



## DPP-4 [Enthalpy]

Chahe tumhe duniya ke sab log kamzor samjhein. . . tum bas ek baar unhe apni kabhi na rukne wali himmat dikhado. Yehi tumhari asli taqat hai.

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**Q1. When a solid melts, there is:**

- (1) No increase in enthalpy
- (2) Increase in enthalpy
- (3) Decrease in enthalpy
- (4) Anything can happen

**Q2. For the reaction  $2\text{NH}_3(\text{g}) \rightarrow \text{N}_2(\text{g}) + 3\text{H}_2(\text{g})$ , which of the following is valid:**

- (1)  $\Delta E = \Delta H$
- (2)  $\Delta E < \Delta H$
- (3)  $\Delta E > \Delta H$
- (4) None of these

**Q3. Heat exchanged in a chemical reaction at constant pressure is called:**

- (1) Internal energy
- (2) Enthalpy
- (3) Entropy
- (4) Free energy

**Q4. Latent heat of vaporisation of a liquid at 500K and 1 atm pressure is 10.0 kCal mol<sup>-1</sup>. What will be the change in internal energy of 3 mol of liquid at same temperature and pressure**

- (1) 13.0 kCal
- (2) -13.0 kCal
- (3) 27.0 kCal
- (4) -27.0 kCal

**Q5. What is the value of  $\Delta n_g$  if we consider the combustion of 1 mol of liquid ethanol if reactants and products are at 298 K:**

- (1) -1
- (2) -2
- (3) +1
- (4) +2

**Q6. If a reaction involves only solids and liquids, which of the following is true**

- (1)  $\Delta E < \Delta H$
- (2)  $\Delta E = \Delta H$
- (3)  $\Delta E > \Delta H$
- (4)  $\Delta H = \Delta E + \Delta nRT$

**Q7. The value of  $\Delta H - \Delta E$  for the following reaction at 27°C will be,  $2\text{NH}_3(\text{g}) \rightarrow \text{N}_2(\text{g}) + 3\text{H}_2(\text{g})$ :**

- (1)  $8.314 \times 273 \times (-2)$  J
- (2)  $8.314 \times 300 \times (-2)$  J
- (3)  $8.314 \times 27 \times (+2)$  J
- (4)  $8.314 \times 273 \times (+2)$  J

**Q8. At constant temperature for the reaction  $\text{C}_2\text{H}_5\text{OH}(\text{l}) + 3\text{O}_2(\text{g}) \rightarrow 2\text{CO}_2(\text{g}) + 3\text{H}_2\text{O}(\text{l})$ ,  $\Delta H - \Delta E$  is:**

- (1)  $+RT$  (3)  $+3RT$   
(2)  $-3RT$  (4)  $-RT$

**Q9.** The difference between  $\Delta H$  and  $\Delta U$  for the reaction  $C_6H_{12}O_6(l) + 6O_2(g) \rightarrow 6CO_2(g) + 6H_2O(l)$  at  $25^\circ C$  in kJ is

- (1)  $-7.43$  kJ (3)  $-3.72$  kJ  
(2)  $+3.72$  kJ (4)  $+7.43$  kJ

**Q10.** The value of  $\Delta H$  and  $\Delta U$  will be same for

- (1)  $2NH_3(g) \rightarrow N_2(g) + 3H_2(g)$  (3)  $CaCO_3(s) \rightarrow CaO(s) + CO_2(g)$   
(2)  $H_2(g) + I_2(g) \rightarrow 2HI(g)$  (4)  $SO_2(g) + 1/2O_2(g) \rightarrow SO_3(g)$

**Q11.** Enthalpy of 1 mole monoatomic ideal gas is equals to:

- (1)  $\frac{3}{2}RT$  (3)  $RT$   
(2)  $\frac{5}{2}RT$  (4)  $2RT$

**Q12.** Under which of the following conditions is the relation  $\Delta H = \Delta E + P\Delta V$  valid for a system:

- (1) Constant pressure (4) Constant temperature, pressure and composition  
(2) Constant temperature  
(3) Constant temperature and pressure

**Q13.** The difference between heats of reaction at constant pressure and constant volume for the reaction  $C_6H_{12}O_6(l) + 6O_2(g) \rightarrow 6CO_2(g) + 6H_2O(l)$  at  $25^\circ C$  in kJ is

- (1)  $+7.43$  (3)  $-7.43$   
(2)  $+3.72$  (4)  $-3.72$

**Q14.** For a gaseous reaction  $A(g) + 3B(g) \rightarrow 3C(g) + 3D(g)$ ,  $\Delta E$  is 17 kcal at  $27^\circ C$  assuming  $R = 2 \text{ cal K}^{-1} \text{ mol}^{-1}$ , the value of  $\Delta H$  for the above reaction is:

- (1) 15.8 kcal (3) 20.0 kcal  
(2) 18.2 kcal (4) 16.4 kcal

**Q15.** Which of the following statements is correct for the reaction  $CO(g) + 1/2O_2(g) \rightarrow CO_2(g)$  at constant temperature and pressure

- (1)  $\Delta E = \Delta H$  (3)  $\Delta E > \Delta H$   
(2)  $\Delta E < \Delta H$  (4) none of these

**Q16.** For the reaction  $CO(g) + 1/2O_2(g) \rightarrow CO_2(g)$ , which one of the statement is correct at constant T and P?

- (1)  $\Delta E = \Delta H$  (4)  $\Delta H$  is independent of physical state of reactants  
(2)  $\Delta E < \Delta H$   
(3)  $\Delta E > \Delta H$

**Q17. Which is true for the combustion of sucrose ( $C_{12}H_{22}O_{11}$ ) at  $25^{\circ}C$ :**

- (1)  $\Delta E > \Delta H$  (3)  $\Delta E = \Delta H$   
(2)  $\Delta E < \Delta H$  (4) None

**Q18. For the reaction  $2Ag(s) + 1/2O_2(g) \rightarrow Ag_2O(s)$ , which one of the following is true:**

- (1)  $\Delta E = \Delta H$  (3)  $\Delta E < \Delta H$   
(2)  $\Delta E = \frac{1}{2}\Delta H$  (4)  $\Delta E > \Delta H$

**Q19. A mixture of 2 moles of carbon monoxide and one mole of oxygen in a closed vessel is ignited to get carbon dioxide. If  $\Delta H$  is the enthalpy change and  $\Delta E$  is the change in internal energy, then:**

- (1)  $\Delta E > \Delta H$  (3)  $\Delta E = \Delta H$   
(2)  $\Delta E < \Delta H$  (4) Not definite

**Q20. For the gaseous reaction involving the complete combustion of isobutane:**

- (1)  $\Delta E = \Delta H$  (3)  $\Delta E = \Delta H = 0$   
(2)  $\Delta E > \Delta H$  (4)  $\Delta E < \Delta H$

**Q21. For the reversible isothermal expansion of one mole of an ideal gas at 300 K, from a volume of  $10 \text{ dm}^3$  to  $20 \text{ dm}^3$ ,  $\Delta H$  is:**

- (1) 1.73 kJ (3) 3.46 kJ  
(2) -1.73 kJ (4) zero

**Q22. For  $CaCO_3(s) \rightarrow CaO(s) + CO_2(g)$  at  $977^{\circ}C$ ,  $\Delta H = 174 \text{ kJ/mol}$ ; then  $\Delta E$  is:**

- (1) 160 kJ (3) 186.4 kJ  
(2) 163.6 kJ (4) 180 kJ

**Q23. Heat of reaction for  $CO(g) + 1/2O_2(g) \rightarrow CO_2(g)$  at constant V is  $-67.71 \text{ kcal}$  at  $17^{\circ}C$ . The heat of reaction at constant P at  $17^{\circ}C$  is:**

- (1)  $-68.0 \text{ kcal}$  (3)  $-67.42 \text{ kcal}$   
(2)  $+68.0 \text{ kcal}$  (4) none of these

**Q24. The reaction  $NH_2CONH_2(s) + 2H_2O(l) \rightarrow 2NH_3(g) + CO_2(g)$  was carried out in a bomb calorimeter. The heat released was  $743 \text{ kJ mol}^{-1}$ . The value of  $\Delta H_{300K}$  for this reaction would be:**

- (1)  $-740.5 \text{ kJ mol}^{-1}$  (3)  $-743.0 \text{ kJ mol}^{-1}$   
(2)  $-741.75 \text{ kJ mol}^{-1}$  (4)  $-744.25 \text{ kJ mol}^{-1}$

**Q25.** The enthalpy of vaporisation of water at 100°C is 40.63 kJ mol<sup>-1</sup>. The value  $\Delta E$  for this process would be:

- (1) 37.53 kJ mol<sup>-1</sup> (3) 42.19 kJ mol<sup>-1</sup>  
(2) 39.08 kJ mol<sup>-1</sup> (4) 4.73 kJ mol<sup>-1</sup>

**Q26.** For the system  $S(s) + O_2(g) \rightarrow SO_2(g)$ :

- (1)  $\Delta E = \Delta H$  (3)  $\Delta H > \Delta E$   
(2)  $\Delta E > \Delta H$  (4)  $\Delta H = 0$

**Q27.** For which change  $\Delta H \neq \Delta E$ :

- (1)  $H_2(g) + I_2(g) \rightarrow 2HI(g)$  (3)  $C(s) + O_2(g) \rightarrow CO_2(g)$   
(2)  $NaOH(aq) + HCl(aq) \rightarrow NaCl(aq) + H_2O(l)$  (4)  $N_2(g) + 3H_2(g) \rightarrow 2NH_3(g)$

**Q28.** The heat of combustion of ethanol determined in a bomb calorimeter is -670.48 kcal mol<sup>-1</sup> at 27°C. What is  $\Delta H$  at 27°C for the reaction:

- (1) -335.24 kcal (3) -670.48 kcal  
(2) -671.08 kcal (4) +670.48 kcal

**Q29.** The difference in  $\Delta H$  and  $\Delta E$  for the combustion of methane at 25°C would be:

- (1) zero (3)  $2 \times 298 \times -3$  cal  
(2)  $2 \times 298 \times -2$  cal (4)  $2 \times 25 \times -3$  cal

**Q30.** For which of the following reactions  $\Delta H$  is less than  $\Delta E$ :

- (1)  $C_{12}H_{22}O_{11}(s) + 6O_2(g) \rightarrow 6CO_2(g) + 6H_2O(l)$  (3)  $N_2O_4(g) \rightarrow 2NO_2(g)$   
(2)  $2SO_2(g) + O_2(g) \rightarrow 2SO_3(g)$  (4)  $N_2(g) + O_2(g) \rightarrow 2NO(g)$

**Q31.** For a reaction  $2X(s) + 2Y(s) \rightarrow 2C(l) + D(g)$ . The  $q_p$  at 27°C is -28 kcal mol<sup>-1</sup>. The  $q_v$  is ... kCal mol<sup>-1</sup>:

- (1) -27.4 (3) -28.6  
(2) +27.4 (4) 28.6

**Q32.** Assume each reaction is carried out in an open container. For which reaction will  $\Delta H = \Delta E$ ?

- (1)  $H_2(g) + Br_2(g) \rightarrow 2HBr(g)$  (3)  $PCl_5(g) \rightarrow PCl_3(g) + Cl_2(g)$   
(2)  $C(s) + 2H_2O(g) \rightarrow 2H_2(g) + CO_2(g)$  (4)  $2CO(g) + O_2(g) \rightarrow 2CO_2(g)$

**Q33.** The enthalpy change ( $\Delta H$ ) for the reaction  $N_2(g) + 3H_2(g) \rightarrow 2NH_3(g)$  is -92.38 kJ at 298 K. The internal energy change  $\Delta U$  at 298 K is

- (1) -92.38 kJ (3) -97.34 kJ  
(2) -87.42 kJ (4) -89.9 kJ

- Q34.** For the formation of  $\text{CH}_4$ , if  $\Delta U^0 = -x \text{ kJ mol}^{-1}$ , then what will be value of  $\Delta H^0$  in  $\text{kJ mol}^{-1}$ :
- (1)  $-x - RT$  (3)  $-x + RT$   
 (2)  $-x + 2RT$  (4)  $-2x - 4RT$
- Q35.** For the reaction of one mole of zinc dust with one mole of sulphuric acid in a bomb calorimeter.  $\Delta U$  and  $w$  correspond to:
- (1)  $\Delta U < 0, w = 0$  (3)  $\Delta U > 0, w = 0$   
 (2)  $\Delta U < 0, w \neq 0$  (4)  $\Delta U > 0, w \neq 0$
- Q36.** Consider the reaction  $\text{N}_2 + 3\text{H}_2 \rightarrow 2\text{NH}_3$  carried out at constant temperature and pressure. If  $\Delta H$  and  $\Delta U$  are the enthalpy and internal energy changes for the reaction, which of the following expressions is true?
- (1)  $\Delta H < \Delta U$  (3)  $\Delta H = 0$   
 (2)  $\Delta H > \Delta U$  (4)  $\Delta H = \Delta U$
- Q37.** Assuming that water vapour is an ideal gas, the internal energy change ( $\Delta U$ ) when 1 mol of water is vapourised at 1 bar pressure and  $100^\circ\text{C}$ , (Given: Molar enthalpy of vapourisation of water at 1 bar and  $373 \text{ K} = 41 \text{ kJ mol}^{-1}$ ,  $R = 8.3 \text{ J mol}^{-1} \text{ K}^{-1}$ ) will be:
- (1)  $4.100 \text{ kJ mol}^{-1}$  (3)  $37.904 \text{ kJ mol}^{-1}$   
 (2)  $3.7904 \text{ kJ mol}^{-1}$  (4)  $41.00 \text{ kJ mol}^{-1}$
- Q38.** The value of enthalpy change ( $\Delta H$ ) for the reaction  $\text{C}_2\text{H}_5\text{OH}(\text{l}) + 3\text{O}_2(\text{g}) \rightarrow 2\text{CO}_2(\text{g}) + 3\text{H}_2\text{O}(\text{l})$  at  $27^\circ\text{C}$  is  $-1366.5 \text{ kJ mol}^{-1}$ . The value of internal energy change for the above reaction at this temperature will be:
- (1)  $-1371.5 \text{ kJ}$  (3)  $-1364.0 \text{ kJ}$   
 (2)  $-1369.0 \text{ kJ}$  (4)  $-1361.5 \text{ kJ}$
- Q39.** Consider the given reaction  $\text{PCl}_5(\text{g}) \rightarrow \text{PCl}_3(\text{g}) + \text{Cl}_2(\text{g})$ . If the enthalpy change (i.e.  $\Delta H$ ) for the given reaction is  $-x \text{ J}$  at  $T \text{ K}$  then the value of  $\Delta U$  is
- (1)  $(-x + 8.314 T) \text{ J}$  (3)  $(x + 8.314 T) \text{ kJ}$   
 (2)  $-(x + 8.314 T) \text{ J}$  (4)  $-(x + 8.314 T) \text{ kJ}$
- Q40.** If 1 mol of an ideal gas at constant temperature changes its pressure from 5 atm to 2 atm and volume from 4 L to 10 L, then enthalpy change will be
- (1)  $20 \text{ L-atm}$  (3) Zero  
 (2)  $120 \text{ L-atm}$  (4)  $100 \text{ L-atm}$