(Time: 3 Hours) (Marks: 100)

Please check whether you have got the right question paper.
1) All the Questions are compulsory.
2) Figures to the right indicate full marks.
3) The use of log table /programmable calculator is allowed.
4) Answers for the same question should be written together.

Q.1A) Select the correct option and complete the following sentences 12
(**Attempt any twelve**)

i) Molar volume of NH_3 gas at NTP is _____.
a) $22.083dm^3$ b) $22.084dm^3$ c) $22.4dm^3$

ii) The second law thermodynamics introduces concept of_____.
a) free energy   b) enthalpy   c) entropy

iii) The compressibility factor is expressed by equation _____.
a) $PV = ZnRT$ b) $PV = RT$ c) $Z = PV$

iv) The mass of $22400 \ cm^3$ of CO_2 (C =12,O=16)gas at NTP will be _____.
a) 4.4g   b) 8.5g   c) 44g

v) For the reaction $C_2H_4 (g) + H_2(g) \rightleftharpoons C_2H_6(g)$ _____.
a) $Kp = Kc$ b) $Kp = Kc /RT$ c) $Kp = Kc \ RT$

vi) When salt dissolves in water, entropy _____.
a) decreases   b) increases   c) remains constant

vii) Carbon dioxide, and sulphur dioxide are_____ gases.
a) acidic   b) basic   c) neutral

viii) The colour of the bromine gas is _____.
a) reddish brown   b) yellow   c) black

ix) Ions with negative charges are called _____.
a) anion   b) cation   c) mixture

x) According to Lowry- Bronsted concept base is _____.
a) protophilic   b) protogenic   c) both a & b

xi) _____ is the Bronstead base
a) S^{2-} b) Cl^- c) Al^{3+}

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xii) _____ is the hard acid
    a) Co^{3+} b) NO_2^- c) SCN^-

xiii) Bromination of propane gives _____as a major product.
    a) n-propyl bromide   b) iso-propyl bromide   c) 1,2-dibromopropane

xiv) Reaction intermediate in E_1 reaction is _____.
    a) carbocation   b) carbanion   c) carbon free radical

xv) More polar solvents favours _____reaction.
    a) E_1 b) E_2 c) E_{1cB}

xvi) Diels-Alder reaction is an example of _____reaction
    a) addition   b) cyclo-addition   c) substitution

xvii) sp hybridized carbon is more _____than sp^2 or sp^3 hybridized carbon atom.
    a) acidic b) basic   c) neutral

xviii) Catalytic hydrogenation of alkenes is _____addition.
    a) cis   b) trans   c) anti

B)   State whether the following sentences are **true** or **false**. (**Attempt any three**)   **3**
   i) Reaction between NaOH and HCl is reversible.
   ii) Entropy is an extensive property.
   iii) Ammonium chloride and ammonium hydroxide have uncommon ions.
   iv) To maintain constant pH a buffer mixture is used.
   v) Hydroxylation of alkene by OsO_4 is stereospecific reaction.
   vi) Alkenes undergo addition reactions.

C)   Match the following (**attempt any five**).   **5**
   i) Boyles law   a) Second order reaction
   ii) n is zero   b) Toxic
   iii) Fe^{+3} c) KOH
   iv) As   d) $V \propto 1/P$
   v) Alkene hydroxylation   e) $k_4 Fe(CN)_6$
   vi) E_1 reaction   f) $Kp = Kc$
                                   g) $KMnO_4$
                                   h) First order reaction

Q.2   Attempt **any four** of the following.

A) State and explain Joule Thomson's effect.   **5**

B) Derive van der Waals equation for pressure correction.   **5**

C) Calculate the pressure exerted by 1mol of NH_3 in $30dm^3$ at 300K using   **5**
a)ideal gas equation b) van der Waals equation. The value of van der
Waals constant 'a' and 'b' for NH_3 are a=$0.5563 Nm^4 mol^{-2}$ and
b=$6.38 \times 10^5 m^3 mol^{-1}$ (R=$8.314 JK^{-1}mol^{-1}$

D) What are Kp and Kc ? Obtain relationship between them.   **5**

E) State the Le-Chateliers principle and discuss its application.   **5**

F) Explain entropy of a system. For the reaction   **5**
$N_2(g) + 3H_2(g) === 2NH_3(g)$ standard free energy at 298K
is -103.25 KJ. Calculate equilibrium constant for the reaction at same
temperature (R=$8.314 JK^{-1}mol^{-1}$).

Q.3   Attempt **any four** of the following.

A) Write short note on use of complexes forming ability in qualitative   **5**
analysis with any one example.

B) What do you mean by qualitative analysis? What are the types of it on   **5**
the basis of weight of sample?

C) How will you prepare starch iodide paper and lead acetate reagent   **5**
papers?

D) Explain Arrhenius concept of acids and bases.   **5**

E) What is Pearson's concept of hard soft acids and bases?   **5**

F) Give any three advantages and limitations of Lewis concept of acids   **5**
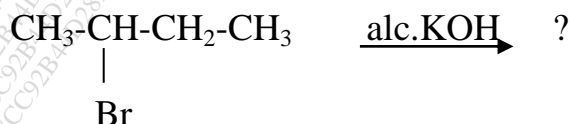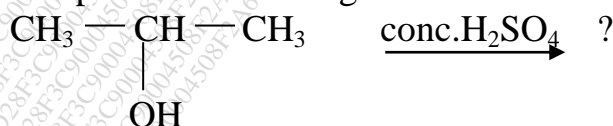and bases.

Q.4   Attempt **any four** of the following.

A) i) Explain Wurtz-Fittig reaction with examples.   **3**

    ii) Explain : Iodination of alkanes is difficult.   **2**

B) Complete the following reaction and give its mechanism   **5**

$$CH_3-\underset{\underset{CH_3}{|}}{C}=CH_2 \quad \xrightarrow[H_2O]{Hg(OCOCH_3)_2} \quad ? \quad \xrightarrow[NaOH]{NaBH_4} \quad ?$$
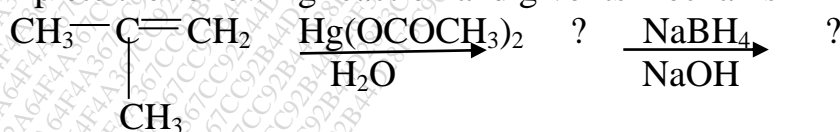
C) i) State and explain Hofmann elimination with suitable example.   **3**

    ii) Complete the following reactions   **2**

$$CH_3-\underset{\underset{OH}{|}}{CH}-CH_3 \quad \xrightarrow{conc.H_2SO_4} \quad ?$$

$$CH_3-\underset{\underset{Br}{|}}{CH}-CH_2-CH_3 \quad \xrightarrow{alc.KOH} \quad ?$$

D) i) How does acetylene converted into following compounds? **3**
    a) Acetaldehyde   b) Vinyl chloride
  ii) Give ozonolysis products of 2-methyl propene. **2**
E) Explain the mechanism of hydroboration-oxidation of alkene with suitable example. **5**
F) Explain the mechanism of E_2- elimination reaction with energy profile diagram. **5**

Q.5   Attempt **any four** of the following.

A) State and explain the law of mass action. What is the significance of equilibrium constant? **5**

B) Explain the assumptions of kinetic theory of gases **5**

C) Calculate the solubility in pure water of silver chloride whose solubility product is 1.1×10^{-10} at 298 K. **5**

D) What are the different types of titrations on the basis of reaction involved? **5**

E) How are metal acetylides prepared? How is sodium acetylide converted to propyne and 1- butyne ? **5**

F) Explain the mechanism of 1,2 and 1,4- addition of Br_2 to 1,3-butadiene. **5**

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