



K. K. Wagh Institute of Engineering Education & Research, Nashik
(An Autonomous Institute From A.Y. 2022-23)

	InSem Examination-I Winter 2023		
	Exam Seat No.:		
	Academic Year: 2023-2024	Semester: III	
	Name of Programme: Chemical Engineering	Pattern: 2023	
	Name of Course: Chemistry I	Course Code: CHE222002	
	Max. Marks: 30	Duration: 01 Hour	

Instructions: Candidates should read carefully the instructions printed on the Question Paper and on the cover page of the Answer Book, which is provided for their use.

1. This question paper contains 02 page(s).
2. Answer to each new question is to be started on a new page.
3. Assume suitable data wherever required, but justify it.
4. Draw the neat labelled diagrams, wherever necessary.
5. The last columns indicates the Course Outcome and level of Blooms Taxonomy of the Question/sub-question

Question No. 1 Attempt following Question

- a) Explain formation of Nitrogen molecule using Molecular orbital theory (5) CO1

OR

- b) One of the compounds of nitrogen and oxygen called nitric oxide (NO) is paramagnetic explain using Molecular orbital theory. (5) CO1

- c) What are the assumptions of V.B.T. explain with the help of hydrogen molecules (5) CO1

OR

- d) Explain linear combination of atomic orbitals (LCAO) approximation and different types of M.O (5) CO1

- e) What is resonance? Explain effect of resonance on strength of acids and bases. (5) CO1

OR

- f) What is Inductive effect? Give its effects on pKa values of acid and bases (5) CO1

Question No. 2 Attempt following Question

- a) Define rate of reactions and explain any two factors affecting rate of reaction. (5) CO2

OR

- b) Define second order reaction and derive the rate constant equation for second order reaction involving same initial concentrations of reactants. (5) CO2
- c) What is energy of activation derive the Arrhenius energy of activation equation. Show how it is calculated graphically. (5) CO2

OR

- d) State and explain (i) Grotthuss Drapper (ii) Stark-Einstein law of photochemical reactions (5) CO2
- e) The time for half change in a first order decomposition of a substance A is 60 seconds. Calculate the rate constant. How much of A will be left after 180 seconds? (5) CO2

OR

- f) Rate constants for the first-order decomposition of acetone dicarboxylic acid are $k = 0.000475$ per second at 293 K and $k = 0.00163$ at 303 K. What is the activation energy for this reaction $R = 8.314 \text{ J/mol/K}$ (5) CO2