Date: 29-10-2018   Dept. No.   Max. : 100 Marks
Time: 01:00-04:00

PART – A

Answer ALL the questions.   **(10x2=20)**

1.   State the principle of equipartition of energy.

2.   What are state and path functions?

3.   The heat of neutralization of strong acid by a strong base is constant. Account.

4.   Define the term bond energy.

5.   State Trouton's rule.

6.   Write the criteria for spontaneity.

7.   State Le-Chatelier-Braun principle.

8.   Write any two characteristic feature of chemical equilibrium.

9.   What are the exceptions of third law of thermodynamics?

10.   Define the thermodynamic probability.

PART – B

Answer any EIGHT questions.   **(8x5=40)**

11.   State the postulates of kinetic theory of gases.

12.   Derive an expression for the work done in a reversible, isothermal expansion process.

13.   10 moles of an ideal gas expand isothermally and reversibly from a volume of $1 \ dm^3$ to a volume of $10 \ dm^3$ at 27^oC.   What is the maximum work done? Express the result in joules.

14.   Explain the determination of calorific value of a fuel using Bomb Calorimeter.

15.   State Hess's law of constant heat summation. Discuss any one of its applications.

16.   What is the thermodynamic principle of working of refrigerator?

17.   Derive Gibbs-Helmholtz equation.

18.   Discuss the dissociation of HI using Le-Chatelier-Braun principle.

19.   Derive the relationship between K_p and K_c.

20.   State and explain Nernst heat theorem.

21.   Derive the Maxwell Boltzmann statistical equation.

22.   Calculate the translational partition function for benzene in a volume of $1 \ m^3$ at 25^oC.

PART – C

Answer any FOUR questions.   **(4x10=40)**

23. (a) Discuss the Maxwell's distribution of molecular velocities.

(b) Derive van der Waals equation of state.

24. (a) State and explain Joule-Thomson effect.   **(5)**

(b) Derive Kirchoff's equation.   **(5)**

25. (a) Calculate the ΔH for the reaction $AgNO_3 + NaCl \rightarrow NaNO_3 + AgCl$.

Given $\Delta H^o_f\ Ag^+_{(aq)}$ = 105.9 kJ/mol, $\Delta H^o_f AgCl_{(s)}$ = 127.0 KJ/mol,

$\Delta H^o_f Cl^-_{(aq)}$ = 167.5 KJ/mol.   **(5)**

(b) Derive Sackur-Tetrode equation.   **(5)**

26. (a) Entropy is a measure of disorderliness-Justify.   **(5)**

(b) Obtain Maxwell's relation of thermodynamic variables.   **(5)**

27. (a) Derive K_p for the dissociation of PCl_5.   **(5)**

(b) Calculate the equilibrium constant for a equilibrium reaction at 300K, whoseΔG^o value at this temperature is 29.29 kJ mol^{-1}.   **(5)**

28. (a) Differentiate the classical thermodynamics from statistical thermodynamics.

(5)

(b) Discuss the determination of standard entropy of oxygen gas at absolute temperature.   **(5)**

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