Q.1 Express the change in internal energy of a system when

(i) No heat is absorbed by the system from the surroundings, but work (w) is done on the system. What type of wall does the system have ?

(ii) No work is done on the system, but q amount of heat is taken out from the system and given to the surroundings. What type of wall does the system have ?

Q.2 Calculate the internal energy change in each of the following cases :-

(i) A system absorbs 15 KJ of heat and does 5 KJ of work.

(ii) 5 KJ of work is done on the system and 15 KJ of heat is given out by the system.

Q.3 Calculate the amount of work done in each of the following cases :-

(i) One mole of an ideal gas contained in a bulb of 10 Litre capacity at 1 bar is allowed to enter into an evacuated bulb of 100 Litre capacity.

(ii) One mole of a gas is allowed to expand from a volume of 1 Litre to a volume of 5 Litres against the constant external pressure of 1 bar (1 litre bar = 100 J)

Calculate the internal energy change (ΔU) in each case if the process were carried out adiabatically.

Q.4 Calculate w, q and ΔU when 0.75 mol of an ideal gas expands isothermally and reversibility at 27˚C from a volume of 15 L to 25 L .

Q.5 Carbon monoxide is allowed to expand isothermally and reversibility from 10 m^3 to 20 m^3 at 300 K and work obtained is 4.754 KJ. Calculate the number of moles of carbon monoxide.

Q.6 A 5 litre cylinder contained 10 moles of oxygen gas at 27˚C . Due to sudden leakage through the hole, all the gas escaped into the atmosphere and the cylinder got empty. If the atmospheric pressure is 1.0 atmosphere, calculate the work done by the gas.(1 L atm = 101.3 J)

Q.7 500 joule of heat was supplied to a system at constant volume. It resulted in the increase of temperature of the system from 20˚C to 25˚C. What is the change in internal energy of the system ?

Q.8 Two moles of an ideal gas initially at 27˚C and one atmospheric pressure are compressed isothermally and reversibility till the final pressure of the gas is 10 atm. Calculate q , w and ΔU for the process.

Q.9 What would be the work done on/by the system if the internal energy of the system falls by 100 joules even when 200 joules of heat is supplied to it ?

Q.10 Calculate the work done when 1 mol of water at 373 K vaporizes against an atmospheric pressure of 1 atmosphere. Assume ideal gas behavior.

Q.11 Two moles of an ideal gas at 2 atm and 27˚C are compressed isothermally to half the volume by an external pressure of 4 atm. Calculate w , q and ΔU.

Q.12 In a process , 701 J of heat is absorbed by a system and 394 J of work is done by the system. What is the change in internal energy of the process ?

Answers

1. (i) wall is adiabatic   (ii) thermally conducting walls   2. (i) increases by 10 KJ   (ii) decreases by 10 KJ

3. (i) q = 0 , w = 0 , ΔU = 0   (ii) w = - 400 J , q = 0 , ΔU = - 400 J   4. w = - 955.5 J , ΔU = 0 , q = + 955.5 J

5. 2.75 moles   6. – 24443.7 J   7. ΔU = 500 J   8. w = 11488 J , ΔU = 0 , q = - 11488 J

9. Work done by the system = 300 J   10. 3100 J   11. w = 5150 J , ΔU = 0 , q = - 5150 J

12. + 307 J

Assignment – II

Q.1   The heat of combustion of benzene in a bomb calorimeter (i.e. constant volume) was found to be 3263.9 KJ mol^{-1} at 25˚C. Calculate the heat of combustion of benzene at constant pressure.

Q.2   If water vapour is assumed to be perfect gas, molar enthalpy change at 1 bar and 100˚C is 41 KJ mol^{-1}. Calculate the internal energy change when

(i)   1 mol of water is vaporised at 1 bar pressure and 100˚C.

(ii) 1 mol of water is converted into ice.

Q.3   Find out the internal energy change for the reaction : A (l) $\rightarrow$ A (g) at 373 K. Heat of vaporisation is 40.66 KJ mol^{-1} and R = 8.3 J mol^{-1} K^{-1}.

Q.4   The heat of combustion of CH_4 (g) at constant volume is measured in a bomb calorimeter at 298.2 K and found to be – 885389 J mol^{-1}. Find the value of enthalpy change.

Q.5   The enthalpy change (ΔH) for the reaction : N_2 (g) + 3 H_2 (g) $\rightarrow$ 2 NH_3 (g) is – 92.38 KJ at 298 K. What is ΔU at 298 K.

Q.6   The internal energy change (ΔU) for the reaction : CH_4 (g) + 2 O_2 (g) $\rightarrow$ CO_2 (g) + 2 H_2O (l) is - 885 KJ mol^{-1} at 298 K. What is ΔH at 298 K.

Q.7   When NH_4NO_2 (s) decomposes at 373 K , it forms N_2 (g) and H_2O (g). The ΔH for the reaction at one atmospheric pressure and 373 K is – 223.6 KJ mol^{-1} of NH_4NO_2 (s) decomposed. What is the value of ΔU for the reaction under the same conditions ? (R = 8.31 J mol^{-1} K^{-1})

Q.8   When 0.532 g of benzene (C_6H_6), boiling point 353 K, is burnt with excess of oxygen in a constant volume system, 22.3 KJ of heat is given out. Calculate ΔH for the combustion process. (R = 8.31 J mol^{-1} K^{-1})

Q.9   The heat of combustion of naphthalene ($C_{10}H_8$ (s)) at constant volume was found to be – 5133 KJ mol^{-1}. Calculate the value of enthalpy change at 298 K.

Q.10 The molar heat formation of NH_4NO_3 (s) is – 367.54 KJ and those of NO_2 (g) and H_2O (l) are + 81.46 KJ and – 285.78 KJ respectively at 25˚C and 1 atmospheric pressure. Calculate ΔH and ΔU for the reaction.

Q.11 Determine the value of ΔH and ΔU for the reversible isothermal evaporation of 90 g of water at 100˚C. Assume that water vapour behave as an ideal gas and heat of evaporation of water is 540 cal g^{-1}. (R = 2 mol^{-1} K^{-1})

Answers

1.   – 3267.6 KJ mol^{-1} 2. (i) 37.90 KJ mol^{-1} (ii) 41 KJ mol^{-1} 3. 37.56 KJ mol^{-1}

4.   – 890347 J   5.   – 87.42 KJ   6.   – 889.96 KJ mol^{-1} 7.   – 232.9 KJ mol^{-1}

8.   – 3274.2 KJ mol^{-1} 9.   – 5138 KJ mol^{-1} 10.   ΔH = - 122.56 KJ mol^{-1} , ΔU = - 125.04 KJ mol^{-1}

11.   ΔH = 48600 cal , ΔU = 44870 cal

Assignment – III

Q.1   1 g of graphite is burnt in a bomb calorimeter in excess of oxygen at 298 K and 1 atmospheric pressure according to the equation :   C (graphite) + O_2 (g) → CO_2 (g). During the reaction, temperature rises from 298 K to 299 K. If the heat capacity of the bomb calorimeter is 20.7 KJ/K , What is the enthalpy change for the above reaction at 298 K and 1 atm ?

Q.2   Calculate the amount of heat evolved when :

(i)   500 cm^3 of 0.1 M hydrochloric acid is mixed with 200 cm^3 of 0.2 M sodium hydroxide solution.

(ii)   200 cm^3 of 0.2 M sulphuric acid is mixed with 400 cm^3 of 0.5 M potassium hydroxide solution.
      Assuming that the specific heat of water is 4.18 J $K^{-1} g^{-1}$ and ignoring the heat absorbed by the container, thermometer, stirrer etc., what would be the rise in temperature in each of the above cases ?

Q.3   A 1.25 g sample of octane (C_8H_{18}) is burned in excess of oxygen in a bomb calorimeter. The temperature of the calorimeter rises from 294.05 K to 300.78 K. If heat capacity of the calorimeter is 8.93 KJ/K, find the heat transferred to the calorimeter. Also calculate the enthalpy combustion of the sample of octane.

Q.4   0.16 g of methane was subjected to combustion at 27˚C in a bomb calorimeter system. The temperature of the calorimeter system (including water) was found to rise by 0.5˚C. Calculate the heat of combustion of methane at (i) constant volume, (ii) constant pressure. The thermal capacity of the calorimeter system is 17.7 KJ/K . (R = 8.314 KJ $mol^{-1} K^{-1}$)

Q.5   When 20 g of ammonium nitrate (NH_4NO_3) is dissolved in 125 g of water in a coffee-cup calorimeter, the temperature falls from 296.5 K to 286.4 K . Find the value of q for the calorimeter.
      (Treat heat capacity of water as the heat capacity of the calorimeter and its contents).

Q.6   Calculate the value of ΔU for the following reaction at 27˚C :
$$C_2H_4 \text{ (g)} + 3 \, O_2 \text{ (g)} \rightarrow 2 \, CO_2 \text{ (g)} + 2 \, H_2O \text{ (l)} \; ; \; \Delta H = -1410.0 \text{ KJ}$$

Q.7   The value of ΔH and ΔU when methane is completely oxidised are − 80 KJ mol^{-1} and − 75.998 KJ mol^{-1} respectively. Calculate the temperature.

Q.8   The heat of combustion of 1 mole of carbon monoxide at constant volume is − 283.298 KJ at 290 K. Calculate its value at constant pressure.

Q.9   Calculate the value of ΔU for the reaction at 25˚C : C_2H_4 (g) + H_2 (g) → C_2H_6 (g) ; ΔH = - 137.76 KJ
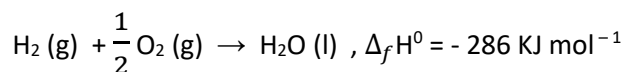
Answers
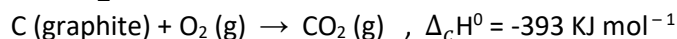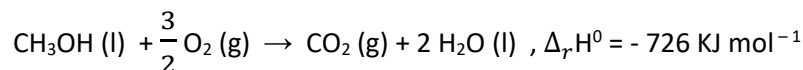
1. − 248.4 KJ mol^{-1} 2. (i) 2.284 KJ   (ii) 4.568 KJ , Temp. change in Ist case = 0.78˚C & 2nd case = 1.82˚C

3. Heat transferred = 60.1 KJ , $\Delta_C H$ = 548.1 KJ mol^{-1} 4. q_v = - 885 KJ mol^{-1} , q_p = - 890 KJ mol^{-1}

5. − 5.28 KJ   6. ΔU = - 1405.05 KJ   7. T = 240.678 K   8. ΔH = - 284.5 KJ

9. ΔU = - 135.28 KJ

N.C.E.R.T EXERCISE

Q.1   Choose the correct answer. A thermodynamic state function is a quantity
      a) used to determine heat changes   b) whose value is independent of path
      c) used to determine pressure volume work d) whose value depends on temperature only

Q.2   For the process to occur under adiabatic conditions, the correct condition is :
      a) $\Delta T = 0$ b) $\Delta p = 0$ c) $q = 0$ d) $w = 0$

Q.3   The enthalpies of all element in their standard states are :
      a) unity   b) zero
      c) < 0   d) different for each element

Q.4 ΔU^0 of combustion of methane is $- X$ KJ mol^{-1}. The value of ΔH^0 is
      a) $= \Delta U^0$ b) $> \Delta U^0$ c) $< \Delta U^0$ d) $= 0$

Q.5   The enthalpy of combustion of methane, graphite and dihydrogen at 298 K are $- 890.3$ KJ mol^{-1} and $- 393.5$ KJ mol^{-1} and $- 285.8$ KJ mol^{-1} respectively. Enthalpy of formation of CH_4 (g) will be :
      a) $- 74.8$ KJ mol^{-1} b) $- 52.27$ KJ mol^{-1} c) $+ 74.8$ KJ mol^{-1} d) $+ 52.26$ KJ mol^{-1}

Q.6   A reaction, $A + B \rightarrow C + D + q$ is found to have a positive entropy change. The reaction will be
      a) possible at high temperature   b) possible only at low temperature
      c) not possible at any temperature   d) possible at any temperature

Q.7   In a process , 701 J of heat is absorbed by a system and 394 J of work is done by the system. What is the change in internal energy of the process ?

Q.8   The reaction of cyanamide, NH_2CN (s), with dioxygen was carried out in a bomb calorimeter, and ΔU was found to be $- 742.7$ KJ mol^{-1} at 298 K. Calculate the enthalpy change of the reaction at 298 K :

$$NH_2CN \text{ (s)} + \frac{3}{2} O_2 \text{ (g)} \rightarrow N_2 \text{ (g)} + CO_2 \text{ (g)} + H_2O \text{ (l)}$$

Q.9   Calculate the number of KJ of heat necessary to rise the temperature of 60 g of aluminium from 35°C to 55°C. Molar heat capacity of Al is 24 J mol K^{-1}.

Q.10 Calculate the enthalpy change on freezing of 1.0 mol^{-1} of water at 10.0°C to ice at $- 10.0$°C. $\Delta_{fus}H = 6.03$ KJ mol^{-1} at 0°C. $C_P [H_2O \text{ (l)}] = 75.3$ J mol^{-1} K , $C_P [H_2O \text{ (s)}] = 36.8$ J mol^{-1} K.

Q.11 Enthalpy of combustion of carbon to CO is $- 393.5$ KJ mol^{-1}. Calculate the heat released upon formation of 35.2 g of CO_2 from carbon and dioxygen gas.

Q.12 Enthalpies of formation of CO (g) , CO_2 (g) , N_2O (g) and N_2O_4 (g) are $- 110$, $- 393$, 81 and 9.7 KJ mol^{-1} respectively. Find the value of $\Delta_r H$ for the reaction :
$$N_2O_4 \text{ (g)} + 3 CO \text{ (g)} \rightarrow N_2O \text{ (g)} + 3 CO_2 \text{ (g)}$$

Q.13 Given : N_2 (g) + 3 H_2 (g) $\rightarrow$ 2 NH_3 (g) : $\Delta_r H^0 = - 92.4$ KJ mol^{-1}
      What is the standard enthalpy of formation of NH_3 gas ?

Q.14 For an isolated system, $\Delta U = 0$, what will be ΔS ?

Q.15 Calculate the standard enthalpy of formation of CH_3OH (l) from the following data :

$$CH_3OH \ (l) \ + \frac{3}{2} O_2 \ (g) \ \rightarrow \ CO_2 \ (g) + 2 \ H_2O \ (l) \ , \Delta_r H^0 = - \ 726 \ KJ \ mol^{-1}$$

$$C \ (graphite) + O_2 \ (g) \ \rightarrow \ CO_2 \ (g) \ , \ \Delta_c H^0 = -393 \ KJ \ mol^{-1}$$

$$H_2 \ (g) \ + \frac{1}{2} O_2 \ (g) \ \rightarrow \ H_2O \ (l) \ , \Delta_f H^0 = - \ 286 \ KJ \ mol^{-1}$$

Q.16 Calculate the enthalpy change for the process , $CCl_4 \ (g) \ \rightarrow C \ (g) + 4 \ Cl \ (g)$ and calculate bond enthalpy of C – Cl in CCl_4 (g).

$\Delta_{vap} H^0$ [CCl_4] = 30.5 KJ mol^{-1} , $\Delta_f H^0$ [CCl_4] = - 135.5 KJ mol^{-1}, $\Delta_a H^0$ [C] = 715.0 KJ mol^{-1} , where $\Delta_a H^0$ is enthalpy of atomization , $\Delta_a H^0$ [Cl_2] = 242 KJ mol^{-1}

Q.17 For the reaction at 298 K : $2 \ A + B \ \rightarrow \ C$, ΔH = 400 KJ mol^{-1} and ΔS = 0.2 KJ mol^{-1}K^{-1}

At what temperature will the reaction become spontaneous considering ΔH and ΔS to be constant over the temperature range?
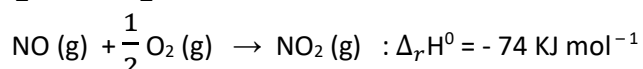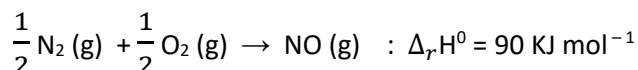
Q.18 For the reaction : $2 \ Cl \ (g) \ \rightarrow \ Cl_2 \ (g)$, what are the signs of ΔH and ΔS ?

Q.19 For the reaction : $2 \ A \ (g) + B \ (g) \ \rightarrow \ 2 \ D \ (g)$, ΔU^0 = - 10.5 KJ and ΔS^0 = - 44.1 J K^{-1}

Calculate ΔG^0 for the reaction, and predict whether the reaction may occur spontaneously.

Q.20 The equilibrium constant for a reaction is 10. What will be the value of ΔG^0 ? R = 8.314 J mol^{-1}K^{-1} , T = 300 K.

Q.21 Comment on the thermodynamic stability of NO (g) , given

$$\frac{1}{2} N_2 \ (g) \ + \frac{1}{2} O_2 \ (g) \ \rightarrow \ NO \ (g) \ \ : \Delta_r H^0 = 90 \ KJ \ mol^{-1}$$

$$NO \ (g) \ + \frac{1}{2} O_2 \ (g) \ \rightarrow \ NO_2 \ (g) \ \ : \Delta_r H^0 = - \ 74 \ KJ \ mol^{-1}$$

Q.22 Calculate the entropy change in surroundings when 1 mol of H_2O (l) is formed under standard conditions. $\Delta_f H^0$ = - 286 KJ mol^{-1}.

Answers

1. b	2. c	3. b	4. c	5. a	6. d	7. 307 J	8. – 741.5 KJ/mol	9. 1066.7 J

10. – 7.151 KJ/mol   11. 314.8 KJ   12. – 777.7 KJ   13. – 46.2 KJ/mol   14. ΔS = + ve

15. – 239 KJ/mol   16. 326 KJ/mol   17. More than 2000 K   18. ΔH = - ve , ΔS = - ve

19. ΔG^0 = + ve , No   20. – 5744.1 J   21. "NO" is unstable , "NO" changes to stable "NO_2 (g)"

22. 959.7 J mol^{-1}K^{-1}

Level – 1

Q.1 Which of the following pairs does not represent example for intensive property?
   a) Temperature and Density
   b) Pressure and Molar volume
   c) Molar heat capacity and Density
   d) Heat capacity and Enthalpy

Q.2 Which one of the following equations does not correctly represent the first law of thermodynamics for the given process?
   a) Isothermal process : q = – w
   b) Cyclic process : q = – w
   c) Isochoric process : ΔE = q
   d) Adiabatic process : ΔE = – w

Q.3 ΔE is always positive when :
   a) System absorbs heat and work is done on it
   b) System emits heat and work is done on it
   c) System emits heat and no work is done on it
   d) System absorbs heat and work is done by it

Q.4 One mole of an ideal gas at 300 K is expanded isothermally from an initial volume of 1 litre to 10 litres. The ΔE for this process is (R = 2 cal K^{-1} mol^{-1}).
   a) 163.7 cal
   b) zero
   c) 138.1 cal
   d) 9 lit atm

Q.5 If 'w' is the amount of work done by the system and 'q' is the amount of heat supplied to the system, Identify the type of the system.
   a) Isolated system
   b) Closed system
   c) Open system
   d) System with thermally conducting walls

Q.6 Which of the following are not state functions? (i) q + w (ii) q (iii) w (iv) H – TS
   a) (i) and (iv)
   b) (ii) , (iii) , (iv)
   c) (i) , (ii) , (iii)
   d) (ii) , (iii)

Q.7 Changes in a system from an initial state to the final state were made by a different manner that 'ΔH' remains same but 'q' changes because :
   a) 'ΔH' is a path function but 'q' is a state function
   b) 'ΔH' is a state function but 'q' is a path function
   c) Both 'ΔH' and 'q' are state function
   d) Both 'ΔH' and 'q' are path function

Q.8 When 1 mole of a gas is heated at a constant volume, temperature is raised from 298 K to 308 K. Heat supplied to the gas is 500 J. Then which statement is correct?
   a) q = W = 500 J , ΔU = 0
   b) q = ΔU = 500 J , W = 0
   c) q = W = 500 J , ΔU = W = 0
   d) ΔU = 0 , q = W = – 500 J

Q.9 4.48 L of an ideal gas at STP requires 12 calories to raise its temperature by 15℃ at constant volume. The C_P of the gas is :
   a) 3 cal
   b) 4 cal
   c) 7 cal
   d) 6 cal

Q.10 The temperature of 2 moles of an ideal gas is raised from 27°C to 77°C. What is the value for $\Delta H - \Delta U$ for this process? (R = 8.3 J K^{-1} mol^{-1}).

a) 415 J   b)   830 J   c)   1660 J   d) None of these

Q.11 Which of the following p – V curve represents maximum work done?

a)   V   b)   c)   d)
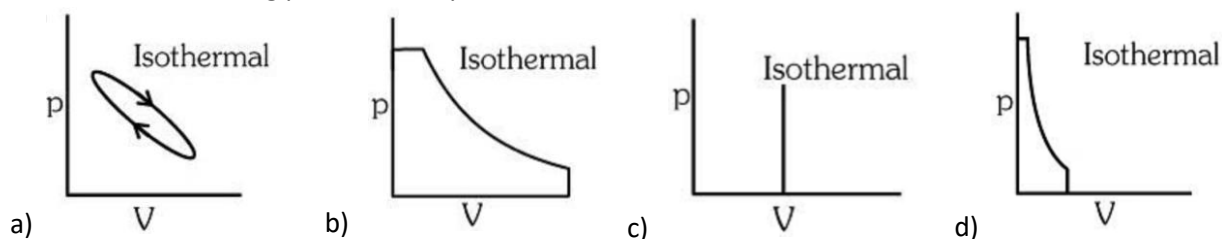
Q.12 Thermodynamics is not concerned about ....

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 if a chemical reaction.

Q.13 Which of the following statement 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 surrounding in the closed system.
c)   The presence of reactant in a closed vessel made up of copper is an example of closed system.
d)   The presence of reactant in a thermos flask or any other closed insulated vessel is an example of closed system.

Q.14 The state of the 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

Q.15 The volume of gas is reduced to half from its original volume. The specific heat will :

a) reduced to half   b)   be doubled   c) remain constant   d) Increase 4 times

Q.16 The pressure volume work for an ideal gas can be calculated by using the expression $w = -\int_{V_i}^{V_f} P_{ex} dV$. This work can also be calculated from pV-plot by using the area under the curve within the specified limits. When an ideal gas is compressed (a) reversibility or (b) irreversibility from volume V_i to V_f, choose the correct option.

a) w (reversible) = w (irreversible)   b)   w (reversible) < w (irreversible)
c) w (reversible) > w (irreversible)   d)   w (reversible) = w (irreversible) + $P_{ex}\Delta V$

Q.17 Which of the following represent open system?

a) Plants & animals   b)   A fridge   c)   A solar cooker   d)   None of these

Q.18 One mole of a gas occupying 3 Litre volume is expanded against a constant external pressure of one atm to a volume of 15 litre. The work in this process is :

a) $- 1.215 \times 10^3$ J   b) 12.15×10^3 J   c) 121.5×10^3 J   d) 1.215×10^3 J

Q.19 The work during the expansion of a gas from a volume of 4 dm^3 to 6 dm^3 against a constant external pressure of 3 atm is :

a) $- 608$ J   b)   304 J   c) $- 304$ J   d) $- 6$ J

Q.20 The work during the expansion of a gas from a volume of 4 dm^3 to 6 dm^3 against a constant external pressure of 2 atm is :

a) − 405.2 J   b) 304 J   c) − 304 J   d) − 6 J

Q.21 Thermodynamics is concerned with :

a) Total energy of a system   b) Energy changes in a system

c) Rate of a chemical reaction   d) Mass changes in nuclear reactions

Q.22 A well stoppered thermos flask contains some ice cubes. This is an example of

a) Closed system   b) Open system

c) Isolated system   d) Non-thermodynamics system

Q.23 Identify the intensive quantities from the following :

a) Enthalpy and temperature   b) Volume and temperature

c) Enthalpy and volume   d) Temperature and refractive index

Q.24 Which of the following is an extensive property :

a) Mass   b) enthalpy   c) energy   d) all of these

Q.25 For an adiabatic process which of the following relations is correct:

a) $\Delta E = 0$ b) $P\Delta V = 0$ c) q = 0   d) q = + w

Q.26 When a gas is compressed adiabatically and reversibly, the final temperature is :

a) Higher than the initial temperature   b) Lower than the initial temperature

c) Same as the initial temperature   d) Dependent at the rate of compression

Q.27 Which one is dependent on initial and final state?

a) Heat supplied at constant pressure   b) Heat supplied at constant volume

c) enthalpy   d) all the above

Q.28 Out of boiling point (i) , enthalpy (ii) , pH (iii) and emf of the cell (iv) ; intensive properties are :

a) (i) , (iii) , (iv)   b) (i) , (ii)   c) (i) , (ii) , (iii)   d) all of these

Q.29 Temperature and volume are not :

a) Extensive properties   b) Intensive properties

c) Intensive and Extensive properties respectively   d) Extensive and intensive properties respectively

Q.30 q = − w is not true for :

a) isothermal process   b) Adiabatic process   c) Cyclic process   d) Both (i) & (iii)

Q.31 Which statement is true for reversible process :

a) It takes place in single step   b) Driving force is much grater than opposing force

c) Work obtained is minimum   d) None

Q.32 Both q and w are _____ functions :

a) state   b) state , path   c) path , state   d) path

Q.33 If work done by the system is 300 joule when 100 cal. Heat is supplied to it. The change in internal energy during the process is :

a) − 200 J   b) 400 J   c) 720 J   d) 120 J

Q.34 A system has internal energy equal to E_1 , 450 J of heat is taken out of it and 600 J of work is done on it. The final energy of the system will be :

a) (E_1 + 150)   b) (E_1 + 1050)   c) (E_1 − 150)   d) None of these

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Q.35 The work done by a system is 8 J when 40 J heat is supplied to it. The change in internal energy of the system during the process :

a) 32 J   b) 40 J   c) 48 J   d) -32 J

Q.36 Internal energy change during a reversible isothermal expansion of an ideal gas is :

a) Always negative   b) Always positive

c) zero   d) May be positive or negative

Q.37 Under which of the following conditions is the relation, $\Delta H = \Delta E + P\Delta V$ valid for a system :

a) Constant pressure   b) Constant temperature

c) Constant temperature and pressure   d) Constant temperature , pressure & composition

Q.38 Which of the following statements is correct for the reaction : $2 SO_2$ (g) + O_2 (g) $\longrightarrow$ $2 SO_3$ (g) at constant temperature and pressure.

a) $\Delta H = \Delta E$ b) $\Delta H < \Delta E$ c) $\Delta H > \Delta E$ d) None of the above

Q.39 For the reaction : Ag_2O (s) $\longrightarrow$ $2 Ag$ + $\frac{1}{2} O_2$ (g), which one of the following is true :

a) $\Delta H = \Delta E$ b) $\Delta H = \frac{1}{2} \Delta E$ c) $\Delta H < \Delta E$ d) $\Delta H > \Delta E$

Q.40 A mixture of 2 moles of carbon monoxide and 1 mole of oxygen in a closed vessel is ignited to get carbon dioxide. If ΔH is the enthalpy change and ΔE is the change in internal energy, then :

a) $\Delta H > \Delta E$ b) $\Delta H < \Delta E$ c) $\Delta H = \Delta E$ d) Nott definite

Q.41 For the gaseous reaction involving the complete combustion of isobutane :

a) $\Delta H = \Delta E$ b) $\Delta H > \Delta E$ c) $\Delta H = \Delta E = 0$ d) $\Delta H < \Delta E$

Q.42 For the reversible isothermal expansion of one mole of an ideal gas at 300 K, from a volume to 10 dm^3 to 20 dm^3, ΔH is :

a) 1.73 KJ   b) $-$ 1.73 KJ   c) 3.46 KJ   d) zero

Q.43 For the system, S (s) + O_2 (g) $\longrightarrow$ SO_2 (g) :

a) $\Delta H = \Delta E$ b) $\Delta H > \Delta E$ c) $\Delta E > \Delta H$ d) $\Delta H = 0$

Q.44 For the reaction : CO (g) + $\frac{1}{2} O_2$ (g) $\longrightarrow$ CO_2 (g) : which one of these statements is correct at constant T and P?

a) $\Delta H = \Delta E$ b) $\Delta H < \Delta E$

c) $\Delta H => \Delta E$ d) ΔH is independent of physical state of reactions

Q.45 Two moles of an ideal gas expand spontaneously into vacuum. The work is :

a) zero   b) 2 J   c) 4 J   d) 8 J

Answers

1.	d	2.	d	3.	a	4.	b	5.	b	6.	d	7.	b	8.	b
9.	d	10.	b	11.	b	12.	c	13.	c	14.	d	15.	c	16.	b
17.	a	18.	a	19.	a	20.	a	21.	b	22.	c	23.	d	24.	d
25.	c	26.	a	27.	d	28.	a	29.	d	30.	b	31.	d	32.	d
33.	d	34.	a	35.	a	36.	c	37.	a	38.	b	39.	d	40.	b
41.	b	42.	d	43.	a	44.	b	45.	a						