

Please check whether you have got the right question paper.

- N.B:**
1. All questions are compulsory.
 2. Answer to the same question must be written together.
 3. Figure to the right indicate full marks.
 4. Use of logtable/non-programmable calculator is allowed.

1. A. Select the correct option and complete the following sentences.

12

- For an ideal gas, compressibility factor is _____
 a) less than one b) greater than one c) equal to one
- The unit of Van der Waals constant 'a' is _____
 a) $\text{Nm}^4 \text{mol}^{-1}$ b) $\text{Nm}^4 \text{mol}^{-2}$ c) $\text{m}^3 \text{mol}^{-1}$
- A reaction at equilibrium, has _____
 a) the rates of forward and backward reaction is equal
 b) the rate constant of forward and backward reaction is unequal
 c) the concentration of reactant is greater than the concentration of products.
- When gases are mixed together _____ changes
 a. entropy b. enthalpy c. free energy
- _____ is the acidic gas
 a) H_2 b) NH_3 c) HCl
- The formula for silver sulphate is _____
 a) Ag_2SO_4 b) $\text{Ag}(\text{SO}_4)_2$ c) AgSO_4
- In the following reaction

$$\text{H}_2\text{O} + \text{H}_2\text{SO}_4 \rightarrow \text{H}_3\text{O}^+ + \text{HSO}_4^-$$
 which species act as a base?
 a) H_2O b) H_3O^+ c) H_2SO_4
- Acidic and basic proportion of non metallic and metallic oxides can be explained by _____ concept
 a) Arrhenius b) Lower-Bronsted c) Lewis
- _____ has lesser reactivity therefore it has better selectivity.
 a) Cl_2 b) Br_2 c) F_2
- Propyne is prepared from _____ on treatment with sodamide.
 a) 1, 2-dichloropropane
 b) 1, 3-dichloropropane
 c) both a and b
- Oxymercuration-Demercuration of an alkene is _____
 a) Anti Markownikoff addition
 b) Markonwnikoff elimination
 c) Markonwnikoff addition
- _____ is an allylic and benzylic brominating agent.
 a) $\text{Br}_2 - \text{H}_2\text{O}$ b) $\text{Br}_2 - \text{CH}_3\text{COOH}$ c) NBS

- B) State whether the following statements are true or false 03
- Non ideal gas obeys the ideal gas equation only at low pressure and high temperature.
 - Higher pH is required to start the precipitation of hydroxides.
 - Birch reduction of 2-Butyne gives cis-2-Butene

- C) Match the following columns: 05

Column P

- Boyle's law
- Spontaneous Process
- Mn^{+3}
- Arrhenius concept
- Wurtz reaction

Column Q

- Preparation of higher Alkane
- $V \propto \frac{1}{P}$ (at constant P)
- Negative Free energy
- Electrolytic dissociation
- Lewis base
- Preparation of alkyl halide
- Unstable

2. A) i) Discuss the Van der Waals modification of the ideal gas equation $PV = nRT$ by replacing the pressure with corrected pressure. 05
- ii) Calculate the compressibility factor for the gas at 298K if 5 moles of it occupy 10 dm^3 at a pressure of $1.013 \times 10^6 \text{ Nm}^{-2}$ ($R = 8.314 \text{ NmK}^{-1} \text{ mol}^{-1}$) 03

OR

- A) i) Write a note on Maxwell-Boltzmann's distribution of velocities. 05
- ii) State and explain Charle's law. 03

- B) 1) Define heterogeneous reaction. 05

The amount of H_2 , I_2 , and HI are 0.2 g, 9.525g and 45.8g respectively, in the reaction



If the volume is 1 L, calculate equilibrium constant for the reaction.

(Mol. Wt. of $H_2 = 2 \text{ g}$, $I_2 = 254 \text{ g}$ and $HI = 128 \text{ g}$)

- ii) Explain with examples reversible and irreversible reactions. 03

OR

- B) i) The free energy change for a reaction at 275 K is -65KJ. The enthalpy change is - 50KJ. Calculate entropy change of a reaction. What will be the free energy change at 300 K? 05

- ii) Explain Le-Chatelier principle with respect to change in temperature and pressure in the formation of gaseous ammonia from Nitrogen gas and Hydrogen gas. 03

- C) Write any four assumptions of kinetic theory of gases. 04

OR

- C) State any four characteristics of chemical equilibrium. 04

3. A) i) Discuss the effect of uncommon ion with examples in qualitative analysis. 05

- ii) The solubility product of $AgBr$ is 3.3×10^{-12} at 25°C . What is the concentration of Br^- ion required to precipitate $AgBr$ from 0.01 M $AgNO_3$ solution? 03

3

OR

- A) i) Explain identification of evolution of sulphur dioxide with balanced chemical reaction. **05**
 ii) Describe the role of oxine paper in qualitative analysis. **03**

- B) i) Explain the concept of acid base theory in understanding Friedel-Craft acylation reaction with mechanism. **05**
 ii) Explain Lowry-Bronsted Acid-base concept with suitable example. **03**

OR

- B) i) Explain Arrhenius acid-base concept. Give any two applications and limitations of the theory. **05**
 ii) What is conjugate acid-base? Label the conjugate acid-base in the following reactions. **03**
 a) $\text{HCl} + \text{H}_2\text{O} \rightleftharpoons \text{H}_3\text{O}^+ + \text{Cl}^-$
 b) $\text{HNO}_3 + \text{NH}_3 \rightleftharpoons \text{NH}_4^+ + \text{NO}_3^-$
 c) $\text{H}_2\text{O} + \text{CO}_2 \rightleftharpoons \text{HCO}_3^- + \text{H}^+$

- C) What are dry tests & wet tests? Explain. **04**

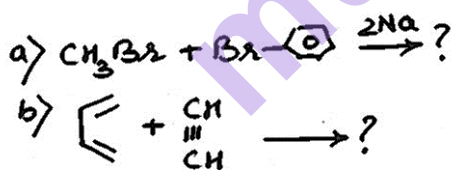
OR

- C) What is equivalence point? Calculate pH of solution in the vicinity of equivalence point when 10.9 cm^3 of 0.1 M NaOH is added to 10.0 cm^3 of 0.1 M HCl . **04**

4. A) i) Explain $\text{E}_{1\text{cB}}$ mechanism with a suitable example. **05**
 ii) Give the reactions for the ozonolysis of propene **03**

OR

- A) i) Define regioselective reaction. Write a short note on Hoffmann elimination. **05**
 ii) Complete the following reactions and name the reactions: **03**



- B) i) Give stepwise reactions for the chlorination of methane. What type of mechanism do the reactions follow? **05**
 ii) What is an acetylide? How is it prepared? **03**

OR

- B) i) Give reactions for the dehydration of primary, secondary and tertiary alcohols. Suggest one more dehydrating agent that can be used. **05**
 ii) What is an elimination reaction? Give one example of a β - elimination reaction. **03**

Turn Over

C) Give the mechanism for the bromination of toluene using NBS. 04

OR

C) Write step wise reactions for hydroboration oxidation of ethene. Is it a Markownikoff or anti-Markownikoff addition? 04

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

A) Show that Joule Thomson effect is an isoenthalpic process. 05

B) Explain the physical significance of free energy. 05

C) How will you identify following evolved gases? 05

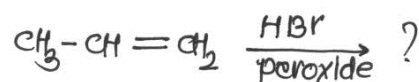
i) Oxygen gas

ii) Hydrogen gas

iii) Water vapour gas

D) Explain Pearsons' principle of acid base. On the basis of it comment on stability of π bonding. 05

E) Complete the following reactions & identify the major products. 05



State and explain the rule governing the above addition reaction.

F) List the factors that favour E_2 reactions. 05