



HPCL RAJASTHAN REFINERY LIMITED

Joint Venture between Hindustan Petroleum Corporation Limited (HPCL)
and Government of Rajasthan.

Site Office : Village Sajiyali Roopji Kanthwada & Sambhra,
Tehsil - Pachpadra, Dist. Balotra, Rajasthan, India – 344032

Reg. Office : Tel Bhavan, Sahkar Marg, Lal Kothi Vistar, Jyoti Nagar,
Jaipur, Rajasthan, India 302005

CIN No.U23201RJ2013GOI043865

Advt. No - HRRL/RECT/01/2024

Computer Based Test (CBT) for Junior Executive-Chemical Position: S/G E0

As per Advt. No - HRRL/RECT/01/2024 clause no. 8 (mentioned in page 33), the syllabus for Junior Executive-Chemical Position: S/G E0 is given as below.

Duration: 2 hours

Total Marks: 100

All questions of the Computer Based Test (CBT) will be objective and multiple-choice type. Total number of questions in the CBT are 100. Each correct answer carries 1 mark and there is no **negative** marking for wrong answers.

Syllabus

Part-1: General Aptitude

(30 Marks)

1. Intellectual Potential Test:

- Distance
- Syllogism
- Logical Operations
- Similarities and dissimilarities
- Verbal Comprehension
- Perpetual Reasoning
- Working Memory
- Processing Speed
- Fluid reasoning

2. Logical Reasoning & Data interpretation

- Seating arrangements and puzzles
- Series – verbal and number
- Relationships
- Coding-decoding
- Verbal and numerical Analogy

- Binary Logic
- Games and Tournaments
- Arrangements
- Team Formations
- Order and Ranking
- Table, Data Caselets – Reasoning-Based DI, 3. Column Graphs, Bar Graphs, Line Charts, Pie Charts, Routes and Network

3. Quantitative Aptitude

The test of QA may cover Number systems including questions on simplification, decimals, fraction, LCM and HCF, square root, divisibility test, Ratio & proportion, Percentage, Average, Profit & loss, Discount, Simple and compound interest, Mensuration, Time & Work, Time and distance, Algebraic identities, Problems on Age, Tables & Graphs etc.

4. English Language

| Program | Education Level | Course | Subject | Topic | Sub Topic | Concept / Type |
|------------------|-----------------|----------------------------------|-------------------|-----------------|-----------------------|---------------------|
| General Aptitude | HSC | General Verbal Ability - English | Grammar - English | Question Tags | Negative question tag | Sentence Completion |
| General Aptitude | HSC | General Verbal Ability - English | Grammar - English | Question Tags | Positive question tag | Sentence Completion |
| General Aptitude | HSC | General Verbal Ability - English | Grammar - English | Parts of speech | Adjective | Sentence Completion |
| General Aptitude | HSC | General Verbal Ability - English | Grammar - English | Parts of speech | Adverb | Sentence Completion |
| General Aptitude | HSC | General Verbal Ability - English | Grammar - English | Parts of speech | Prepositions | Sentence Completion |
| General Aptitude | HSC | General Verbal Ability - English | Grammar - English | Parts of speech | Conjunctions | Sentence Completion |
| General | HSC | General | Grammar - | Parts of | Verb | Sentence |

| | | | | | | |
|------------------|-----|----------------------------------|---------------------------------|-----------|------------------------------|---|
| Aptitude | | Verbal Ability - English | English | speech | | Completion |
| General Aptitude | HSC | General Verbal Ability - English | Indirect Writing - English | Prose | Syntax and structure | Para Jumbles |
| General Aptitude | HSC | General Verbal Ability - English | Indirect Writing - English | Sentences | Word Usage and Understanding | One word substitution |
| General Aptitude | HS | General Verbal Ability - English | Reading Comprehension - English | Passage | Appropriate Title | Identify the suitable title for the passage |
| General Aptitude | HSC | General Verbal Ability - English | Reading Comprehension - English | Passage | Central theme of the passage | Identify the central theme of the passage |
| General Aptitude | HSC | General Verbal Ability - English | Reading Comprehension - English | Passage | Facts | Identify the facts given in the passage |
| General Aptitude | HSC | General Verbal Ability - English | Reading Comprehension - English | Passage | Inferences drawn | Identify the inferences drawn from the passage |
| General Aptitude | HSC | General Verbal Ability - English | Reading Comprehension - English | Passage | Structure of the passage | Identify the structure of the passage |
| General Aptitude | HSC | General Verbal Ability - English | Reading Comprehension - English | Passage | Summary | Select the correct summary for the passage |
| General Aptitude | HSC | General Verbal Ability - English | Reading Comprehension - English | Passage | Text to World connection | The most appropriate connection to the real-life situations |
| General Aptitude | HSC | General Verbal Ability - English | Reading Comprehension - English | Passage | Tone of the passage | Identify the tone of the passage |

| | | | | | | |
|------------------|-----|----------------------------------|---------------------------------|--------------------|------------|---|
| General Aptitude | HSC | General Verbal Ability - English | Reading Comprehension - English | Passage | Vocabulary | Antonyms of the word |
| General Aptitude | HSC | General Verbal Ability - English | Reading Comprehension - English | Passage | Vocabulary | Correct usage of the word in other examples |
| General Aptitude | HSC | General Verbal Ability - English | Reading Comprehension - English | Passage | Vocabulary | Synonyms of the word |
| General Aptitude | HSC | General Verbal Ability - English | Reading Comprehension - English | Passage | Vocabulary | Word meaning |
| General Aptitude | HSC | General Verbal Ability - English | Vocabulary - English | Idioms and Phrases | Idioms | Word-segment substitution |
| General Aptitude | HSC | General Verbal Ability - English | Vocabulary - English | Idioms and Phrases | Proverbs | Word-segment substitution |
| General Aptitude | HSC | General Verbal Ability - English | Vocabulary - English | Semantics | Antonyms | Identification of antonym in a sentence |
| General Aptitude | HSC | General Verbal Ability - English | Vocabulary - English | Semantics | Synonyms | Word meaning in sentence |

Part 2: Technical/Professional Knowledge

(70 Marks)

1. Different types of hydrocarbons:

- Saturated – Alkanes, unsaturated – Alkenes and Alkynes and aromatic hydrocarbons.
- Nature, properties of Alkanes
- Structure of double bond
- Isomerism in alkynes
- Preparation of alkynes
- Nomenclature of alkynes
- Structure of triple bond
- Carcinogenicity and toxicity
- Preparation of benzene
- Properties of benzene
- Structure of benzene

2. Flammability, explosivity and combustion

- Factors affecting flammability of materials.
- Classification of materials based on flammability characteristics.
- Testing methods for detecting flammability of materials.
- Types of explosions – Chemical, dust and vapor cloud
- Methods for preventing and mitigating explosions
- Complete and Incomplete combustion
- Product of combustion and their effects on health and environment
- Combustion controls and strategies for fire prevention and suppression.

3. Different types of Polymers with reactions and its properties.

4. Heat Transfer Equipment (Ex Heat exchangers and fired heaters etc.)

- Steady and unsteady heat conduction
- Convection and radiation
- Thermal boundary layer and heat transfer coefficients
- Boiling, condensation, and evaporation
- Types of heat exchangers and evaporators and their process calculations.
- Design of double pipe, shell, and tube heat exchangers
- Single and multiple effect evaporators.

5. Different types of Process equipment – operation (Pumps, compressors, distillation towers, strippers, extractors etc.)

- Operation and control of Pump Houses
- Fired Heaters: Types and operations.
- Compressors: Types and operations
- Distillation Columns: Tray and packed columns, operations

- Reactors: Types and operations
- Heat Exchangers: Types, operations, and maintenance.

6. Process Instrumentation and control systems:

- Measurement of process variables
- sensors, transducers, and their dynamics
- Process modeling and linearization.
- Transfer functions and dynamic responses of various systems.
- Systems with inverse response
- Process reaction curve.
- Controller modes (P, PI, and PID)
- Control valves.
- Analysis of closed loop systems including stability, frequency response, controller tuning, cascade, and feed forward control.

7. Process safety:

- Process Safety Management
- Job Safety Analysis (JSA), HAZOP
- Hazard Identification and Risk Assessment
- Safety in handling hazardous materials
- Environmental regulations and considerations in a refinery/petrochemical plant
- Industry standards and guidelines related to process safety.

8. Different types of firefighting equipment:

- Emergency handling
- Fire Water Pump house
- Test & Operation of Gas Detectors
- Handling of Hazardous Chemicals & Toxic Gases
- Fire Extinguishers (Types/operation/Maintenance)
- Fire Fighting Chemicals (Foam /DCP/CO₂/Clean Agent)
- Hose, Hose Fitting
- Ladder
- Small Gear
- Ropes and Lines
- Foam and foam making equipment.

9. Utility systems – Properties and uses (Air, water, steam, nitrogen):

- Properties and Application of compressed air in pneumatic control systems
- Water Relay
- Water Tender & Special appliances
- Use of water as coolant, solvent in boilers
- Application of nitrogen in fire suppression systems

- Utilization of steam in distillation and sterilization

10. Chemical Thermodynamics

11. Fluid Mechanics, Heat Transfer and Mass Transfer

NOTE:

- 1. The syllabus/topics mentioned are indicative in nature. Candidates are expected to possess significant knowledge/proficiency pertaining to the relevant subjects and their qualifying degree.**
- 2. The Computer Based Test (CBT) will be done tentatively in the month of June-2024.**
- 3. Those candidates who are not meeting the eligibility criteria as per clause no 4 and 13 of Advt. No - HRRL/RECT/01/2024 need not appear for the test. If he/she still appears in the test, his/her candidature will be cancelled at later stages.**