



Syllabus for Quality Control (Grade A0)

1. Technical Competency Related to Testing and Analytical Equipment

- Knowledge of working principles, recent trends, operations and chemistry of analytical equipment
 - HPLC
 - GC
 - UV-VIS Spectrophotometer
 - X-Ray Fluorescence (XRF)
 - Micro-coulometer
 - CHNS
 - ICP (ICP-OES and ICP-MS)
 - Atomic Absorption Spectrometry (AAS)
 - Ultraviolet Fluorescence Technology for Sulfur Determination
 - Chromatography Techniques
 - Fourier Transform Infrared Spectroscopy (FTIR)
 - Karl Fischer Titration
 - Differential Scanning Calorimetry (DSC)
- Knowledge of basic principles of chemistry techniques
 - Types of titration, indicators, principal of reaction of titration and applications
 - Lambert Beer Law and applications
 - Analytical techniques: principle and operation
 - Metal analysis by wet chemistry
 - Units of measurement
 - ppm to % conversion
 - Repeatability, reproducibility and precision
 - Analytical standards and CRMs
 - Uncertainty of measurement
- Basic physical properties of petroleum and petrochemical products
 - Flash Point
 - Pour Point
 - Aniline Point
 - Kinematic Viscosity and Viscosity Index
 - Smoke Point
 - Octane Number



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- Cetane Number
- Density
- Distillation
- Boiling Point Distribution
- Aromatics determination
- Melt Flow Index
- UTM (polymer testing)
- Polymer additives and chemistry
- Crude and physical data
- Specification of petroleum products and global standards
 - LPG
 - Gasoline
 - HSD
 - Aviation Fuels
 - Bitumen
 - Lubes
 - PE and PP polymers
 - ASTM, ISO, IS standards
 - ISO/IEC 17025 Testing and Calibration Laboratories
- Water Chemistry
 - Physical and chemical properties of water
 - Importance of water properties
 - Effluent and drinking water analysis
 - Boiler water chemistry

2. Domain Knowledge: Basic Chemistry

- SI units and conversions
- Solution chemistry (Normality, Molarity, Molality, ppm, ppb, %)
- Basic chemistry of titration
- Critical name reactions
- Elementary thermodynamics
- Catalyst chemistry and significance
- Liquid and gaseous states
- Nomenclature of organic compounds
- Basic polymer chemistry and Ziegler-Natta catalyst
- Laboratory safety rules
- Identification of glassware
- Primary and secondary measurement tools and glassware



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- Calibration of spectrophotometer
- Calibration of balance
- Solvent polarity
- Boiling and melting points
- Matter and its states
- Atoms and molecules
- Chemical bonds: ionic, covalent, metallic
- Chemical reactions: endothermic, exothermic, combustion, synthesis, decomposition, replacement

3. Basic Organic Chemistry

- Hydrocarbons: alkanes, alkenes, alkynes
- Functional group chemistry: alcohols, ketones, acids

4. Laboratory Safety

- Chemical storage and labelling
- Personal protective equipment
- Safe handling of glassware
- Safe/Unsafe Conditions, Acts and Near Miss