Date Planned : __ / __ / __	**Daily Tutorial Sheet-2**	**Expected Duration : 90 Min**
Actual Date of Attempt : __ / __ / __	**JEE Advanced (Archive)**	**Exact Duration :________**

16. An insulated container contains 1 mole of a liquid, molar volume 100 ml, at 1 bar. When liquid is steeply pressed to 100 bar, volume decreases to 99 ml. Find $\Delta H - \Delta U$ for the process. **(2004)**

17. 1 mole of a monoatomic ideal gas at T K undergoes adiabatic expansion under a constant external pressure of 1 atm from 1 L to 2 L. The final temperature (in K) would be : **(2005)**

(A) $\frac{T}{2^{2/3}}$ **(B)** $T + \frac{2}{3 \times 0.0821}$

(C) T **(D)** $T - \frac{2}{3 \times 0.0821}$

18. A monotomic ideal gas undergoes a process in which the ratio of P to V at any instant is constant and equals to 1. What is the molar heat capacity of the gas ? **(2006)**

(A) $\frac{4R}{2}$ **(B)** $\frac{3R}{2}$ **(C)** $\frac{5R}{2}$ **(D)** 0

19. The direct conversion of A to B is difficult, hence it is carried out by the following shown path ? Given $\Delta S_{(A \to C)} = 50\,\text{e.u.}$, $\Delta S_{(C \to D)} = 30\,\text{e.u.}$, $\Delta S_{(D \to B)} = -20\,\text{eu}$ where e.u. is entropy unit, then $\Delta S_{(A \to B)}$ is :

$$\begin{tikzcd} C \arrow[r] & D \arrow[d] \\ A \arrow[u] & B \end{tikzcd}$$

(A) $+60\,\text{e.u.}$ **(B)** $+100\,\text{e.u.}$ **(2006)**

(C) $-60\,\text{e.u.}$ **(D)** $-100\,\text{e.u.}$

***20.** $N_2 + 3H_2 \rightleftharpoons 2NH_3$. Which is correct statement if N_2 is added at equilibrium condition ? **(2006)**

(A) The equilibrium will shift to forward direction because according to IInd law of the thermodynamics the entropy must increase in the direction of spontaneous reaction.

(B) The condition for equilibrium is $G_{N_2} + 3G_{H_2} = 2G_{NH_3}$, where G is Gibbs free energy per mole of the gaseous species measured at that partial pressure. The condition of equilibrium is unaffected by the use of catalyst, which increases the rate of both the forward and backward reactions to the same extant.

(C) The catalyst will increase the rate of forward reaction by α and that of backward reaction by β.

(D) Catalyst will not alter the rate of either of the reaction.

21. The value of $\log_{10} K$ for reaction $A \rightleftharpoons B$ is :

(Given: $\Delta_r H^\circ_{298K} = -54.07\,\text{kJ mol}^{-1}$, $\Delta_r S^\circ_{298K} = 10\,\text{J K}^{-1}\,\text{mol}^{-1}$ and $R = 8.314\,\text{JK}^{-1}\,\text{mol}^{-1}$;

$2.303 \times 8.314 \times 298 = 5705$) **(2007)**

(A) 5 **(B)** 10 **(C)** 95 **(D)** 100

22. For the process: $H_2O(l)(1\,\text{bar}, 373\,\text{K}) \longrightarrow H_2O(g)(1\,\text{bar}, 373\,\text{K})$, the correct set of thermodynamic parameters is : **(2007)**

(A) $\Delta G = 0, \Delta S = +\text{ve}$ **(B)** $\Delta G = 0, \Delta S = -\text{ve}$

(C) $\Delta G = +\text{ve}, \Delta S = 0$ **(D)** $\Delta G = -\text{ve}, \Delta S = +\text{ve}$

23. **Statement I:** For every chemical reaction at equilibrium, standard Gibbs energy of reaction is zero.

Statement II: At constant temperature and pressure, chemical reactions are spontaneous in the direction of decreasing Gibbs energy. **(2008)**

(A) Statement-I is True, Statement-II is True and Statement-II is a correct explanation for Statement-I.

(B) Statement-I is True, Statement-II is True and Statement-II is NOT a correct explanation for Statement-I.

(C) Statement-I is True, Statement-II is False.

(D) Statement-I is False, Statement-II is True.

24. **Assertion :** There is a natural asymmetry between converting work to heat and converting heat to work.

Reason : No process is possible in which the sole result is the absorption of heat from a reservoir and its complete conversion into work. **(2008)**

(A) Statement-I is True, Statement-II is True and Statement-II is a correct explanation for Statement-I.

(B) Statement-I is True, Statement-II is True and Statement-II is NOT a correct explanation for Statement-I.

(C) Statement-I is True, Statement-II is False.

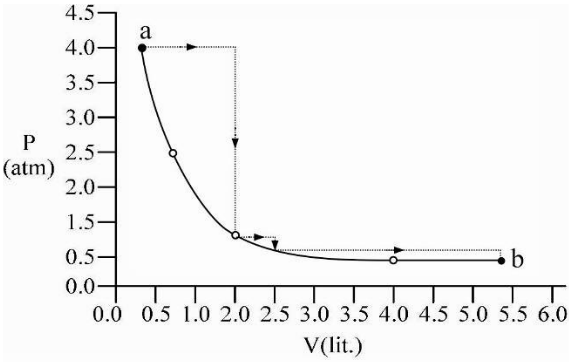
(D) Statement-I is False, Statement-II is True.

25. Among the following the state function(s) is (are) : **(2009)**

(A) internal energy **(B)** irreversible expansion work

(C) reversible expansion work **(D)** molar enthalpy

26. One mole of an ideal gas is taken from a to b along two paths denoted by the solid and the dashed lines as shown in the graph below. If the work done along the solid line path is w_s and that along the dotted line path is w_d, then the integer closest to the ratio w_d / w_s is : **(2010)**



27. To an evacuated vessel with movable piston under external pressure of 1 atm, 0.1 mol of He and 1.0 mol of an unknown compound (vapour pressure 0.68 atm. at 0°C) are introduced. Considering the ideal gas behaviour, the total volume (in litre) of the gases at 0°C is close to : **(2011)**

28. Match the transformations in Column I with appropriate option in Column II. **(2011)**

Column I		**Column II**	
(A)	$CO_2(s) \rightarrow CO_2(g)$	**(p)**	Phase transition
(B)	$CaCO_3(s) \rightarrow CaO(s) + CO_2(g)$	**(q)**	Allotropic change
(C)	$2\overset{\bullet}{H} \rightarrow H_2(g)$	**(r)**	ΔH is positive
(D)	$P_{(white,\, solid)} \rightarrow P_{(red,\, solid)}$	**(s)**	ΔS is positive
		(t)	ΔS is negative

29. Match the thermodynamics processes given under Column I with the expressions given under Column II. **(2011)**

Column I		Column II	
(A)	Freezing of water at 273 K and 1 atm	**(p)**	$q = 0$
(B)	Expansion of 1 mol of an ideal gas into a vacuum under isolated conditions	**(q)**	$w = 0$
(C)	Mixing of equal volumes of two ideal gases at constant temperature and pressure in an isolated container	**(r)**	$\Delta S_{sys} < 0$
(D)	Reversible heating of $H_2(g)$ at 1 atm from 300 K, followed by reversible cooling to 300 K at 1 atm	**(s)**	$\Delta U = 0$
		(t)	$\Delta G = 0$

***30.** 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 ΔS as change in entropy and W as work done]. **(2012)**

(A) $\Delta S_{x \to z} = \Delta S_{x \to y} + \Delta S_{y \to z}$

(B) $W_{x \to z} = W_{x \to y} + W_{y \to z}$

(C) $W_{x \to y \to z} = W_{x \to y}$

(D) $\Delta S_{x \to y \to z} = \Delta S_{x \to y}$