

GUJARAT TECHNOLOGICAL UNIVERSITY
BACHELOR OF ENGINEERING – SEMESTER 3 – EXAMINATION – SUMMER 2026

Subject Code: 3130506

Date: 17/06/2026

Subject Name: Applied Chemistry

Time: 02:30 PM TO 05:00 PM

Total Marks: 70

Instructions:

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.
4. Simple and non-programmable scientific calculators are allowed.

- Q.1** (a) Explain following terms: Inductive effect, Resonance, Free radicals. 03
 (b) Write short notes on: Normality, Molality, Depression of freezing point, Osmosis. 04
 (c) Write detailed reaction mechanism of Friedel Craft alkylation reaction with suitable example. 07
- Q.2** (a) On the basis of your understandings, give details of utility or applications of applied chemistry in chemical industries. 03
 (b) Write notes on: Geometrical Isomerism, Optical Isomerism, Conformational isomerism, E & Z isomer designations. 04
 (c) Explain all terms associated with optical isomerism in details by taking the example of tartaric acid. 07
- OR
- Q.2** (c) Explain following with required equations: Heisenberg uncertainty principle, Shrodinger wave equation. 07
- Q.3** (a) Elaborate following terms: Order of reaction, Molecularity, Rate law. 03
 (b) Describe the importance of polymers, nanocomposites, zeolites and silicates with respect to engineering application. 04
 (c) The rate law for the decomposition of N_2O_5 (l) is rate = $k [N_2O_5]$ where $k = 6.22 \times 10^{-4} \text{ sec}^{-1}$. Calculate half-life of N_2O_5 (l) and number of seconds it will take for an initial concentration of N_2O_5 (l) of 0.100 M to drop to 0.0100 M. 07
- OR
- Q.3** (a) What is Pseudo first order reaction, explain with one example. 03
 (b) "Identification and characterization of any material/chemical is the key of its application/utilization." justify the statement with relevant facts and figure. 04
 (c) Derive the integrated rate law equation for first order reaction kinetics and units or rate constant for first and second order reactions. 07
- Q.4** (a) Explain following terms: Phase, component, Degree of freedom. 03
 (b) Write classification of refractories. 04
 (c) Give details of two component eutectic system with the help of one example of your choice. 07
- OR
- Q.4** (a) Explain Following terms: Heat of neutralization, Heat of transition, Heat of combustion. 03
 (b) Explain Classification of ceramics. 04

- (c) What is phase rule? Explain in detail the one component system taking water as an example. 07
- Q.5** (a) Write a short notes on applications of electronic spectroscopy. 03
- (b) Explain surface characterization in brief and draw instrumentation diagram of TEM. 04
- (c) Sandip synthesized nitro-benzene from benzene in applied chemistry laboratory. 07
Suggest him the relevant spectroscopy (with approximate peak value) to analyse the mass, functional groups and absorption spectrum. Also draw the instrumentation diagram of mass spectroscopy.
- OR
- Q.5** (a) Explain following terms: Bathochromic shift, Hook's Law, Lambert's Beer Law. 03
- (b) Purvi made some metal nanoparticles in applied chemistry laboratory. Name some 04
techniques which can help in characterization of synthesised nanoparticles, also write principle of XRD.
- (c) Identify the spectroscopy for exact structural determination of an organic compounds, 07
draw it's instrumentation diagram and also explain it's working principle.
