

*Syllabus for the trade  
of*

**LABORATORY ASSISTANT (CHEMICAL PLANT)**  
(SEMESTER PATTERN)

UNDER

**CRAFTSMEN TRAINING SCHEME**

*Revised in: 2015*

By  
Government of India

**Central Staff Training and Research Institute**

Directorate General of Training  
Ministry of Skill Development and Entrepreneurship  
EN -81, Sector-V, Salt Lake City,  
Kolkata-700091

**List of the Members of Trade Committee Meeting for the trade of**

**INSTRUMENT MECHANIC (CHEMICAL PLANT)** held on 24.03.2015 and 25.05.2015 at DVE&T, Mumbai and I.T.I. Mahad, Maharashtra

<b>SR.NO.</b>	<b>NAME &amp; DESIGNATION</b>	<b>REPRESENTING ORGANIZATION WITH FULL ADDRESS</b>	<b>REMARKS</b>
1	G. J. Shivalkar Principal	I.T.I. Mahad	Chairman
2	Shri.N.N.Samale Training Officer	I.T.I. Mahad	Member
3	Shri.D.N.More Training Officer	I.T.I. Mahad	Member
4	Shri.P.S.Rane Craft Instructor	I.T.I. Panvel	Member
5	C. P. Jadhav, Craft Instructor	I.T.I. Panvel	Member
6	S.V.Ghadigaonkar Manager Mechanical	Pidilite Industries Ltd,A-21 MIDC Mahad Dist- Raigad	Member
7	SukhirajShette Manager Maintenance	Sandoz Pvt. Ltd,L-1 MIDC Mahad Dist- Raigad	Member
8	Sanjay Janrao Manager Maintenance	Emblio Ltd,E-21,22 MIDC Mahad Dist- Raigad	Member
9	Sameer N. Lahane Dy. Manager Engg.	Shree Hari Chemicals Export Ltd,A-8 MIDC Mahad Dist- Raigad	Member
10	A Markandeyula Manager Maintenance	Privi Organics Ltd,C-3,4,5,6MIDC Mahad Dist- Raigad	Member
11	V N Malusare Sr. Manager Engg.	Hical Ltd,A-18 MIDC Mahad,Dist- Raigad	Member
12	S T Dhumane Asst.ManagerEngg.	Sadhana Nitrochem Ltd, MIDC Roha, Dist- Raigad	Member
13	R.S.Bhosale G.M. Engg.	Elppe chemicals Pvt MIDC Roha Dist- Raigad	Member
14	S.K. Singh Sr. Executive	Sudarshan Chemicals Ltd. MIDC Roha, Dist- Raigad	Member
15	Vineet Singh Manager Maintenance	Pepsi-co India Holdings Pvt Ltd MIDC Roha. Dist- Raigad	Member

List of the Members of Trade Committee Meeting for the trade of

**LABORATORY ASSISTANT (CHEMICAL PLANT)**

held on 02<sup>nd</sup> July, 2015 at Industrial Training Institute, Maninagar, Ahmedabad, Gujarat

Sr. No.	NAME & DESIGNATION	REPRESENTING ORGANIZATION WITH FULL ADDRESS	REMARKS
1.	Shri Sanjaykumar, Joint Director	CSTARI, Kolkata	Chairman
2.	Shri L. K. Mukherjee, Dy. Director	CSTARI, Kolkata	Member
3.	Shri A. C. Muliya, Dy. Director	Directorate of Employment & Training, Gandhinagar	Member
4.	Shri G. N. Parekh, Dy. Director	Directorate of Employment & Training, Gandhinagar	Member
5.	Shri Yatin K. Shah, Supervisor	J. B. Packaging, Ahmedabad	Member
6.	Shri Krunal J Patel, Manager	Dishman Pharma & Chemical Ltd., Ahmedabad	Member
7.	Shri Praful S Sompura, Q.C. Chemist	Maize Products, Ahmedabad	Member
8.	Shri Kamlesh Prajapati, Director	Technology Exchange Services Pvt. Ltd., Ahmedabad	Member
9.	Shri Imtiyaz Kureshi, Sr. Engg.	Technical Resources & Planning Services Pvt. Ltd., Ahmedabad	Member
10.	Shri P. D. Pendkar, Prod. Manager	Jay Chemical Industries, Ahmedabad	Member
11.	Shri Vijay Sinha, Exe. Incharge	Jay Chemical Industries, Ahmedabad	Member
12.	Shri Prakash Patel, General Manager	Meghmani Dyes & Intermediates Ltd, Ahmedabad	Member
13.	Shri Vishnu Patel, Manager	Meghmani Dyes & Intermediates Ltd, Ahmedabad	Member
14.	Shri Jayeshbhai Dave, Manager	Meghmani Pigments, Ahmedabad	Member
15.	Shri Hetal Shah, Asst. Prod. Manager	Meghmani Pigments, Ahmedabad	Member
16.	Shri Patel Nikesh M, Manager	Mcfills Enterprises Pvt. Ltd, Ahmedabad	Member
17.	Shri Rajendra Mandora, Vice President	RLT Instrumentation Pvt. Ltd, Chennai	Member
18.	Shri Akshit Raycha, Jt. Managing Director	Zenith Healthcare, Ahmedabad	Member
19.	Shri Dr. A. P. Vyas, Principal	Saffrony Institute of Technology, Mehsana	Member
20.	Shri D. B. Chaudhari, Principal	ITI Sachin, Surat	Member
21.	Shri Nilesh H Patel, S. I. AOC	ITI Vasad, Anand	Member
22.	Shri B. R. Prajapati, S. I. AOC	ITI Palana, Kheda	Member
23.	Shri H. B. Rajput, S. I. AOC	ITI Visnagar, Mehsana	Member
24.	Shri A. G. Parmar, S. I. AOC	ITI Kubernagar, Ahmedabad	Member

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**LABORATORY ASSISTANT (CHEMICAL PLANT)**

held on 02<sup>nd</sup> July, 2015 at Industrial Training Institute, Maninagar, Ahmedabad, Gujarat

SR. NO.	NAME & DESIGNATION	REPRESENTING ORGANIZATION WITH FULL ADDRESS	REMARKS
25.	Shri M. M. Patel, S. I. IMCP	ITI Kubernagar, Ahmedabad	Member
26.	Shri D. D. Dave, S.I. (MMCP)	ITI Kubernagar, Ahmedabad	Member
27.	Smt. S. C. Madi, S. I. (LACP)	ITI Kubernagar, Ahmedabad	Member
28.	Shri S. N. Patel, S. I. (IMCP)	ITI Kuberrnagar, Ahmedabad	Member
29.	Shri V. R. Patel, S. I. (MMCP)	ITI Kubernagar, Ahmedabad	Member
30.	Ku. R. K. Parmar, S.I. (LACP)	ITI Kubernagar, Ahmedabad	Member
31.	Ku. Z. R. Dave, S. I. (AOCP)	ITI Kubernagar, Ahmedabad	Member
32.	Shri A. B. Shrimali, S. I. (MMCP)	ITI Kubernagar, Ahmedabad	Member

## GENERAL INFORMATION

1. Name of the Trade : **LABORATORY ASSISTANT (CHEMICAL PLANT)**
2. NCO Code No. :
3. Duration : 2 Year Course with 4 Semesters of 6 months each
4. Power Norms : 6 Kw
5. Space Norms : 96 sq. mtrs.
6. Entry qualification : Passed 10<sup>th</sup> Class Examination under 10+2 system with Science and Mathematics and equivalent.
  
7. Unit Size (No. of Trainees) : 16
8. Instructor Qualification :
  - a. Degree in Chemical/Petro chemical/ Technology/ Engineering from recognized University with one year experience in the relevant field.

OR
  - b. Diploma in Chemical/Petro Chemical Technology/ Engineering from recognized board of Technical Education with 2 years post qualification experience in relevant field  

OR
  - c. 10<sup>th</sup> Class Passed and NTC / NAC in Trade with 3 years post qualification experience in the relevant field.
  
9. Desirable : CIC in the trade.

Note: - At least one instructor must have Degree/ Diploma in the relevant field.

SYLLABUS OF THE TRADE OF		
LABORATORY ASSISTANT (CHEMICAL PLANT) UNDER CTS		
SEMESTER – I (Semester Code No. LAC-01)		
Week No.	TRADE PRACTICAL	TRADE THEORY
1	Induction Training. Operation of fire extinguisher. Use of personal protective equipments. Introduction to Material Safety Data Sheet (MSDS) and personal protection equipments (PPEs) used in chemical plant.	Induction Training. Fire & Safety in Chemical Lab/Plant. First Aid. Introduction of pollution control.
2	Volumetric Analysis (Acidimetric Titrations) Preparation of solutions of solids, liquids, volatile, non-volatile, etc. substances. Preparation of standard & primary standard solutions	General & Physical Chemistry  Introduction to chemistry. Elements, atoms & molecules  Chemical & physical changes
3	Analysis of acids & bases.	Atomic molecular and equivalent weights. Crystallography. Solutions.
4	Analysis of acids & bases.	the laws of chemical combinations
5	Analysis of acids & bases.	Periodic table of the elements.
6	Oxidation-Reduction titration. Permanganometry-titration using permanganate solution	Periodic study of S & P Block Elements:
7	Oxidation-Reduction titration. Permanganometry-titration using permanganate solution	Periodic study of: a) Zero group b) Transition Elements.
8	Dichrometry titrations using dichromate solution.	Periodic study of: a) 4th B group b) 5th B group (c) 6th B group c) 7th B group d) 8th B group elements.
9	Dichrometry titrations using dichromate solution.	Chemical equilibrium. Thermo-chemistry & thermodynamics.
10	Iodo and iodimetry titrations using iodine solution directly or indirectly.	Chemical equilibrium. Thermo-chemistry & thermodynamics.
11	Iodo and iodimetry titrations using iodine solution directly or indirectly.	Colloidal osmosis catalysis
12	Precipitation titration.	Metallurgy Metallurgy of: a) Aluminum. b) Copper
13	Precipitation titration.	Metallurgy of: a) Silver b) Chromium
14	Complexometric titrations	Metallurgy of: a) Iron & Steel b) Zinc & its alloys.
15	Complexometric titrations	Non-Metals: Preparation, properties & uses of following: a) Hydrogen & its peroxide. b) Oxygen c) Sulphur & its compounds.

16	Calibration of mechanical recorders	Preparation, properties & uses of following: a) Nitrogen & its compounds. b) Phosphorus & its compounds. c) Chlorine & Fluorine and its compounds. Potential metric type recorders
17	Physics Lab  To study parallelogram of forces with the help of mechanical board.  Determination of acceleration due to gravity by simple pendulum  Determination of Young's Modulus by Seattle's apparatus	Moment and Levers : moments, units, arm of couple and moment of couple , types of Levers Simple machines. Simple machines , efforts and load , mechanical advantage, velocity ratio , efficiency of machines , their relationship, examples
18	Determination of coefficient of expansion of solid Determination of coefficient of Thermal conductivity of metal rod	Elasticity,: Introduction, stress and strain, modulus of elasticity, different types of stresses, Hook's Law, Young's modulus, Yield point, ultimate, stress-strain graph, modulus of Rigidity, poisson ration, bulk modulus, factor of safety, examples
19	Determination of mechanical equivalent of heat using electrical method.	Heat and Temperature Heat, unit of heat, temperature, difference between heat and temp., modes of heat transfer, Boiling point, Melting point, scale of temp., specific heat, thermal capacity, water equivalent of heat, interchanges of heat, latent heat of fusion, latent heat of vapour, transmission of heat, thermal expansion of solids, liquids and gases, co-efficient of linear expansion, indicated thermal efficiency, brake thermal efficiency, examples.
20	To study electric cell using series and parallel connections.	Electricity : Electric current, +Ve and -Ve terminals use of fuses and switches , conductors and insulators , simple electrical Circuits ,
21 to 22	To study Ohm's law and Kirchhoff's law about current and voltage.  Determination of specific resistance using wheat stone's Bridge	Ohm's law , electrical insulating Materials, Kirchhoff's law, examples, Parallel and series circuit connections. Whetstone's bridge potentiometer.
23 to 24	Verification of faraday's First law of electrolysis.	Electrolysis, conservation of electrical energy into heat energy, Joule's law. mechanical equivalent of heat
25	PROJECT WORK / INDUSTRIAL VISIT (OPTIONAL)	
26	EXAMINATION	

<b>SYLLABUS OF THE TRADE OF</b>		
<b>LABORATORY ASSISTANT (CHEMICAL PLANT) UNDER CTS</b>		
<b>SEMESTER – II (Semester Code No. LAC-02)</b>		
<b>Week No.</b>	<b>TRADE PRACTICAL</b>	<b>TRADE THEORY</b>
01	Gravimetric estimations	General & Physical Chemistry
02	Gravimetric estimations	The structure of atom.
03	Gravimetric estimations	The structure of atom
04	Gravimetric estimations	radioactivity
05	Gravimetric estimations	Chemical bonding electronic theory of valancy
06 & 07	Gravimetric estimations	Gas laws, Boyles law, Charls law, Gas equation, Grahams Law of diffusion, Daltons law of partial pressure.
08 & 09	Gravimetric estimations	Fertilizer its types & uses
10 & 11	Inorganic qualitative analysis	Atmosphere air
12 & 13	Inorganic qualitative analysis	Electro-chemistry & electrolysis Water & its type Water Treatment (Purification )
14 & 15	Inorganic qualitative analysis	Law of mass action
16	Inorganic qualitative analysis	Study of physical properties of substances
17	Calibration of Bourdon tube pressure gauges Study Manometer	Units of pressure, measurement of pressure by different methods.
18	Calibration of Alcohol in glass thermometer	Same as week No.18
19	Calibration of bimetallic thermometer	Temperature scale, different methods of temperature measurement.
20	Testing of a Resistance thermometer	Same as week No.18 Thermometer
21 to 22	Testing of Thermocouple, Thermocouple Pyrometer	Thermocouple and pyrometer
23 to 24	Study of recorders transmitters Controllers	Recorder, On off controller. Transmitter
<b>25</b>	<b>PROJECT WORK / INDUSTRIAL VISIT (optional)</b>	
<b>26</b>	<b>EXAMINATION</b>	



SYLLABUS OF THE TRADE OF		
LABORATORY ASSISTANT (CHEMICAL PLANT) UNDER CTS		
SEMESTER – III (Semester Code No. LAC-03)		
Week No.	TRADE PRACTICAL	TRADE THEORY
01	General introduction.	Introduction to Organic Chemistry.
02	Organic Preparation: Acetylation: preparation of acetalide, & percentage yield determination.	Purification of Organic Compounds.
03	EASTERIFICATION Preparation of Methyl Oxalate & percentage yield determination	Purification of Organic Compounds.
04	Sulphonation: Laboratory preparation of sodium benzene sulphonate & percentage yield determination	Types of organic reactions
05	Nitration: Laboratory preparation of nitrobenzene. & percentage yield determination Halogenation: Preparation of tribromophenol	Classification & nomenclature.
06	Oxidation: Laboratory preparation of oxalic acid Reduction Laboratory preparation of aniline:	Aliphatic hydrocarbons Halogen derivatives of hydrocarbons – aliphatic alcohol
07	Diazotization: Preparation of methyl orange, Ozazone, glucosazone	Ethers, Aldehydes, Ketones
08	Saponification: Preparation of soap. Preparation of aspirin	Carboxylic acid. Amides & Anhydride, Acid Halides
09	Preparation of phenolphthalein	Esters Oil & Fats. Soaps & Detergents.
10	Inorganic preparation: Preparation of sodium carbonate. And determination of % of purity, % yield	Amines Cyanogan compounds
11	Preparation of copper sulphate & percentage purity, % yield determination.	Carbohydrates & Protein
12	Preparation of Mohr's salt & percentage purity, % yield determination	Polymers, Aromatic, Hydrocarbons, aromatic ethers.
13	Preparation of alum: Ferric or potash alum, & % yield determination	halogen derivatives
14	Preparation of potassium nitrate. & percentage purity, % yield determination	Compounds with nitrogen urea
15	Analysis of organic compounds to determine : a) elements present b) functional group c) melting point d) preparation of derivative e) M.P. of derivative for following group of compounds f) compounds alcohols, acids,	-Do -
16	- Do -	Aromatic acids
17	Analysis of organic compounds to determine : a) elements present b) functional group c) melting point d) preparation of derivative e) M.P. of derivative f) for following group of compounds, carbohydrates, nitro compounds, amines,	Compounds of double & triple rings

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LABORATORY ASSISTANT (CHEMICAL PLANT) UNDER CTS		
SEMESTER – III (Semester Code No. LAC-03)		
Week No.	TRADE PRACTICAL	TRADE THEORY
18	-do-	Compounds of double & triple rings
19	Analysis of organic compounds to determine : a) elements present b) functional group c) melting point d) preparation of derivative e) M.P. of derivative f) for following group of compounds, halogen compounds, sulphur compounds,	Heterocyclic compounds
20	- Do -	Diazonium salts, colour and dyes.
21 to 22	Analysis of organic compounds to determine : a) elements present b) functional group c) melting point d) preparation of derivative e) M.P. of derivative for following group of compounds, phenolic compounds, hydrocarbons, aldehydes, ketones & esters, etc. f) C.O.D., B.O.D., T.S.S. analysis equipment g) Turbidity meter	- Do -
23 to 24	- Do -	
25	PROJECT WORK / INDUSTRIAL VISIT	
26.	EXAMINATION	

SYLLABUS OF THE TRADE OF		
LABORATORY ASSISTANT (CHEMICAL PLANT) UNDER CTS		
SEMESTER – IV (Semester Code No. LAC-04)		
Week No.	TRADE PRACTICAL	TRADE THEORY
01	ESTIMATIONS-ORE AND ALLOY ANALYSIS: Analysis of bauxite or zinc ore. Aim, chemical required, reaction, method of estimations of elements.	Determination of concentration of solutions by molarity, IMP by weight by grams per litre. The Laws of chemical combination
02	Analysis of brass or analysis of soldering materials. Aim, chemicals & reagent required, reaction, method of estimations of elements.	Law of multiple proportions Determination of atomic & molecular equivalent weight.
03	INORGANIC ESTIMATIONS: estimation of calcium in given tablet. Aim, chemicals & reagent required, reaction, method of operations.	Percentage of elements in chemical compounds Empirical formulae of chemical compounds.
04	Analysis of gas by Orsat's Apparatus .theory of gas analysis. Method of operation.	Empirical formulae of chemical compounds, balancing chemical equation
05	OIL ANALYSIS: Determination of acid value of an oil & or fat. Procedures, chemicals required. Definition of acid value & reaction. Determination of saponification value of an oil or fat. Aim, apparatus & chemicals required. Definition, procedure & reaction.	Electrolysis.  Electro chemistry Heat effect of electricity.
06	Estimation of sugar by Lane's & Eynon's method.	
07	Determination of fat by Soxhlet's Extraction method. Aim, apparatus & chemicals required, reaction, procedure & theory of the experiment.	Analysis, volumetric analysis.
08	Estimation of nitrogen by Kjeldahl's method. Aim, apparatus, procedure & theory of the experiment	Acidimetry, Redox method, precipitation method, gravimetric analysis. Indirect method of analysis. Calculation of results of analysis on dry materials.
09	Estimation of formaldehyde by Iodometric method. Aim, apparatus, chemical required, procedure & principle of the experiment.	THERMO CHEMISTRY Heat of dissolving, heat of chemical reactions. i) Hess's law ii) heat of for
10	Estimation of aniline or phenol in the given solution by Bromination method. Aim, apparatus, chemical required, procedure & principle of the experiment.	PH & buffer solution Law of mass action
11	Instrumental analysis Potentiometric Titrations. Conductometric Titrations.	Analysis of chemical compound by electrical energy.
12	Determination optical rotation of sugar solution. Using polari-meter	Radio chemistry, Decay of radio isotopes. Equation of decay half time value.
13	Determination of % of elements by electrolytic analyzer	Introduction to microbiology.
14	To determine the PH of given solutions by using PH-meter & lovibond comparator.  Paleographic ppt	Introduction to Bacteria cell.  Lovibond comparator  Paleographic apparatus
15	Calorimetric estimation	Sterilization – Details study
16	Spectrophotometric analysis	Introduction to Nutrition of bacteria.

<b>SYLLABUS OF THE TRADE OF</b>		
<b>LABORATORY ASSISTANT (CHEMICAL PLANT) UNDER CTS</b>		
<b>SEMESTER – IV (Semester Code No. LAC-04)</b>		
<b>Week No.</b>	<b>TRADE PRACTICAL</b>	<b>TRADE THEORY</b>
17 to 20	Principle, handling & procedure for following laboratory equipment: a) balance b) photo calorimeter c) Digital flame photometer d) refractometer (oil sugar) e) Karlfisher Apparatus. f) T.L.C., Paper Chromatography g) Gas chromatography Digital Type h) High performance liquid chromatography i) Digital Moisture balance j) Redwood viscometer k) Melting & boiling point apparatus l) Digital Viscometer m) Electrophoresis apparatus n) Conductivity meter o) COD equipments p) BOD equipments q) Turbidity meter	Introduction to Industrial Microbiology
21	<b>MICROBIOLOGY</b> Study & use of microscope. Study of common laboratory equipment's used in microbiology.	Identification of different micro-organism
22	Preparation of media technique of inoculations.	Micro- organisms & infections. Streptomycin Yeast
23	Study of staining techniques.	Micro- organisms & infections. Streptomycin Yeast
24.	Study of gram staining	Bread ,Alcohol, Beers, Wines
22 & 23 & 24	<b>PROJECT WORK / INDUSTRIAL VISIT</b>	
25	<b>REVISION</b>	
26	<b>EXAMINATION</b>	

**LIST OF TOOLS AND EQUIPMENT FOR A BATCH OF 16 TRAINEES  
FOR THE TRADE OF LABORATORY ASSISTANT (CHEMICAL PLANT)**

**A. General Machinery shop outfit**

Sl. No.	Name of the Item	Quantity
1	Digital balance (1mg to 200 Gms)	5 nos.
2	Balance (tech.) to 1 kg.	1 no.
3	Auto-clave electrically heated	1 no.
4	Vacuum pump (central, for 20 places)	1 no.
5	Vacuum pump mounted on moving tables	2 nos.
6	Electric drying ovens (200°C)	2 nos.
7	Water baths(6 places)(electrically heated)	4 nos.
8	Sand bath	1 no.
9	Refrigerator	1 no.
10	Chromatographic equipment (paper, column, thin layer)	1 each
11	Stirrers with motors, 230V, AC, capacity 5 – 7 liters	8 nos.
12	Magnetic stirrers (with heating plate) 2 litres capacity	2 nos.
13	Mortar , 100mm, porcelain with pestle	6 nos.
14	Heating plates (electric) 1000 watt	1 no.
15	Mortar 150 mm. steel / cast iron	1 no.
16	Electric heating plates	2 nos.
17	Heating mantles (universal)	6 nos.
18	Borer for stoppers with sharpener	1 no.
19	Clamps with spring or screw	16 nos.
20	Cork press	1 no.
21	Scissors	2 nos.
22	Bunsen's burner	16 nos.
23	Set sieves 20 – 200mesh	1 no.
24	Shaking machines for sieves & bottles	1 no.
25	Steam generator (copper) for steam distillation 2 liters	10 nos.
26	Hot water funnel 1liter with thermometer 0 to 110 *C	10 nos.
27	Tongs (forceps) nickel for crucibles & weights	16 nos.
28	Tongs long for crucibles (muffle furnace)	6 nos.
29	Spatulas nickel	20 nos.
30	Test tube stand for 10 – 12 test tubes	16nos.
31	Tripods	16 nos.
32	Test tube holders	16 nos.
33	Clamp holders	16 nos.
34	Clamps	16 nos.
35	Retort Rings with clamps for filtering & heating	16 nos.
36	Stands	16 nos.
37	Stands with clamps for burettes	16 nos.
38	Apparatus for distilled water and demineralising water	1 each
39	Crucible nickel 30 mm. dia, height 40 mm.,	6 nos.
40	One pan analytical balances 0.1 mg. To 100 Gm. sensibility (Digital Electronic Type)	5 nos.
41	LCD Multimedia projector	1 no.

42	Computer (latest configuration) with licentiate operating software.	1 no.
43	Printer (Printer, Scanner & Copier)	1 no.
44	Microscope x 1000 (Monocular)	1 no.
45	Polarimeters (Digital) with extra sodium lamp	2 no.
46	Refractometers (Abbe type with refractive index)	1 no.
47	pH meter Digital	1 no.
48	Potentiometer titration apparatus	1 no.
49	Conductivity meter	1 no.
50	Viscometer Digital	1 no.
51	Orsat's Apparatus with glassware	1 no.
52	Karl Fisher apparatus for moisture determination, if available indigenously	1 no.
53	Gas chromatography instrument with computer & printer	1 no
54	High performance liquid chromatography instrument with computer & printer	1 no
55	Apparatus for determination of flash point	1 no.
56	Melting point apparatus	1 no.
57	Electrolytic analyser and Cl, H, N, S analyser	1no. each
58	Photo-colorimeter	1no.
59	Spectroscopy-IR/NMR/UV-Visible Spectrophotometer , FTIR	2 nos.
60	Flame photometer	1no.
61	Bourdon Tube Pressure Gauges Different Ranges	2 each
62	Compound Gauge	2 No.
63	Diaphragm Type Pressure Gauge	2 No.
64	Dead Weight Tester with Accessories	1nos.
65	Comparator with Accessories & STD Pressure Gauges	1 no.
66	Thermocouple Type K, J,I,T	2 each
67	Digital Mill voltmeter	2 nos.
68	Mercury in Glass Thermometer	4 no.
69	Alcohol in Glass Thermometer	2 No.
70	Filled System Temperature Indicator	2 nos.
71	Bimetallic Thermometer	2 nos.
72	Resistance Thermometer (Pt-100)	6 nos.
73	Heating plate (electric) 1000 watt	4 no.
74	Thermostatic bath	2 pieces
75	T.C. Pyrometer	2 NO.
76	Digital Multimeter	4 No.
77	Pressure regulating Valve	2 No.
78	Quantity meters, Orifice meter ,Rotameter	1 each
79	Circular chart Recorder	2 No.
80	Diaphragm control valve, Air to open	1 No.
81	Diaphragm control valve, Air to Close	1 No.
82	Capacitance Type Level Transmitter	1 No.
83	Differential Pressure Transmitter	1 No.
84	ON-OFF Controller	1 No.
85	Physical balance (with weight box) 1 to 500 gms.	3 sets

86	Chemical balance (with weight box) 1 mg to 200 gms.	3 sets
87	Viscometer :	
88	(a) Oswald viscometer (Consumable)	3 pieces
89	(b) Redwood viscometer	3 pieces
90	(c) Stop watch (1/10 <sup>th</sup> Secn)	6 pieces
91	(d) Thermostatic bath	2 pieces
92	Specific gravity bottle	6 nos.
93	Pyknometer	6 nos.
94	Mechanical board for testing triangle and parallelogram of forces including all accessories	6 sets
95	Spirit level	3 sets
96	Different types of levers	1 set
97	Instrument for determining 'g' (simple pendulum).	2 sets
98	Barometer	1 no.
99	Altimeter (3000 ft.)	1 no.
100	Searle's apparatus for young's, modules, modules	2 sets
101	Wet and dry bulb thermometer	2 sets
102	Apparatus for measurement of coefficient of expansion (thermal) of solid and liquid.	2 sets.
103	Apparatus for measurement of thermal conductivity of good and bad conductor	2 sets
104	Calorimeter for determining mechanical equivalent of heat and specific heat.	4 sets.
105	Polarimeter with monochromatic light	2 sets
106	Abbe refractometer (Digital)	2 sets
107	Pulfrich-refractometer	2 sets
108	Equipment to study Kirchhoff's law and Electrochemical equivalent	1 set
109	Wheatstone's bridge	2 sets
110	Resistances Centre zero galvanometer	4 nos.
111	Resistance box (a) Resistance box 0 to 100 ohms (b) Resistance box 0 to 500 ohms.	2 nos. 2 nos.
112	Rheostat : a) Rheostat 25 Ohms b) Rheostat 100 Ohms c) Rheostat 500 Ohms	2 nos. 2 nos. 2 nos.
113	Ammeter a) 0 to 1 Amp (DC) b) 0 to Amp (DC) c) 0 to 10 Amp (AC, DC) d) 0 to 30 Amp (AC, DC)	2 sets 2 sets 2 sets 2 sets.
114	Volt meter a) 0 to 1 volt (DC) b) 0 to 4 volt (DC) c) 0 to 5 volt (DC) d) 0 to 10 volt (DC) e) 0 to 50 volt (DC) f) 0 to 25 volt (DC)	2 sets 2 sets 2 sets 2 sets 2 sets 2 sets
115	Milli voltmeter a) 0 to 5 mV b) 0 to 50 mV Digital Milli voltmeter) 0 to 200mv	2 No.2 No. 2 No

116	Resistance coils (5 Ohms, 10 Ohms, 50 Ohms, 100 Ohms)	2 sets
117	Multimeter Analog& Digital	2 each
118	Battery eliminator	2 nos.
119	Digital Viscometer	2 Nos.
120	Element Analyser	1.No
121	Lovibond Comparator	02 Nos
122	Paleographic apparatus	02 Nos.
123	Digital Moisture Balance	02 Nos.
124	C.O.D.,B.O.D.,T.D.S. analysis equipment	01 No. Each
125	Turbidity Meter	02 Nos.
126	Automatic Titration (Computerized)	02 Nos.
127	Gas fuming chamber with exhaust	02 Nos.
128	Photo calorimeter	02 Nos.
129	Electrophoresis apparatus	02 Nos.
130	Digital Flame photometer	02 Nos.
131	Furnace (Muffle ovens 1100 deg. C) 300 x 300 x 450 mm	01 No.
132	Fire Extinguisher	01 No.
133	Sand Bucket set	01 No.
134	LPG Cylinder	01 No.



## B. Consumable Glassware and miscellaneous

Consumable Items		
1.	Desiccators 150 mm. dia.	As Required
2.	Desiccators vacuum	As Required
3.	Extraction thimbles	As Required
4.	Glass tubes & rods of different diameter	As Required
5.	Rubber tubes for water, gas & vacuum, stopper, rubber each glass, plastic & cork of different sizes	As Required
6.	Asbestos wire gauge	As Required
7.	Wire gauge (without asbestos)	As Required
8.	Cork rings	As Required
9.	Pipe clay Triangles	As Required
10.	Erlenmeyer flasks 250 ml.	As Required
11.	Erlenmeyer flasks 500 ml.	As Required
12.	Burettes 25 ml.	As Required
13.	Burettes 50 ml.	As Required
14.	Pipettes Volumetric 10 ml.	As Required
15.	Pipettes Volumetric 25 ml.	As Required
16.	Pipettes measuring 0 to 5 ml.	As Required
17.	Pipettes measuring 0 to 10 ml.	As Required
18.	Pipettes measuring 0 to 1 ml.	As Required
19.	Pipettes micro 0 to 0.2 ml.	As Required
20.	Pipettes 1ml. (graduated)	As Required
21.	Each pipettes automatic 1, 2, 5, 10 ml.	As Required
22.	Flasks for distilled water 500 ml.	As Required
23.	Vacuum pipettes	As Required
24.	Measuring cylinders 25 ml.	As Required
25.	Measuring cylinders 50 ml.	As Required
26.	Measuring cylinders 100 ml.	As Required
27.	Measuring cylinders 250 ml.	As Required
28.	Measuring cylinders 500 ml.	As Required
29.	Measuring cylinders 1000 ml.	As Required
30.	Volumetric flask 100 ml.	As Required
31.	Volumetric flask 250 ml.	As Required
32.	Volumetric flask 500 ml.	As Required
33.	Volumetric flask 1000 ml.	As Required
34.	Weighing bottles polyethylene or glass 50 ml.	As Required
35.	Weighing bottles polyethylene or glass 100 ml.	As Required
36.	Funnels with regular & long stem 7 cm. dia.	As Required
37.	Funnels 4 cm. dia.	As Required
38.	Funnels 9 cm. dia.	As Required
39.	Funnels Buchner different sizes 10 to 25 cm. dia.	As Required
40.	Funnels Hirsch 10 cm.	As Required
41.	Funnels separatory 50 ml.	As Required
42.	Funnels separatory 100 ml.	As Required
43.	Funnels separatory 250 ml.	As Required
44.	Funnels separatory 500 ml.	As Required

45.	Funnels for filter crucibles & Gooch crucibles with rubber rings	As Required
46.	Beakers 100 ml. Corning	As Required
47.	Beakers 250 ml. Corning	As Required
48.	Beakers 400 ml. Corning	As Required
49.	Beakers 600 ml. Corning	As Required
50.	Beakers 1000 ml.	As Required
51.	Watch glasses 5 cm.dia.	As Required
52.	Watch glasses 7.5 cm.dia.	As Required
53.	Watch glasses 10 cm.dia.	As Required
54.	Dishes evaporating 5 cm. dia. porcelain, glass	As Required
55.	Dishes evaporating 7.5 cm. dia.	As Required
56.	Dishes evaporating 10 cm. dia. flat bottom	As Required
57.	Dishes evaporating 15 cm. dia.	As Required
58.	Dishes evaporating 20 cm. dia.	As Required
59.	Thermometers 0 to 110°C	As Required
60.	Thermometers 0 to 250°C	As Required
61.	Thermometers 0 to 350°C	As Required
62.	Thermometers for drying oven (L shape )	As Required
63.	Boiling flasks with round bottom 100ml.	As Required
64.	Boiling flasks with round bottom 250ml.	As Required
65.	Boiling flasks with round bottom 500ml. for each distilling flasks 50 ml., 100 ml., 250 ml.	As Required
66.	Boiling flasks with round bottom 500ml. for each distilling flasks 50 ml, 100 ml, 250 ml – Writz and others	As Required
67.	Filtering flasks 250 ml.	As Required
68.	Filtering flasks 500 ml.	As Required
69.	Filtering flasks 1000 ml.	As Required
70.	Flasks soxhlet with condensers	As Required
71.	Flasks kjeldahal 250 ml.	As Required
72.	Condensers liebig 30 mm. long	As Required
73.	Condensers liebig 50 cm. long	As Required
74.	Condenser bulb type 30 cm. long	As Required
75.	Condenser spiral type 20 cm. long	As Required
76.	Connecting tubes for khejeldahal distillation	As Required
77.	Ventiles for volumetric analysis (KCl O3, etc.)	As Required
78.	CO2 determination apparatus (Schrotter)	As Required
79.	Gas generator (Kipp) 500 ml. (plastic)	As Required
80.	Gas washing bottles (Dreshsler)	As Required
81.	Drying tubes with one bulb (Calcium chloride)	As Required
82.	Crucibles porcelain 5 cm, dia, height 4 cm indigenous	As Required
83.	Crucibles quarts 5 cm, dia, height 4 cm indigenous	As Required
84.	Gooch porcelain or glass	As Required
85.	Filtering crucible 0, 1, 2, 3 glass	As Required
86.	Test tube ( 160 mm x 15 mm.)	As Required
87.	Test tube (10 mm. )	As Required
88.	Gas sampling tubes	As Required
89.	Paiers nessler tubes	As Required
90.	Tubes for centrifuge	As Required

91.	Tubes for Gerber centrifuge	As Required
92.	Bottles with droppers for indicator solutions & semi-micro qualitative analysis 30 ml.	As Required
93.	Bottles with droppers for indicator solutions & semi-micro qualitative analysis 50 ml.	As Required
94..	Bottles for solids 50 ml.	As Required
95.	Bottles for solids 100 ml.	As Required
96.	Bottles for solutions 100 ml.	As Required
97.	Bottles for solutions 250 ml.	As Required
98.	Bottles for solutions 1000 ml.	As Required
99.	Bottles for solutions 2000 ml.	As Required
100.	Bottles for solutions 3000 ml.	As Required
101.	Bottles for solutions 5000 ml.	As Required
102.	Hand Gloves (Rubber)	As Required
103.	Acid Alkali Goggles	As Required
104.	Nose Mask (Cotton)	As Required

**A: Trade Details**

S. N.	Particulars	As per DGET
1	Name of the Trade	<b>LABORATORY ASSISTANT (CHEMICAL PLANT)</b>
2	Duration (In Semester):	4
3	Intake:	16
6	Space Required (in Sq. Meter):	96
7	Power Required (in KW):	6

**G: Common Facility Utilization (Per 1 Unit in a Shift)**

**(This section specifies utilization of Common Facilities provided in the ITI)**

	Particulars	Hours per Week	Remark
1	Computer Lab Utilization (Hours Per Week)	2	Per 1 Unit in a Shift
2	Drawing Hall Utilization (Hours Per Week)	2	Per 1 Unit in a Shift
3	Library Hall Utilization (Hours Per Week)	2	Per 1 Unit in a Shift
4	Class Room Utilization (Hours Per Week)	12	Per 1 Unit in a Shift
5	CNC Lab Utilization (Hours per Week)	0	

**H. Safety**

S. N.	Name of Item	Category	Qty	Unit	Remark
1	Apron - Blue	Equipment	12	Number	Per 1 Unit in a Shift

**I: Special Instructions**

**(This section specifies instruction related to Infrastructure Management)**

S. N.	Particulars
1	Nil

**J: Instructor Facility (Optional)**

**(This section specifies the items to be provided to the Instructor during Training.)**

S. N.	Name of Item	Category	Qty	Unit	Remark
1	Blank CD (rewritable)	Stationary	10	Number	Per 1 Unit in a Shift
2	Box File	Stationary	5	Number	Per 1 Unit in a Shift
3	Calculator - Scientific	Equipment	1	Number	Per 1 Unit in a Shift
4	Eraser	Stationary	1	Number	Per 1 Unit in a Shift
5	Gum Bottle	Stationary	1	Number	Per 1 Unit in a Shift
6	Highlighter pen	Stationary	5	Number	Per 1 Unit in a Shift
7	Office File	Stationary	10	Number	Per 1 Unit in a Shift
8	Paper Rim - A4 Size Xerox Paper	Stationary	1	Number	Per 1 Unit in a Shift
9	Paper Rim - Legal Size Xerox Paper	Stationary	1	Number	Per 1 Unit in a Shift
10	Pen Drive - 8 GB	Stationary	1	Number	Per 1 Unit in a Shift
11	Pencil Box	Stationary	1	Number	Per 1 Unit in a Shift

12	Permanent Marker Pen	Stationary	5	Number	Per 1 Unit in a Shift
13	Punch Machine	Stationary	1	Number	Per 1 Unit in a Shift
14	Register - 200 Pages	Stationary	2	Number	Per 1 Unit in a Shift
15	Sharpener	Stationary	1	Number	Per 1 Unit in a Shift
16	Sketch pen box	Stationary	1	Number	Per 1 Unit in a Shift
17	Stapler Big	Stationary	1	Number	Per 1 Unit in a Shift
18	Stapler Big Pins - Box	Stationary	1	Number	Per 1 Unit in a Shift
19	Stapler Small	Stationary	1	Number	Per 1 Unit in a Shift
20	Stapler Small Pins - Box	Stationary	1	Number	Per 1 Unit in a Shift
21	White Board Marker/Ink Bottle/ Chalk	Stationary	10	Number	Per 1 Unit in a Shift
22	White/ Black Board Duster	Stationary	2	Number	Per 1 Unit in a Shift
23	Torch	Tool	1	Number	Per 1 Unit in a Shift