Q.P. Code :03729

[Time: 3:00 Hours] **[Marks:100]**

Please check whether you have got the right question paper.

N.B:
1. All Questions are compulsory.
2. Answer to the same questions must be written together.
3. Figures to the right indicate full marks.
4. The use of log table / non-programmable calculator is allowed.

Q.1 A. Select the correct option (MCQ) and complete the following sentences. 12

i. According to Charle's law, at constant pressure, the volume of fixed mass of an ideal gas is _____
   a) Equal to its temperature
   b) Directly proportional to its absolute temperature
   c) Inversely proportional to its temperature.

ii. During Joule-Thomson effect, the enthalpy of an system_____
   a) Remains constant
   b) Increases
   c) decreases.

iii. The unit of entropy is _____
   a) JK
   b) JK^{-1}
   c) J.

iv. When the number of moles of gaseous reactants is equal to the number of moles of gaseous products formed then_____
   a) $K_{p=} K_c$
   b) $K_p > K_c$
   c) $K_{p<} K_c$.

v. When zinc is heated with dilute sulphuric acid it evolves_____gas.
   a) H_2
   b) O_2
   c) N_2.

vi. Sample required for micro qualitative analysis is about _____
   a) 0.01g to 0.05g
   b) 0.05g to 0.1g
   c) 0.5g to 1.0g

vii. _____among the following is a Lewis base.
   a) BF_3
   b) BCl_3
   c) NH_3.

viii. Methyl orange shows distinct colour change at the pH range of_____
   a) 3.1 to 4.4
   b) 8.3 to 9.0
   c) 1.5 to 11.0.

ix. Alkenes give addition reaction with_____
   a) Only Br_2
   b) Only BH_3
   c) Both (a) and (b).

x. Diels-Alder reaction is an example of_____reaction.
   a) Pericyclic
   b) Substitution
   c) Elimination.

(P.T.O)

xi. Reaction intermediate in addition of HBr to alkene is _____
   a) Free radical
   b) Carbocation
   c) Carbanion.

xii. Conversion of alkene to alkane involves _____reaction.
   a) Addition
   b) Elimination
   c) Substitution.

B. State whether the following statements are True or False : 03

i. The average velocity is the arithmetic mean of the various velocities of the molecule.
ii. S^{-2} is an example of Bronsted base.
iii. Iodination of alkanes is reversible.

C. Match the following : 05

Column P		Column Q	
i.	Most probable velocity	m.	Two step reaction
ii.	Unit for molar entropy	n.	One step reaction
iii.	DMG paper	o.	$\sqrt{2RT/M}$
iv.	SO_2	p.	$JK^{-1}mol^{-1}$
v.	E1 reaction.	q.	Pd^{2+}
		r.	Acidified $K_2Cr_2O_7$
		s.	cm^{-1}.

Q.2 A. i. Explain the causes of the deviation of gases from an ideal behavior. 05

ii. Explain the term Inversion Temperature. 03

OR

A. i. Discuss Vander Waal's modification of the ideal gas equation PV = nRT by replacing pressure with correction due to intermolecular force of attraction. 05

ii. State Boyle's law, Charle's law and Avogadro's law. 03

B. i. Derive an expression for equilibrium constant thermodynamically. 05

ii. For the equilibrium, $A_2B_{4(g)} \leftrightarrows 2AB_{2(g)}$ it was found that at 298K and at equilibrium, A_2B_4 was 18% dissociated. Calculate the equilibrium constant (K_P) under atmospheric pressure condition and at the same temperature. 03

OR

B. i. Explain the spontaneity of a chemical reaction and physical significance of free energy. 05

ii. The free energy change for a reaction at 350K is -63kJ, the enthalpy change is -38kJ. Calculate the entropy change of the reaction. 03

C. i. Calculate by using Vander Waal's equation, the pressure exerted by 2 mol of NH_3 enclosed in a 5 dm^3 flask at 300K. 04
(Given : a=0.417 Nm^4mol^{-2}; b=3.71×10^{-5} m^3mol^{-1}; R=8.314 $NmK^{-1}mol^{-1}$)

OR

C. i. State and explain the law of mass action. 02

ii. Define : 02
   a) Equilibrium constant
   b) Heterogeneous reaction.

(P.T.O)

Q.3 A. i. Explain diverse ion effect. 05

ii. What is concentration of NaBr required to precipitate AgBr from 0.01M $AgNO_3$ solution if its solubility product is 3.3×10^{-12} at 25°C. 03

OR

A. i. On the basis of the weight of the sample for analysis, explain the types of qualitative analysis. 05

ii. Explain the importance of solubility product. 03

B. i. Explain the Arrhenius concept of acids and bases. Give any two applications and two limitations of the theory. 05

ii. What is equivalence point? Calculate pH of the solution in the vicinity of equivalence point when 9.9 cm^3 of 0.1M NaOH is added to 10.0 cm^3 of 0.1M HCl. 03

OR

B. i. Explain 'Pearson's principle' of acids and bases. On the basis of this, comment on the stabilities of $[AgI_2]^-$, $[Cd(NH_3)_4]^{2+}$ and $MgCO_3$. 05

ii. Explain the terms acid and base on the basis of auto-ionisation of H_2O. 03

C. What is complexation phenomenon? Explain its use in the separation of Cu^{2+} and Fe^{3+}. 04

OR

C. What is conjugate acid base pairs? Label the conjugate acid base pairs in the following reactions. 04

a) $HI + H_2O \rightleftharpoons H_3O^+ + I^-$

b) $NH_3 + HCl \rightleftharpoons NH_4 + Cl^-$

c) $H_2O + CO_2 \rightleftharpoons HCO_3^- + OH^-$

Q.4 A. i. Explain ozonolysis of alkenes with a suitable example and its use in synthetic chemistry. 05

ii. How is acetylene converted into the following compounds? 03

a) Vinyl chloride

b) 1,1-Dichloroethane

OR

A. i. Explain oxymercuration-demercuration with a suitable example. 05

ii. What are the advantages of Wilkinson's catalyst in the hydrogenation of olefins? 03

B. i. Give the mechanism involved in allylic bromination using NBS. 05

ii. Explain Wurtz-Fittig reaction with examples. 03

OR

B. i. Give the mechanism involved of Markownikoff's addition. 05

ii. Give one method for preparation of a) Propane b) Ethyne. 03

C. State and explain Hofmann rule with an example. 04

OR

C. Complete the following reactions : 04

i. 2-Butyne $\xrightarrow{H_2 \text{ /Lindlar catalyst}}$?

ii. $H_3C-C\equiv C-H \xrightarrow{HBr}$? $\xrightarrow[\text{Peroxide}]{HBr}$?

(P.T.O)

Q.5 Attempt any four of the following :

A. Explain the compressibility factor and calculate the compressibility factor for the gas if 5 mol of it occupy 10 dm^3 at 300K and at pressure of 1.0135×10^6 Nm^{-2}. ($R = 8.314$ NmK^{-1} mol^{-1}) 05

B. State the Le-chatelier's principle and discuss its application. 05

C. Explain the importance of reagent papers in qualitative analysis. Give the preparation and use of lead paper. 05

D. Explain the factors influencing the strengths of Lewis acids and bases. 05

E. Explain the meaning of reactivity and selectivity by taking example of chlorination and bromination of alkanes. 05

F. How does ethyne react with the following reagent?

a) H_2/Pd
b) HCN
c) HBr
d) 20% H_2SO_4 and 1% $HgSO_4$.
e) Na.
