

GUJARAT TECHNOLOGICAL UNIVERSITY

BE- 1 SEMESTER – OLD PAPER – S22 TO W24 – QUESTION BANK

Subject Name & Code:

Chemistry (3110001)

Chapter 1: General Chemistry

Repeated Questions:

1. **Define/Explain periodic trends (Ionization Enthalpy, Electron Affinity, Electronegativity, Atomic size).**
 - (SUM 22 - Q1(c) - Ionization Energy trends - 07 Marks)
 - (WIN 22 - Q1(a) - All trends - 03 Marks)
 - (SUM 24 - Q4(a) - Define terms - 03 Marks)
2. **Explain Hard and Soft Acid Base (HSAB) concept with applications/examples.**
 - (WIN 22 - Q1(b) - 04 Marks)
 - (WIN 23 - Q2(c) (OR) - 07 Marks)
 - (SUM 22 - Q4(b) (OR) - With examples - 04 Marks)
3. **Define and differentiate between types of bonds (Covalent, Ionic, Polar, Non-polar).**
 - (WIN 23 - Q1(a) - Polar vs Non-polar - 03 Marks)
 - (SUM 24 - Q4(b) - Define all - 04 Marks)
 - (WIN 24 - Q1(a) - Covalent bond - 03 Marks)
4. **Explain hybridization with examples (sp^3 , sp^2 , etc.).**
 - (S25 - Q3(c) - Types of hybridization - 07 Marks)
 - (W24 - Q2(a) - In CH_4 and C_2H_4 - 04 Marks)
 - (WIN 24 - Q2(a) - In methane - 03 Marks)

Other Important Questions:

- **de Broglie's concept / Heisenberg's Uncertainty Principle.** (W24 - Q1(a) - 03 Marks | S25 - Q5(a) (OR) - 03 Marks | WIN 24 - Q5(a) (OR) - 03 Marks)
- **Schrodinger's wave equation.** (S25 - Q4(b) - 04 Marks)
- **Shapes of s, p, d, f orbitals.** (WIN 23 - Q2(b) - 04 Marks)
- **Define: pH, calculate pH of strong acid.** (WIN 23 - Q3(b) (OR) - 04 Marks | WIN 24 - Q4(a) - 03 Marks)

Chapter 2: Water Technology

Repeated Questions:

1. **Define hardness of water. Differentiate between temporary & permanent hardness.**
 - (SUM 23 - Q2(a) - 03 Marks)
 - (WIN 22 - Q2(a) - 03 Marks)
 - (WIN 23 - Q1(b) - 04 Marks)
 - (SUM 24 - Q1(c) - 07 Marks)
2. **Explain the Lime-Soda process for water softening (with advantages/disadvantages).**
 - (WIN 23 - Q1(c) - 07 Marks)
 - (WIN 24 - Q1(c) - 07 Marks)
3. **Explain/Compare scale and sludge formation in boilers.**
 - (W24 - Q2(b) - 04 Marks)
 - (WIN 22 - Q3(b) (OR) - 04 Marks)
 - (WIN 24 - Q1(b) - 04 Marks)
4. **Explain Zeolite process or Ion-Exchange (Deionization) process.**
 - (S25 - Q1(c) - Zeolite process - 07 Marks)
 - (W24 - Q2(c) - Deionization - 07 Marks)

Other Important Questions:

- **Explain Reverse Osmosis for water treatment/desalination.** (SUM 22 - Q5(b) - 04 Marks | WIN 24 - Q5(b) (OR) - 04 Marks)
- **Caustic embrittlement, Priming & Foaming.** (S25 - Q2(a) - Caustic embrittlement - 03 Marks | SUM 23 - Q1(b) - Priming & Foaming - 03 Marks)
- **Numericals on hardness calculation (in ppm, °Cl, °Fr).** (SUM 22 - Q4(a) - 03 Marks)
- **Internal and External water treatment methods.** (W24 - Q3(b) - 04 Marks | SUM 22 - Q4(c) (OR) - Internal treatment - 07 Marks)

Chapter 3: Metals, Alloys and Corrosion

Repeated Questions:

1. **Explain the Electrochemical Theory of corrosion.**
 - (WIN 22 - Q2(c) - 07 Marks)
 - (W24 - Q3(c) - 07 Marks)
 - (SUM 24 - Q2(c) (OR) - 07 Marks)
2. **Explain methods of corrosion prevention (Sacrificial anode, Cathodic protection, Inhibitors).**
 - (SUM 24 - Q2(c) - Sacrificial anode - 07 Marks)
 - (SUM 23 - Q1(c) - Cathodic protection - 07 Marks)
 - (S25 - Q4(a) - Inhibitors - 03 Marks)
3. **What are alloys? Why are they made? Give examples (Steel, Cu, Al).**
 - (SUM 23 - Q4(a) - 04 Marks)
 - (SUM 24 - Q5(b) - 04 Marks)
 - (WIN 24 - Q4(b) (OR) - Classify alloys - 04 Marks)
4. **Discuss physical properties of metals.**
 - (SUM 24 - Q4(a) (OR) - 03 Marks)
 - (WIN 23 - Q2(a) - 03 Marks)
 - (WIN 24 - Q2(b) - 04 Marks)

Other Important Questions:

- **Pitting corrosion.** (S25 - Q2(c) - 07 Marks)
- **Factors influencing corrosion.** (WIN 24 - Q3(b) (OR) - 04 Marks)
- **Define: Cathodic protection.** (SUM 22 - Q5(a) (OR) - 03 Marks)

Chapter 4: Polymers and Fibers

Repeated Questions:

1. **Define/Differentiate between addition and condensation polymerization.**
 - (SUM 24 - Q1(a) - 03 Marks)
 - (WIN 23 - Q3(c) - Part of classification - 07 Marks)
2. **Explain vulcanization of rubber and its importance.**
 - (SUM 22 - Q3(b) - Advantages - Part of 04 Marks)
 - (SUM 24 - Q5(b) - 04 Marks)
3. **What are biodegradable polymers? Give examples and importance.**
 - (SUM 22 - Q2(c) (OR) - 07 Marks)
 - (WIN 22 - Q4(b) - 04 Marks)
 - (WIN 24 - Q5(a) - 03 Marks)
4. **Explain preparation, properties, and uses of specific polymers (Nylon 6,6, Buna-S, PVC, PS, Polyester).**
 - (WIN 23 - Q3(c) (OR) - Nylon 6,6, Buna-S - 07 Marks)
 - (SUM 24 - Q5(c) - Nylon 6,6, Buna-S - 07 Marks)
 - (WIN 22 - Q2(b) - PVC, PS - 04 Marks)

Other Important Questions:

- **Define: Monomer, Polymer, Oligomer.** (SUM 23 - Q2(b) - 04 Marks)
- **Mechanism of polymerization (Free radical, Ionic).** (SUM 23 - Q4(c) - Free radical - 07 Marks | SUM 22 - Q5(c) - Ionic - 07 Marks)
- **Applications of specific polymers (PVC, Glyptal, LDPE, HDPE).** (SUM 23 - Q4(b) - 04 Marks)
- **Liquid crystals (types, applications).** (WIN 22 - Q3(c) (OR) - 07 Marks | WIN 23 - Q5(a) - 03 Marks)

Chapter 5: Nanomaterial

Repeated Questions:

1. **Explain Top-down and Bottom-up approaches for nanomaterial synthesis.**
 - (S25 - Q2(b) - 04 Marks)
 - (WIN 23 - Q3(b) - 04 Marks)
 - (WIN 24 - Q3(c) (OR) - 07 Marks)
 - (SUM 23 - Q5(b) (OR) - Bottom-up - 04 Marks)
2. **Discuss applications of nanomaterials (in catalysis, medicine, textiles).**
 - (W24 - Q4(b) - 04 Marks)
 - (WIN 23 - Q4(a) - In catalysis - 03 Marks)
 - (SUM 23 - Q5(a) - In textiles - 03 Marks)
 - (S25 - Q3(a) - In medicine - 03 Marks)
3. **Define nanomaterials and their properties.**
 - (WIN 23 - Q3(a) - 03 Marks)
 - (WIN 24 - Q3(a) (OR) - 03 Marks)

Other Important Questions:

- **Properties and applications of Fullerenes, Carbon Nanotubes (CNTs), Nanowires.** (S25 - Q4(a) (OR) - Fullerenes - 03 Marks | S25 - Q5(a) (OR) - CNTs, Nanowires - 03 Marks | W24 - Q2(a) - Fullerenes - Part of 03 Marks)
- **Effects of nanoscale on properties.** (SUM 24 - Q3(a) (OR) - 03 Marks)

Chapter 6: Fuel and Combustion

Repeated Questions:

1. **Explain Proximate and Ultimate analysis of coal.**
 - (WIN 22 - Q1(c) - Proximate - 07 Marks)
 - (SUM 23 - Q3(a) - Proximate - 07 Marks)
 - (SUM 24 - Q3(c) (OR) - Both - 07 Marks)
 - (WIN 24 - Q4(c) (OR) - Proximate - 07 Marks)
2. **Define Octane Number and Cetane Number.**
 - (SUM 22 - Q5(a) - 03 Marks)
 - (WIN 23 - Q5(a) - 03 Marks)
 - (WIN 24 - Q4(a) (OR) - 03 Marks)
3. **Characteristics of a good fuel.**
 - (SUM 23 - Q3(b) (OR) - 04 Marks)
 - (WIN 23 - Q5(b) - 04 Marks)
 - (WIN 24 - Q3(a) - 03 Marks)
4. **Draw and explain fractional distillation of crude petroleum.**
 - (SUM 23 - Q2(c) - 07 Marks)
 - (SUM 24 - Q2(a) - 03 Marks)
 - (WIN 24 - Q4(c) - 07 Marks)

Other Important Questions:

- **Numerical on calorific value / air requirement calculation.** (S25 - Q5(c) - Bomb calorimeter - 07 Marks | WIN 24 - Q5(b) (OR) - Air requirement - 04 Marks)
- **Difference between gross and net calorific value.** (WIN 24 - Q4(b) - 04 Marks)
- **Classification of fuels.** (WIN 23 - Q5(c) - 07 Marks)

Chapter 7: Chemical aspect of Biotechnology

Repeated Questions:

1. **Explain fermentation process for Ethanol/Acetic acid production.**
 - (SUM 23 - Q4(c) - Acetic acid - 07 Marks)
 - (W24 - Q2(c) (OR) - Acetic acid - 07 Marks)
 - (SUM 24 - Q4(c) (OR) - Ethanol - 07 Marks)
 - (WIN 24 - Q5(c) (OR) - Ethanol - 07 Marks)
2. **What are enzymes? State their characteristics/applications.**
 - (SUM 22 - Q1(b) - Properties - 04 Marks)
 - (SUM 23 - Q5(a) (OR) - Characteristics - 03 Marks)
 - (SUM 24 - Q4(b) - Application - 04 Marks)
3. **Importance/Applications of Biofuels, Biofertilizers.**
 - (WIN 22 - Q4(c) - 07 Marks)
 - (WIN 23 - Q4(b) - Biofuels - 04 Marks)
 - (WIN 23 - Q4(a) (OR) - Biofertilizers - 03 Marks)

Other Important Questions:

- **What is a bioreactor?** (SUM 22 - Q1(b) - 03 Marks | WIN 24 - Q5(c) - 07 Marks)
- **Advantages of biofertilizers.** (SUM 23 - Q5(a) - 03 Marks)

Chapter 8: Analytical Techniques

Repeated Questions:

1. **State and derive Lambert-Beer's Law.**
 - (S25 - Q3(b) (OR) - 04 Marks)
 - (SUM 23 - Q4(b) - 04 Marks)
 - (SUM 24 - Q2(b) - 04 Marks)
2. **Explain the principle and applications of IR Spectroscopy.**
 - (S25 - Q3(a) - 03 Marks)
 - (WIN 22 - Q5(c) - 07 Marks)
 - (WIN 23 - Q4(c) (OR) - 07 Marks)
 - (SUM 24 - Q3(b) (OR) - 04 Marks)
3. **Explain the principle and applications of UV-Visible Spectroscopy.**
 - (WIN 22 - Q3(a) - 03 Marks)
 - (SUM 24 - Q1(b) - 04 Marks)
 - (WIN 24 - Q3(c) (OR) - Principle & applications - 07 Marks)
4. **Explain the principle and applications of NMR Spectroscopy.**
 - (S25 - Q2(c) (OR) - 07 Marks)
 - (W24 - Q3(c) (OR) - Principle - 07 Marks)

Other Important Questions:

- **Basic principle of conductometric titration.** (WIN 22 - Q5(c) - 07 Marks | SUM 23 - Q5(c) - 07 Marks)
- **Difference between absorption and emission spectra.** (SUM 23 - Q3(a) - 03 Marks | SUM 24 - Q5(a) - 03 Marks)
- **Instrumentation of Gas Chromatography.** (S25 - Q4(c) (OR) - 07 Marks)
- **pH meter principle.** (SUM 24 - Q3(b) - 04 Marks | WIN 22 - Q3(a) (OR) - 03 Marks)