) (2018)
- (A) 3260 (B)  $-3267.6$  (C) 4152.6 (D)  $-452.46$
13. For which of the following reactions,  $\Delta H$  is equal to  $\Delta U$  ? (2018)
- (A)  $N_2(g) + 3H_2(g) \longrightarrow 2NH_3(g)$  (B)  $2HI(g) \longrightarrow H_2(g) + I_2(g)$   
 (C)  $2NO_2(g) \longrightarrow N_2O_4(g)$  (D)  $2SO_2 + O_2(g) \longrightarrow 2SO_3(g)$

14. Given : (2018)



Free energy change,  $\Delta_r G^\circ$  for the reaction

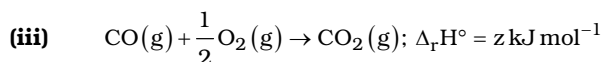
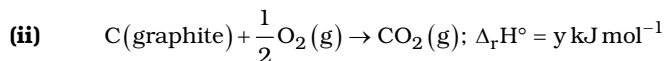
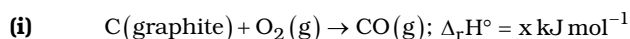


- (A)  $-112.4 \text{ kJ mol}^{-1}$  (B)  $-56.2 \text{ kJ mol}^{-1}$  (C)  $-168.2 \text{ kJ mol}^{-1}$  (D)  $-208.0 \text{ kJ mol}^{-1}$

15. For which of the following processes,  $\Delta S$  is negative ? (2018)



16. Given : (2019)



Based on the above thermochemical equations, find out which one of the following algebraic relationships is correct ?

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

17. The difference between  $\Delta H$  and  $\Delta U$  ( $\Delta H - \Delta U$ ), when the combustion of one mole of heptane(l) is carried out at a temperature T, is equal to : (2019)

- (A)  $-4RT$  (B)  $4RT$  (C)  $-3RT$  (D)  $3RT$

18. Enthalpy of sublimation of iodine is  $24 \text{ cal g}^{-1}$  at  $200^\circ\text{C}$ . If specific heat of  $\text{I}_2(\text{s})$  and  $\text{I}_2(\text{vap})$  are  $0.055$  and  $0.031 \text{ cal g}^{-1} \text{ K}^{-1}$  respectively, then enthalpy of sublimation of iodine at  $250^\circ\text{C}$  in  $\text{cal g}^{-1}$  is : (2019)

- (A)  $5.7$  (B)  $22.8$  (C)  $11.4$  (D)  $2.85$

19. The standard heat of formation ( $\Delta_f H_{298}^\circ$ ) of ethane (in  $\text{kJ/mol}$ ), if the heat of combustion of ethane, hydrogen and graphite are  $-1560$ ,  $-393.5$  and  $-286 \text{ kJ/mol}$ , respectively is \_\_\_\_\_. (2020)

20. If enthalpy of atomisation for  $\text{Br}_2(\ell)$  is  $x \text{ kJ/mol}$  and bond enthalpy for  $\text{Br}_2$  is  $y \text{ kJ/mol}$ , the relation between them : (2020)

- (A) does not exist (B) is  $x = y$  (C) is  $x > y$  (D) is  $x < y$