Daily Problem Practice-II (CHEMICAL-THERMODYNAMICS)

1. An ideal gas expands in volume from 1×10^{-3} m^3 to 1×10^{-2} m^3 at 300 K temp against a constant pressure P = 1×10^5 Nm^{-2}. The work done is –
(a) –900 J (b) –900 kJ (c) 270 kJ (d) +900 kJ

2. Two moles of an ideal gas are expended isothermally and reversibly from 1L to 10 L at 300 k. The enthalpy change (in kJ) for process is
(a) + 11.4 (b) –11.4 (c) 0 (d) +4.8

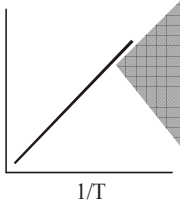
3. For the process H_2O (*l*) [1bar, 373k] → H_2O(g) [1bar, 373 k] the correct set of thermodynamic parameter is –
(a) ΔG = 0, ΔS = +ve (b) ΔG = +ve, ΔS = 0
(c) ΔG = 0, ΔS = –ve (d) ΔG = –ve, ΔS = +ve

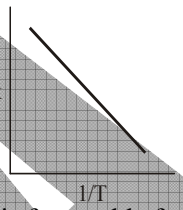
4. For a reaction to occur spontaneously:
(a) (ΔH - TΔS) must be negative (b) (ΔH + TΔS) must be negative
(c) (ΔH) must be negative (d) (ΔS) must be negative

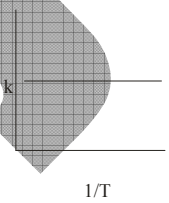
5. The change in entropy for the following transformations is respectively (+ indicates increases, - indicates decreases and 0 indicates no change)
(i) $SO_2Cl_{2(g)} \rightarrow SO_{2(g)} + Cl_{2(g)}$ (ii) $nCH_2 = CH_{2(g)} \rightarrow [CH_2\text{-}CH_{2(s)}]_n$
(iii) $I_{2(s)} \rightarrow I_{2(v)}$ (iv) Adiabatic reversible expansion an ideal gas
(A) +, –, 0, + **(B) +, –, 0, 0** **(C) –, +, +, 0** **(D) +, –, +, 0**

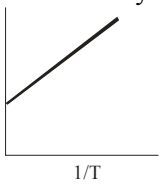
6. Which of the following relation is correct –
(a) ΔG° = RT lnk (b) ΔG° = RT log K (c) $K = e^{-\Delta G°/2.303RT}$ (d) $K = 10^{-\Delta G°/2.303RT}$

7. ΔG° for the reaction A + B $\rightleftharpoons$ C + D is equal to –4.606 kcal. The value of equilibrium constant for the reaction is-
(a) 100 (b) 10 (c) 2 (d) 0.01

8. Which of the following PLOT is correct for relation between log *K* and 1/T for exothermic thermodynamic process
(a) 

(b) 

(c) 

(d) 

9. Which of the following conditions is favourable for the feasibility of a reaction –
(a) ΔH = –ve, TΔS = +ve (b) ΔH = –ve, TΔS = +ve, TΔS < ΔH
(c) ΔH = +ve, TΔS = +ve, TΔS < ΔH (d) ΔH = +ve, TΔS + ve, TΔS > ΔH

10. The value of ΔG for the reaction *nx* → mB, at 700 K if ΔH = –113 kJ mol^{-1} and DS = 145 JK^{-1} mol^{-1}
(a) +11.50 kJ mol^{-1} (b) –11.50 kJmol^{-1} (c) +22.80 kJ mol^{-1} (d) –30.57 kJ mol^{-1}

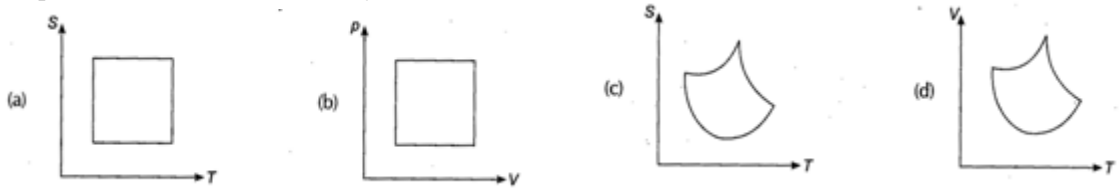
11. $\left(\frac{\partial G}{\partial p}\right)_T$ =
(a) V (b) S (c) –S (d) –V

12. Among the following, the system that would require the highest amount of thermal energy to bring its temperature to 80°C is
(a) 400 g of water at 40°C (b) 200 g of water at 20°C
(c) 3000 g of water at 50°C (d) 600 g of water at 30°C

13. Among the following, the reaction that is accompanied by a decrease in the entropy is
(a) $N_2(g) + 3H_2(g) \rightarrow 2NH_3$ (g) (b) $C_6H_{12}O_6(s) + 6O_2(g) \rightarrow 6CO_2(g) + 6H_2O$ (*l*)
(c) PCl_5 (s) → PCl_3 (*l*) + Cl*2* (g) (d) $2H_2O$ (*l*) → $2H_2$ (g) + O_2(g)

14. A thermodynamic process is endothermic and takes place with increase in entropy
(a) is always non-spontaneous (b) is always spontaneous
(c) spontaneous at high temperature (d) spontaneous at low temperature

15. The plot that describes a Carnot cycle is



16. Which of the following relation is INCORRECT?

(a) $\left(\frac{\partial A}{\partial T}\right)_V = -S$ (b) $\left[\frac{\partial A}{\partial V}\right]_T = -P$ (c) $\left[\frac{\partial G}{\partial T}\right]_P = -S$ (d) $\left[\frac{\partial A}{\partial T}\right]_T = P$

17. For a chemical reaction, $\Delta H° = -38.3$ kJ & $\Delta S° = -113$ JK^{-1} mol^{-1}. This reaction is –
(a) Spontaneous at all temperature (b) Non-spontaneous at all temperature.
(c) Spontaneous at temperature above 340 K (d) Spontaneous at temperature above 340 K

18. The change in entropy when 1 mole of an ideal gas is compressed to 1/4th of its initial volume and simultaneously heated to twice of its initial temperature is:

(a) $[C_v - R] \ln 2$ (b) $[C_v - 2R] \ln 2$ (c) $[C_v + 2R] \ln 2$ (d) $[C_v - R] \ln 4$

19. A Carnot engine operating between 27°C and 127°C has efficiency equal to
(a) 21% (b) 22% (c) 24% (d) 25%

20. *T-S* diagram for a Carnot's cycle is
(a) Rectangle (b) circle (c) ellipse (d) Parabolic

21. The difference in entropy (ΔS) between a state of volume V_i and a state of volume V_f (temperature and number of molecules remaining constant) is equal to

(a) $nR \log \frac{V_f}{V_i}$ (b) $nR \log \frac{V_i}{V_f}$ (c) $nR^2 \log \frac{V_f}{V_i}$ (d) $nR^2 \log \frac{V_i}{V_f}$

22. The entropy of an isolated system
(a) Remains unchanged in any process (b) Remains unchanged or increase during any process
(c) Remains unchanged in an irreversible process (d) The entropy of non-isolated systems always increase

23. In one of the Maxwell's relations $\left(\frac{\partial S}{\partial p}\right)$ equals

(a) $\left(\frac{\partial V}{\partial T}\right)_V$ (b) $-\left(\frac{\partial V}{\partial T}\right)_p$ (c) $-\left(\frac{\partial T}{\partial V}\right)_S$ (d) $\left(\frac{\partial p}{\partial T}\right)_V$

24. Which of the following Maxwell's equation is NOT correct?

(a) $\left(\frac{\partial S}{\partial V}\right)_T = \left(\frac{\partial V}{\partial T}\right)_p$ (b) $\left(\frac{\partial T}{\partial V}\right) = -\left(\frac{\partial p}{\partial S}\right)_V$ (c) $\left(\frac{\partial V}{\partial p}\right)_S = \left(\frac{\partial T}{\partial S}\right)$ (d) $\left(\frac{\partial T}{\partial p}\right)_S = \left(\frac{\partial V}{\partial S}\right)_p$

25. The enthalpy of vaporization of a liquid is 30 kJ mol^{-1} and entropy of vaporization is 75 J $mo1^{-1}$ K^{-1}. The boiling point of the liquid at 1 atm is:
(a) 250 K (b) 400 K (c) 450 K (d) 600 K

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ANSWER KEY

1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
11.	**12.**	**13.**	**14.**	**15.**	**16.**	**17.**	**18.**	**19.**	**20.**
21.	**22.**	**23.**	**24.**	**25.**					