



## CHEMISTRY

### BOOKS - MTG CHEMISTRY (ENGLISH)

### THERMODYNAMICS

#### Mcqs

1. The system in which there is no exchange of matter, work, or energy from the surroundings is

- A. closed
- B. adiabatic
- C. isolated
- D. isothermal.

**Answer: C**



**Watch Video Solution**

2. A process in which the system does not exchange heat with the surroundings is known as

A. isothermal

B. adiabatic

C. thermal

D. isochoric

**Answer: B**



**Watch Video Solution**

3.  $\Delta U = q + w$ , is mathematical expression for

- A. first law of thermodynamics
- B. second law of thermodynamics
- C. third law of thermodynamics
- D. zeroth law of thermodynamics

**Answer: A**

 [Watch Video Solution](#)

4. The work done during the expansion of a gas from a volume of  $4dm^3$  to  $6dm^3$  against a constant external pressure of 3 atm is (1 L atm = 101.32 J)

- A.  $-6J$
- B.  $-608J$
- C.  $+304J$
- D.  $-304J$

**Answer: B**



[Watch Video Solution](#)

5. What will be the work done when one mole of a gas expands isothermally from 15 L to 50 L against a constant pressure of 1 atm at  $25^{\circ}C$ ?

A.  $-3542cal$

B.  $-843.3cal$

C.  $-718cal$

D.  $-60.23cal$

**Answer: C**



[Watch Video Solution](#)

6. What is the work done when 1 mole of a gas expands isothermally from 25 L to 250 L at a constant pressure of 1 atm and a temperature of 300 K ?

A. (a)  $-3542J$

B. (b)  $-5744J$

C. (c)  $-2657J$

D. (d)  $-4890J$

**Answer: B**



**Watch Video Solution**

7. In thermodynamics, a process is called reversible when

A. surrounding and system change are same

B. there is no boundary between system and surrounding

C. surrounding is always in equilibrium with system

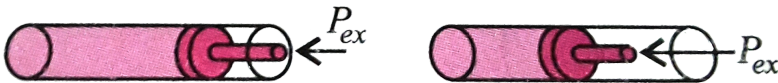
D. system change into surrounding spontaneously:

Answer: C

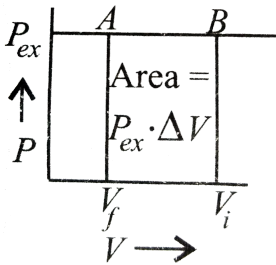


Watch Video Solution

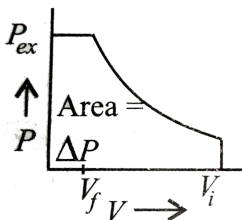
8. Work done on an ideal gas in a cylinder when it is compressed by and external pressure in a single step is shown below :



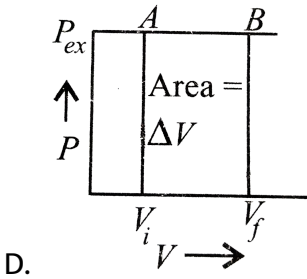
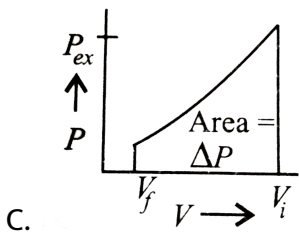
Which of the following graphs will show the work done on the gas ?



A.



B.



Answer: A

[▶ Watch Video Solution](#)

9. For an isothermal reversible expansion process, the value of  $q$  can be calculated by the expression

A.  $q = 2.303nRT \log. \frac{V_2}{V_1}$

B.  $q = - 2.303nRT \log. \frac{V_2}{V_1}$

C.  $q = - 2.303nRT \log. \frac{V_1}{V_2}$

$$D. q = - P_{\text{exp}} nRT \log. \frac{V_1}{V_2}$$

**Answer: A**



**Watch Video Solution**

**10.** In an adiabatic expansion of an ideal gas -

A. (a)  $W = - \Delta U$

B. (b)  $W = \Delta U$

C. (c)  $\Delta U = 0$

D. (d)  $W = 0$

**Answer: B**



**Watch Video Solution**



11. Two litres of an ideal gas at a pressure of 10 atm expands isothermally at  $25^{\circ}C$  into a vacuum until its total volume is 10 litres. How much heat is absorbed and how much work is done in the expansion ?

A. 10 J, 10 J

B. 8 J, 10 J

C. 18 J, 0 J

D. 0 J, 0 J

**Answer: D**

 [Watch Video Solution](#)

12. If the heat change at constant volume for decomposition of silver oxide is 80.25 kJ, what will be the heat change at constant pressure ?

A. 80.25 kJ

B. >80.25kJ

C.  $<80.25$  kJ

D. 160.50 kJ

**Answer: B**



**Watch Video Solution**

**13.** The enthalpy change of a reaction does not depend upon

A. Nature of intermediate state

B. Difference in initial and final temperature

C. Physical state of reactant

D. Use of different reactant for the same reaction

**Answer: C**



**Watch Video Solution**

14. Which of the following relationships is not correct for the relation between  $\Delta H$  and  $\Delta U$ ?

A. When  $\Delta n_g = 0$  then  $\Delta H = \Delta U$

B. When  $\Delta n_g > 0$  then  $\Delta H > \Delta U$

C. When  $\Delta n_g < 0$  then  $\Delta H < \Delta U$

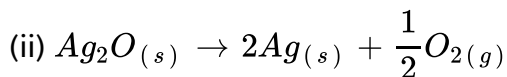
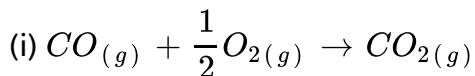
D. When  $\Delta n_g RT = 0$  then  $\Delta H = \Delta U$

Answer: D



Watch Video Solution

15. Two reactions are given below :



Which of the following statements is true ?

A. For (i)  $\Delta H < \Delta U$  and for (ii)  $\Delta H > \Delta U$

B. For (i)  $\Delta H > \Delta U$  and for (ii)  $\Delta H < \Delta U$

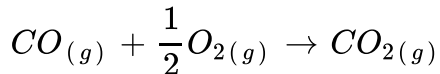
C. For both (i) and (ii)  $\Delta H > \Delta U$

D. For both (i) and (ii)  $\Delta H < \Delta U$

**Answer: A**

 [Watch Video Solution](#)

**16.** Consider the following reaction :



How are  $\Delta U$  and  $\Delta H$  related for the reaction ?

A. (a)  $\Delta H = \Delta U - 0.5RT$

B. (b)  $\Delta H = \Delta U - RT$

C. (c)  $\Delta H = \Delta U + 0.5RT$

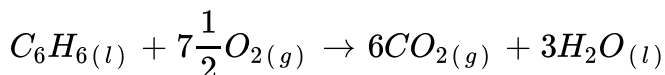
D. (d)  $\Delta H = \Delta U - 1.5RT$

**Answer: A**

 [Watch Video Solution](#)

17. For combustion of 1 mole of benzene at  $25^{\circ}\text{C}$ , the heat of reaction at constant pressure is  $-780.9$  kcal.

What will be the heat of reaction at constant volume ?



A.  $-781.8$  kcal

B.  $-780.0$  kcal

C.  $+781.8$  kcal

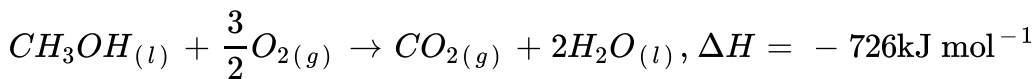
D.  $+780.0$  kcal

**Answer: B**

 [Watch Video Solution](#)

18. Reaction of methanol with dioxygen was carried out and  $\Delta U$  was found to be  $-726\text{kJ mol}^{-1}$  at  $298$  K. The enthalpy change for the

reaction will be



A.  $-741.5 \text{ kJ mol}^{-1}$

B.  $-727 \text{ kJ mol}^{-1}$

C.  $+741.5 \text{ kJ mol}^{-1}$

D.  $+727.2 \text{ kJ mol}^{-1}$

**Answer: B**

 [Watch Video Solution](#)

**19.** According to the first law of thermodynamics,  $\Delta U = q + w$ . In special cases the statement can be expressed in different ways. Which of the following is not a correct expression ?

A. At constant temperature,  $q = -w$

B. When no work is done,  $\Delta U = q$

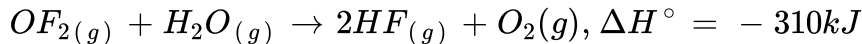
C. In gaseous system ,  $\Delta U = q + P\Delta V$

D. When work is done by the system :  $\Delta U = q + w$

**Answer: D**

 [Watch Video Solution](#)

**20.** What will be the standard internal energy change for the reaction at 298 K ?



A. (a)  $-312.5kJ$

B. (b)  $-125.03kJ$

C. (c)  $-310kJ$

D. (d)  $-156kJ$

**Answer: A**

 [Watch Video Solution](#)

21. The value for  $\Delta U$  for the reversible isothermal evaporation of 90 g water at  $100^\circ C$  will be  $\left(\Delta H_{\text{evap}} \text{ of water} = 40.8 \text{ kJ mol}^{-1}, R = 8.314 \text{ J K}^{-1} \text{ mol}^{-1}\right)$

A. (a)  $4800 \text{ kJ}$

B. (b)  $188.494 \text{ kJ}$

C. (c)  $40.8 \text{ kJ}$

D. (d)  $125.03 \text{ kJ}$

**Answer: B**

 [Watch Video Solution](#)

22. A system changes from state X to Y with a change in internal energy measuring to  $25 \text{ kJ mol}^{-1}$ , by a reversible path and returns from Y to X by an irreversible path. What will be the net change in internal energy?



A. 25 kJ

B. > 25 kJ

C. < 25 kJ

D. zero

**Answer: D**



**Watch Video Solution**

**23.** What will be the change in internal energy when 12 kJ of work is done on the system and 2 kJ of heat is given by the system?

A.  $+10\text{kJ}$

B.  $-10\text{kJ}$

C.  $+5\text{kJ}$

D.  $-5\text{kJ}$

**Answer: A**



[Watch Video Solution](#)

24. A system absorbs 50 kJ heat and does 20 kJ of work. What is the net change in the internal energy of the system ?

- A. Increase by 30 kJ
- B. Decrease by 30 kJ
- C. Increase by 70 kJ
- D. Decrease by 70 kJ

**Answer: A**



[Watch Video Solution](#)

25. 200 joules of heat was supplied to a system at constant volume. It resulted in the increase in temperature of the system from 298 to 323 K. What is the change in internal energy of the system ?

A. 400 J

B. 200 J

C. 50 J

D. 150 J

**Answer: B**



**Watch Video Solution**

**26.** In thermodynamics, which one of the following properties is not an intensive property?

A. Pressure

B. Temperature

C. Volume

D. Density

**Answer: C**



[Watch Video Solution](#)

27. The molar heat capacity of water at constant pressure,  $C_p$  is  $75 \text{ J K}^{-1} \text{ mol}^{-1}$ . When 10 kJ of heat is supplied to 1 kg water which is free to expand, the increase in temperature of water is

A. (a) 2.4 K

B. (b) 4.8 K

C. (c) 3.2 K

D. (d) 10 K

**Answer: A**



[Watch Video Solution](#)

28. Which of the following expressions is correct to calculate enthalpy of a reaction ?

$$A. \Delta H_{\text{reaction}} = \Sigma \Delta_f H_{\text{reactions}} - \Sigma \Delta_f H_{\text{products}}$$

$$B. \Delta H_{\text{reaction}} = \Sigma B. E_{\text{products}} - \Sigma B. E_{\text{reactants}}$$

$$C. \Delta H_{\text{reaction}} = \Sigma B. E_{\text{reactants}} - \Sigma B. E_{\text{products}}$$

$$D. \Delta H_{\text{reaction}} = \Delta H_1 \times \Delta H_2 \times \Delta H_3 \dots$$

**Answer: C**

 [Watch Video Solution](#)

29. If enthalpy of overall reaction  $X \rightarrow Y$  along one route is  $\Delta_r H$  and  $\Delta_r H_1, \Delta_r H_2, \Delta_r H_3 \dots$  Representing enthalpies of reactions leading to same product Y then  $\Delta_r H$  is

A. (a)  $\Delta_r H = \Delta_r H_1 + \Delta_r H_2 + \Delta_r H_3 \dots$

B. (b)  $\Delta_r H = \Delta_r H_1 \times \Delta_r H_2 \times \Delta_r H_3 \dots$

C. (c)  $\Delta_r H = \Delta_r H_1 + \Delta_r H_2 - \Delta_r H_3 \dots$

D. (d)  $\Delta_r H = \frac{\Delta_r H_1 \times \Delta_r H_2 \times \Delta_r H_3}{2} \dots$

**Answer: A**



**Watch Video Solution**

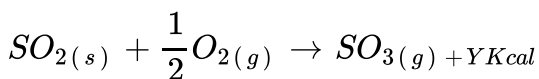
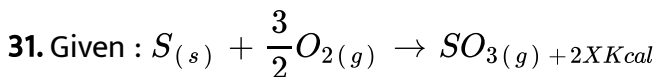
**30.** Which of the following does not represent enthalpy change during phase transformation?

- A. Standard enthalpy of fusion
- B. Standard enthalpy of vaporisation
- C. Standard enthalpy of sublimation
- D. Standard enthalpy of formation

**Answer: D**



**Watch Video Solution**



The heat of formation of  $SO_2$  is : –

A.  $(x + y)$

B.  $(x - y)$

C.  $(2x + y)$

D.  $(2x - y)$

**Answer: D**

 [Watch Video Solution](#)

**32.** The enthalpy of formation of ammonia when calculated from the following bond energy data is (B.E. of  $N - H$ ,  $H - H$ ,  $N \equiv N$  is  $389 \text{ kJ mol}^{-1}$ ,  $435 \text{ kJ mol}^{-1}$ ,  $945.36 \text{ kJ mol}^{-1}$  respectively)

A.  $-41.82 \text{ kJ mol}^{-1}$

B.  $+83.64 \text{ kJ mol}^{-1}$

C.  $-945.36 \text{ kJ mol}^{-1}$

D.  $-833 \text{ kJ mol}^{-1}$

**Answer: A**

 [Watch Video Solution](#)

33. The bond dissociation energy of gaseous  $H_2$ ,  $Cl_2$  and  $HCl$  are 104, 58 and  $103 \text{ kcal mol}^{-1}$  respectively. Calculate the enthalpy of formation for  $HCl$  gas.

A. (a)  $-22 \text{ kcal}$

B. (b)  $+22 \text{ kcal}$

C. (c)  $+184 \text{ kcal}$

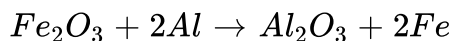
D. (d)  $-184 \text{ kcal}$

**Answer: A**

 [Watch Video Solution](#)



34. What is the enthalpy change for the given reaction, if enthalpies of formation of  $Al_2O_3$  and  $Fe_2O_3$  are  $-1670 \text{ kJ mol}^{-1}$  and  $-834 \text{ kJ mol}^{-1}$  respectively?



A.  $-836 \text{ kJ mol}^{-1}$

B.  $+836 \text{ kJ mol}^{-1}$

C.  $-424 \text{ kJ mol}^{-1}$

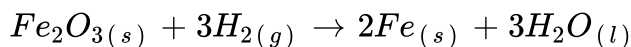
D.  $+424 \text{ kJ mol}^{-1}$

Answer: A



Watch Video Solution

35. What will be the heat of reaction for the following reaction? Will the reaction be exothermic or endothermic?



$$\Delta_f H^\circ (H_2O, l) = -285.83 \text{ kJ mol}^{-1}$$

$$\Delta_f H^\circ (Fe_2O_3, s) = -824.2 \text{ kJ mol}^{-1}$$

- A.  $-824.2 \text{ kJ mol}^{-1}$ , exothermic
- B.  $+33.3 \text{ kJ mol}^{-1}$ , endothermic
- C.  $-33.3 \text{ kJ mol}^{-1}$ , exothermic
- D.  $+824.2 \text{ kJ mol}^{-1}$ , endothermic

**Answer: C**

 [Watch Video Solution](#)

**36.** For the reaction :  $H_{2(g)} + Cl_{2(g)} \rightarrow 2HCl$ ,  $\Delta H = -44 \text{ kcal}$

What is the enthalpy of decomposition of HCl?

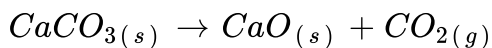
- A.  $+44 \text{ kcal/mol}$
- B.  $-44 \text{ kcal/mol}$
- C.  $-22 \text{ kcal/mol}$

D. +22 kcal/mol

Answer: D

 Watch Video Solution

37. For a reaction,



$$\Delta_f H^\circ (\text{CaO}) = -631.1 \text{ kJ mol}^{-1}$$

$$\Delta_f H^\circ (\text{CO}_2) = -393.5 \text{ kJ mol}^{-1} \text{ and}$$

$$\Delta_f H^\circ (\text{CaCO}_3) = -1206.9 \text{ kJ mol}^{-1}$$

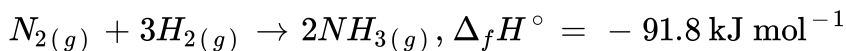
Which of the following is a correct statement? (A) A large amount of heat is evolved during the decomposition of  $\text{CaCO}_3$ . (B) Decomposition of  $\text{CaCO}_3$  is an endothermic process and heat is provided for decomposition (C) The amount of heat evolved cannot be calculated from the data provided. (D)  $\Delta_f H^\circ = \sum \Delta_f H^\circ (\text{reactants}) - \sum \Delta_f H^\circ (\text{products})$

- A. A large amount of heat is evolved during the decomposition of  $CaCO_3$ .
- B. Decomposition of  $CaCO_3$  is an endothermic process and heat is provided for decomposition
- C. The amount of heat evolved cannot be calculated from the data provided .
- D.  $\Delta_f H^\circ = \Sigma \Delta_f H^\circ$  (reactants)  $- \Sigma \Delta_f H^\circ$  (products)

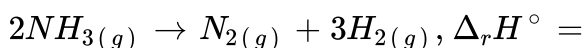
**Answer: B**

 [Watch Video Solution](#)

**38.** Formation of ammonia is shown by the reaction,



What will be the enthalpy of reaction for the decomposition of  $NH_3$  according to the reaction ?



A.  $-91.8 \text{ kJ mol}^{-1}$

B.  $+91.8 \text{ kJ mol}^{-1}$

C.  $-45.9 \text{ kJ mol}^{-1}$

D.  $+45.9 \text{ kJ mol}^{-1}$

**Answer: B**

 [Watch Video Solution](#)

**39.** Hess's law is application for the determination of heat of

A. transition

B. formation

C. reaction

D. all of these.

**Answer: D**

 [Watch Video Solution](#)

40. "The change of enthalpy of a chemical reaction is the same whether the reaction takes place in one step or in several steps". This law was presented by:

- A. Le Chatelier's law
- B. vant's Hoff's law
- C. first law of thermodynamics
- D. Hess's law.

**Answer: D**

 [Watch Video Solution](#)

41. The heat of combustion of ethane and benzene is  $-1560$  and  $-3268 \text{ kJ mol}^{-1}$  respectively. Which two has higher efficiency as fuel per gram and the amount of heat produced per gram?

A. Benzene,  $41.9 \text{ kJ g}^{-1}$

B. Ethane,  $52 \text{ kJ g}^{-1}$

C. Benzene,  $78 \text{ kJ g}^{-1}$

D. Ethane,  $30 \text{ kJ g}^{-1}$

**Answer: B**

 [Watch Video Solution](#)

**42.** What will be the enthalpy change of conversion of graphite into diamond

 [Watch Video Solution](#)

**43.** What will be the amount of heat evolved by burning 10 L of methane under standard conditions?

$-76.2$ ,  $-398.8$  and  $-241.6 \text{ kJ mol}^{-1}$  respectively

A. 805.8kJ

B. 398.8 kJ

C. 359.7 kJ

D. 640.4 kJ

**Answer: C**

 [Watch Video Solution](#)

**44.** For a reaction,  $C_{(s)} + O_{2(g)} \rightarrow CO_{2(g)}$

What is the relation between enthalpy of reaction ( $\Delta H_r$ ), enthalpy of formation of  $CO_2$  ( $\Delta H_f$ ) and enthalpy of combustion of carbon ( $\Delta H_{\text{comb}}$ ) ?

A.  $\Delta H_r > \Delta H_f = \Delta H_{\text{comb}}$

B.  $\Delta H_r = \Delta H_f = \Delta H_{\text{comb}}$

C.  $\Delta H_r = \Delta H_f + \Delta H_{\text{comb}}$

D.  $\Delta H_r = 2 \times \Delta H_f$



**Answer: B**

 [Watch Video Solution](#)

45. The heat of combustion of C, S and  $CS_2$  are  $-393.3kJ$ ,  $-293.7kJ$  and  $-1108.76kJ$ . What will be the heat of formation of  $CS_2$  ?

A.  $-128.02kJ$

B.  $+970kJ$

C.  $+1108.7kJ$

D.  $+128.06kJ$

**Answer: A**

 [Watch Video Solution](#)

46. How much heat is evolved if 3.2 g of methane is burnt and if the heat of combustion of methane is  $-880 \text{ kJ mol}^{-1}$  ?

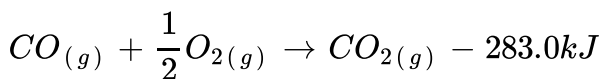
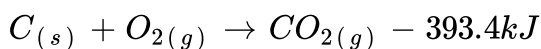
- A. 88 kJ
- B. 264 kJ
- C. 176 kJ
- D. 440 kJ

**Answer: C**



[Watch Video Solution](#)

47. What will be the enthalpy of formation of carbon to produce carbon monoxide on the basis of data given below:



- A.  $+676.4kJ$

B.  $-676.4\text{kJ}$

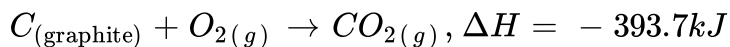
C.  $-110.4\text{kJ}$

D.  $+110.4\text{kJ}$

**Answer: C**

 [Watch Video Solution](#)

**48.** Two reactions are given below :



What quantity of diamond will give 800 kJ of heat on burning ?

A. a.24.25 g

B. b.15.24 g

C. c.2 g

D. d.12.12 g

**Answer: A**

 [Watch Video Solution](#)

**49.** Which of the following relationships is not correct ?

A.  $\Delta H = \Delta U + \Delta n_g RT$

B.  $\Delta H_{\text{sub}} = \Delta H_{\text{fusion}} + \Delta H_{\text{vap}}$

C.  $\Delta H_r^\circ = \sum H_{f(\text{reactants})}^\circ - \sum H_{f(\text{products})}^\circ$

D.  $\Delta H_r^\circ = \sum \text{B.E. of reactants} - \sum \text{B.E. of products}$

**Answer: C**

 [Watch Video Solution](#)

**50.** Which of the following is not a correct statement about enthalpy of solution?

- A. a. For most ionic compounds,  $\Delta H_{\text{soln.}}^{\circ}$  is positive and the dissociation process is endothermic.
- B. b. Solubility of most salts increases with increase in temperature.
- C. c. If the lattice enthalpy is very high, the dissolution of compound becomes very easy.
- D. d. Enthalpy of solution is determined by the selective values of the lattice enthalpy and hydration enthalpy.

**Answer: C**

 [Watch Video Solution](#)

51. The enthalpy of solution of sodium chloride is  $4\text{kJmol}^{-1}$  and its enthalpy of hydration of ion is  $-784\text{kJmol}^{-1}$ . Then the lattice enthalpy of  $\text{NaCl}$  (in  $\text{kJmol}^{-1}$ ) is

A. a.  $+780\text{kJ mol}^{-1}$

B. b. + 394 kJ mol<sup>-1</sup>

C. c. + 788 kJ mol<sup>-1</sup>

D. d. + 398 kJ mol<sup>-1</sup>

**Answer: C**

 [Watch Video Solution](#)

**52.** The amount of heat evolved when 0.50 mole of HCl is mixed with 0.30 mole of NaOH solution is

A. 57.1 kJ

B. 28.55 kJ

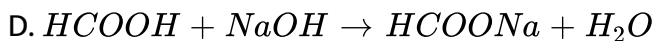
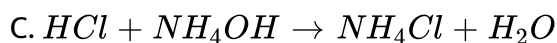
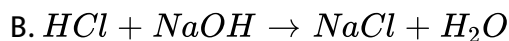
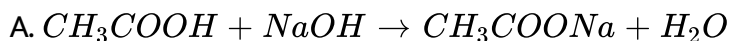
C. 11.42 kJ

D. 17.13 kJ

**Answer: D**

 [Watch Video Solution](#)

53. Which of the following reactions will have the value of enthalpy of neutralisation as  $-57.1\text{kJ mol}^{-1}$  ?



Answer: B

 [Watch Video Solution](#)

54. Bond energies of  $\text{H} - \text{H}$  and  $\text{Cl} - \text{Cl}$  are  $430\text{kJ mol}^{-1}$  and  $242\text{kJ mol}^{-1}$  respectively.  $\Delta H_f$  for  $\text{HCl}$  is  $91\text{kJ mol}^{-1}$ .

What will be the bond energy of  $\text{H} - \text{Cl}$ ?

A.  $672\text{kJ}$

B. 182 kJ

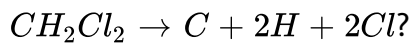
C. 245 kJ

D. 88 kJ

**Answer: C**

 [Watch Video Solution](#)

55. What will be  $\Delta H$  for the reaction,



(B.E. of  $C - H$  and  $C - Cl$  bonds are  $416 \text{ kJ mol}^{-1}$  and  $325 \text{ kJ mol}^{-1}$  respectively)

A. 832 kJ

B. 1482 kJ

C. 650 kJ

D. 1855 kJ



**Answer: B**

 [View Text Solution](#)

56.  $\Delta H$  for the reaction,  $OF_2 + H_2O \rightarrow O_2 + 2HF$

(B.E. of  $O - F$ ,  $O - H$ ,  $H - F$  and  $O = O$  are 44, 111, 135 and 119 kcal mol<sup>-1</sup> respectively)

A. -222 kcal

B. -88 kcal

C. -111 kcal

D. -79 kcal

**Answer: D**

 [Watch Video Solution](#)

57. Dissociation of water takes place in two steps :



Water is the bond energy of  $O - H$  bond ?

A.  $463.15 \text{ kJ mol}^{-1}$

B.  $428.5 \text{ kJ mol}^{-1}$

C.  $69.3 \text{ kJ mol}^{-1}$

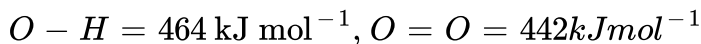
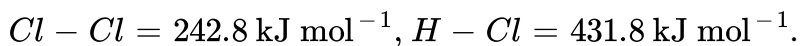
D.  $926.3 \text{ kJ mol}^{-1}$

**Answer: A**

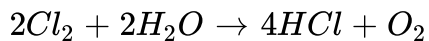


[View Text Solution](#)

58. Bond energies of few bonds are given below :



Using the B.E., calculate  $\Delta H$  for the following reaction,



- A. 906 kJ mol<sup>-1</sup>
- B. 172.4 kJ mol<sup>-1</sup>
- C. 198.8 kJ mol<sup>-1</sup>
- D. 442 kJ mol<sup>-1</sup>

**Answer: B**

 [Watch Video Solution](#)

59. Which is the correct order of bond energy of single, double and triple bonds between carbon atoms ?

- A.  $C - C > C = C > C \equiv C$
- B.  $C = C > C \equiv C > C - C$
- C.  $C \equiv C > C - C > C = C$

D.  $C \equiv C > C = C > C - C$

**Answer: D**



[Watch Video Solution](#)

**60.** In endothermic reactions,

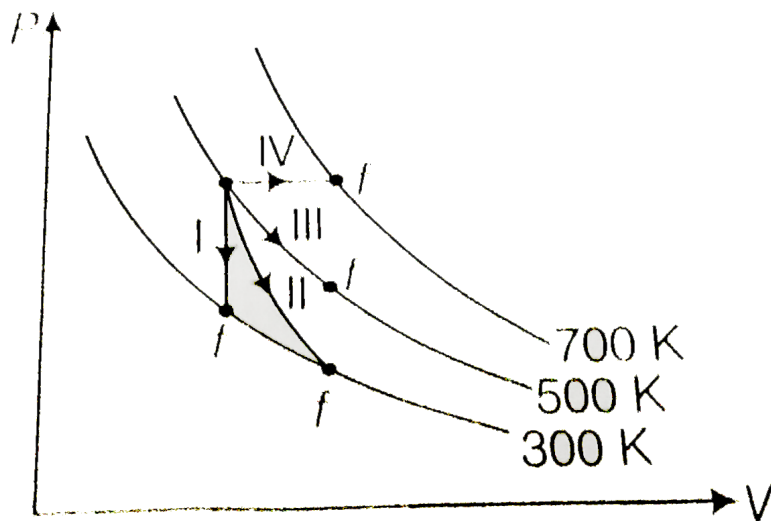
- A. reactants have more energy than products
- B. reactants have less energy than products
- C. reactants and products have same energy
- D. reactants have lower temperature than products.

**Answer: B**



[Watch Video Solution](#)

61. Thermodynamic processes are indicated in the following diagram



Match the following :

Column-I	Column-II
P. Process I	a. Adiabatic
Q. Process II	b. Isobaric
R. Process III	c. Isochoric
S. Process IV	d. Isothermal

[▶ Watch Video Solution](#)

62. The total entropy change ( $\Delta S_{\text{total}}$ ) for the system and surrounding of a spontaneous process is given by

A.  $\Delta S_{\text{total}} = \Delta S_{\text{system}} + \Delta S_{\text{surr}} > 0$

B.  $\Delta S_{\text{total}} = \Delta S_{\text{system}} + \Delta S_{\text{surr}} < 0$

C.  $\Delta S_{\text{system}} = \Delta S_{\text{total}} + \Delta S_{\text{surr}} > 0$

D.  $\Delta S_{\text{surr}} = \Delta S_{\text{total}} + \Delta S_{\text{system}} < 0$

**Answer: A**

 [Watch Video Solution](#)

**63.** Which of the following expressions regarding entropy is not correct?

A.  $\Delta S_{\text{system}} = \frac{q}{T}$

B.  $\Delta S_{\text{system}} = \Delta S_{\text{total}} + \Delta S_{\text{surrounding}}$

C.  $\Delta S = \Delta S_{\text{final}} - S_{\text{initial}}$

D.  $\Delta S_{\text{total}} = \Delta S_{\text{system}} + \Delta S_{\text{surrounding}}$

**Answer: B**

 [Watch Video Solution](#)

64. For a reaction,  $P + Q \rightarrow R + S$ . The value of  $\Delta H^\circ$  is  $-30 \text{ kJ mol}^{-1}$  and  $\Delta S$  is  $-100 \text{ J K}^{-1}\text{mol}^{-1}$ . At what temperature the reaction will be at equilibrium?

A.  $27^\circ \text{ C}$

B.  $52^\circ \text{ C}$

C.  $30^\circ \text{ C}$

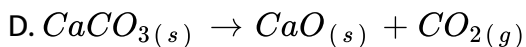
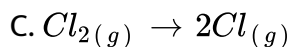
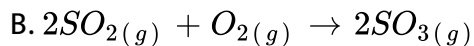
D.  $45^\circ \text{ C}$

Answer: A

 [Watch Video Solution](#)

65. Which of the following reactions will have the value of  $\Delta S$  with a negative sign?

A.  $H_2O_{(l)} \rightarrow H_2O_{(g)}$



**Answer: B**

 [Watch Video Solution](#)

**66.** A reaction is at equilibrium at  $100^{\circ}C$  and the enthalpy change for the reaction is  $42.6 \text{ kJ mol}^{-1}$ . What will be the value of  $\Delta S$  in  $\text{J K}^{-1}\text{mol}^{-1}$ ?

A. 120

B. 426.2

C. 373.1

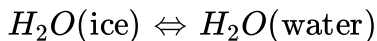
D. 114.2

**Answer: D**



 [Watch Video Solution](#)

67. Enthalpy change for the process,



is  $6.01 \text{ kJ mol}^{-1}$ . The entropy change of 1 mole of ice at its melting point will be

A.  $12 \text{ J K}^{-1} \text{ mol}^{-1}$

B.  $22 \text{ J K}^{-1} \text{ mol}^{-1}$

C.  $100 \text{ J K}^{-1} \text{ mol}^{-1}$

D.  $30 \text{ J K}^{-1} \text{ mol}^{-1}$

**Answer: B**

 [Watch Video Solution](#)

68. At what temperature liquid water will be in equilibrium with water vapour?

$$\Delta H_{\text{vap}} = 40.73 \text{ kJ mol}^{-1}, \Delta S_{\text{vap}} = 0.109 \text{ kJ K}^{-1}\text{mol}^{-1}$$

A. 282.4 K

B. 373.6 K

C. 100 K

D. 400 K

**Answer: B**



[Watch Video Solution](#)

**69.** For a reaction:  $X \rightarrow Y + Z$

Absolute entropies are  $X = 120 \text{ J K}^{-1}\text{mol}^{-1}$ ,

$Y = 213.8 \text{ J K}^{-1}\text{mol}^{-1}$  and  $Z = 197.9 \text{ J K}^{-1}\text{mol}^{-1}$ .

What will be the entropy change at 298 K and 1 atm?

A.  $291.7 \text{ J K}^{-1}$

B.  $255 \text{ J K}^{-1}$

C.  $213.8 JK^{-1}$

D.  $257.3 J K^{-1}$

**Answer: A**

 [Watch Video Solution](#)

70. What will be the melting point of KCl if enthalpy change for the reaction is  $7.25 J mol^{-1}$  and entropy change is  $0.007 J K^{-1}mol^{-1}$ ?

A. 1835.2 K

B. 173 K

C. 1035.7 K

D. 1285.2 K

**Answer: C**

 [Watch Video Solution](#)

71. For reversible reaction :  $X_{(g)} + 3Y_{(g)} \rightleftharpoons 2Z_{(g)}$ ,  $\Delta H = -40 \text{ kJ}$

Standard entropies of X, Y and Z are 60, 40 and  $50 \text{ J K}^{-1}, \text{ol}^{-1}$

respectively. The temperature at which the above reaction is in equilibrium is

A. 273 K

B. 600 K

C. 500 K

D. 400 K

**Answer: C**

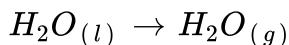


**Watch Video Solution**

72. At 373 K, steam and water are in equilibrium and

$\Delta H = 40.98 \text{ kJ mol}^{-1}$ . What will be  $\Delta S$  for conversion of water into

system ?



A.  $109.8 \text{ J K}^{-1}\text{mol}^{-1}$

B.  $31 \text{ J K}^{-1}\text{mol}^{-1}$

C.  $21.98 \text{ J K}^{-1}\text{mol}^{-1}$

D.  $326 \text{ J K}^{-1}\text{mol}^{-1}$

**Answer: A**

 [Watch Video Solution](#)

**73.** Read the following statements regarding spontaneity of a process and mark the appropriate choice.

(i) When enthalpy factor is absent then randomness factor decides spontaneity of a process.

(ii) When randomness factor is absent then enthalpy factor decides spontaneity of a process.

(iii) When both the factors take place simultaneously, the magnitude of both of factors decide spontaneity of a process.

- A. Statements (i) and (ii) are correct and (iii) is incorrect.
- B. Statement (iii) is correct, (i) and (ii) are incorrect.
- C. Statements (i), (ii) and (iii) are correct.
- D. Statements (i), (ii) and (iii) are incorrect.

**Answer: C**

 [Watch Video Solution](#)

**74.** Which of the following processes is a non-spontaneous process?

- A. Dissolution of salt of sugar in water
- B. Mixing of different gases through diffusion
- C. Precipitation of copper when zinc rod is dipped in aqueous solution of copper sulphate
- D. Flow of heat from a cold body to a hot body in contact

**Answer: D**



Watch Video Solution

75. Which of the following statements regarding Gibb's energy change is correct?

- A. If  $\Delta G$  is negative (lt 0), the process is non-spontaneous.
- B. If  $\Delta G$  is positive (gt 0), the process is spontaneous.
- C. If  $\Delta G$  is negative (lt 0), the process is spontaneous.
- D. If  $\Delta G$  is positive (gt 0), the process is in equilibrium.

Answer: C



Watch Video Solution

76. For a reaction to be spontaneous at any temperature, the conditions are

- A.  $\Delta H = +ve, \Delta S = +ve$

B.  $\Delta H = -ve, \Delta S = -ve$

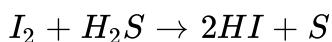
C.  $\Delta H = +ve, \Delta S = -ve$

D.  $\Delta H = -ve, \Delta S = +ve$

**Answer: D**

 [Watch Video Solution](#)

77. For the reaction given below the value of standard Gibbs free energy of formation at 298 K are given. What is the nature of the reaction?



$$\Delta G_f^\circ (HI) = 1.8 \text{ kJ mol}^{-1}, \Delta G_f^\circ (H_2S) = 33.8 \text{ kJ mol}^{-1}$$

- A. Non-spontaneous in forward direction.
- B. Spontaneous in forward direction.
- C. Spontaneous in backward direction.
- D. Non-spontaneous in both forward and backward directions.



**Answer: B**



[Watch Video Solution](#)

**78.** What is the entropy change when 1 mole oxygen gas expands isothermally and reversibly from an initial volume of 10 L to 100 L at 300 K?

A.  $19.14 \text{ J K}^{-1}$

B.  $109.12 \text{ J K}^{-1}$

C.  $29.12 \text{ J K}^{-1}$

D.  $10 \text{ J K}^{-1}$

**Answer: A**



[Watch Video Solution](#)

79. One word answer is given for the following definitions, Mark the one which is incorrect.

- A. The process in which temperature remains constant : Isobaric
- B. The process in which volume remains constant : Isochoric
- C. The relation between  $\Delta H$  and  $\Delta U$  when all the reactants and products are solid :  $\Delta H = \Delta U$
- D. The relation between  $\Delta G$ ,  $\Delta H$  and  $\Delta S$ :

$$\Delta G = \Delta H - T\Delta S$$

**Answer: A**



[Watch Video Solution](#)

80. In a reaction  $P + Q \rightarrow R + S$ , there is no change in entropy, Enthalpy change for the reaction ( $\Delta H$ ) is  $12 \text{ kJ mol}^{-1}$ . Under what conditions, reaction will have negative value of free energy change?

- A. If  $\Delta H$  is positive
- B. If  $\Delta H$  is negative.
- C. If  $\Delta H$  is  $24 \text{ kJ mol}^{-1}$ .
- D. If temperature of reaction is high

**Answer: B**

 [Watch Video Solution](#)

81. For reaction,
- $$2K_{(g)} + L_{(g)} \rightarrow 2M_{(g)}, \Delta U^\circ = -10.5 \text{ KJ and } \Delta S^\circ = -44.1 \text{ J K}^{-1}$$
- . Calculate  $\Delta G^\circ$  for the reaction and predict whether the reaction will be spontaneous or non-spontaneous?
- A.  $\Delta G = +0.16 \text{ kJ}$ , non-spontaneous
  - B.  $\Delta G = -0.16 \text{ kJ}$ , spontaneous
  - C.  $\Delta G = +26.12 \text{ kJ}$ , non-spontaneous
  - D.  $\Delta G = -26.12 \text{ kJ}$ , spontaneous

**Answer: A**

 [Watch Video Solution](#)

**82.** Which of the following statements is not correct ?

- A. For a spontaneous process,  $\Delta G$  must be negative.
- B. Enthalpy, entropy, free energy etc. are state variables.
- C. A spontaneous process is reversible in nature.
- D. Total of all possible kinds of energy of a system is called its internal energy.

**Answer: C**

 [Watch Video Solution](#)

**83.**  $\Delta G$  is the net energy available to do useful work and is a measure of free energy. If a reaction has positive enthalpy change and positive

entropy change, under what conditions will the reaction be spontaneous?

- A.  $\Delta G$  will be positive at low temperature hence reaction is spontaneous at low temperature.
- B.  $\Delta G$  is negative at high temperature hence reaction is spontaneous at high temperature.
- C.  $\Delta G$  is negative at low temperature.
- D.  $\Delta G$  is negative at all temperature hence reaction is spontaneous at all temperatures.

**Answer: B**



[Watch Video Solution](#)

**84.** Dissolution of ammonium chloride in water is an endothermic reaction, yet it is a spontaneous process. This is due to the fact that

A.  $\Delta H$  is  $+ve$ ,  $\Delta S$  is  $-ve$

B.  $\Delta H$  is  $-ve$ ,  $\Delta S$  is  $+ve$

C.  $\Delta H$  is  $+ve$ ,  $\Delta S$  is  $+ve$  and  $\Delta H < T\Delta S$

D.  $\Delta H$  is  $+ve$  and  $\Delta H > T\Delta S$

**Answer: C**

 [Watch Video Solution](#)

**85.** What will be the signs of  $\Delta H$  and  $\Delta S$  when NaOH is dissolved in water?

A.  $\Delta H$   $\Delta S$   
- -

B.  $\Delta H$   $\Delta S$   
+ -

C.  $\Delta H$   $\Delta S$   
- +

D.  $\Delta H$   $\Delta S$   
+ +

**Answer: C**



Watch Video Solution

86. At absolute zero, the entropy of a pure crystal is zero. This is

- A. first law of thermodynamics
- B. second law of thermodynamics
- C. third law of thermodynamics
- D. zeroth law of thermodynamics

Answer: C



Watch Video Solution

87. At dynamic equilibrium the reaction on both sides occur at the same rate and the mass on both sides of the equilibrium does not undergo any change. This condition can be achieved only when the value of  $\Delta G$  is

- A.  $-1$

B. +1

C. +2

D. 0

**Answer: D**

 [Watch Video Solution](#)

88. 300 पर एक अभिक्रिया के लिए साम्य स्थिरांक 10 है।  $\Delta G^\ominus$  का मान क्या होगा ?

$$R = 8.314JK^{-1}\text{mol}^{-1}$$

A.  $-5.74kJ$

B.  $-574kJ$

C.  $+11.48kJ$

D.  $+5.74kJ$

**Answer: A**

 [Watch Video Solution](#)



89. A reaction attains equilibrium state under standard conditions, then what is incorrect for this?

- A. Equilibrium constant  $K = 0$
- B. Equilibrium constant  $K = 1$
- C.  $\Delta G^\circ = 0$  and  $\Delta H^\circ = T\Delta S^\circ$
- D.  $\Delta S = 0$  and  $\Delta H = T\Delta S$

Answer: A



Watch Video Solution

90. Which is the correct relationship between  $\Delta G^\circ$  and equilibrium constant  $K_p$ ?

- A. a.  $K_p = -RT \log \Delta G^\circ$
- B. b.  $K_p = [E/RT]^{\Delta G^\circ}$

C. c.  $K_p = -\Delta G^\circ / RT$

D. d.  $K_p = e^{-\Delta G^\circ / RT}$

**Answer: D**

 [Watch Video Solution](#)

### Higher Order Thinking Skills

1. A ideal gas does work on its surroundings when it expands by 2.5 L against external pressure 2 atm. This work done is used to heat up 1 mole of water at 293 K. What would be the final temperature of water in kelvin if specific heat for water is  $4.184 \text{ Jg}^{-1}\text{K}^{-1}$ ?

A. 300

B. 600

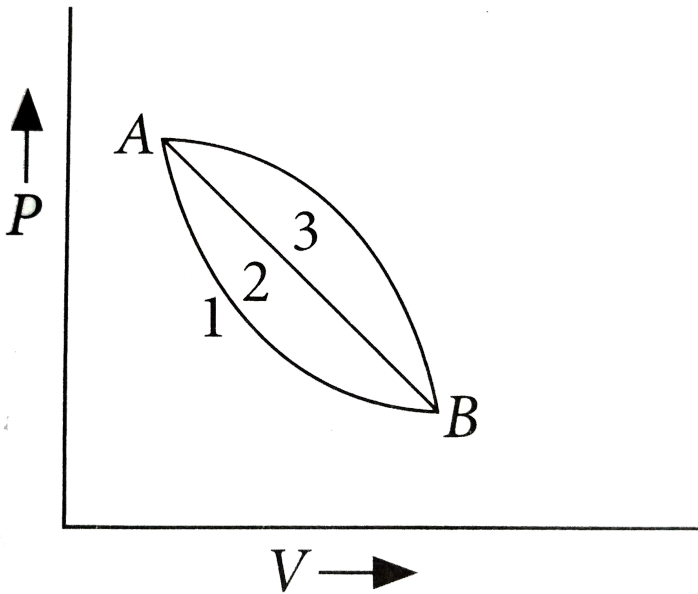
C. 200

D. 1000

Answer: A

[▶ Watch Video Solution](#)

2. A given mass of gas expands from state A to state B by three paths 1, 2, and 3 as shown in the figure :



If  $w_1$ ,  $w_2$  and  $w_3$  respectively, be the work done by the gas along three paths, then

A.  $w_1 > w_2 > w_3$

B.  $w_1 < w_2 < w_3$

C.  $w_1 = w_2 = w_3$

D.  $w_1 < w_2, w_1 < w_3$

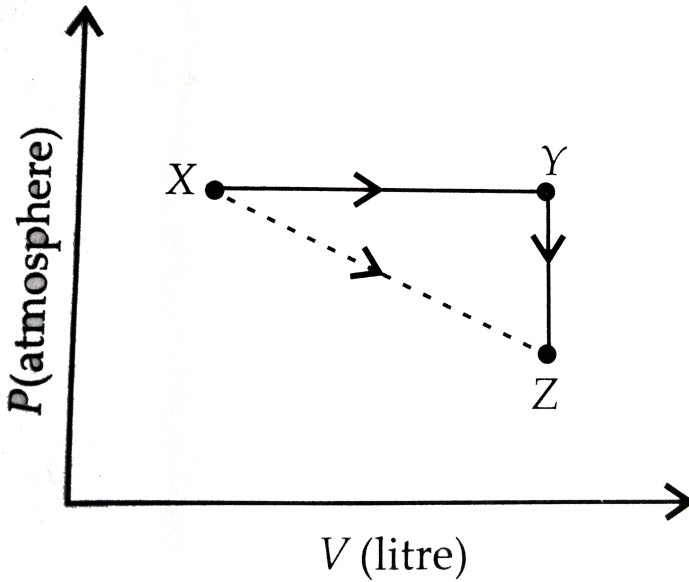
**Answer: B**



**Watch Video Solution**

3. For an ideal gas, consider only P-V work in going from an initial state X to the final state Z. The final state Z can be reached by either of the two paths shown in the figure. Which of the following choice(s) is(are)

correct? [Take  $\Delta S$  as change in entropy and  $w$  as work done]



A.  $\Delta S_{X \rightarrow Z} = \Delta S_{X \rightarrow Y} + \Delta S_{Y \rightarrow Z}$

B.  $w_{X \rightarrow Z} = w_{X \rightarrow Y} + w_{Y \rightarrow Z}$

C.  $w_{X \rightarrow Y \rightarrow Z} \neq w_{X \rightarrow Y}$

D.  $\Delta S_{X \rightarrow Y \rightarrow Z} = \Delta S_{X \rightarrow Y}$

Answer: A



Watch Video Solution

4.  $H_2$  gas is mixed with air at  $25^\circ C$  under a pressure of 1 atmosphere and exploded in a closed vessel. The heat of the reaction,  $H_{2(g)} + \frac{1}{2}O_{2(g)} \rightarrow H_2O_{(v)}$  at constant volume,  $\Delta U_{298\text{ K}} = -240.60 \text{ kJ mol}^{-1}$  and  $C_V$  values for  $H_2O$  vapour and  $N_2$  in the temperature range 298 K and 3200 K are  $39.06 \text{ JK}^{-1}\text{mol}^{-1}$  and  $26.40 \text{ JK}^{-1}\text{mol}^{-1}$  respectively. The explosion temperature under adiabatic conditions is (Given :  $n_{N_2} = 2$ )

- A. 2900 K
- B.  $2900^\circ C$
- C. 2917 K
- D.  $3000^\circ C$

**Answer: C**



**Watch Video Solution**

5. Bond dissociation enthalpies of  $H_{2(g)}$  and  $N_{2(g)}$  are  $426.0 \text{ kJ mol}^{-1}$  and  $941.8 \text{ kJ mol}^{-1}$ , respectively, and enthalpy of formation of  $NH_{3(g)}$  is  $-46 \text{ kJ mol}^{-1}$ . What are the enthalpy of atomisation of  $NH_{3(g)}$  and the average bond enthalpy of  $N - H$  bond respectively ( in  $\text{kJ mol}^{-1}$ )?

A. 1170.9, 390.3

B. 117, 300

C. 300, 200

D. 2000, 1975

**Answer: A**



**Watch Video Solution**

6. Consider the following two reactions :

(i) Propene +  $H_2 \rightarrow$  Propane,  $\Delta H_1$

(ii) Cyclopropane +  $H_2 \rightarrow$  Propane,  $\Delta H_2$

Then,  $\Delta H_2 - \Delta H_1$  will be

A. (a) 0

B. (b)  $2BE_{C-C} - BE_{C=C}$

C. (c)  $BE_{(C=C)}$

D. (d)  $2BE_{C=C} - BE_{C-C}$

**Answer: B**



**Watch Video Solution**

7. A gaseous system is initially characterised by 500 mL volume and 1 atm pressure at 298 K. This system is allowed to do work as

In isobaric conditions it expands to 800 mL resulting a decrease in pressure and temperature to 0.6 atm and 273 K respectively.

(ii) In adiabatic conditions it is allowed to expand upto 800 mL and results a decrease in pressure and temperature to 0.6 atm and 273 K respectively.



If Gibbs energy change in (i) is  $\Delta G_a$  and in (ii) is  $\Delta G_b$ , then what will be the ratio of  $\frac{\Delta G_a}{\Delta G_b}$ ? (a) 0 (B) 1 (C) between 0 -1 (D) more than 1

A. 0

B. 1

C. between 0 -1

D. gt 1

**Answer: B**

 [Watch Video Solution](#)

8. What will be  $\Delta G$  for the reaction at  $25^\circ C$  when partial pressures of reactants  $H_2$ ,  $CO_2$ ,  $H_2O$  and  $CO$  are 10, 20, 0.02 and 0.01 atm respectively. (Given :

$G_{H_2O}^\circ = -228.58 \text{ kJ}$ ,  $G_{CO}^\circ = -137.15 \text{ kJ}$ ,  $G_{CO}^\circ = -394.37 \text{ kJ}$ .)

A.  $+5.61 \text{ kJ}$

B.  $-5.61 \text{ kJ}$

C.  $7.09\text{kJ}$

D.  $-8.13\text{kJ}$

**Answer: B**

 [Watch Video Solution](#)

## Ncert Exemplar Problems

1. Thermodynamics is not concerned about \_\_\_\_\_.

- A. energy changes involved in a chemical reaction
- B. the extent to which a chemical reaction proceeds
- C. the rate at which a reaction proceeds
- D. the feasibility of a chemical reaction

**Answer: C**

 [Watch Video Solution](#)

2. Which of the following statements is correct?

- A. The presence of reacting species in a covered beaker is an example of open system.
- B. There is an exchange of energy as well as matter between the system and the surroundings in a closed system.
- C. The presence of reactants in a closed vessel made up of copper is an example of a closed system.
- D. The presence of reactants in a thermos flask or any other closed insulated vessel is an example of a closed system.

**Answer: C**



**Watch Video Solution**

3. The state of gas can be described by quoting the relationship between

- A. pressure, volume, temperature
- B. temperature, amount, pressure
- C. amount, volume, temperature
- D. pressure, volume, temperature, amount

**Answer: D**



**Watch Video Solution**

4. The volume of gas is reduced to half from its original volume. The specific heat will be

- A. be reduced to half
- B. be doubled
- C. remain constant
- D. be increased four times

**Answer: C**



Watch Video Solution

5.  $\Delta U^\circ$  of combustion of  $CH_4(g)$  at certain temperature is  $-393 \text{ kJ mol}^{-1}$ . The value of  $\Delta H^\circ$  is

A. zero

B.  $< \Delta H^\circ$

C.  $> \Delta U^\circ$

D. equal to  $\Delta U^\circ$

Answer: B



Watch Video Solution

6. In an adiabatic process, no transfer of heat takes place between system and surroundings. Choose the correct option for free expansion of an ideal gas under adiabatic condition from the following.

A.  $q = 0, \Delta T \neq 0, W = 0$

B.  $q \neq 0, \Delta T = 0, W = 0$

C.  $q = 0, \Delta T = 0, W = 0$

D.  $q = 0, \Delta T < 0, W \neq 0$

**Answer: C**

 [Watch Video Solution](#)

7. The pressure-volume work for an ideal gas can be calculated by using the expression  $W = - \int_{V_i}^{V_f} P_{ex} dV$ . The work can also be calculated from the pV - plot by using the area under the curve within the specified limits. When an ideal gas is compressed (i) reversibly or (ii) irreversibly from volume  $V_i$  to  $V_f$ . Choose the correct option.

A.  $W_{\text{reversible}} = W_{\text{irreversible}}$

B.  $W_{\text{reversible}} < W_{\text{irreversible}}$

C.  $W_{\text{reversible}} > W_{\text{irreversible}}$

$$D. W_{\text{reversible}} = W_{\text{irreversible}} + P_{\text{ex}} \Delta V$$

**Answer: B**

 [Watch Video Solution](#)

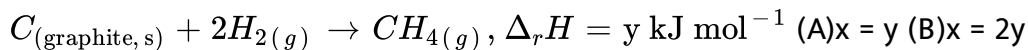
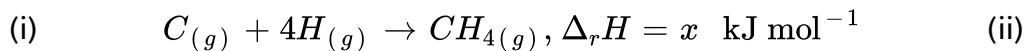
8. The entropy change can be calculated by using the expression,  $\Delta S = \frac{q_{\text{rev}}}{T}$ . When water freezes in a glass beaker, choose the correct statement amongst the following:

- A.  $\Delta S_{\text{system}}$  decreases but  $\Delta S_{\text{surroundings}}$  remains the same.
- B.  $\Delta S_{\text{system}}$  increases but  $\Delta S_{\text{surroundings}}$  decreases.
- C.  $\Delta S_{\text{system}}$  decrease but  $\Delta S_{\text{surroundings}}$  increases.
- D.  $\Delta S_{\text{system}}$  decreases and  $\Delta S_{\text{surroundings}}$  also decreases.

**Answer: C**

 [Watch Video Solution](#)

9. Consider the reactions given below. On the basis of these reactions find out which of the algebraic relations given in options (a) to (d) is correct ?



(C)x > y (D)x < y

A. x = y

B. x = 2y

C. x > y

D. x < y

**Answer: C**

 [Watch Video Solution](#)

10. The enthalpies of elements in their standard states are taken as zero.

The enthalpy of formation of a compound



- A. is always negative
- B. is always positive
- C. may be positive or negative
- D. is never negative

**Answer: C**

 [Watch Video Solution](#)

**11.** Enthalpy of sublimation of a substance is equal to

- A. enthalpy of fusion + enthalpy of vapourisation
- B. enthalpy of fusion
- C. enthalpy of vapourisation
- D. twice the enthalpy of vapourisation.

**Answer: A**

 [Watch Video Solution](#)

## Assertion Reason

1. Assertion : The presence of reactants in a closed vessel made of conducting material is an example of a closed system.

Reason : In a closed system, there is no exchange of matter but exchange of energy is possible between the system and the surroundings.

- A. If both assertion and reason are true and reason is the correct explanation of assertion.
- B. If both assertion and reason are true but reason is not the correct explanation of assertion
- C. If assertion is true but reason is false.
- D. If both assertion and reason are false.

**Answer: A**



[Watch Video Solution](#)

2. Assertion : In adiabatic system,  $\Delta U = w_{ad}$ .

Reason : In adiabatic system, no transfer of heat takes place.

- A. If both assertion and reason are true and reason is the correct explanation of assertion.
- B. If both assertion and reason are true but reason is not the correct explanation of assertion
- C. If assertion is true but reason is false.
- D. If both assertion and reason are false.

**Answer: A**



[Watch Video Solution](#)

3. Assertion (A): Internal energy change in a cyclic process is zero.

Reason (R) : Internal energy is a state function.

- A. If both assertion and reason are true and reason is the correct explanation of assertion.
- B. If both assertion and reason are true but reason is not the correct explanation of assertion
- C. If assertion is true but reason is false.
- D. If both assertion and reason are false.

**Answer: A**

 [Watch Video Solution](#)

4. Assertion : Work done during free expansion of an ideal gas whether reversible or irreversible is positive.

Reason : During free expansion, external pressure is always less than the pressure of the system.

- A. If both assertion and reason are true and reason is the correct explanation of assertion.

- B. If both assertion and reason are true but reason is not the correct explanation of assertion
- C. If assertion is true but reason is false.
- D. If both assertion and reason are false.

**Answer: D**

 [Watch Video Solution](#)

5. Assertion : The difference between  $\Delta H$  and  $\Delta U$  is not significant for systems consisting of only solids and/or liquids.

Reason : Solids and liquids do not suffer any significant volume changes upon heating.

- A. If both assertion and reason are true and reason is the correct explanation of assertion.
- B. If both assertion and reason are true but reason is not the correct explanation of assertion

C. If assertion is true but reason is false.

D. If both assertion and reason are false.

**Answer: A**



**Watch Video Solution**

**6.** Assertion : For the change,  $H_2O_{(l)} \rightarrow H_2O_{(s)}$ ,  $\Delta H = \Delta U$ .

Reason : No enthalpy change is involved in this process.

A. If both assertion and reason are true and reason is the correct explanation of assertion.

B. If both assertion and reason are true but reason is not the correct explanation of assertion

C. If assertion is true but reason is false.

D. If both assertion and reason are false.

**Answer: C**



[Watch Video Solution](#)

7. Assertion :  $\Delta H$  for an exothermic reaction is negative and for an endothermic reaction is positive.

Reason : Enthalpy is an extensive property.

- A. If both assertion and reason are true and reason is the correct explanation of assertion.
- B. If both assertion and reason are true but reason is not the correct explanation of assertion
- C. If assertion is true but reason is false.
- D. If both assertion and reason are false.

**Answer: B**



[Watch Video Solution](#)

8. Assertion : The enthalpy change for the reaction  $CaO_{(s)} + CO_{2(g)} \rightarrow CaCO_{3(s)}$  is called enthalpy of formation of calcium carbonate.

Reason : The reaction involves formation of 1 mole of  $CaCO_3$  from its constituent elements.

- A. (a) If both assertion and reason are true and reason is the correct explanation of assertion.
- B. (b) If both assertion and reason are true but reason is not the correct explanation of assertion
- C. (c) If assertion is true but reason is false.
- D. (d) If both assertion and reason are false.

**Answer: D**



**Watch Video Solution**



9. Assertion : The solubility of most salts in water increases with rise of temperature.

Reason : For most of the ionic compounds,  $\Delta_{\text{sol}}H^\circ$  is positive and the dissociation process is endothermic.

- A. If both assertion and reason are true and reason is the correct explanation of assertion.
- B. If both assertion and reason are true but reason is not the correct explanation of assertion
- C. If assertion is true but reason is false.
- D. If both assertion and reason are false.

**Answer: A**



**Watch Video Solution**

10. Assertion : Heat of neutralisation of  $HNO_3$  and  $NaOH$  is same as that of  $HCl$  and  $KOH$ .

Reason : Both  $HNO_3$  and  $HCl$  are strong acids and  $NaOH$  and  $KOH$  are strong bases.

- A. If both assertion and reason are true and reason is the correct explanation of assertion.
- B. If both assertion and reason are true but reason is not the correct explanation of assertion
- C. If assertion is true but reason is false.
- D. If both assertion and reason are false.

**Answer: A**



**Watch Video Solution**

**11. Assertion :** Heat added to a system at lower temperature causes greater randomness than when the same quantity of heat is added to it at higher temperature.

**Reason :** Entropy is a measure of the degree of randomness or disorder in the system.

- A. (a) If both assertion and reason are true and reason is the correct explanation of assertion.
- B. (b) If both assertion and reason are true but reason is not the correct explanation of assertion
- C. (c) If assertion is true but reason is false.
- D. (d) If both assertion and reason are false.

**Answer: B**



**Watch Video Solution**

12. Assertion : In the proces,  $H_{2(g)} \rightarrow 2H_{(g)}$  .entropy increases.

Reason : Breaking of bonds is an endothermic process.

- A. If both assertion and reason are true and reason is the correct explanation of assertion.
- B. If both assertion and reason are true but reason is not the correct explanation of assertion
- C. If assertion is true but reason is false.
- D. If both assertion and reason are false.

**Answer: B**



[Watch Video Solution](#)

13. Assertion : An exothermic process which is non-spontaneous at high temperature may become spontaneous at low temperature.

Reason : Spontaneous process is an irreversible process and may be reversed by some external agency.

- A. If both assertion and reason are true and reason is the correct explanation of assertion.
- B. If both assertion and reason are true but reason is not the correct explanation of assertion
- C. If assertion is true but reason is false.
- D. If both assertion and reason are false.

**Answer: B**

 [Watch Video Solution](#)

**14.** Assertion : If both  $\Delta H^\circ$  and  $\Delta S^\circ$  are positive then reaction will be spontaneous at high temperature.

Reason : All processes with positive entropy change are spontaneous.

- A. If both assertion and reason are true and reason is the correct explanation of assertion.
- B. If both assertion and reason are true but reason is not the correct explanation of assertion
- C. If assertion is true but reason is false.
- D. If both assertion and reason are false.

**Answer: C**

 [Watch Video Solution](#)

**15.** Assertion : Third law of thermodynamics is confined to pure crystalline solids.

Reason : Theoretical arguments and practical evidences have shown that entropy of solutions and super cooled liquids is not zero at 0 K.

- A. If both assertion and reason are true and reason is the correct explanation of assertion.

B. If both assertion and reason are true but reason is not the correct explanation of assertion

C. If assertion is true but reason is false.

D. If both assertion and reason are false.

**Answer: A**



**Watch Video Solution**

## Thermodynamic Terms

1. The system in which there is no exchange of matter, work, or energy from the surroundings is

A. closed

B. adiabatic

C. isolated

D. isothermal.

**Answer: C**

 [Watch Video Solution](#)

2. A process in which the system does not exchange heat with the surroundings is known as

A. isothermal

B. adiabatic

C. thermal

D. isochoric

**Answer: B**

 [Watch Video Solution](#)



3.  $\Delta U = q + w$ , is mathematical expression for

- A. first law of thermodynamics
- B. second law of thermodynamics
- C. third law of thermodynamics
- D. zeroth law of thermodynamics

**Answer: A**



[Watch Video Solution](#)

## Applications

1. The work done during the expansion of a gas from a volume of  $4dm^3$  to  $6dm^3$  against a constant external pressure of 3 atm is (1 L atm = 101.32 J)

A.  $-6J$

B.  $-608J$

C.  $+304J$

D.  $-304J$

**Answer: B**

 [Watch Video Solution](#)

2. What will be the work done when one mole of a gas expands isothermally from 15 L to 50 L against a constant pressure of 1 atm at  $25^{\circ}C$ ?

A.  $-3542cal$

B.  $-843.3cal$

C.  $-718cal$

D.  $-60.23cal$

**Answer: C**



[Watch Video Solution](#)

3. What is the work done when 1 mole of a gas expands isothermally from 25 L to 250 L at a constant pressure of 1 atm and a temperature of 300 K ?

A. (a)  $-3542J$

B. (b)  $-5744J$

C. (c)  $-2657J$

D. (d)  $-4890J$

**Answer: B**



[Watch Video Solution](#)

4. In thermodynamics, a process is called reversible when

A. surrounding and system change are same

B. there is no boundary between system and surrounding

C. surrounding is always in equilibrium with system

D. system change into surrounding spontaneously:

**Answer: C**

 [Watch Video Solution](#)

5. For an isothermal reversible expansion process, the value of  $q$  can be calculated by the expressin

A.  $q = 2.303nRT \log. \frac{V_2}{V_1}$

B.  $q = - 2.303nRT \log. \frac{V_2}{V_1}$

C.  $q = - 2.303nRT \log. \frac{V_1}{V_2}$

D.  $q = - P_{\text{exp}}nRT \log. \frac{V_1}{V_2}$

**Answer: A**

 [Watch Video Solution](#)

6. In an adiabatic expansion of an ideal gas -

A. (a)  $W = -\Delta U$

B. (b)  $W = \Delta U$

C. (c)  $\Delta U = 0$

D. (d)  $W = 0$

**Answer: B**



[Watch Video Solution](#)

7. Two litres of an ideal gas at a pressure of 10 atm expands isothermally at  $25^\circ C$  into a vacuum until its total volume is 10 litres. How much heat is absorbed and how much work is done in the expansion ?

A. 10 J, 10 J

B. 8 J, 10 J

C. 18 J, 0 J

D. 0 J, 0 J

**Answer: D**

 [Watch Video Solution](#)

8. If the heat change at constant volume for decomposition of silver oxide is 80.25 kJ, what will be the heat change at constant pressure ?

A. 80.25 kJ

B. >80.25kJ

C. <80.25 kJ

D. 160.50 kJ

**Answer: B**

 [Watch Video Solution](#)

9. The enthalpy change of a reaction does not depend upon

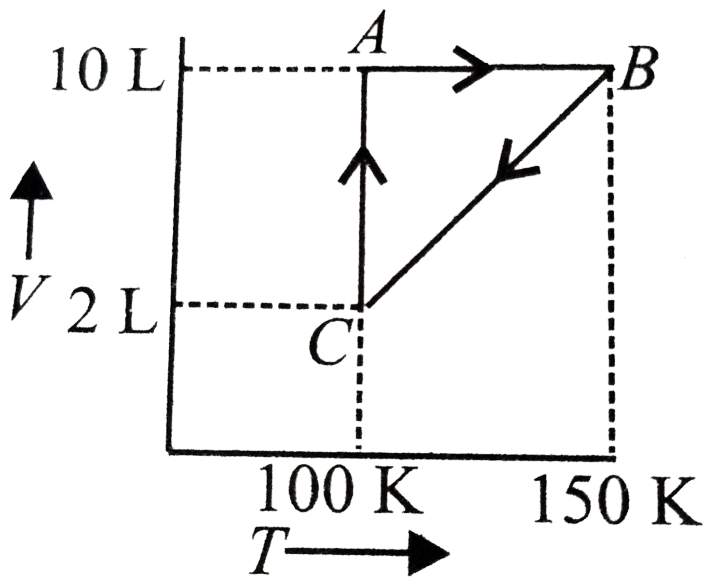
- A. Nature of intermediate state
- B. Difference in initial and final temperature
- C. Physical state of reactant
- D. Use of different reactant for the same reaction

**Answer: C**



**Watch Video Solution**

10. Consider the given diagram for 1 mole of a gas X and answer the following question.



The process  $A \rightarrow B$  represents

- A. isobaric change
- B. isothermal change
- C. adiabatic change
- D. isochoric change.

**Answer: D**

[Watch Video Solution](#)



11. Which of the following relationships is not correct for the relation between  $\Delta H$  and  $\Delta U$ ?

A. When  $\Delta n_g = 0$  then  $\Delta H = \Delta U$

B. When  $\Delta n_g > 0$  then  $\Delta H > \Delta U$

C. When  $\Delta n_g < 0$  then  $\Delta H < \Delta U$

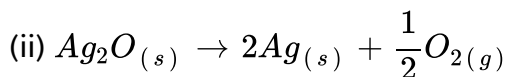
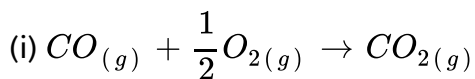
D. When  $\Delta n_g RT = 0$  then  $\Delta H = \Delta U$

Answer: D



Watch Video Solution

12. Two reactions are given below :



Which of the following statements is true ?

A. For (i)  $\Delta H < \Delta U$  and for (ii)  $\Delta H > \Delta U$

B. For (i)  $\Delta H > \Delta U$  and for (ii)  $\Delta H < \Delta U$

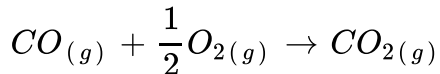
C. For both (i) and (ii)  $\Delta H > \Delta U$

D. For both (i) and (ii)  $\Delta H < \Delta U$

**Answer: A**

 [Watch Video Solution](#)

**13.** Consider the following reaction :



How are  $\Delta U$  and  $\Delta H$  related for the reaction ?

A. (a)  $\Delta H = \Delta U - 0.5RT$

B. (b)  $\Delta H = \Delta U - RT$

C. (c)  $\Delta H = \Delta U + 0.5RT$

D. (d)  $\Delta H = \Delta U - 1.5RT$

**Answer: A**

14. Match the column I with column II and mark the appropriate choice.

Column I		Column II	
(A)	$\text{H}_{2(g)} + \text{Br}_{2(g)} \rightarrow 2\text{HBr}_{(g)}$	(i)	$\Delta H = \Delta U - 2RT$
(B)	$\text{PCl}_{5(g)} \rightarrow \text{PCl}_{3(g)} + \text{Cl}_{2(g)}$	(ii)	$\Delta H = \Delta U + 3RT$
(C)	$\text{N}_{2(g)} + 3\text{H}_{2(g)} \rightarrow 2\text{NH}_{3(g)}$	(iii)	$\Delta H = \Delta U$
(D)	$2\text{N}_2\text{O}_{5(g)} \rightarrow 4\text{NO}_{2(g)} + \text{O}_{2(g)}$	(iv)	$\Delta H = \Delta U + RT$

A. (a) (A)  $\rightarrow$  (iii), (B)  $\rightarrow$  (i), (C)  $\rightarrow$  (ii), (D)  $\rightarrow$  (iv)

B. (b) (A)  $\rightarrow$  (iii), (B)  $\rightarrow$  (iv), (C)  $\rightarrow$  (i), (D)  $\rightarrow$  (ii)

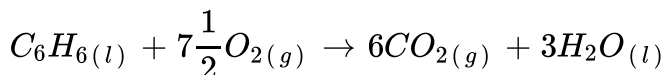
C. (c) (A)  $\rightarrow$  (ii), (B)  $\rightarrow$  (i), (C)  $\rightarrow$  (iv) (D)  $\rightarrow$  (iii)

D. (d) (A)  $\rightarrow$  (iv), (B)  $\rightarrow$  (ii), (C)  $\rightarrow$  (i), (D)  $\rightarrow$  (iii)

**Answer: B**

15. For combustion of 1 mole of benzene at  $25^{\circ}\text{C}$ , the heat of reaction at constant pressure is  $-780.9$  kcal.

What will be the heat of reaction at constant volume ?



A.  $-781.8$  kcal

B.  $-780.0$  kcal

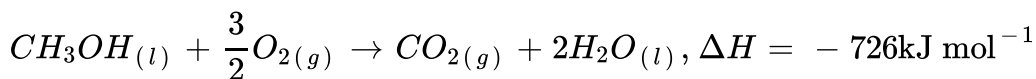
C.  $+781.8$  kcal

D.  $+780.0$  kcal

**Answer: B**

 [Watch Video Solution](#)

16. Reaction of methanol with dioxygen was carried out and  $\Delta U$  was found to be  $-726\text{kJ mol}^{-1}$  at 298 K. The enthalpy change for the reaction will be



A.  $-741.5 \text{ kJ mol}^{-1}$

B.  $-727 \text{ kJ mol}^{-1}$

C.  $+741.5 \text{ kJ mol}^{-1}$

D.  $+727.2 \text{ kJ mol}^{-1}$

**Answer: B**

 [Watch Video Solution](#)

17. According to the first law of thermodynamics,  $\Delta U = q + w$ . In special cases the statement can be expressed in different ways. Which of the following is not a correct expression ?

A. At constant temperature,  $q = -w$

B. When no work is done,  $\Delta U = q$

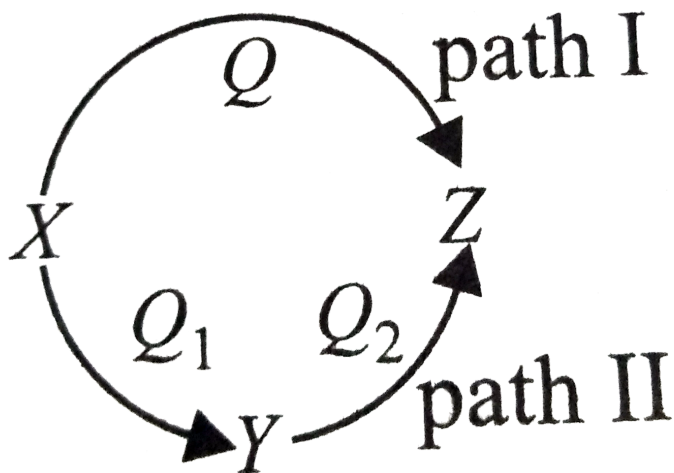
C. In gaseous system,  $\Delta U = q + P\Delta V$

D. When work is done by the system:  $\Delta U = q + w$

Answer: D

 Watch Video Solution

18. A reaction proceeds through two paths I and II to convert  $X \rightarrow Z$ .



What is the correct relationship between  $Q$ ,  $Q_1$  and  $Q_2$ ?

A.  $Q = Q_1 \times Q_2$

B.  $Q = Q_1 + Q_2$

C.  $Q = Q_2 - Q_1$

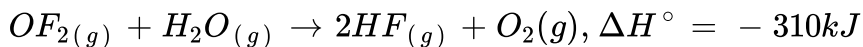
D.  $Q = Q_1 / Q_2$

**Answer: B**



**Watch Video Solution**

**19.** What will be the standard internal energy change for the reaction at 298 K ?



- A. (a)  $-312.5kJ$
- B. (b)  $-125.03kJ$
- C. (c)  $-310kJ$
- D. (d)  $-156kJ$

**Answer: A**



**Watch Video Solution**

20. The value for  $\Delta U$  for the reversible isothermal evaporation of 90 g water at  $100^\circ\text{C}$  will be

$$\left( \Delta H_{\text{evap}} \text{ of water} = 40.8 \text{ kJ mol}^{-1}, R = 8.314 \text{ J K}^{-1} \text{ mol}^{-1} \right)$$

- A. (a)  $4800 \text{ kJ}$
- B. (b)  $188.494 \text{ kJ}$
- C. (c)  $40.8 \text{ kJ}$
- D. (d)  $125.03 \text{ kJ}$

**Answer: B**



[Watch Video Solution](#)

21. A system changes from state X to Y with a change in internal energy measuring to  $25 \text{ kJ mol}^{-1}$ , by a reversible path and returns from Y to X by an irreversible path. What will be the net change in internal energy?

- A.  $25 \text{ kJ}$



B.  $> 25 \text{ kJ}$

C.  $< 25 \text{ kJ}$

D. zero

**Answer: D**

 [Watch Video Solution](#)

**22.** What will be the change in internal energy when  $12 \text{ kJ}$  of work is done on the system and  $2 \text{ kJ}$  of heat is given by the system?

A.  $+10 \text{ kJ}$

B.  $-10 \text{ kJ}$

C.  $+5 \text{ kJ}$

D.  $-5 \text{ kJ}$

**Answer: A**

 [Watch Video Solution](#)

23. A system absorbs 50 kJ heat and does 20 kJ of work. What is the net change in the internal energy of the system ?

- A. Increase by 30 kJ
- B. Decrease by 30 kJ
- C. Increase by 70 kJ
- D. Decrease by 70 kJ

**Answer: A**



[Watch Video Solution](#)

24. 200 joules of heat was supplied to a system at constant volume. It resulted in the increase in temperature of the system from 298 to 323 K. What is the change in internal energy of the system ?

- A. 400 J

B. 200 J

C. 50 J

D. 150 J

**Answer: B**



[Watch Video Solution](#)

25. In thermodynamics, which one of the following properties is not an intensive property?

A. Pressure

B. Temperature

C. Volume

D. Density

**Answer: C**



[Watch Video Solution](#)

26. The molar heat capacity of water at constant pressure,  $C_p$  is  $75 \text{ J K}^{-1}\text{mol}^{-1}$ . When 10 kJ of heat is supplied to 1 kg water which is free to expand, the increase in temperature of water is

A. (a) 2.4 K

B. (b) 4.8 K

C. (c) 3.2 K

D. (d) 10 K

**Answer: A**

 [Watch Video Solution](#)

## Enthalpy Change Of A Reaction

1. Which of the following expressions is correct to calculate enthalpy of a reaction ?

$$A. \Delta H_{\text{reaction}} = \Sigma \Delta_f H_{\text{reactions}} - \Sigma \Delta_f H_{\text{products}}$$

$$B. \Delta H_{\text{reaction}} = \Sigma B. E_{\text{products}} - \Sigma B. E_{\text{reactants}}$$

$$C. \Delta H_{\text{reaction}} = \Sigma B. E_{\text{reactants}} - \Sigma B. E_{\text{products}}$$

$$D. \Delta H_{\text{reaction}} = \Delta H_1 \times \Delta H_2 \times \Delta H_3 \dots$$

**Answer: C**

 [Watch Video Solution](#)

2. If enthalpy of overall reaction  $X \rightarrow Y$  along one route is  $\Delta_r H$  and  $\Delta_r H_1, \Delta_r H_2, \Delta_r H_3 \dots$  Representing enthalpies of reactions leading to same product Y then  $\Delta_r H$  is

A. (a)  $\Delta_r H = \Delta_r H_1 + \Delta_r H_2 + \Delta_r H_3 \dots$

B. (b)  $\Delta_r H = \Delta_r H_1 \times \Delta_r H_2 \times \Delta_r H_3 \dots$

C. (c)  $\Delta_r H = \Delta_r H_1 + \Delta_r H_2 - \Delta_r H_3 \dots$

D. (d)  $\Delta_r H = \frac{\Delta_r H_1 \times \Delta_r H_2 \times \Delta_r H_3}{2} \dots$

**Answer: A**



**Watch Video Solution**

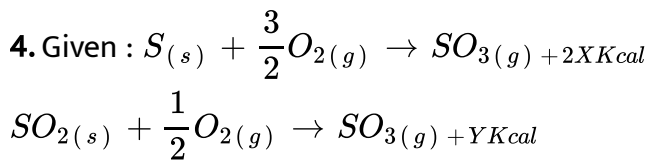
3. Which of the following does not represent enthalpy change during phase transformation?

- A. Standard enthalpy of fusion
- B. Standard enthalpy of vaporisation
- C. Standard enthalpy of sublimation
- D. Standard enthalpy of formation

**Answer: D**



**Watch Video Solution**



The heat of formation of  $SO_2$  is : –

A.  $(x + y)$

B.  $(x - y)$

C.  $(2x + y)$

D.  $(2x - y)$

**Answer: D**



**Watch Video Solution**

5. The enthalpy of formation of ammonia when calculated from the following bond energy data is (B.E. of  $N - H$ ,  $H - H$ ,  $N \equiv N$  is  $389 \text{ kJ mol}^{-1}$ ,  $435 \text{ kJ mol}^{-1}$ ,  $945.36 \text{ kJ mol}^{-1}$  respectively)

A.  $-41.82 \text{ kJ mol}^{-1}$

B.  $+83.64 \text{ kJ mol}^{-1}$

C.  $-945.36 \text{ kJ mol}^{-1}$

D.  $-833 \text{ kJ mol}^{-1}$

**Answer: A**

 [Watch Video Solution](#)

6. The bond dissociation energy of gaseous  $H_2$ ,  $Cl_2$  and  $HCl$  are 104, 58 and  $103 \text{ kcal mol}^{-1}$  respectively. Calculate the enthalpy of formation for  $HCl$  gas.

A. (a)  $-22 \text{ kcal}$

B. (b)  $+22 \text{ kcal}$

C. (c)  $+184 \text{ kcal}$

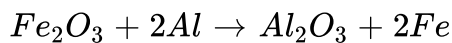
D. (d)  $-184 \text{ kcal}$

**Answer: A**

 [Watch Video Solution](#)



7. What is the enthalpy change for the given reaction, if enthalpies of formation of  $Al_2O_3$  and  $Fe_2O_3$  are  $-1670 \text{ kJ mol}^{-1}$  and  $-834 \text{ kJ mol}^{-1}$  respectively?



A.  $-836 \text{ kJ mol}^{-1}$

B.  $+836 \text{ kJ mol}^{-1}$

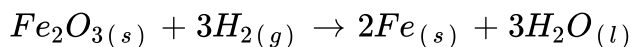
C.  $-424 \text{ kJ mol}^{-1}$

D.  $+424 \text{ kJ mol}^{-1}$

**Answer: A**

 [Watch Video Solution](#)

8. What will be the heat of reaction for the following reaction? Will the reaction be exothermic or endothermic?



$$\Delta_f H^\circ (H_2O, l) = -285.83 \text{ kJ mol}^{-1}$$

$$\Delta_f H^\circ (Fe_2O_3, s) = -824.2 \text{ kJ mol}^{-1}$$

- A.  $-824.2 \text{ kJ mol}^{-1}$ , exothermic
- B.  $+33.3 \text{ kJ mol}^{-1}$ , endothermic
- C.  $-33.3 \text{ kJ mol}^{-1}$ , exothermic
- D.  $+824.2 \text{ kJ mol}^{-1}$ , endothermic

**Answer: C**

 **Watch Video Solution**

9. For the reaction :  $H_{2(g)} + Cl_{2(g)} \rightarrow 2HCl$ ,  $\Delta H = -44 \text{ kcal}$

What is the enthalpy of decomposition of HCl?

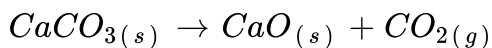
- A.  $+44 \text{ kcal/mol}$
- B.  $-44 \text{ kcal/mol}$
- C.  $-22 \text{ kcal/mol}$

D. +22 kcal/mol

Answer: D

 Watch Video Solution

10. For a reaction,



$$\Delta_f H^\circ(\text{CaO}) = -631.1 \text{ kJ mol}^{-1}$$

$$\Delta_f H^\circ(\text{CO}_2) = -393.5 \text{ kJ mol}^{-1} \text{ and}$$

$$\Delta_f H^\circ(\text{CaCO}_3) = -1206.9 \text{ kJ mol}^{-1}$$

Which of the following is a correct statement? (A) A large amount of heat is evolved during the decomposition of  $\text{CaCO}_3$ . (B) Decomposition of  $\text{CaCO}_3$  is an endothermic process and heat is provided for decomposition. (C) The amount of heat evolved cannot be calculated from the data provided. (D)  $\Delta_f H^\circ = \sum \Delta_f H^\circ(\text{reactants}) - \sum \Delta_f H^\circ(\text{products})$

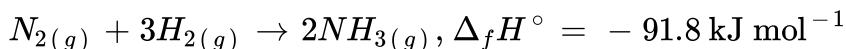
- A. A large amount of heat is evolved during the decomposition of  $CaCO_3$ .
- B. Decomposition of  $CaCO_3$  is an endothermic process and heat is provided for decomposition
- C. The amount of heat evolved cannot be calculated from the data provided .
- D.  $\Delta_f H^\circ = \Sigma \Delta_f H^\circ$  (reactants)  $- \Sigma \Delta_f H^\circ$  (products)

**Answer: B**

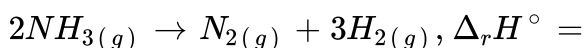


**Watch Video Solution**

**11.** Formation of ammonia is shown by the reaction,



What will be the enthalpy of reaction for the decomposition of  $NH_3$  according to the reaction ?



A.  $-91.8 \text{ kJ mol}^{-1}$

B.  $+91.8 \text{ kJ mol}^{-1}$

C.  $-45.9 \text{ kJ mol}^{-1}$

D.  $+45.9 \text{ kJ mol}^{-1}$

**Answer: B**

 [Watch Video Solution](#)

12. Hess's law is application for the determination of heat of

A. transition

B. formation

C. reaction

D. all of these.

**Answer: D**

 [Watch Video Solution](#)

13. "The change of enthalpy of a chemical reaction is the same whether the reaction takes place in one step or in several steps". This law was presented by:

- A. Le Chatelier's law
- B. vant's Hoff's law
- C. first law of thermodynamics
- D. Hess's law.

**Answer: D**

 [Watch Video Solution](#)

**Enthalpies For Different Type Of Reaction**

1. The heat of combustion of ethane and benzene is  $-1560$  and  $-3268 \text{ kJ mol}^{-1}$  respectively. Which two has higher efficiency as fuel per gram and the amount of heat produced per gram?

A. Benzene,  $41.9 \text{ kJ g}^{-1}$

B. Ethane,  $52 \text{ kJ g}^{-1}$

C. Benzene,  $78 \text{ kJ g}^{-1}$

D. Ethane,  $30 \text{ kJ g}^{-1}$

**Answer: B**

 [Watch Video Solution](#)

2. What will be the enthalpy change of conversion of graphite into diamond

 [Watch Video Solution](#)

3. What will be the amount of heat evolved by burning 10 L of methane under standard conditions?

$-76.2$ ,  $-398.8$  and  $-241.6 \text{ kJ mol}^{-1}$  respectively

A. 805.8 kJ

B. 398.8 kJ

C. 359.7 kJ

D. 640.4 kJ

Answer: C



Watch Video Solution

4. For a reaction,  $C_{(s)} + O_{2(g)} \rightarrow CO_{2(g)}$

What is the relation between enthalpy of reaction ( $\Delta H_r$ ), enthalpy of formation of  $CO_2$  ( $\Delta H_f$ ) and enthalpy of combustion of carbon ( $\Delta H_{\text{comb}}$ ) ?

A.  $\Delta H_r > \Delta H_f = \Delta H_{\text{comb}}$



B.  $\Delta H_r = \Delta H_f = \Delta H_{\text{comb}}$

C.  $\Delta H_r = \Delta H_f + \Delta H_{\text{comb}}$

D.  $\Delta H_r = 2 \times \Delta H_f$

**Answer: B**

 [Watch Video Solution](#)

5. The heat of combustion of C, S and  $CS_2$  are  $-393.3kJ$ ,  $-293.7kJ$  and  $-1108.76kJ$ . What will be the heat of formation of  $CS_2$  ?

A.  $-128.02kJ$

B.  $+970kJ$

C.  $+1108.7kJ$

D.  $+128.06kJ$

**Answer: A**

 [Watch Video Solution](#)

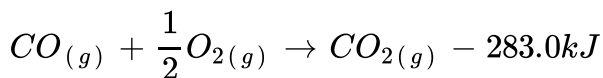
6. How much heat is evolved if 3.2 g of methane is burnt and if the heat of combustion of methane is  $-880 \text{ kJ mol}^{-1}$  ?

- A. 88 kJ
- B. 264 kJ
- C. 176 kJ
- D. 440 kJ

**Answer: C**

 [Watch Video Solution](#)

7. What will be the enthalpy of formation of carbon to produce carbon monoxide on the basis of data given below:



A.  $+676.4kJ$

B.  $-676.4kJ$

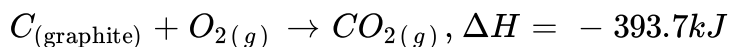
C.  $-110.4kJ$

D.  $+110.4kJ$

**Answer: C**

 [Watch Video Solution](#)

**8. Two reactions are given below :**



What quantity of diamond will give 800 kJ of heat on burning ?

A. a.24.25 g

B. b.15.24 g

C. c.2 g

D. d.12.12 g

**Answer: A**

 [Watch Video Solution](#)

**9.** Which of the following relationships is not correct ?

A.  $\Delta H = \Delta U + \Delta n_g RT$

B.  $\Delta H_{\text{sub}} = \Delta H_{\text{fusion}} + \Delta H_{\text{vap}}$

C.  $\Delta H_r^\circ = \sum H_{f(\text{reactants})}^\circ - \sum H_{f(\text{products})}^\circ$

D.  $\Delta H_r^\circ = \Sigma \text{B.E. of reactants} - \Sigma \text{B.E. of products}$

**Answer: C**

 [Watch Video Solution](#)

**10.** Which of the following is not a correct statement about enthalpy of solution?

- A. a. For most ionic compounds,  $\Delta H_{\text{soln.}}^{\circ}$  is positive and the dissociation process is endothermic.
- B. b. Solubility of most salts increases with increase in temperature.
- C. c. If the lattice enthalpy is very high, the dissolution of compound becomes very easy.
- D. d. Enthalpy of solution is determined by the selective values of the lattice enthalpy and hydration enthalpy.

**Answer: C**



[Watch Video Solution](#)

11. The enthalpy of solution of sodium chloride is  $4\text{kJmol}^{-1}$  and its enthalpy of hydration of ion is  $-784\text{kJmol}^{-1}$ . Then the lattice enthalpy of  $\text{NaCl}$  (in  $\text{kJmol}^{-1}$ ) is

A. a.  $+780\text{kJ mol}^{-1}$

B. b.  $+ 394 \text{ kJ mol}^{-1}$

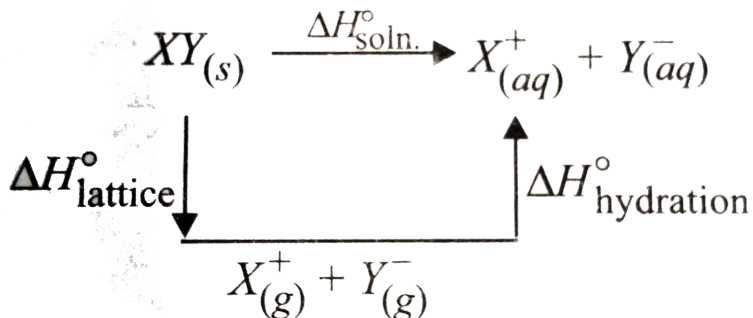
C. c.  $+ 788 \text{ kJ mol}^{-1}$

D. d.  $+ 398 \text{ kJ mol}^{-1}$

Answer: C

 Watch Video Solution

12. Study the figure given below and mark the correct expression.



The enthalpy of solution of  $XY_{(s)}$ ,  $\Delta H_{\text{soln.}}^{\circ}$  in water can be determined by

A.  $\Delta H_{\text{lattice}}^{\circ} = \Delta H_{\text{hyd}}^{\circ} + \Delta H_{\text{Soln.}}^{\circ}$

B.  $\Delta H_{\text{hyd}}^{\circ} = \Delta H_{\text{lattice}}^{\circ} + \Delta H_{\text{soln.}}^{\circ}$

$$C. \Delta H_{\text{Soln.}}^{\circ} = \Delta H_{\text{lattice}}^{\circ} + \Delta H_{\text{hyd}}^{\circ}$$

$$D. \Delta H_{\text{soln}}^{\circ} = \Delta H_{\text{lattice}}^{\circ} \times \Delta H_{\text{hyd}}^{\circ}$$

Answer: C

 Watch Video Solution

13. Match the column I with column II and mark the appropriate choice.

Column I		Column II	
(A)	$\text{CH}_{4(g)} + 2\text{O}_{2(g)} \rightarrow \text{CO}_{2(g)} + 2\text{H}_2\text{O}$	(i)	$\Delta_{\text{sol}}H^{\circ}$
(B)	$\text{H}_{2(g)} \rightarrow 2\text{H}_{(g)}$	(ii)	$\Delta_{\text{lattice}}H^{\circ}$
(C)	$\text{NaCl}_{(s)} \rightarrow \text{Na}^+_{(g)} + \text{Cl}^-_{(g)}$	(iii)	$\Delta_c H^{\circ}$
(D)	$\text{NaCl}_{(s)} \rightarrow \text{Na}^+_{(aq)} + \text{Cl}^-_{(aq)}$	(iv)	$\Delta_{\text{bond}}H^{\circ}$

A. (A)  $\rightarrow$  (iv), (B)  $\rightarrow$  (iii), (C)  $\rightarrow$  (i), (D)  $\rightarrow$  (ii)

B. (A)  $\rightarrow$  (ii), (B)  $\rightarrow$  (i), (C)  $\rightarrow$  (iv), (D)  $\rightarrow$  (iii)

C. (A)  $\rightarrow$  (i), (B)  $\rightarrow$  (ii), (C)  $\rightarrow$  (iii), (D)  $\rightarrow$  (iv)

D. (A)  $\rightarrow$  (iii), (B)  $\rightarrow$  (iv), (C)  $\rightarrow$  (ii), (D)  $\rightarrow$  (i)

**Answer: D**

 [Watch Video Solution](#)

**14.** The amount of heat evolved when 0.50 mole of HCl is mixed with 0.30 mole of NaOH solution is

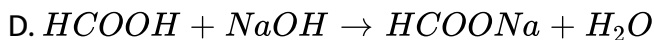
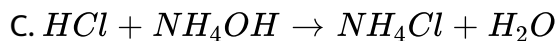
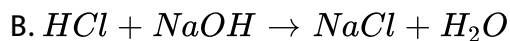
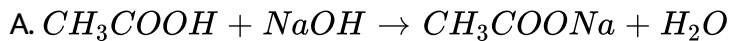
- A. 57.1 kJ
- B. 28.55 kJ
- C. 11.42 kJ
- D. 17.13 kJ

**Answer: D**

 [Watch Video Solution](#)

**15.** Which of the following reactions will have the value of enthalpy of neutralisation as  $-57.1\text{kJ mol}^{-1}$  ?





**Answer: B**

 [Watch Video Solution](#)

16. Bond energies of  $H - H$  and  $Cl - Cl$  are  $430 \text{ kJ mol}^{-1}$  and  $242 \text{ kJ mol}^{-1}$  respectively.  $\Delta H_f$  for  $HCl$  is  $91 \text{ kJ mol}^{-1}$ .

What will be the bond energy of  $H - Cl$ ?

A. 672 kJ

B. 182 kJ

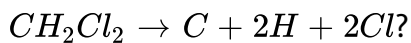
C. 245 kJ

D. 88 kJ

**Answer: C**

 [Watch Video Solution](#)

17. What will be  $\Delta H$  for the reaction,



(B.E. of  $C - H$  and  $C - Cl$  bonds are  $416 \text{ kJ mol}^{-1}$  and  $325 \text{ kJ mol}^{-1}$  respectively)

- A. 832 kj
- B. 1482 kj
- C. 650 kj
- D. 1855 kj

**Answer: B**

 [View Text Solution](#)

18.  $\Delta H$  for the reaction,  $OF_2 + H_2O \rightarrow O_2 + 2HF$

(B.E. of  $O - F$ ,  $O - H$ ,  $H - F$  and  $O = O$  are 44, 111, 135 and 119 kcal mol<sup>-1</sup> respectively)

A. -222 kcal

B. -88 kcal

C. -111 kcal

D. -79 kcal

Answer: D



Watch Video Solution

19. Dissociation of water takes place in two steps :



Water is the bond energy of  $O - H$  bond ?

A.  $463.15 \text{ kJ mol}^{-1}$

B.  $428.5 \text{ kJ mol}^{-1}$

C.  $69.3 \text{ kJ mol}^{-1}$

D.  $926.3 \text{ kJ mol}^{-1}$

**Answer: A**

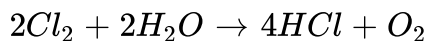
 [View Text Solution](#)

**20.** Bond energies of few bonds are given below :

$$Cl - Cl = 242.8 \text{ kJ mol}^{-1}, H - Cl = 431.8 \text{ kJ mol}^{-1}.$$

$$O - H = 464 \text{ kJ mol}^{-1}, O = O = 442 \text{ kJ mol}^{-1}$$

Using the B.E., calculate  $\Delta H$  for the following reaction,



A.  $906 \text{ kJ mol}^{-1}$

B.  $172.4 \text{ kJ mol}^{-1}$

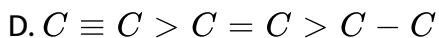
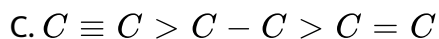
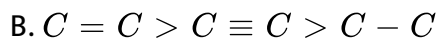
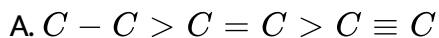
C.  $198.8 \text{ kJ mol}^{-1}$

D.  $442 \text{ kJ mol}^{-1}$

Answer: B

 Watch Video Solution

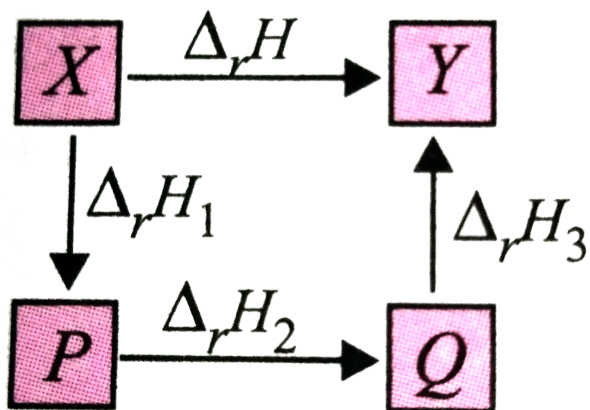
21. Which is the correct order of bond energy of single, double and triple bonds between carbon atoms ?



Answer: D

 Watch Video Solution

22. Which thermochemical process is shown by the following figure?

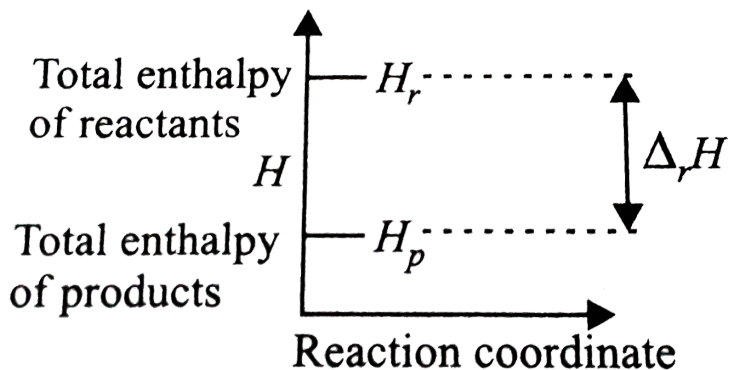


- A. Standard enthalpy of a reaction
- B. Born - Haber cycle of lattice enthalpy
- C. Hess's law of constant heat summation
- D. Standard enthalpy of a solution.

Answer: C

[▶ Watch Video Solution](#)

1. The given enthalpy diagram represents which of the following reactions ?

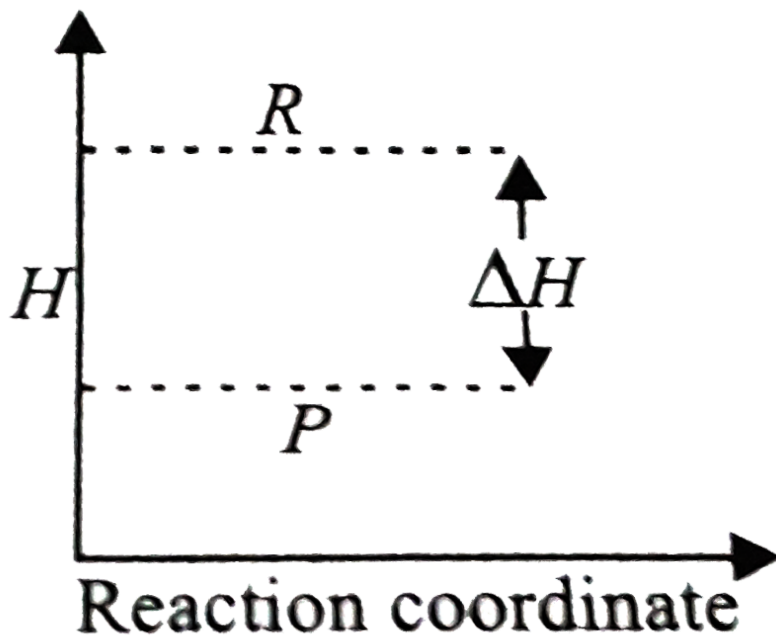


- A. Enthalpy diagram for endothermic reaction
- B. Enthalpy diagram for exothermic reaction
- C. Enthalpy diagram for reversible reaction
- D. Enthalpy diagram for non-spontaneous reaction

**Answer: B**

 [Watch Video Solution](#)

2. Study the given graph and choose the correct option.



- A.  $\Delta H =$  Net heat absorbed from the surroundings
- B.  $\Delta H =$  Net heat given to the surroundings
- C.  $\Delta H = +ve$  for the reaction
- D.  $\Delta H =$  Total energy possessed by the reactants

**Answer: B**

 [Watch Video Solution](#)



3. In endothermic reactions,

- A. reactants have more energy than products
- B. reactants have less energy than products
- C. reactants and products have same energy
- D. reactants have lower temperature than products.

**Answer: B**



**Watch Video Solution**

4. The total entropy change ( $\Delta S_{\text{total}}$ ) for the system and surrounding of a spontaneous process is given by

A.  $\Delta S_{\text{total}} = \Delta S_{\text{system}} + \Delta S_{\text{surr}} > 0$

B.  $\Delta S_{\text{total}} = \Delta S_{\text{system}} + \Delta S_{\text{surr}} < 0$

C.  $\Delta S_{\text{system}} = \Delta S_{\text{total}} + \Delta S_{\text{surr}} > 0$

$$D. \Delta S_{\text{surr}} = \Delta S_{\text{total}} + \Delta S_{\text{system}} < 0$$

**Answer: A**

 [Watch Video Solution](#)

5. Which of the following expressions regarding entropy is not correct?

A.  $\Delta S_{\text{system}} = \frac{q}{T}$

B.  $\Delta S_{\text{system}} = \Delta S_{\text{total}} + \Delta S_{\text{surrounding}}$

C.  $\Delta S = \Delta S_{\text{final}} - S_{\text{initial}}$

D.  $\Delta S_{\text{total}} = \Delta S_{\text{system}} + \Delta S_{\text{surrounding}}$

**Answer: B**

 [Watch Video Solution](#)

6. For a reaction,  $P + Q \rightarrow R + S$ . The value of  $\Delta H^\circ$  is  $-30 \text{ kJ mol}^{-1}$  and  $\Delta S$  is  $-100 \text{ J K}^{-1}\text{mol}^{-1}$ . At what temperature the reaction will be at equilibrium?

A.  $27^\circ \text{C}$

B.  $52^\circ \text{C}$

C.  $30^\circ \text{C}$

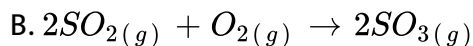
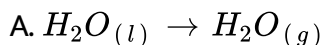
D.  $45^\circ \text{C}$

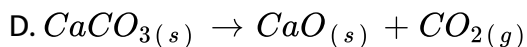
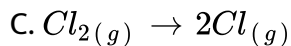
**Answer: A**



**Watch Video Solution**

7. Which of the following reactions will have the value of  $\Delta S$  with a negative sign?





**Answer: B**

 [Watch Video Solution](#)

8. A reaction is at equilibrium at  $100^{\circ}C$  and the enthalpy change for the reaction is  $42.6 \text{ kJ mol}^{-1}$ . What will be the value of  $\Delta S$  in  $\text{J K}^{-1}\text{mol}^{-1}$ ?

A. 120

B. 426.2

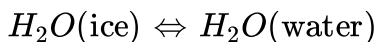
C. 373.1

D. 114.2

**Answer: D**

 [Watch Video Solution](#)

9. Enthalpy change for the process,



is  $6.01 \text{ kJ mol}^{-1}$ . The entropy change of 1 mole of ice at its melting point will be

A.  $12 \text{ J K}^{-1}\text{mol}^{-1}$

B.  $22 \text{ J K}^{-1}\text{mol}^{-1}$

C.  $100 \text{ J K}^{-1}\text{mol}^{-1}$

D.  $30 \text{ J K}^{-1}\text{mol}^{-1}$

**Answer: B**



**Watch Video Solution**

10. At what temperature liquid water will be in equilibrium with water vapour?

$$\Delta H_{\text{vap}} = 40.73 \text{ kJ mol}^{-1}, \Delta S_{\text{vap}} = 0.109 \text{ kJ K}^{-1}\text{mol}^{-1}$$

A. 282.4 K

B. 373.6 K

C. 100 K

D. 400 K

**Answer: B**

 [Watch Video Solution](#)

11. For a reaction:  $X \rightarrow Y + Z$

Absolute entropies are  $X = 120 \text{ J K}^{-1}\text{mol}^{-1}$ ,

$Y = 213.8 \text{ J K}^{-1}\text{mol}^{-1}$  and  $Z = 197.9 \text{ J K}^{-1}\text{mol}^{-1}$ .

What will be the entropy change at 298 K and 1 atm?

A.  $291.7 \text{ J K}^{-1}$

B.  $255 \text{ J K}^{-1}$

C.  $213.8 \text{ J K}^{-1}$

D.  $257.3 \text{ J K}^{-1}$

Answer: A

 [Watch Video Solution](#)

12. What will be the melting point of KCl if enthalpy change for the reaction is  $7.25 \text{ J mol}^{-1}$  and entropy change is  $0.007 \text{ J K}^{-1}\text{mol}^{-1}$ ?

A. 1835.2 K

B. 173 K

C. 1035.7 K

D. 1285.2 K

Answer: C

 [Watch Video Solution](#)

13. For reversible reaction :  $X_{(g)} + 3Y_{(g)} \rightleftharpoons 2Z_{(g)}$ ,  $\Delta H = -40 \text{ kJ}$

Standard entropies of X, Y and Z are 60, 40 and  $50 \text{ J K}^{-1}, \text{ol}^{-1}$

respectively. The temperature at which the above reaction is in equilibrium is

A. 273 K

B. 600 K

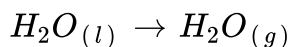
C. 500 K

D. 400 K

**Answer: C**

 [Watch Video Solution](#)

**14.** At 373 K, steam and water are in equilibrium and  $\Delta H = 40.98 \text{ kJ mol}^{-1}$ . What will be  $\Delta S$  for conversion of water into system ?



A.  $109.8 \text{ J K}^{-1}\text{mol}^{-1}$

B.  $31 \text{ J K}^{-1}\text{mol}^{-1}$



C.  $21.98 \text{ J K}^{-1}\text{mol}^{-1}$

D.  $326 \text{ J K}^{-1}\text{mol}^{-1}$

Answer: A

 Watch Video Solution

15. Match the column I with column II and mark the appropriate choice.

Column I		Column II	
(A)	State function	(i)	At constant pressure
(B)	$\Delta H = q$	(ii)	Specific heat
(C)	$\Delta U = q$	(iii)	Entropy
(D)	Intensive property	(iv)	At constant volume

A. (A)  $\rightarrow$  (iii), (B)  $\rightarrow$  (i), (C)  $\rightarrow$  (iv), (D)  $\rightarrow$  (ii)

B. (A)  $\rightarrow$  (ii), (B)  $\rightarrow$  (iv), (C)  $\rightarrow$  (i), (D)  $\rightarrow$  (ii)

C. (A)  $\rightarrow$  (ii), (B)  $\rightarrow$  (iv), (C)  $\rightarrow$  (iii), (D)  $\rightarrow$  (i)

D. (A)  $\rightarrow$  (iii), (B)  $\rightarrow$  (ii), (C)  $\rightarrow$  (i), (D)  $\rightarrow$  (iv)

**Answer: A**



**Watch Video Solution**

**16.** Read the following statements regarding spontaneity of a process and mark the appropriate choice.

(i) When enthalpy factor is absent then randomness factor decides spontaneity of a process.

(ii) When randomness factor is absent then enthalpy factor decides spontaneity of a process.

(iii) When both the factors take place simultaneously, the magnitude of both of factors decide spontaneity of a process.

A. Statements (i) and (ii) are correct and (iii) is incorrect.

B. Statement (iii) is correct, (i) and (ii) are incorrect.

C. Statements (i), (ii) and (iii) are correct.

D. Statements (i), (ii) and (iii) are incorrect.

**Answer: C**



[Watch Video Solution](#)

**17.** Which of the following processes is a non-spontaneous process?

- A. Dissolution of salt of sugar in water
- B. Mixing of different gases through diffusion
- C. Precipitation of copper when zinc rod is dipped in aqueous solution of copper sulphate
- D. Flow of heat from a cold body to a hot body in contact

**Answer: D**



[Watch Video Solution](#)

**18.** Which of the following statements regarding Gibb's energy change is correct?

A. If  $\Delta G$  is negative ( $< 0$ ), the process is non-spontaneous.

B. If  $\Delta G$  is positive ( $> 0$ ), the process is spontaneous.

C. If  $\Delta G$  is negative ( $< 0$ ), the process is spontaneous.

D. If  $\Delta G$  is positive ( $> 0$ ), the process is in equilibrium.

**Answer: C**

 [Watch Video Solution](#)

**19.** For a reaction to be spontaneous at any temperature, the conditions are

A.  $\Delta H = +ve, \Delta S = +ve$

B.  $\Delta H = -ve, \Delta S = -ve$

C.  $\Delta H = +ve, \Delta S = -ve$

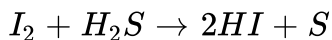
D.  $\Delta H = -ve, \Delta S = +ve$

**Answer: D**



Watch Video Solution

20. For the reaction given below the value of standard Gibbs free energy of formation at 298 K are given. What is the nature of the reaction?



$$\Delta G_f^\circ(HI) = 1.8 \text{ kJ mol}^{-1}, \Delta G_f^\circ(H_2S) = 33.8 \text{ kJ mol}^{-1}$$

- A. Non-spontaneous in forward direction.
- B. Spontaneous in forward direction.
- C. Spontaneous in backward direction.
- D. Non-spontaneous in both forward and backward directions.

**Answer: B**



Watch Video Solution

21. What is the entropy change when 1 mole oxygen gas expands isothermally and reversibly from an initial volume of 10 L to 100 L at 300

K ?

A.  $19.14 \text{ J K}^{-1}$

B.  $109.12 \text{ J K}^{-1}$

C.  $29.12 \text{ J K}^{-1}$

D.  $10 \text{ J K}^{-1}$

**Answer: A**



**Watch Video Solution**

**22.** Match the following columns and mark the appropriate choice.

Column I		Column II	
(A)	Exothermic	(i)	$\Delta H = 0, \Delta U = 0$
(B)	Spontaneous	(ii)	$\Delta G = 0$
(C)	Cyclic process	(iii)	$\Delta H$ is negative.
(D)	Equilibrium	(iv)	$\Delta G$ is negative.

A. (A)  $\rightarrow$  (ii), (B)  $\rightarrow$  (iii), (C)  $\rightarrow$  (i), (D)  $\rightarrow$  (iv)

B. (A)  $\rightarrow$  (iv), (B)  $\rightarrow$  (i), (C)  $\rightarrow$  (iii), (D)  $\rightarrow$  (ii)

C. (A)  $\rightarrow$  (i), (B)  $\rightarrow$  (ii), (C)  $\rightarrow$  (iv), (D)  $\rightarrow$  (iii)

D. (A)  $\rightarrow$  (iii), (B)  $\rightarrow$  (iv), (C)  $\rightarrow$  (i), (D)  $\rightarrow$  (ii)

**Answer: D**



**Watch Video Solution**

**23.** One word answer is given for the following definitions, Mark the one which is incorrect.

A. The process in which temperature remains constant : Isobaric

B. The process in which volume remains constant : Isochoric

C. The relation between  $\Delta H$  and  $\Delta H$  when all the reactants and products are solid :  $\Delta H = \Delta U$

D. The relation between  $\Delta G$ ,  $\Delta H$  and  $\Delta S$ :

$$\Delta G = \Delta H - T\Delta S$$

**Answer: A**



[Watch Video Solution](#)

24. In a reaction  $P + Q \rightarrow R + S$ , there is no change in entropy, Enthalpy change for the reaction ( $\Delta H$ ) is  $12 \text{ kJ mol}^{-1}$ . Under what conditions, reaction will have negative value of free energy change?

- A. If  $\Delta H$  is positive
- B. If  $\Delta H$  is negative.
- C. If  $\Delta H$  is  $24 \text{ kJ mol}^{-1}$ .
- D. If temperature of reaction is high

**Answer: B**



[Watch Video Solution](#)



25. For reaction,  
 $2K_{(g)} + L_{(g)} \rightarrow 2M_{(g)}$ ,  $\Delta U^\circ = -10.5 \text{ kJ}$  and  $\Delta S^\circ = -44.1 \text{ J K}^{-1}$ . Calculate  $\Delta G^\circ$  for the reaction and predict whether the reaction will be spontaneous or non-spontaneous?

- A.  $\Delta G = +0.16 \text{ kJ}$ , non-spontaneous
- B.  $\Delta G = -0.16 \text{ kJ}$ , spontaneous
- C.  $\Delta G = +26.12 \text{ kJ}$ , non-spontaneous
- D.  $\Delta G = -26.12 \text{ kJ}$ , spontaneous

**Answer: A**

 [Watch Video Solution](#)

26. Which of the following statements is not correct ?

- A. For a spontaneous process,  $\Delta G$  must be negative.
- B. Enthalpy, entropy, free energy etc. are state variables.

C. A spontaneous process is reversible in nature.

D. Total of all possible kinds of energy of a system is called its internal energy.

**Answer: C**

 [Watch Video Solution](#)

27.  $\Delta G$  is the net energy available to do useful work and is a measure of free energy. If a reaction has positive enthalpy change and positive entropy change, under what conditions will the reaction be spontaneous?

A.  $\Delta G$  will be positive at low temperature hence reaction is spontaneous at low temperature.

B.  $\Delta G$  is negative at high temperature hence reaction is spontaneous at high temperature.

C.  $\Delta G$  is negative at low temperature.

D.  $\Delta G$  is negative at all temperature hence reaction is spontaneous at all temperatures.

**Answer: B**

 [Watch Video Solution](#)

28. Dissolution of ammonium chloride in water is an endothermic reaction, yet it is a spontaneous process. This is due to the fact that

A.  $\Delta H$  is  $+ve$ ,  $\Delta S$  is  $-ve$

B.  $\Delta H$  is  $-ve$ ,  $\Delta S$  is  $+ve$

C.  $\Delta H$  is  $+ve$ ,  $\Delta S$  is  $+ve$  and  $\Delta H < T\Delta S$

D.  $\Delta H$  is  $+ve$  and  $\Delta H > T\Delta S$

**Answer: C**

 [Watch Video Solution](#)

29. What will be the signs of  $\Delta H$  and  $\Delta S$  when NaOH is dissolved in water?

- A.  $\Delta H$   $\Delta S$   
- -
- B.  $\Delta H$   $\Delta S$   
+ -
- C.  $\Delta H$   $\Delta S$   
- +
- D.  $\Delta H$   $\Delta S$   
+ +

**Answer: C**



[Watch Video Solution](#)

30. At absolute zero, the entropy of a pure crystal is zero. This is

- A. first law of thermodynamics
- B. second law of thermodynamics
- C. third law of thermodynamics
- D. zeroth law of thermodynamics

**Answer: C**

 [Watch Video Solution](#)

## Gibbs Energy Change And Equilibrium

1. At dynamic equilibrium the reaction on both sides occur at the same rate and the mass on both sides of the equilibrium does not undergo any change. This condition can be achieved only when the value of  $\Delta G$  is

A.  $-1$

B.  $+1$

C.  $+2$

D.  $0$

**Answer: D**

 [Watch Video Solution](#)

2. 300 पर एक अभिक्रिया के लिए साम्य स्थिरांक 10 है।  $\Delta G^\circ$  का मान क्या होगा ?

$$R = 8.314 JK^{-1}mol^{-1}$$

- A.  $-5.74kJ$
- B.  $-574kJ$
- C.  $+11.48kJ$
- D.  $+5.74kJ$

**Answer: A**



[Watch Video Solution](#)

3. A reaction attains equilibrium state under standard conditions, then what is incorrect for this?

- A. Equilibrium constant  $K = 0$
- B. Equilibrium constant  $K = 1$
- C.  $\Delta G^\circ = 0$  and  $\Delta H^\circ = T\Delta S^\circ$

D.  $\Delta S = 0$  and  $\Delta H = T\Delta S$

**Answer: A**

 [Watch Video Solution](#)

4. Which is the correct relationship between  $\Delta G^\circ$  and equilibrium constant  $K_p$ ?

A. a.  $K_p = -RT \log \Delta G^\circ$

B. b.  $K_p = [E/RT]^{\Delta G^\circ}$

C. c.  $K_p = -\Delta G^\circ / RT$

D. d.  $K_p = e^{-\Delta G^\circ / RT}$

**Answer: D**

 [Watch Video Solution](#)

1. Thermodynamics is not concerned about \_\_\_\_\_.

- A. energy changes involved in a chemical reaction
- B. the extent to which a chemical reaction proceeds
- C. the rate at which a reaction proceeds
- D. the feasibility of a chemical reaction

**Answer: C**



[Watch Video Solution](#)

2. Which of the following statements is correct?

- A. The presence of reacting species in a covered beaker is an example of open system.
- B. There is an exchange of energy as well as matter between the system and the surroundings in a closed system.



C. The presence of reactants in a closed vessel made up of copper is an example of a closed system.

D. The presence of reactants in a thermos flask or any other closed insulated vessel is an example of a closed system.

**Answer: C**

 [Watch Video Solution](#)

3. The state of gas can be described by quoting the relationship between

A. pressure, volume, temperature

B. temperature, amount, pressure

C. amount, volume, temperature

D. pressure, volume, temperature, amount

**Answer: D**

 [Watch Video Solution](#)

4. The volume of gas is reduced to half from its original volume. The specific heat will be

- A. be reduced to half
- B. be doubled
- C. remain constant
- D. be increased four times

**Answer: C**

 [Watch Video Solution](#)

5.  $\Delta U^\circ$  of combustion of  $CH_4(g)$  at certain temperature is  $-393 \text{ kJ mol}^{-1}$ . The value of  $\Delta H^\circ$  is

- A. zero
- B.  $< \Delta H^\circ$

C.  $> \Delta U^\circ$

D. equal to  $\Delta U^\circ$

**Answer: B**



**Watch Video Solution**

6. In an adiabatic process, no transfer of heat takes place between system and surroundings. Choose the correct option for free expansion of an ideal gas under adiabatic condition from the following.

A.  $q = 0, \Delta T \neq 0, W = 0$

B.  $q \neq 0, \Delta T = 0, W = 0$

C.  $q = 0, \Delta T = 0, W = 0$

D.  $q = 0, \Delta T < 0, W \neq 0$

**Answer: C**



**Watch Video Solution**

7. The pressure-volume work for an ideal gas can be calculated by using the expression  $W = - \int_{V_i}^{V_f} P_{ex} dV$ . The work can also be calculated from the pV - plot by using the area under the curve within the specified limits. When an ideal gas is compressed (i) reversibly or (ii) irreversibly from volume  $V_i$  to  $V_f$ . Choose the correct option.

- A.  $W_{\text{reversible}} = W_{\text{irreversible}}$
- B.  $W_{\text{reversible}} < W_{\text{irreversible}}$
- C.  $W_{\text{reversible}} > W_{\text{irreversible}}$
- D.  $W_{\text{reversible}} = W_{\text{irreversible}} + P_{ex} \Delta V$

**Answer: B**

 [Watch Video Solution](#)

8. The entropy change can be calculated by using the expression,  $\Delta S = \frac{q_{\text{rev}}}{T}$ . When water freezes in a glass beaker, choose the correct

statement amongst the following:

A.  $\Delta S_{\text{system}}$  decreases but  $\Delta S_{\text{surroundings}}$  remains the same.

B.  $\Delta S_{\text{system}}$  increases but  $\Delta S_{\text{surroundings}}$  decreases.

C.  $\Delta S_{\text{system}}$  decrease but  $\Delta S_{\text{surroundings}}$  increases.

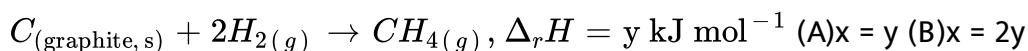
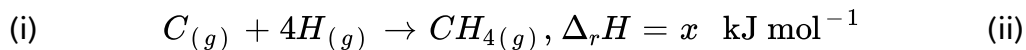
D.  $\Delta S_{\text{system}}$  decreases and  $\Delta S_{\text{surroundings}}$  also decreases.

**Answer: C**



**Watch Video Solution**

9. Consider the reactions given below. On the basis of these reactions find out which of the algebraic relations given in options (a) to (d) is correct ?



(C) $x > y$  (D) $x < y$

A.  $x = y$

B.  $x = 2y$

C.  $x > y$

D.  $x < y$

**Answer: C**

 [Watch Video Solution](#)

**10.** The enthalpies of elements in their standard states are taken as zero.

The enthalpy of formation of a compound

A. is always negative

B. is always positive

C. may be positive or negative

D. is never negative

**Answer: C**

 [Watch Video Solution](#)

11. Enthalpy of sublimation of a substance is equal to

- A. enthalpy of fusion + enthalpy of vapourisation
- B. enthalpy of fusion
- C. enthalpy of vapourisation
- D. twice the enthalpy of vapourisation.

**Answer: A**



[Watch Video Solution](#)

### Assertion And Reason

1. Assertion : The presence of reactants in a closed vessel made of conducting material is an example of a closed system.

Reason : In a closed system, there is no exchange of matter but exchange of energy is possible between the system and the surroundings.

- A. If both assertion and reason are true and reason is the correct explanation of assertion.
- B. If both assertion and reason are true but reason is not the correct explanation of assertion
- C. If assertion is true but reason is false.
- D. If both assertion and reason are false.

**Answer: A**



**Watch Video Solution**

**2. Assertion :** In adiabatic system,  $\Delta U = w_{ad}$ .

**Reason :** In adiabatic system, no transfer of heat takes place.

- A. If both assertion and reason are true and reason is the correct explanation of assertion.



- B. If both assertion and reason are true but reason is not the correct explanation of assertion
- C. If assertion is true but reason is false.
- D. If both assertion and reason are false.

**Answer: A**

 [Watch Video Solution](#)

**3. Assertion (A):** Internal energy change in a cyclic process is zero.

**Reason (R ) :** Internal energy is a state function.

- A. If both assertion and reason are true and reason is the correct explanation of assertion.
- B. If both assertion and reason are true but reason is not the correct explanation of assertion
- C. If assertion is true but reason is false.

D. If both assertion and reason are false.

**Answer: A**

 [Watch Video Solution](#)

4. Assertion : Work done during free expansion of an ideal gas whether reversible or irreversible is positive.

Reason : During free expansion, external pressure is always less than the pressure of the system.

A. If both assertion and reason are true and reason is the correct explanation of assertion.

B. If both assertion and reason are true but reason is not the correct explanation of assertion

C. If assertion is true but reason is false.

D. If both assertion and reason are false.

**Answer: D**



**Watch Video Solution**

5. Assertion : The difference between  $\Delta H$  and  $\Delta U$  is not significant for systems consisting of only solids and/or liquids.

Reason : Solids and liquids do not suffer any significant volume changes upon heating.

- A. If both assertion and reason are true and reason is the correct explanation of assertion.
- B. If both assertion and reason are true but reason is not the correct explanation of assertion
- C. If assertion is true but reason is false.
- D. If both assertion and reason are false.

**Answer: A**



**Watch Video Solution**

6. Assertion : For the change,  $H_2O_{(l)} \rightarrow H_2O_{(s)}$ ,  $\Delta H = \Delta U$ .

Reason : No enthalpy change is involved in this process.

- A. If both assertion and reason are true and reason is the correct explanation of assertion.
- B. If both assertion and reason are true but reason is not the correct explanation of assertion
- C. If assertion is true but reason is false.
- D. If both assertion and reason are false.

**Answer: C**



**Watch Video Solution**

7. Assertion :  $\Delta H$  for an exothermic reaction is negative and for an endothermic reaction is positive.

Reason : Enthalpy is an extensive property.

- A. If both assertion and reason are true and reason is the correct explanation of assertion.
- B. If both assertion and reason are true but reason is not the correct explanation of assertion
- C. If assertion is true but reason is false.
- D. If both assertion and reason are false.

**Answer: B**

 [Watch Video Solution](#)

8. Assertion : The enthalpy change for the reaction  $CaO_{(s)} + CO_{2(g)} \rightarrow CaCO_{3(s)}$  is called enthalpy of formation of calcium carbonate.

Reason : The reaction involves formation of 1 mole of  $CaCO_3$  from its constituent elements.

- A. (a) If both assertion and reason are true and reason is the correct explanation of assertion.
- B. (b) If both assertion and reason are true but reason is not the correct explanation of assertion
- C. (c) If assertion is true but reason is false.
- D. (d) If both assertion and reason are false.

**Answer: D**

 [Watch Video Solution](#)

**9. Assertion :** The solubility of most salts in water increases with rise of temperature.

**Reason :** For most of the ionic compounds,  $\Delta_{\text{sol}}H^{\circ}$  is positive and the dissociation process is endothermic.

A. If both assertion and reason are true and reason is the correct explanation of assertion.

B. If both assertion and reason are true but reason is not the correct explanation of assertion

C. If assertion is true but reason is false.

D. If both assertion and reason are false.

**Answer: A**

 [Watch Video Solution](#)

**10.** Assertion : Heat of neutralisation of  $HNO_3$  and  $NaOH$  is same as that of  $HCl$  and  $KOH$ .

Reason : Both  $HNO_3$  and  $HCl$  are strong acids and  $NaOH$  and  $KOH$  are strong bases.

A. If both assertion and reason are true and reason is the correct explanation of assertion.

B. If both assertion and reason are true but reason is not the correct explanation of assertion

C. If assertion is true but reason is false.

D. If both assertion and reason are false.

**Answer: A**



**Watch Video Solution**

**11.** Assertion : Heat added to a system at lower temperature causes greater randomness than when the same quantity of heat is added to it at higher temperature.

Reason : Entropy is a measure of the degree of randomness or disorder in the system.

A. (a) If both assertion and reason are true and reason is the correct explanation of assertion.

B. (b) If both assertion and reason are true but reason is not the correct explanation of assertion

C. (c) If assertion is true but reason is false.



D. (d) If both assertion and reason are false.

**Answer: B**

 [Watch Video Solution](#)

12. Assertion : In the process,  $H_{2(g)} \rightarrow 2H_{(g)}$  .entropy increases.

Reason : Breaking of bonds is an endothermic process.

- A. If both assertion and reason are true and reason is the correct explanation of assertion.
- B. If both assertion and reason are true but reason is not the correct explanation of assertion
- C. If assertion is true but reason is false.
- D. If both assertion and reason are false.

**Answer: B**

 [Watch Video Solution](#)

**13. Assertion :** An exothermic process which is non-spontaneous at high temperature may become spontaneous at low temperature.

**Reason :** Spontaneous process is an irreversible process and may be reversed by some external agency.

- A. If both assertion and reason are true and reason is the correct explanation of assertion.
- B. If both assertion and reason are true but reason is not the correct explanation of assertion
- C. If assertion is true but reason is false.
- D. If both assertion and reason are false.

**Answer: B**



**Watch Video Solution**

14. Assertion : If both  $\Delta H^\circ$  and  $\Delta S^\circ$  are positive then reaction will be spontaneous at high temperature.

Reason : All processes with positive entropy change are spontaneous.

- A. If both assertion and reason are true and reason is the correct explanation of assertion.
- B. If both assertion and reason are true but reason is not the correct explanation of assertion
- C. If assertion is true but reason is false.
- D. If both assertion and reason are false.

**Answer: C**



[Watch Video Solution](#)

15. Assertion : Third law of thermodynamics is confined to pure crystalline solids.

Reason : Theoretical arguments and practical evidences have shown that entropy of solutions and super cooled liquids is not zero at 0 K.

- A. If both assertion and reason are true and reason is the correct explanation of assertion.
- B. If both assertion and reason are true but reason is not the correct explanation of assertion
- C. If assertion is true but reason is false.
- D. If both assertion and reason are false.

**Answer: A**



[Watch Video Solution](#)