

Model Curriculum

Research Associate-Product development/Synthesis/Medicinal Chemistry

SECTOR: LIFE SCIENCES
SUB-SECTOR: PHARMACEUTICAL AND BIOPHARMACEUTICAL
OCCUPATION: RESEARCH AND DEVELOPMENT
REF ID: LFS/Q0505, V1.0
NSQF LEVEL: 5



Certificate

CURRICULUM COMPLIANCE TO QUALIFICATION PACK – NATIONAL OCCUPATIONAL STANDARDS

is hereby issued by the

LIFE SCIENCES SECTOR SKILL DEVELOPMENT COUNCIL

for the

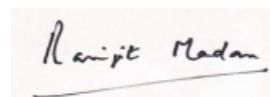
MODEL CURRICULUM

Complying to National Occupational Standards of
Job Role/ Qualification Pack: **Research Associate-Product development/Synthesis/Medicinal
Chemistry** QP No. **LFS/Q0505,V1.0, NSQF Level 5**

Date of Issuance: **January 10th, 2019**

Valid up to: **March 30th, 2020**

** Valid up to the next review date of the Qualification Pack*



Authorized Signatory
(Life Sciences Sector Skill Development Council)

TABLE OF CONTENTS

1. Curriculum	01
2. Trainer Prerequisites	11
3. Annexure: Assessment Criteria	12

Research Associate- Product Development/ Synthesis/ Medicinal Chemistry

CURRICULUM / SYLLABUS

This program is aimed at training candidates for the job of a “Research Associate-Product Development/Synthesis/ Medicinal Chemistry”, in the “Life Sciences” Sector/Industry and aims at building the following key competencies amongst the learner

Program Name	Research Associate-Product Development/Synthesis/Medicinal Chemistry		
Qualification Pack Name & Reference ID.	Research Associate-Product Development/Synthesis/Medicinal Chemistry LFS/Q0505, V1.0		
Version No.	1.0	Version Update Date	10-01-2019
Pre-requisites to Training	Minimum qualification – Masters in a relevant Science discipline (Preferably Organic Chemistry)/ M. Pharma Experience- Fresher, 1-2 years' experience preferred		
Training Outcomes	<p>After completing this program, participants will be able to:</p> <ul style="list-style-type: none"> • Outline the industry regulations and ethical practice to enable him/herself for establishing industry standards in his/her performance. • Explain the basics of organic chemistry, analytical chemistry, formulation development for the new chemical entity (NCE) / new product (NP) development • Plan the reaction setup and resources needed for a new chemical entity (NCE) / new product (NP) development • Recap the analytical and purification methods for a new chemical entity (NCE) / new product (NP) development • Perform planned reactions in the lab, in compliance with Good Laboratory Practices (GLP) and deliver the new chemical entity (NCE) / new product (NP) as per specifications • Demonstrate the development of new routes/ new methods/ solutions to the scientific problems using literature, IT tools and applying the problem solving and decision-making skills • Explain research work documentation in Lab notebooks • Discuss to write the research articles/ presentations • Explain the environment, health, and safety (EHS) norms and maintain a healthy, safe and secure working environment in the lab • Discuss the need to coordinate and support supervisor, cross-functional teams and within the team for various functional activities 		

This course encompasses 6 out of 6 Compulsory NOS (National Occupational Standards) of “Research Associate-Product Development/Synthesis/Medicinal Chemistry” Qualification Pack issued by “Life Sciences Sector Skill Development Council”.

S. No.	Module Name	Key Learning Outcomes	Equipment Required
1	<p>Life Sciences Industry and R&D related regulations</p> <p>Theory Duration (hh:mm) 04:00</p> <p>Practical Duration (hh:mm) 00:00</p> <p>Corresponding NOS Code Bridge Module</p>	<ul style="list-style-type: none"> • Explain the Life Sciences industry and its sub-sectors • Summarize various regulatory authorities and their rules & regulations for research and development (R&D) lab • Explain typical R&D laboratory functions in a life sciences organization • Explain the good laboratory practice (GLP) and good manufacturing practices (GMP) and good documentation practices (GDP) at work as applicable • Explain the organizational structure and employment benefits in life sciences organizations • Outline the role and responsibility of a Research Associate-Product Development /Synthesis/ Medicinal Chemistry 	
2	<p>Organic Chemistry for Chemical Synthesis</p> <p>Theory Duration (hh:mm) 08:00</p> <p>Practical Duration (hh:mm) 24:00</p> <p>Corresponding NOS Code Bridge Module</p>	<ul style="list-style-type: none"> • Explain organic reaction mechanisms • Discuss the procedure to develop organic reactive intermediates • Explain the methods for generation, structure, and stability of reactive intermediates • Perform important reactions involving carbocations, nitrenes, carbenes, arynes, ketenes, and neighboring group participation • Conduct reactions involving hard and soft electrophiles and nucleophiles (HSAB principle) • Explain aromatic nucleophilic and electrophilic substitution • Explain hydrolysis, bond formation (C-C, C-N, C-O, C-Si), Grignard reactions, amidations, diazotization, esterification, elimination reactions, addition reactions, substitution reactions, metal-halogen exchange reactions • Explain pericyclic reactions, stereochemistry, and reactivity • Discuss the name of reactions with mechanism and explain their applications in synthesis • Explain protection-deprotection of functional groups, the concept of umpolung • Discuss methods of preparation and reactivity of Enamines, ylides (phosphorus, sulphur, and nitrogen) • Explain C-H activation reactions • Discuss metals/non-metals in organic synthesis 	<p>Rota Vapor with Vacuum Pump, Analytical Balance, Fridge, Magnetic Stirrer with Hot Plate, Fume Hoods, UV Chamber (Torch type/ Box type), Water Circulation Pump, Heat gun, Thermometer, Heating, Thermometer, Cooling, Forceps, Bosshead /Clamp, Stand, O-Ring, Clamp for 250 ml Separatory Funnel, Apron, Spatula, Medium Size, 6", Plastic Wash Bottles, Plastic Cable Tie, 4" Measuring Cylinder, 250 ml Plastic Solid Funnel, Plastic Liquid Funnel, Plastic Tub, Plastic Base, Plastic Bucket, Glass Trap Container, Plastic Droppers, Goggles, Plastic Clip, Blast Sheet, Thermostat, RB Flask 50 ml single neck, B-19 RB Flask 100 ml single neck, B-19 RB Flask 250 ml single neck, B-29 RB Flask 500 ml single neck, B-29 Rota Joint B-19 Conical Flask 250 ml, Filtration Flasks 250 ml, Two Neck RB Flask 100 ml B-19 x B-19, 50 ml Rota Washer,</p>

		<ul style="list-style-type: none"> • Discuss heterocyclic compounds synthesis and reactivity • Explain the study of natural products and their chemical synthesis • Describe spectroscopic techniques and their applications in structure elucidation (UV-Visible, IR, NMR (H, B, C, N, O, F, Na, Si, Cl, P-nuclei)) • Explain asymmetric synthesis and discuss the radicals in organic synthesis • Demonstrate the process of designing organic synthesis: retrosynthesis, disconnection, synthons, linear and convergent synthesis • Describe the use of transition and rare earth metals in organic synthesis • Explain the use of green chemistry • Perform preparation of organic reagents, molar solutions, preparation of HCl gas, H₂S gas. • Discuss hydrogenation, ozonolysis, diazotization, Grignard and metal-halogen exchange • Discuss the principles of parallel reactor/synthesis and their applications 	<p>Sintered Funnel, G3 Grade 100 ml Capillary Tube, Glass column 40 mm dia x 24 inch x 500 ml reservoir with disc, Glass Beakers, 250 ml Condenser 400 mm ,Solvent Bottles, 1L Capacity Solvent Bottles, 100 ml Capacity Distillation Assembly, Test Tubes for Column, Medium Size Oil Bath (250 ml) ,Oil Bath (500ml),Aluminium Foil - 99 Mtr ,Balloon, Butter Paper, Cotton Roll ,Absorbent, Dettol Liquid Soap, Disposable Needle (0.9 x 25 mm),Disposable Face Mask, Disposable Syringes, 1 ml Disposable Syringes, 5 ml Stainless Steel Needle 18G*6" ,Parafilm Roll, Range 1-14 Rubber Band 2" 500G Teflon Tape Size 3/4" , Washing Brush, Nylon Medium, Surgical Gloves, 7 No., Surgical Gloves, 6.5 No., Septum - B19 ,Microcentrifuge ,Tube, 1.5 ml, Silicone Oil for Oil Baths, Nitrogen Cylinder, Silicon Pipe for Condensers, Stir bars, small size (5 x 10 mm),Stir bars, medium size (10 x 20 mm),Grease , Rubber Tube for Vacuum Pumps ,Ethyl Acetate, Hexane, Dichloromethane, Methanol, Acetone, Dimethyl formamide, Ethanol, Dioxane, n- Butanol, Acetic Acid, HCl, IPA, THF, Acetonitrile, Pentane, Diethyl ether, Silica Gel (100-200 mesh),Ninhydrin,2,4- DNP,KMnO₄,Basic Alumina, Sodium Sulphate, Sodium Chloride,Celite,NaOH,NaH CO₃,Iodine,Benzophenone, Sodium Metal, Calcium Hydride</p>
3	Fundamentals of Medicinal Chemistry	<ul style="list-style-type: none"> • Explain the process of drug discovery • Discuss the Lipinski Rule of 5 	

	<p>Theory Duration (hh:mm) 08:00</p> <p>Practical Duration (hh:mm) 24:00</p> <p>Corresponding NOS Code LFS/N0516</p>	<ul style="list-style-type: none"> • Explain the structure-activity relationship (SAR), structure modification to increase potency and therapeutic index • Discuss the concept of prodrugs and soft drugs • Demonstrate how to perform enzyme-catalyzed organic reactions 	
4	<p>Fundamentals of Analytical Chemistry and Purification Techniques</p> <p>Theory Duration (hh:mm) 08:00</p> <p>Practical Duration (hh:mm) 24:00</p> <p>Corresponding NOS Code LFS/N0516</p>	<ul style="list-style-type: none"> • Explain the basics of pharmaceutical science and chemistry inclusive of organic nomenclature system and organic reaction mechanism • Discuss about the fundamentals of basic analytical chemistry • Discuss the critical system parameters and their Industrial use in R&D analysis for the life sciences industry • Explain the principles and techniques of separation sciences • Demonstrate separation techniques • Describe in detail about molecular, atomic near Infrared spectroscopy and vibrational spectroscopy • Explain the concepts of science and operate analytical instruments like Fourier Transfer-Infrared (FT-IR), Inductively Coupled Plasma (ICP), Auto-Titration, UV-Visible mass spectrophotometer detector, and pH meter • Discuss the application of Thin Layer Chromatography, Gas Chromatography and Liquid Chromatography in New Chemical Entity (NCE)/ New Product (NP) development 	<p>Fridge, Magnetic Stirrer with Hot Plate ,Fume Hoods , UV Chamber (Torch type/ Box type),Water Circulation Pump ,Thermometer ,Heating, Thermometer, Cooling, Forceps, Bosshead/Clamp, Stand, ,Clamp for 250 ml Separatory Funnel, Apron, Spatula, Medium Size, 6",Plastic Wash Bottles, Plastic Cable Tie, 4" Measuring Cylinder, 250 ml Plastic Solid Funnel, Plastic Liquid Funnel, Plastic Tub, Plastic Base, Plastic Bucket, Glass Trap Container, Plastic Droppers, Goggles, Plastic Clip, Blast Sheet, Thermostat, Conical Flask 250 ml, Filtration Flasks 250 ml ,Separatory Funnel 250 ml, TLC Chamber, 50 ml Rota Washer, Sintered Funnel, G3 Grade 100 ml Capillary Tube, Glass column 40 mm dia x 24 inch x 500 ml reservoir with disc, Glass Beakers, 250 ml Condenser 400 mm ,Solvent Bottles, 1L Capacity Solvent Bottles, 100 ml Capacity Distillation Assembly, Test Tubes for Column, Medium Size Oil Bath (250 ml) ,Oil Bath (500ml),Aluminium Foil - 99 Mtr ,Balloon, Butter Paper, Cotton Roll ,Absorbent, Disposable Syringes, 1 ml Disposable Syringes, 5 ml Stainless Steel Needle 18G*6" ,Parafilm Roll, Range 1-14 Rubber Band 2" 500G Teflon Tape Size 3/4" ,Surgical Gloves, 7 No.,</p>

			<p>Surgical Gloves, 6.5 No., Septum - B19, Microcentrifuge Tube, 1.5 ml, Silicone Oil for Oil Baths, TLC Plates, Nitrogen Cylinder, Silicon Pipe for Condensers, Stir bars, small size (5 x 10 mm), Stir bars, medium size (10 x 20 mm), Rubber Tube for Vacuum Pumps, Ethyl Acetate, Hexane, Dichloromethane, Methanol, Acetone, Dimethyl formamide, Ethanol, Dioxane, n-Butanol, Acetic Acid, HCl, IPA, THF, Acetonitrile, Pentane, Diethyl ether, Silica Gel (100-200 mesh)</p>
5	<p>Chemical substance, drug substance, and Scale-up</p> <p>Theory Duration (hh:mm) 20:00</p> <p>Practical Duration (hh:mm) 56:00</p> <p>Corresponding NOS Code LFS/N0514</p>	<ul style="list-style-type: none"> • Explain how to differentiate chemicals and drugs • Describe the concept of Occupational Exposure Limit (OEL) as cytotoxicity measurement • Explain the concepts of Design of Experiment (DoE) • Discuss raw material sourcing, planning, and execution of reactions within the timeline • Explain the use of green chemicals for maximizing yields • Demonstrate how to check the quality of the intermediates and the final products using analytical techniques • Explain setting and freezing of specification parameters, standard temperature and pressure (STPs) of the raw material and documentation as per good manufacturing practices (GMP) • Explain protocols for safe handling of reagents in large scale • Explain scale-up reactions 	<p>Rota Vapor with Vacuum Pump, Analytical Balance, Fridge, Magnetic Stirrer with Hot Plate, Fume Hoods, UV Chamber (Torch type/ Box type), Water Circulation Pump, Heat gun, Thermometer, Heating, Thermometer, Cooling, Forceps, Bosshead/Clamp, Stand, O-Ring, Clamp for 250 ml Separatory Funnel, Apron, Spatula, Medium Size, 6", Plastic Wash Bottles, Plastic Cable Tie, 4" Measuring Cylinder, 250 ml Plastic Solid Funnel, Plastic Liquid Funnel, Plastic Tub, Plastic Base, Plastic Bucket, Glass Trap Container, Plastic Droppers, Goggles, Plastic Clip, Blast Sheet, Thermostat, RB Flask 50 ml single neck, B-19 RB Flask 100 ml single neck, B-19 RB Flask 250 ml single neck, B-29 RB Flask 500 ml single neck, B-29 Rota Joint B-19 Conical Flask 250 ml, Filtration Flasks 250 ml, Separatory Funnel 250 ml, Two Neck RB Flask 100 ml B-19 x B-19, TLC Chamber, 50 ml Rota Washer, Sintered Funnel, G3 Grade 100 ml Capillary Tube, Glass column 40 mm dia x 24 inch</p>

			<p>x 500 ml reservoir with disc, Glass Beakers, 250 ml Condenser 400 mm ,Solvent Bottles, 1L Capacity Solvent Bottles, 100 ml Capacity Distillation Assembly, Test Tubes for Column, Medium Size Oil Bath (250 ml) ,Oil Bath (500ml),Aluminium Foil - 99 Mtr ,Balloon, Butter Paper, Cotton Roll ,Absorbent, Dettol Liquid Soap, Disposable Needle (0.9 x 25 mm),Disposable Face Mask, Disposable Syringes, 1 ml Disposable Syringes, 5 ml Stainless Steel Needle 18G*6" ,Parafilm Roll, Range 1-14 Rubber Band 2" 500G Teflon Tape Size 3/4" , Washing Brush, Nylon Medium, Surgical Gloves, 7 No., Surgical Gloves, 6.5 No., Septum - B19 ,Microcentrifuge ,Tube, 1.5 ml, Silicone Oil for Oil Baths, TLC Plates, Nitrogen Cylinder ,Silicon Pipe for Condensers, Stir bars, small size (5 x 10 mm),Stir bars, medium size (10 x 20 mm),Grease ,Rubber Tube for Vacuum Pumps ,Ethyl Acetate, Hexane, Dichloromethane, Methanol, Acetone, Dimethyl formamide, Ethanol, Dioxane, n-Butanol, Acetic Acid, HCl, IPA, THF, Acetonitrile, Pentane, Diethyl ether, Silica Gel (100-200 mesh),Ninhydrin,2,4-DNP,KMnO₄,Basic Alumina, Sodium Sulphate, Sodium Chloride, Celite, NaOH,NaHO₃,Iodine,Benzo phenone,Sodium Metal, Calcium Hydride</p>
6	<p>Basics of Formulation Development</p> <p>Theory Duration (hh:mm) 08:00</p>	<ul style="list-style-type: none"> • Explain the basic biology and pharmacology required to interpret the manufacturing specifications • Explain the basics of formulation development • Explain the excipients used in formulations development 	<p>Material Data safety sheet, AR brochure developed by LSSSDC for API and formulation machines</p>

	<p>Practical Duration (hh:mm) 40:00</p> <p>Corresponding NOS Code LFS/N0516</p>	<ul style="list-style-type: none"> • Demonstrate various steps of formulation process for oral solid dosage (OSD), liquid and ointment dosage forms • Discuss cleanroom operation rules in formulation development • Demonstrate the gowning process for formulation development • Explain the regulatory (cGMP) guidelines regarding in-process checks in packaging, visual inspection of newly developed formulation dosage 	
7	<p>Inspection and Quality Check</p> <p>Theory Duration (hh:mm) 08:00</p> <p>Practical Duration (hh:mm) 30:00</p> <p>Corresponding NOS Code LFS/N0516</p>	<ul style="list-style-type: none"> • Demonstrate how to perform a quality check and compare results with statistical limits • Demonstrate the working of instruments like stability chambers, BOD incubators, and Photofluorometer • Explain the checklist for the instruments used in R&D • Discuss the statistical analysis of laboratory data • Explain equipment malfunction and how to report faults during the equipment breakdown • Discuss productivity norms and the concept of overall equipment efficiency (OEE) • Explain advanced QC approaches like quality by design (QbD), process analytical technology and method transfer process • Demonstrate practical problem solving/ troubleshooting in QC analysis • Recall the use of QC statistics like Levey-Jennings charts and Westgard Rules, CV, comparative evaluations, CVR, SDI • 	
8	<p>Innovation and Problem Solving for research</p> <p>Theory Duration (hh:mm) 08:00</p> <p>Practical Duration (hh:mm) 16:00</p> <p>Corresponding NOS Code LFS/N0515</p>	<ul style="list-style-type: none"> • Explain the basic concepts of organic chemistry • Describe the literature search • Discuss the problem-solving tools and methods • Discuss the systematic approach to problem solution • Describe the product development feasibility analysis • Explain the new routes/ new methods/ solutions to the scientific problems to the scientists and research team • Practice the analytical thinking and critical thinking 	
9	<p>Reporting and documentation of research activities</p> <p>Theory Duration (hh:mm) 04:00</p>	<ul style="list-style-type: none"> • Explain the company's standard operating procedure(SOP) and guidelines and various coding system of the company • Demonstrate the material labels and safety signage • Explain the interpretation of the graphs/ images of product and instructions given in tool/ equipment manual, research plan and 	<p>Formats of Lab Notebook, Logbooks, a sample of graphs and analytical reports</p>

	<p>Practical Duration (hh:mm) 16:00</p> <p>Corresponding NOS Code LFS/N0513</p>	<p>schedules, reaction workflow sequence and material safety sheet</p> <ul style="list-style-type: none"> • Discuss the right format of documentation for recording and communicating details of work done as per standard operating procedure (SOP) and GMP and GDP guidelines • Elaborate daily report format and enter lab notebook records as per the SOPs • Explain the research report in an e-lab notebook as per SOP • Explain the ways to report and record each incident/deviation in time and as per SOP • Explain the impact of wrong practices and inform scientist/ lab in charge as per SOPs and instructions • Describe escalation matrix for decision making that is not defined in the SOP • Use the English language for recording and reporting as defined in the SOP • Demonstrate to record research team inputs for suitable action 	
10	<p>Information Technology Skills for research activities</p> <p>Theory Duration (hh:mm) 08:00</p> <p>Practical Duration (hh:mm) 08:00</p> <p>Corresponding NOS Code LFS/N0513</p>	<ul style="list-style-type: none"> • Use IT tools for data entry in e-documents wherever needed • Describe how to maintain the confidentiality of the data and internal processes • Use different software to operate the laboratory instruments • Discuss the requirements of 21 CFR Part 11 and data integrity rules • Describe how to maintain information security while using e-mail and other official communication channels • Explain the procedure for maintaining online records as per SOP • Use chemistry-related IT tools for drawing the route and literature search 	<p>Internet Connection, Marvin software, ACD/ChemSketch software, MedChemDesigner software, ChemSpider, SciFinder/reaxys</p>
11	<p>Presentation of research activities</p> <p>Theory Duration (hh:mm) 08:00</p> <p>Practical Duration (hh:mm) 16:00</p> <p>Corresponding NOS Code LFS/N0514</p>	<ul style="list-style-type: none"> • Demonstrate scientific writing skills for research activity documentation • Present the research activity to the scientist and research team using powerpoint presentations • Explain how to publish research/scientific publications under the guidance of scientists 	
12	<p>Health and Safety</p> <p>Theory Duration (hh:mm) 04:00</p>	<ul style="list-style-type: none"> • Select appropriate personal protection equipment (PPEs) while performing R&D work • Explain the concepts of safety including hazards, accidents, safety signs and signals 	<p>Half Face Mask, Full Face Mask, Safety Goggles, Safety Shoes, Gum Boots, Chemical Absorbent, Self-Contained Breathing Apparatus, PVC Apron,</p>

	<p>Practical Duration (hh:mm) 08:00</p> <p>Corresponding NOS Code LFS/N0101</p>	<ul style="list-style-type: none"> • Explain the clean room classifications and requirements • Interpret material safety data sheet (MSDS) and follow the process of safety analysis • Explain the guidelines to be followed for handling and storage of hazardous material • Explain EHS rules and Heinrich pyramid at shop floor • Explain the fire safety concepts in case of fire emergency in R&D lab • Describe the process for reporting critical information to concerned team members and supervisor • Demonstrate emergency and first aid measures • Practice core and professional skills such as planning and organizing, problem solving, objection handling, and critical thinking 	<p>Gloves (Nitrile, {Heat, acid, chemical} resistant, washing), Lab Coat, Surgical Gloves (in Microbiology), Eye washer with sprinkler/ Manual bottle eye washer, CO₂ Type Fire Extinguisher, ABC Type Fire Extinguisher,</p>
13	<p>Coordinate with cross-functional teams</p> <p>Theory Duration (hh:mm) 04:00</p> <p>Practical Duration (hh:mm) 08:00</p> <p>Corresponding NOS Code LFS/N0104</p>	<ul style="list-style-type: none"> • Explain general reporting process, protocol and escalation policy • Explain the importance of supervisor-reportee relationship to identify partnering opportunities at work • Discuss techniques for collaborating with other groups and divisions in order to achieve organizational goals • Summarise reports and R&D related documents as per SOP • Demonstrate proficiency in IT tools for communication and coordination • Explain the procedure to impart training to the team members/cross-functional teams • Practice core communication skills and professional skills to meet the work output requirements 	
	<p>Total Duration</p> <p>Theory Duration 100:00</p> <p>Practical Duration 270:00</p> <p>OJT Duration 200:00</p>	<p>Unique Equipment Required: Periodic Table of Elements, Formats of Log Books, Format of Shift Schedule, Format of Job Cards, Sample SOP document, GMP Guidelines, GDP Guidelines, Material Safety Data Sheet, AR brochures developed by LSSSDC, Computer lab, internet connection, GMP Guideline Book, Gum Boots, Micrometre Screw Gauge, Safety Shoes, Sample Log Books, Various Mask Cartridges, Vernier Callipers, Commercial Weighing Balance, White Screen, Rota Vapor with Vacuum Pump, Analytical Balance, Fridge, Magnetic Stirrer with Hot Plate, Fume Hoods, UV Chamber (Torch type/ Box type), Water Circulation Pump, Heat gun, Thermometer, Heating, Thermometer, Cooling, Forceps, Bosshead/Clamp, Stand, O-Ring, Clamp for 250 ml Separatory Funnel, Apron, Spatula, Medium Size, 6", Plastic Wash Bottles, Plastic Cable Tie, 4" Measuring Cylinder, 250 ml Plastic Solid Funnel, Plastic Liquid Funnel, Plastic Tub, Plastic Base, Plastic Bucket, Glass Trap Container, Plastic Droppers, Goggles, Plastic Clip, Blast Sheet, Thermostat, RB Flask 50 ml single neck, B-19 RB Flask 100 ml single neck, B-19 RB Flask 250 ml single neck, B-29 RB Flask 500 ml single neck, B-29 Rota Joint B-19 Conical Flask 250 ml, Filtration Flasks 250 ml, Separatory Funnel 250 ml, Two Neck RB Flask 100 ml B-19 x B-19, TLC Chamber, 50 ml Rota Washer, Sintered Funnel, G3 Grade 100 ml Capillary Tube, Glass column 40 mm dia x 24 inch x 500 ml reservoir with disc, Glass Beakers, 250 ml</p>	

	<p>Condenser 400 mm ,Solvent Bottles, 1L Capacity Solvent Bottles, 100 ml Capacity Distillation Assembly, Test Tubes for Column, Medium Size Oil Bath (250 ml) ,Oil Bath (500ml),Aluminium Foil - 99 Mtr ,Balloon, Butter Paper, Cotton Roll ,Absorbent, Dettol Liquid Soap, Disposable Needle (0.9 x 25 mm),Disposable Face Mask, Disposable Syringes, 1 ml Disposable Syringes, 5 ml Stainless Steel Needle 18G*6" ,Parafilm Roll, Range 1-14 Rubber Band 2" 500G Teflon Tape Size 3/4" , Washing Brush, Nylon Medium, Surgical Gloves, 7 No., Surgical Gloves, 6.5 No., Septum - B19 ,Microcentrifuge ,Tube, 1.5 ml, Silicone Oil for Oil Baths, TLC Plates, Nitrogen Cylinder ,Fire Extinguisher (ABC Type),Silicon Pipe for Condensers, Stir bars, small size (5 x 10 mm),Stir bars, medium size (10 x 20 mm),Grease ,Sand Bucket , Rubber Tube for Vacuum Pumps ,First Aid Box ,Ethyl Acetate, Hexane, Dichloromethane, Methanol, Acetone, Dimethyl formamide, Ethanol, Dioxane, n-Butanol, Acetic Acid, HCl, IPA, THF, Acetonitrile, Pentane, Diethyl ether, Silica Gel (100-200 mesh),Ninhydrin,2,4-DNP,KMnO₄,Basic Alumina, Sodium Sulphate, Sodium Chloride,Celite,NaOH,NaHCO₃,Iodine,Benzophenone,Sodium Metal, Calcium Hydride</p> <p>Classroom aids: A computer system, LCD Projector & Screen/ LCD Monitor, Mike, Sound System, Laser Pointer</p>
--	--

Grand Total Course Duration: 370 Hours (200 hours of OJT is recommended)

(This syllabus/ curriculum has been approved by Life Sciences Sector Skill Development Council.)

Trainer Prerequisites for Job role: “Research Associate-Product Development/Synthesis/Medicinal Chemistry” mapped to Qualification Pack: “LFS/Q0505, V1.0”

Sr. No.	Area	Details
1	Job Description	To deliver accredited training service, mapping to the curriculum detailed above, in accordance with the Qualification Pack “LFS/Q0505, V1.0”.
2	Personal Attributes	Aptitude for conducting training, and pre/ post work to ensure competent, employable candidates at the end of the training. Strong communication skills, interpersonal skills, ability to work as part of a team; a passion for quality and for developing others; well-organized and focused, eager to learn and keep oneself updated with the latest in the mentioned field.
3	Minimum Educational Qualifications	Doctorate in any discipline of Life Sciences, Pharmaceutics
4a	Domain Certification	Certified for Job Role: “Research Associate-Product Development/Synthesis/Medicinal Chemistry” mapped to QP: “LFS/Q0505, V1.0”. The minimum accepted score is 80% as per LSSSDC guidelines.
4b	Platform Certification	Recommended that the Trainer is certified for the Job Role: “Trainer”, mapped to the Qualification Pack: “ <u>MEP/Q2601</u> ”. The minimum accepted score is 80% as per LSSSDC guidelines.
5	Experience	<p>Minimum Six (6) years’ experience in life sciences (Nutraceutical/ Pharmaceutical/ Biopharmaceutical) Research and Development occupation for non-trained and non-qualified talent with Post Graduation (M. Sc Chemistry/ M. Pharm. are preferred) educational qualification</p> <p>Or</p> <p>Minimum Four (4) years’ experience in life sciences (Nutraceutical/ Pharmaceutical/ Biopharmaceutical) Research and Development occupation as Research Associate-Product Development/Synthesis/Medicinal Chemistry with Research and Development</p> <p>Or</p> <p>Minimum Two (2) years’ experience in life sciences (Nutraceutical/ Pharmaceutical/ Biopharmaceutical) Research and Development occupation for non-trained and non-qualified talent with Ph. D (in Organic Chemistry/ Pharmaceutical Sciences are preferred) educational qualification</p> <p>Or</p> <p>Minimum Two (2) years’ experience in life sciences (Nutraceutical/ Pharmaceutical/ Biopharmaceutical) Research and Development occupation as Research Associate-Product Development/Synthesis/Medicinal Chemistry with post-research Associate-Product Development/Synthesis/Medicinal Chemistry -Life Sciences Level-5 (LFS/Q0505) qualification</p>

Annexure: Assessment Criteria

Please refer to the QP PDF for the Assessment Criteria.