



IMPROVEMENT/FAILURES TARGET PAPER 2019
XI – CHEMISTRY
PAPER – I (Science Pre-Engineering & Pre-Medical Groups)

Time Allowed: 2 Hours 40 mins.

Max. Marks: 68

SECTION ‘B’
(SHORT – ANSWER QUESTIONS)

(Marks: 40)

NOTE: Answer any TEN questions from this Section. All questions carry equal marks.

Q-2

i) Define the following:

* Threshold energy	* Mole	* Stoichiometry	* Avogadro's Number	* Internal energy
* Limiting reactant	* Surface Tension	* Significant Figures	* Unit cell	* Rounding off
* Activation energy	* Specific rate constant	* Intensive Properties	* Molar Volume	* Hydrogen Bonding
* Latent heat of fusion	* Order of reaction	* Common ion effect	* Exponential notation	
* Enthalpy	* Empirical formula	* Systematic Error	* Bond Energy	* Atomic Mass
* Colligative Properties	* System	* Ionization Energy	* Sublimation	* Molarity
* Standard Heat of formation	* Molar volume	* Extensive Properties	* Sublimation	

ii) Differentiate between the following (ANY TWO):

* **Azimuthal Quantum Number and Principal Quantum Number*** **Polar and Non-polar bond (60%)*** **V.B.T and M.O.T*** **Isomorphism & Polymorphism (80%)*** **Extensive and Intensive Properties*** **Balmer and Lyman Series*** **Hydration and Hydrolysis (70%)*** **Molar and Molal Concentrations (90%)*** **Orbit and Orbital (80%)*** **Solubility and Solubility Product*** **Bonding Molecular Orbital and Anti-bonding Molecular Orbital*** **Continuous and Line Spectrum*** **E.N. & Electron affinity*** **Exothermic and Endothermic reactions*** **Sigma and Pi Bond*** **Exponential Notation and Significant figures (90%)*** **Natural and Artificial Radioactivity*** **Molecular and Empirical Formula*** **Rate of Reaction and Velocity of Reaction*** **Crystalline and Amorphous Solids (90%)*** **Reversible and irreversible reactions**iii) How is chemical equilibrium established? How is equilibrium constant used to predict the direction of a reversible reaction. **OR** A 250 ml solution contains 49 gms of H_2SO_4 Calculate the molarity of the solution. **OR****Define the term Concentration? Discuss the various units of concentration.**

iv) Give reasons for ANY FOUR of the following:

* **Glycerine is distilled at reduced pressure.*** **Ionic compounds have higher melting points.*** **Chemical equilibrium is dynamic in nature.*** **Pressure of a gas collected over water is not the true pressure.*** **No liquid ionic compounds are known but many of the known covalent compounds are liquids & gases.*** **Aqueous solution of NH_4Cl is acidic and whereas Na_2CO_3 is basic.*** **A positive catalyst increases the rate of reaction.*** **Ice is a solid but it floats on water.*** **Spilled water evaporate more quickly than a water on a surface.*** **The rates of diffusion of CO_2 and C_3H_8 gases are the same.*** **p-p sigma bond is stronger than s-p sigma bond.*** **With HCl , Powdered marble reacts more rapidly.*** **A pressure cooker is used for rapid cooking.*** **H_2S is a gas while H_2O is a water at room temperature*** **Water forms concave meniscus but mercury forms convex meniscus.**

*Food is preserved in refrigerator.

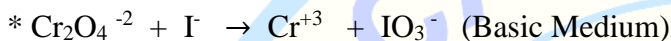
*Evaporation is a cooling Process.

*H₂O has higher B.P. than HF, although Fluorine is more electronegative than Oxygen.

*Honey is more viscous than water.

*The ability of an ion to form hydrate depends on its charge density.

v) Balance any ONE of the following Chemical equation by Ion-electron Method?

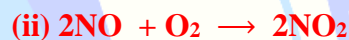
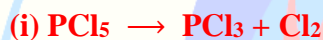


OR

Discuss the ionic character of Covalent bond? OR Name ANY FOUR series in the Hydrogen Spectrum?

vi) a) Find the pH of 1.0×10^{-3} M NaOH Solution? OR Write the rate expressions

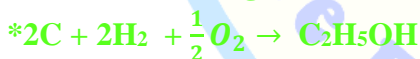
for the following:



b) Derive the value of 'R' in TWO different Unit Systems? OR Define Buffer solution. Write two examples. OR

Derive both forms of Equation of State/Ideal Gas Equation from Gas Laws? OR Compare the rates of diffusion of He and SO₂? OR CH₄ and SO₂? OR State Hess's Law of constant heat of summation. Give its verification and applications?

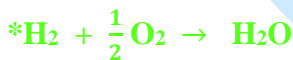
vii) Write the Postulates of Kinetic Molecular Theory of Gases? Calculate the volume of 14g of Nitrogen at 20° C and 740 torr pressure. OR Write down the postulates of Arrhenius Theory of Ionisation? OR State and Explain Activation Energy? OR Define Heat of formation. Calculate the Heat of Formation of Acetic acid from the following data:



$\Delta H_f = ?$



$\Delta H_f = -393.5 \text{ KJ/mol}$

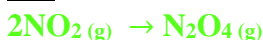


$\Delta H_f = -286 \text{ KJ/mol}$

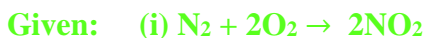


$\Delta H_f = -1369 \text{ KJ/mol}$

OR



$\Delta H_f = ?$



$\Delta H_f = 67.9 \text{ KJ/mol}$



$\Delta H_f = 9.3 \text{ KJ/mol}$

viii) Describe the Chadwick experiment for the discovery of Sub-atomic Particle? OR

What is Dipole moment with its unit? Explain it in CO₂ and H₂O molecules. OR

Helium takes 5 seconds to effuse from a hole of 10 dm³ container. How long would it take for oxygen to effuse from the same container at the same pressures and temperatures.

ix) What do you mean by Exothermic and Endothermic Reactions. Illustrate it with the help of diagram and give one example of each. OR What are the Postulates of Electron pair repulsion theory? Explain the Shape of NH₃, BF₃ and H₂O (or C₂H₄) on the basis of this theory. OR

What do you understand by the term Ionization Potential, Electron Affinity and Electronegativity? How E.N. can be used to predict the nature of bonds between the atoms.

x) State the rule which is violated in the following electronic configurations:



OR What are the applications of Law of equilibrium? Explain with examples. OR

Do as directed: (ANY FOUR)

* Arrange 4s, 3p, 3d, 2p, 1s and 7p by $n + l$ rule.

* Arrange 4 Quantum Numbers to 2 electrons in 3p orbitals or He atom.

* State Hund's Rule? Also write the stable electronic configuration of Z = 24, 29, 42, Br⁻ (Z=35) or Ga³⁺ (Z=31)

* Which rule or principle is violated in $1s^2, 2s^3, 2p^5$ OR $1s^2, 2s^2, 2p_x^2$

* Solve by using exponential notation: $43100 + 3900 + 2100$

* Which law is related to given statement 'we can easily identify that a person just entered in the room is wearing perfume'. * Association of water molecules through hydrogen bond (Draw the Diagram only)

* Draw the shape of orbital for which $l = 0$ and $l = 1$? * Draw dot & cross structures of CHCl₃ and C₂H₄

OR

A Voltaic cell (Emf = 0.34 V) is made up of Standard Hydrogen Electrode and Copper electrode is represented by:

Pt H₂ / 2H⁺ aq. (1M) || Cu²⁺ aq. (1M) / Cu

- Draw the Complete diagram of this cell, showing the direction of electron flow in the circuit.
- Write the Half Cell reactions and overall cell reaction.
- Determine the Reduction Potential of Copper mentioning its sign.

xi) What is an Ionic Bond and Lattice Energy? Write the formation of NaCl from sodium atom and Chlorine atom along with the energy changes involved. Also discuss its Stability.

OR

State and Explain Dalton's Law of Partial Pressures with application.

OR 60 cm³ of hydrogen gas were collected over water at 15⁰ C and 767 torr pressure. What volume will the dry gas occupy at S.T.P? (Vapor pressure of water at 15⁰ C is 15.7 torr) OR 50 cm³ of hydrogen gas was collected at 27⁰ C at a pressure of 800 torr pressure. Calculate its volume at S.T.P?

OR For the gaseous equilibrium.



Predict only the directions in which the reaction will proceed after the following changes are brought about an equilibrium.**

(i) increasing the concentration of NO

(ii) decreasing the concentration of NO₂

(iii) increasing the temperature

(iv) increasing the pressure

xii) Define Oxidising and Reducing Agent? In this reaction which substance is a reducing agent?



*Mn in MnO₄⁻

*N in NCl₃

*Fe in Fe₂(SO₄)₃

*P in H₃PO₄

*C in C₂H₆O

*S in Na₂S₂O₃

*Cr in K₂Cr₂O₇

*O in OF₂

*O in KO₂

OR Define Solubility Product. Will AgCl precipitate from a solution prepared by mixing 400 ml of 0.1 M NaCl and 600 ml of 0.03 M AgNO₃? (K_{sp} = 1.6 x 10⁻¹⁰).

OR On what factors does the solubility of substance depends? K_{sp} for PbI₂ is 1.2 x 10⁻⁹ mol³/dm⁹. Find its:

*Solubility in mol/dm³

*Solubility in g/dm³

xiii) What volume at S.T.P of Ammonia will be produced when 214 gm NH₄Cl react with slaked lime?



OR For the reaction:



1.5gm of each reactant i.e. Mg and N₂ are used; what is the amount of Mg₃N₂ formed and which element is the limiting reactant?

OR

Calculate the wave number of spectral lines of hydrogen gas when an electron jumps from n = 4 to n = 2.

(R_H = 109, 678 cm⁻¹) OR

2.273 g of a gas at 27⁰ C and 900 torr pressure occupies a volume of 1.4 dm³. Calculate the molecular mass of the gas.

xiv) When 4000 joule of heat is added to a gaseous system at a constant pressure of 101300 N/m² ; its internal energy increases by 500 J. Calculate the change in the volume of the system.

OR

Calculate the no. of molecules of CO₂ at S.T.P when 6.1 gm marble is reacted with 2.8 g hydrochloric acid,



OR If 250 ml of 1M HCl solution is diluted to 1000 ml. What would be the molarity of diluted solution and also calculate its pH. OR

a) Calculate the no. of atoms of Na in 9.2 grams of Sodium? OR A container holds 9gm of H₂O. How many water molecules are present? Also calculate the total no. of atoms.

b) A 600 dm³ vessel contains 2g of H₂ and 8g of CH₄. Calculate the total pressure of mixture of gas at 30⁰C. OR

Calculate the no. of atoms present in 7.2gm of Calcium? OR Calculate the mass and no. of molecules in 18000 cm³ of H₂S at S.T.P?

xv) Using the significant figure rules, simplify: $\frac{92 \times 751 \times 173}{760 \times 297}$ OR $\frac{2.417 \times 8.123}{4.956}$ OR Give the significant figures of the following: *46.75 *0.00067 *506.40 *76000

OR An organic compound producing air pollution contains 8.73% carbon, 77.45% chlorine and 13.82% fluorine; find the molecular formula of the compound if its molecular mass is 137.5

(Atomic mass: C = 12, Cl = 35.5, F = 19)

OR 1.8gm of an organic compound on combustion gave 3.21gm CO₂ and 1.322gm H₂O. Calculate the empirical formula.

SECTION 'C' (DETAILED-ANSWER QUESTIONS)

(Marks: 28)

NOTE: Attempt any **TWO** question from this Section. Draw diagram where necessary.

Q-3

- a) State Le-Chatelier's Principle. Describe suitable conditions for the high yield of SO_3 in Contact process. OR NH_3 by Haber process.
OR What are Ideal and Non-ideal gases? Explain the causes of non-ideal behavior of gases especially at high pressures and low temperatures. OR
State the postulates of Bohr's Atomic Model. Derive an expression for the *Total Energy* OR *Radius of the electron in the nth orbit*. Also calculate the radius of 2nd orbit? ($a_0 = 0.529\text{\AA}$). (90%)
- b) Define Electrolyte, Electrode, Electrode Potential and Standard Electrode Potential? What is the electrode potential of Zinc and How it is determined experimentally. (90%)
OR
When the equilibrium was attained for the reaction $\text{A} + \text{B} \rightleftharpoons 2\text{C}$, the concentration of $[\text{A}] = [\text{B}] = 4 \text{ mol/dm}^3$ and that of $[\text{C}] = 6 \text{ mol/dm}^3$, Calculate K_c and initial concentration of A and B. OR Find the pH and pOH of 0.3M $\text{Mg}(\text{OH})_2$ solution which is 60% ionized? OR What is the H^+ and OH^- ion concentration of a solution having pH equal to 7.86? OR The equilibrium constant for the reaction $\text{H}_2 + \text{I}_2 \rightarrow 2\text{HI}$ at 700°C is 55. Calculate the equilibrium concentration of reactants and products when the initial concentrations of H_2 and I_2 are 2.55 moles/dm^3 each.
- c) Write Short Notes on Any TWO of the following:
 *Heisenberg's Uncertainty Principle *Surface Tension *Viscosity (90%)
 *Indicators *Crystal Systems *Quantum Number *Planck's Quantum Theory
 *Covalent bond and its types

Q-4

- a) Consider the following experimental data: (90%)

S.No.	[A] mol.dm^{-3}	[B] mol.dm^{-3}	Rate $\text{mol.dm}^{-3}\text{sec}^{-1}$
1.	0.10	0.10	8.0×10^{-4}
2.	0.20	0.20	16.0×10^{-4}
3.	0.10	0.10	16.0×10^{-4}

- *Write rate expression.
 *Determine the order of reaction.
 *Calculate the rate constant of the reaction.

OR

State and Explain first law of thermodynamics. Prove that $q_p = \Delta E + P\Delta V = \Delta H$ and $W = P\Delta V$ (90%) OR

If the initial rate for the decomposition of NO_2 (Nitrogen dioxide) $2\text{NO}_2 \longrightarrow 2\text{NO} + \text{O}_2$ is 4.5×10^{-9} mole per liter per second.

- i) Write the rate equation. ii) Calculate the rate constant
 iii) Calculate the rate constant when the concentration of NO_2 is doubled.
- b) Define rate of reaction. List the factors affecting rate of chemical reaction and explain any TWO of them.
OR Discuss the effect of Temperature and catalyst on the rate of reaction? Also Explain how the rate of the following reaction is determined by the chemical method. $\text{CH}_3\text{COOC}_2\text{H}_5 + \text{H}_2\text{O} \longrightarrow \text{CH}_3\text{COOH} + \text{C}_2\text{H}_5\text{OH}$

OR

Name the crystal system which has the following axes and angles:

- $a = b = c$; $\alpha = \beta = \gamma = 90^\circ$
- $a = b \neq c$; $\alpha = \beta = \gamma = 90^\circ$
- $a \neq b \neq c$; $\alpha = \beta = \gamma = 90^\circ$
- $a = b \neq c$; $\alpha = \beta = 90^\circ, \gamma = 120^\circ$

- c) What do you understand by the term Common ion effect? Explain its application in Qualitative salt analysis. (90%) **OR**

What are Cathode rays? How were Cathode rays discovered by Discharge Tube Experiment. Did they depend upon the nature of gas filled inside the tube. (90%)

Q-5

- a) Define Orbital Hybridization and write its types. Draw and explain following the molecules on the basis of H₂O/Hybridization:

*H₂O

*C₂H₆

*NH₃

*BeCl₂

*C₂H₄

OR

State and Explain the Law of Mass Action. Derive an expression for the equilibrium constant K_c for the reaction. $n_1A + n_2B \rightleftharpoons n_3C + n_4D$. Also give the relationship between K_p and K_c .***

OR

9.2gm of ethyl alcohol, 3.6gm of acetic acid, 1.1gm of ethyl acetate and 9.0gm of water were mixed and allowed to attain equilibrium. If $K_c = 4$, what was the concentration of the resulting mixture?

OR What is meant by electrolysis? Discuss the electrolysis of CuCl₂ with necessary electrode reactions? **OR**

For the reaction $N_2 + O_2 \rightleftharpoons 2NO$ K_c is 0.110 at 2000⁰ C. Calculate the equilibrium concentration of N₂, O₂ and NO when the initial concentrations of N₂ and O₂ are 0.1M each and the volume of the vessel is 5dm³.

- b) What are Roentgen-rays? Discuss their origin and also describe their relationship with the atomic number. (90%) **OR**

What is Dative bond? Illustrate it with the formation of: (i) POCl₃ (ii) CH₃NO₂ (iii) NH₄⁺ (90%)

- c) State and Explain Graham's Law of Diffusion?

OR

Describe Gold foil Experiment with its Conclusion for the discovery of nucleus in an atom. Also mention its drawbacks. (80%) **OR**

State the following Laws in terms of K.M.T:

*Boyle's Law

*Charle's Law

*Dalton's Law of Partial Pressures

OR Two gases A and B having the same volume effuse from a container in 20 seconds and 10 seconds respectively. If the molecular mass of gas A is 49 a.m.u. Find the molecular mass of gas B. (70%)

----- BEST OF LUCK -----

Marked with '**RED BOLD**' are the '**MOST IMPORTANT**' Questions to Secure Excellent Marks.

These Students will also do **LIGHT GREEN MARKED** Questions.

Marked with '**LIGHT GREEN BOLD**' are the '**MOST IMPORTANT**' Questions to Secure **FOURTY PLUS (40+)*** Marks.

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MS (APPLIED MATHEMATICS) [NED UET]
 ✚ **CAREER COUNSELOR / ADMISSIONS EXPERT –**
CEO / FOUNDER (EDUCATIONIST HUB)
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 ✚ **MOBILE / WHATSAPP: +92322-238705-6**
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