



COMSATS University Islamabad, Lahore Campus
Defence Road, Off Raiwind Road, Lahore

Tender No. CUI-LHR-TN-13-19-1319

Case # 2938

Single Stage Two Envelop Procedure

Title of Tender: **Lab Equipment for Establishment of Centre for Advanced Technologies in Biomedical Materials (Knowledge Economy Initiative)**

TERMS AND CONDITIONS

1. All pages of bidding documents are mandatory to be signed / stamped, meaning thereby bidder agrees to our terms & conditions mentioned herein, failing which the bid may be rejected.
2. Any addition, deletion or modification of any clause of the procurement terms & conditions/ BoQs of CUI Lahore Campus by any vendor will not be acceptable and may lead to rejection of the bid.
3. Only registered Suppliers, who are on Active Taxpayers List (ATL) of FBR, are eligible to participate in tender.
4. The contract will be executed and handed over in satisfactory conditions up to the entire satisfaction of COMSATS University Islamabad, Lahore Campus.
5. Documents along with Pay Order / Demand Draft amounting to **Rs. 1,000/-** as a tender document fee (Non-Refundable) shall be submitted in favor of COMSATS University Islamabad, Lahore Campus to the address given below. No bid will be accepted without tender documents' fee.
6. Part / Advance payments is not allowed.
7. The exact completion/delivery time for is **120 Days (starting from the date of LC Opening)**. The handing over / completion time for this contract is of critical importance.
8. The bid proposal must be quoted inclusive of all freight and packing charges in C&F and to be delivered at Lahore Airport. CUI Lahore Campus shall open the direct LC in favor of Original Manufacturer / Principal and shall also clear the shipment from Custom Authorities.
9. After opening of bids, CUI-Lahore Campus will examine the bids for completeness as per tender document.
10. Purchase order (s) will be awarded to the lowest or technically recommended bidder (s) on the basis of item wise / subtotal wise / grand total wise according to the nature of BoQs.
11. The bid should be submitted in a sealed envelope up to **January 13, 2020** on or before **1400hrs** and will be opened on the same date **at 1430hrs** in the presence of available bidders.
12. COMSATS University Islamabad, Lahore Campus, will follow the PPRA rule of **single stage two envelope procedure**:
 - i. The bid shall comprise a single package containing **two separate envelopes**. Each envelope shall contain separately the **financial proposal** and the **technical proposal**;
 - ii. The envelopes shall be marked as **“FINANCIAL PROPOSAL”** and **“TECHNICAL PROPOSAL”** in bold and legible letters to avoid confusion;

Signature & Stamp of Bidder

- iii. Initially, only the envelope marked **“TECHNICAL PROPOSAL”** shall be opened;
 - iv. The envelope marked as **“FINANCIAL PROPOSAL”** shall be retained in the custody of the procuring agency without being opened;
 - v. The procuring agency shall evaluate the technical proposal in a manner prescribed in advance, without reference to the price and reject any proposal which does not conform to the specified requirements;
 - vi. During the technical evaluation no **amendments** in the technical proposal shall be permitted;
 - vii. The financial proposals of bids shall be opened publicly at a time, date and venue announced and communicated to the bidders in advance;
 - viii. After the evaluation and approval of the technical proposal the procuring agency, shall at a time within the bid validity period, publicly open the financial proposals of the technically accepted bids only. The financial proposal of bids found technically nonresponsive shall be returned un-opened to the respective bidders;
 - ix. and
 - x. The bid found to be the lowest evaluated bid shall be accepted.
13. The envelope should be marked as under;
- Secretary, Purchase Committee**
COMSATS University Islamabad, Lahore Campus
 Defence Road, Off Raiwind Road, Lahore.
 Tel: 042-111-001-007, Ext: 875
14. The envelope shall also bear the word **“CONFIDENTIAL”** and following identification quotation of **“Lab Equipment for Establishment of Centre for Advanced Technologies in Biomedical Materials (Knowledge Economy Initiative)”**.
15. The bid form (BoQs) must be duly filled in, stamped and signed by the authorized representative of the bidder.
16. **If the vendor fails to deliver the goods / services to COMSATS University Islamabad (CUI), Lahore Campus within the given deadline, any of the following can be opted by CUI Lahore campus on the recommendation of the end user and approval of the authority;**
- a. An extension in the delivery period may be granted in case a valid reason/justification with necessary documentary evidence is provided by the vendor supporting the reason for delay.
 - b. A penalty upto 10% of the invoice value may be charged.
 - c. Purchase order may be cancelled along with confiscation of earnest money if the vendor fails to deliver the goods / services after the initial or extended delivery time, as the case may be.
17. If the delivered goods / services are not according to the required quality standards / specifications, the same shall be liable to be rejected after inspection. The vendor would be required to supply as per requirements mentioned in our BoQs, otherwise the purchase / work order will be cancelled after due date with confiscation of earnest money.
18. Deduction of Income Tax and any other tax will be deducted at source according to Government prevailing rules.

- 19. Payment will be made on submission of Invoice in the name of “COMSATS University Islamabad (CUI), Lahore Campus” with a copy of delivery challan (s) after the complete order has been supplied, inspected and accepted which includes delivery / installation, and COMSATS acceptance / inspection thereof.
- 20. All prices should be valid for at least **120 days**. Withdrawal or any modification of the original offer within the validity period shall entitle CUI-Lahore Campus to forfeit the earnest money in favor of the CUI-Lahore Campus and / or put a ban on such vendor participation in tenders / works.
- 21. It is the sole responsibility of the agent / supplier / manufacturer to comply with the applicable laws, be national or international.
- 22. In case of any dispute or grievance, the matter shall be addressed as per PPRA rules.
- 23. The CUI-Lahore Campus reserves the right to modify the quantities of goods / services at any time before the award of purchase / work order.
- 24. Minimum one-year warranty shall be provided from the date of installation or standard warranty whichever is higher
- 25. The Successful/lowest bidder is required to submit the **05% of the total value of Purchase Order as a retention money in form of Call Deposit Receipt/ Local Bank Guarantee with the validity of Warranty Time Period (As mentioned in BoQs)** in favor of COMSATS University Islamabad (CUI), Lahore Campus and it will be released after the completion of warranty period.
- 26. **The bidder is required to furnish in form of Bank deposit/ CDR / Pay order equivalent to 2% of the total Bid price as Earnest Money crossed in favor of “COMSATS University Islamabad, Lahore Campus”.**
- 27. **CUI Lahore Campus** reserves the rights to reject the bid if;
 - i. Received without earnest money
 - ii. Received later than the date and time fixed for tender submission
 - iii. The tender is unsigned/ unstamped
 - iv. The offer is ambiguous
 - v. The offer is conditional
 - vi. The offer is from a firm, which is black listed by any Govt. Office.
 - vii. The offer is received by telephone/telex/fax/telegram.
 - viii. Any unsigned / ambiguous erasing, cutting / overwriting etc. is made.
- 28. The bidder should furnish a certificate as worded below in token of acceptance of all the terms and conditions of the tender otherwise the tender will not be considered under any circumstances.
- 29. The undersigned affirm that the terms and conditions as contained in this document have been read and accepted and that in the event of selection of my/our rate the agreement in the prescribed form will be entered into:

- **Company / Vendor Name:**.....
- **Postal Address:**.....
- **Tel. / Mobile:**.....**Email:**.....
- **NTN# :**.....**GST#:**.....
- **Signature:**

- **Please also attach the Certificate supporting being Active Taxpayer as per requirement of FBR.**

Signature & Stamp of Bidder

BoQs of Lab Equipment for Establishment of Centre for Advanced Technologies in Biomedical Materials (Knowledge Economy Initiative)

Technical Portion (Please mention the quoted model/ brand in technical portion with no mention of price otherwise the bid will be rejected)

No change in the BoQs (Specs & Qty.) of CUI-Lahore Campus, as detailed below, is allowed. Any additional information may be mentioned in the blank columns (i.e. model / brand or Price). Any modification in CUI-Lahore Campus BoQ may lead to rejection of bid (fully or partially).				Qty	Please mention the quoted Model / Brand with meeting the all specifications mentioned in BoQs
Sr. #	Equipment Name	Required Specifications			
1	Atomic Absorption spectrophotometer with Graphite Furnace	Purpose of the Atomic Absorption spectrophotometer	For multi element analysis using atomic absorption spectrometer technique	1	
		Light source	Continuum light source		
		Lamp	Lamp for multi elemental analysis with cooling		
		Flame technique	Burner head 100 mm and 50 mm		
			O ring for organic samples		
			Automatic adjustment		
			Nebulizer with platinum/rhodium capillary		
		Graphite furnace	Automatic calibration		
			Autosampler		
			Integrated cooling system		
			Camera with integrated vision tool		
		Hydride system	Direct analysis of solid samples		
			For analysis of hydride and Hg		
			Cooling tube for graphite connection		
		Auto sampler	Iridium standard (100mL)		
			For automatic analysis of samples and standards		
			Rack with minimum 54 positions		
75 pieces of 50 ml sample vials					
software	Automatic dilution				
software	Integrated software to run all the accessories				
Air compressor	At least 50 Hz for dust, oil and water free air				

Signature & Stamp of Bidder

		Computer With Power Backup	Specifications As recommended by OEM with genuine windows	01
			Laser printer	01
		accessories	Cleaning strips	150 Nos.
			set of sealing rings mixing chamber nebulizer system	03
			intake ptfе tubes with 0.5mm diameter	02
			intake tubes for autosampler	02
			wash bottles	3
			IC graphite tubes coated	10
			IC graphite inserts	10
			Pieces sample cup of polysterol 1.5ml	2000
			PTFE 2ml cup	20
			20 pieces polypropylene special cup 5 ml	20
			Pump tube	2
			Sample tube	12
			Acid tubes	4
			Connection tube 01	01
			Connection tube from reactor to double valve	2
			reactor tube	2
			drying tube	2
			Hg drying membrane hybrid predry tube	2
		Power backup with additional Servo Stabilizer	online pure sinewave UPS	01
			built in AVR capable of regulating ± 30 volts	
			Power factor ≥ 0.95	
			Power backup in case of power failure for at least 30 mins	
			Including lead Acid free dry batteries	
		OR A better alternative as recommended and provided by OEM for optimum operations		
		others	Argon gas cylinder with double regulator and certified (pressure rated and tested)	01
			Acetylene gas cylinder with double regulator and certified (pressure rated and tested)	01
			Nitrous oxide gas cylinder with double regulator and certified (pressure rated and tested)	01
			2 stage moisture trappers for gas cylinders	03
			Exhaust assembly	01
Air compressor	01			

		Warranty	12 Months from the date of installation with vendor having good local reputation with running machines and well-trained engineers	
2	Micro-CT	Purpose of the Micro-CT	Micro-computed tomography of ceramics, polymers, composites, bone and tissue.	01 No.
		X-ray source	100 kV or better, 10 W or better	
		Spot size	5 µm or better	
		X-ray detector	11 MP or better	
		Frame rate	4x4 binning or better	
		Scanning object size	75x70 (D x L) mm or higher	
		Resolution/ detectability	0.45 µm voxel size or better	
		Image matrix /Reconstruction array	12k x 12k pixel or above, isotropic grid	
		adjustment of geometry/ Fixed	Automatic	
		Software	Volumetric reconstruction, visualization software, Morphology analysis software (2D/3D quantitative analysis), Realistic surface rendering visualization, realistic volume rendering software, /softwares recommended by OEM	
			Format converter to TIFF, BMP, JPEG	
		Reconstruction workstation (Computer) With Power backup	Specifications as recommended by OEM With color laser printer	
		Radiation safety	<1 µSv/h	
		Compressor	oil, moisture and particle filter particles size > 10 microns if needed	01 No.
		others	Artifact to calibrate the equipment	01 No.
Integrated stage				
sample holders/mount for different size samples	01 No.			
calibration rods for 2-4 mm for BMD and/ TMD	01 No.			

			calibration rods for 8-16 mm for BMD and/ TMD	01 No.			
			calibration rods for 32mm for BMD and/ TMD	01 No.			
				01 No.			
		Power backup with additional Servo Stabilizer				online pure sinewave UPS	01 No.
						built in AVR capable of regulating ± 30 volts	
						Power factor ≥ 0.95	
						Power backup in case of power failure for at least 30 mins	
						Including lead free dry batteries	
		Warranty, Training & Others				OR A better alternative as recommended and provided by OEM for optimum operations	
						12 Months from the date of installation with vendor having good local reputation with running machines and well-trained engineers	
						Enabled with Remote Access feature for troubleshooting and identification of the routine problems	
		3	Real-time PCR	Thermal cycler		2-persons advanced training (Operations, Trouble Shooting etc.) at Original Equipment Manufacturer site (travel & accommodation included)	01 No.
Reactions/wells: 96							
Scan format: SYBR® Green & FAM							
Thermal block: should accommodate 96 well plate, 8X12 strips, 0.2ml tubes							
Lid heating limits: Heat up to 105°C							
Range: 0-100°C							
Filters: 6 Excitations, 6 Emissions							
Run time: 30min-40min							
Sample size volumes: 10-100 µL							
Automation compatible: Yes							
Remote monitoring: Yes							
On-Board memory: Yes							
Dynamic range: Up to 10 logs							
Collaboration Features							
IP connectivity							
Strong Password Requirements							
Multiplex: 5-21 targets combinations							

		Flexibility	Flexible for passive reference dye (can be use with or without reference dye)		
		Sensitivity	Temperature uniformity: up to $\pm 0.5^{\circ}\text{C}$ Sensitivity: Detect down to 1 copy		
		Accuracy	$\pm 0.2^{\circ}\text{C}$		
		Optical Detection	Excitation source: LED light of enhanced System		
			Filters range excitation/emission: 6X6 filters (450–720 nm)		
		Computer	Specifications as recommended by OEM with genuine windows with [power backup of 30 minutes	01	
		Power backup with additional Servo Stabilizer	online pure sinewave UPS	01	
			built in AVR capable of regulating ± 30 volts		
			Power factor ≥ 0.95		
			Power backup in case of power failure for at least 30 mins		
			Including lead Acid free dry batteries		
			OR A better alternative as recommended and provided by OEM for optimum operations		
		Applications	Gene Expression, Protein Detection, Genotyping, MicroRNA, Copy Number Variation, High Resolution Melt		
		Accessories	Interchangeable Trays: for using plates, strips, or tubes	01 each	
			Samples mixing shaker: For 96 well plates and 8 well strips	01	
			PCR Tubes (0.2ml): 1000 tubes	1000	
			PCR strips (0.2ml): 1000 strips with caps	1000	
			Micropipettes: 0.1-2.5μl, 0.5-10μl, 10-100μl (pipette should have calibration window along with volume window and spring-loaded tip cone)	01 each	
		Warranty	12 Months from the date of installation with vendor having good local reputation with running machines and well-trained engineers		

4	Electrospinning with power supply and syringe pumps	Purpose	Fabrication of electrospun mats and electro spraying of solutions for specifically biomedical applications	01
		For biological purposes	Complete electrospinning setup with single benchtop compartment having digital display of pump and power supply operations.	
			The compartment should be made up of stainless steel with proper insulation with climate control chamber	
			Overall the equipment should be designed for fabrication of fiber for biomedical applications.	
		Syringe pump	Channels Four-channel pump: can be controlled independently for individual syringe Flow rate, volume and time of infusion can be controlled precisely. Compatible to work under high voltage.	
			Working temperature 5-40 °C (or better range)	
			Pumping rate 50ml syringe : 0.1ml/h ~1500ml/h 30ml syringe : 0.1ml/h ~900ml/h 20ml syringe : 0.1ml/h ~600ml/h 10ml syringe : 0.1ml/h ~400ml/h	
			Pump rate accuracy : +/-2%	
			Climate control chamber	
		Power supply	Controllable temperature Ambient to 40 °C or better	
			Humidity control 10 to 90% or better	
			Output Current Upto 1mA	
			Voltages Up to 30KV or higher	
		Collectors	Over voltage protection Over current protection Protection against output short circuit Over temperature protection Manual recovery after cutoff	
Drum collector (1-5000rpm, +/- 1rpm)	01			
disk collector	01			
Plate collector	01			
		Grooved collector	01	

			Needle sets 11 g to 27 g	05	
			Multi option coaxial needle set ranging from 11g to 27g	02	
			Triaxial spinneret Needle length should be 6cm with inner 22g, middle 18g and outer 14g	02	
			Triaxial spinneret Needle length should be 6cm with inner 22g, middle 18g and outer 15g	02	
			Triaxial spinneret Needle length should be 6cm with inner 22g, middle 18g and outer 16g	02	
			Tri-channel spinneret	02	
			Multi-nozzle spinnerets also called islands in the sea spinneret	02	
		Accessories	Cold light source for observing the electrospinning process	01	
			Exhaust fan to cool down the equipment in working process and solvent vaporization. Should be controlled by control panel	01	
			HD Camera for observation (3 MP or higher)	01	
			Syringe heater Two-channel heater : 2 syringes can be heated at the same time. Up to 250°C or higher	01	
			50ml Glass syringes	05	
			20ml Glass syringes	05	
			10ml Glass syringes	10	
			5ml Glass syringes	10	
			2ml Glass syringes	10	
		Power backup with additional Servo Stabilizer	as recommended by OEM for optimum operations	01	
		Warranty	12 Months from the date of installation		

5	Electrospinning with power supply and syringe pumps	Basic setup	Fabrication of electrospun mats and electro spraying of solutions	02	
		General features	Complete electrospinning setup with plate and rotating drum collector in single benchtop compartment having digital display of pump and power supply operations.		
		Syringe pump	Channels 02-channel pump: can be controlled independently for individual syringe Flow rate, volume and time of infusion can be controlled precisely. Compatible to work under high voltage.		
			Working temperature 5-40 °C (or better range)		
			Pumping rate (or better) 50ml syringe : 0.1ml/h ~1500ml/h 30ml syringe : 0.1ml/h ~900ml/h 20ml syringe : 0.1ml/h ~600ml/h 10ml syringe : 0.1ml/h ~400ml/h		
			Pump rate accuracy : +/-2%		
		Power supply	Voltages Up to 30KV or higher		
			Output Current Upto 1mA		
			Over voltage protection Over current protection Protection against output short circuit Over temperature protection Manual recovery after cutoff		
		Collectors	Drum collector (1-3000rpm, +/- 1rpm) or higher		02
			disk collector		02
		Accessories	Needle sets 11 gauge to 27 gauge		05
Multi option coaxial needle set ranging from 11 gauge to 27 gauge	05				
Cold light source for observing the electrospinning process	02				
Exhaust fan to cool down the equipment in working process and solvent vaporization. Should be controlled by control panel	02				

			<p>Syringe heater Two-channel heater : 2 syringes can be heated at the same time. Up to 250°C or higher</p>	02	
			50ml Glass syringes	05	
			20ml Glass syringes	05	
			10ml Glass syringes	10	
			5ml Glass syringes	10	
			2ml Glass syringes	10	
		Power backup with additional Servo Stabilizer	online pure sinewave UPS	01	
			built in AVR capable of regulating ± 30 volts		
			Power factor ≥ 0.95		
			Power backup in case of power failure for at least 30 mins		
			Including lead free Acid dry batteries		
			OR A better alternative as recommended by OEM for optimum operations		
		Warranty	12 Months from the date of installation		
6	Particle size analyzer (with zeta potential)	General features	<p>Needed for the measurement of size, molecular weight, mobility, transmittance and zeta potential, with complete package for liquid and solid samples. The system should provide the results for diluted and concentrated liquids samples, solid samples. User friendly interface for measurement control and data analysis</p>	01	
			Measuring size range; 0.5 nm-10 µM or better		
			Molecular weight measurement range; 900 Da ⁻² x 10 ⁷ Da or better		
			Zeta potential Range; >+/- 400mV or better		
			Mobility Range: >+/- 15 µ. cm/V.s or better		
			Accuracy should be better than ± 3 % on NIST traceable standards		
			Reproducibility should be better than ± 3 % on NIST traceable standards		

		<p>Sensitivity should be better than 0.5 mg/mL of standard protein</p> <p>Software should include the off line data analysis option too</p>		
	Polystyrene cuvettes	Polystyrene cuvettes (12 mm) with stoppers, compatible and suitable with the above mentioned specs instrument	200 pieces	
	Low volume quartz cuvette	<p>Quartz cuvette; compatible with the above mentioned specs instrument</p> <p>Should be suitable to perform all type of above mentioned measurements</p> <p>Sample volume range should be;</p> <p>Minimum; 15 μL</p> <p>Maximum; above 50 μL</p>	4	
	Accessory for aqueous and non-aqueous sample	<p>A kit to perform all above mentioned measurements for aqueous and non-aqueous samples such as non-polar dispersants such as hydrocarbons. Compatible with the above mentioned cuvettes or compatible cuvettes should be provided in the package.</p> <p>Should be compatible with the above mentioned specs instrument.</p> <p>Cuvettes should be compatible with the above mentioned specs instrument, in case of separately provided cuvettes</p>	01	
	Accessory for high concentrated sample	<p>A kit to perform all above mentioned measurements for high concentrated sample. Compatible with the above mentioned cuvettes or compatible cuvettes should be provided in the package.</p> <p>Should be compatible with the above mentioned specs instrument.</p> <p>Cuvettes should be compatible with the above mentioned specs instrument, in case of separately provided cuvettes</p>	01	
	Accessory for solid sample	<p>A kit to perform all above mentioned measurements for solid sample surfaces. Compatible with the above mentioned cuvettes or compatible cuvettes should be</p>	01	

			<p>provided in the package. Should be compatible with the above mentioned specs instrument. Cuvettes should be compatible with the above mentioned specs instrument, in case of separately provided cuvettes. In case of unsuitable of main instrument software for solid samples, a separate software compatible for solid samples, compatible with the above mentioned specs instruments should be included in the package.</p>		
		Computer with power backup	Specifications as recommended by OEM with genuine windows	01	
		LaserJet Printer	To print the output results	01	
		Power backup with additional Servo Stabilizer	online pure sinewave UPS	01	
			built in AVR capable of regulating ± 30 volts		
			Power factor ≥ 0.95		
			Power backup in case of power failure for at least 30 mins		
			Including lead free Acid dry batteries		
			OR A better alternative as recommended by OEM for optimum operations		
		Warranty	12 Months from the date of installation with vendor having good local reputation with running machines and well-trained engineers		
7	Freeze Dryer	Console Laboratory Freeze Dryer	Upright model capable of removing water and acetonitrile from samples	01	
		Exterior	Upright powder coated stainless-steel		
		Temperature	-55 °C or below		
		Water capture capacity	4 Kg/24 h or above		
		Solvents	Water, acetonitrile		
		Drying Chamber	<ul style="list-style-type: none"> • 6-12 or more port transparent acrylic drying chamber 		
			<ul style="list-style-type: none"> • Adjustable 4 trays/shelves or more 		
			<ul style="list-style-type: none"> • Polished SS304 stainless steel shelves 		

		Condenser	<ul style="list-style-type: none"> • stainless-steel collector coil condenser 		
			<ul style="list-style-type: none"> • Electric heating defrost 		
		Cold trap	<ul style="list-style-type: none"> • Cold trap temperature ≤ -50 °C • Cold trap capacity 5-10 L • Total loading capacity (liquid) 1.2L or better 		
		Refrigeration system	<ul style="list-style-type: none"> • Dual 1/3 hp refrigeration compressor • CFC-free • Cooling type: Air cooled 		
		Vacuum system	<ul style="list-style-type: none"> • two stage Rotary Vane vacuum pump • Displacement capacity: 80-90 L/min • Ultimate vacuum: ≤ 0.002 mBar 		
		Control panel	<ul style="list-style-type: none"> • LCD touch screen display panel • Show operating parameters, set-up parameters and alarm messages • user-configured to display vacuum in mBar, Pa or Torr and temperature in ° F or ° C • Display time of refrigeration system operation, time since the refrigeration system was serviced, time of vacuum pump operation and time since the vacuum pump was serviced 		
		Safety controls	<ul style="list-style-type: none"> • Vacuum control option to maintain set point vacuum level • special arrangement for preventing the oil back-streaming into the collector chamber during the power outage • auto restore functions in case of power failure 		
		Electrical requirements	<ul style="list-style-type: none"> • Power supply 20V/50Hz,60Hz (single phase) 		
		Accessories	<ul style="list-style-type: none"> • Freeze drying flasks 100ml (06 Qty) • Cone connectors (06 Qty) • power supply • power stabilizer (01) 		
		Warranty	12 Months from the date of installation		

8	Thermogravimetric Analyzer (TGA)	Purpose	Used to determine characteristics of materials such as Sample Volatility, Moisture Content, Oxidation Stability, Decomposition Temperature and Flammability Studies. It should measure <ul style="list-style-type: none"> • changes in weight in relation to change in temperature extremely precisely and accurately. • The level of inorganic and organic components in materials • Absorbed moisture content of materials, • Determine degradation temperatures of polymers 	01	
		Temperature Range	(from ambient to 1000 °C or more)		
		Temperature Precision	1 °C or better		
		Heating rate	0.1 to 100°C/min or better		
		Sample Weight Capacity	1000 mg or more		
		Weighing Precision	±0.01 % or better		
		Autosampler	For multiple sample analysis Sample position ≥20		
		Features	<ul style="list-style-type: none"> • Low Mass Furnace • Hi-Resolution • Modulated Auto-Stepwise • DTA Signal • App-Style Touch Screen • Temperature Calibration • Customizable program with multiple cooling and heating steps 		
		Software	<ul style="list-style-type: none"> • Unlimited licenses and free lifetime software upgrades. • Advanced custom analysis with user-defined variables and models • Must be compatible with all provided hardware 	01	
		Power backup with additional Servo Stabilizer	online pure sinewave UPS		
built in AVR capable of regulating ± 30 volts					
Power factor ≥ 0.95					
Power backup in case of power failure for at least 30 mins					

		<p>Lead acid free dry battery (1 year warranty)</p>	
		<p>OR A better alternative as recommended by OEM for optimum operations</p>	
		<p>12 Months from the date of installation with vendor having good local reputation with running machines and well-trained engineers</p>	
	Computer With power backup	<ul style="list-style-type: none"> • Computer compatible with system and recommended by OEM with genuine windows • Laser printer 	01
	Accessories	<ul style="list-style-type: none"> • Set of standard samples for calibration measurements with purity certificate 	01
		<ul style="list-style-type: none"> • Aluminum Pans with lids 	50
		<ul style="list-style-type: none"> • Platinum reusable pans 	03
		<ul style="list-style-type: none"> • Alumina reusable pans 	10
	others	<p>Argon gas cylinder with double regulator and certified (pressure rated and tested)</p>	01
		<p>Nitrogen gas cylinder with double regulator and certified (pressure rated and tested)</p>	01
		<p>2 stage moisture trappers for gas cylinders</p>	02
	Installation	<p>Complete Installation, operation, Onsite Training</p>	
	Warranty	<p>12 Months from the date of installation with vendor having good local reputation for providing high quality equipment. Must have well-trained engineers. Engineers must have been trained by the OEM with proof of trainings by the OEM.</p>	

9	Surface area and porosity measurement	General Requirement	System that allows physisorption for specific surface area with single point and multiple points (BET), pore size, pore diameter for mesoporous and microporous materials and DFT calculations etc.	01	
			Chemisorption with analysis for metal area, crystallite size, active metal dispersion, activation energy, Temperature Programmed Reduction, Temperature Programmed Oxidation, Temperature Programmed Desorption with inbuilt analysis and programmable multiple degassing units		
		Operating Specifications	Surface area range :0.01 m ² /g or better		
			Pore Diameter Range: 17-5000 A° or better		
			Pressure range: 0-950 mmHg or more		
			Degassing range: Ambient to 450 °C or more		
			Multiple Physisorption stations with Dewar and elevator		
			High temperature furnace with minimum 1100 °C with forced air cooling		
			Multiple gas inputs for different gases		
			Inbuilt programmable degassing stations (2-4 stations or more)		
Analysis gases	N ₂ , O ₂ , Ar, Kr, CO ₂ , CO, H ₂ , Butane or any non-corrosive gases				
Available Techniques and Reports:	Physisorption Report: Specific Surface area (single point and multiple point) Pore volume Pore Size Langmuir plot t-plot DFT Calculations Chemisorption Report: Active metal area dispersion Crystallite Size Monolayer Capacity Activation energy, Temperature Programmed Reduction, Temperature Programmed Oxidation,				

			Temperature Programmed Desorption	
		Oil free Vacuum Pump system	High vacuum with no oil contamination or back streaming	01
		Regulator Expansion Kit	Expands regulator's single outlet into two (2) outlets, each with an isolation valve.	01
		Accessories	Surface area reference materials	one
			Micropore reference materials	one
			Active surface area reference material	one
			O-rings compatible with analysis tubes	15
			Analysis quartz Tubes	10
			Glass Rods for samples analysis	10
		Software	Software for Data collection and analysis	
		Computer With power backup	<ul style="list-style-type: none"> ○ Computer Specifications as recommended by OEM with Genuine windows ● Laser printer ● Power backup 	01
		Gas Cylinders	Helium gas cylinder with double regulator and certified (pressure rated and tested)	01
			Nitrogen gas cylinder with double regulator and certified (pressure rated and tested)	01
			2 stage moisture trappers for gas cylinders	02
		Kit for sample transfer from Degassing unit to Analysis unit under vacuum	Device which enables transfer of physisorption sample tubes while under vacuum from degas to analysis port.	01
		Installation and Training	1-person advanced training (Operations, Trouble Shooting etc.) at Original Equipment Manufacturer site (travel & accommodation included)	
		Power backup with additional Servo Stabilizer	online pure sinewave UPS	01
			built in AVR capable of regulating ± 30 volts	
			Power factor ≥ 0.95	
			Power backup in case of power failure for at least 30 mins	
			Including lead Acid free dry batteries	

			<p>OR A better alternative as recommended by OEM for optimum operations</p>		
		<p>Warranty and Services</p>	<p>12 Months from the date of installation with vendor having good local reputation for providing high quality equipment. Must have well-trained engineers. Engineers must have been trained by the OEM with proof of trainings by the OEM.</p>		
10	X-ray Diffractometer (XRD)	<p>Functional Specifications</p>	<ul style="list-style-type: none"> ▪ Phase identification ▪ Quantitative phase analysis ▪ Crystallinity ▪ Crystallite size & strain ▪ Rietveld refinement ▪ Powders, solids and metals ▪ Structure analysis 	01	
		<p>X-ray Generation</p>	<p>Rated output – 600 W or higher</p>		
			<p>Voltage – up to 30 KV or higher</p>		
			<p>Current – up to 10 mA or higher</p>		
			<p>Tube – Copper radiation Full safety shielding</p>		
		<p>Goniometer</p>	<p>Vertical type - θ-θ or θ-2θ -3° (or less) to 140° (or higher) 2θ range</p>		
			<p>Accuracy – 0.02° (2θ) or better</p>		
		<p>Optics</p>	<p>Fixed/variable Divergence, scatter/anti-scatter, receiving, sollar slits</p>		
		<p>Detector</p>	<ul style="list-style-type: none"> ▪ Capable of 0D, 1D & 2D modes ▪ High speed data acquisition 		
		<p>Sample stage</p>	<p>Multipurpose sample stage and holders with zero low background</p>		
		<p>Sample Changer</p>	<p>Multiple position sample changer with sample holders</p>		
<p>Desktop Computer and printer</p>	<p>Specifications recommended by OEM with genuine windows</p>				
<p>Cooling system</p>	<p>In-built or external cooling system (if required) for temperature control. Must provide optimum cooling for operation in local Pakistani conditions.</p>				

		<p>online pure sinewave UPS</p> <p>built in AVR capable of regulating ± 30 volts</p> <p>Power factor ≥ 0.95</p> <p>Power backup in case of power failure for at least 30 mins</p> <p>Including lead Acid free dry batteries</p> <p>OR</p> <p>A better alternative as recommended by OEM for optimum operations</p>		
		Software for data collection	Needed for data acquisition along with license and installer disk/storage	
		Software for Analysis and Library	<ul style="list-style-type: none"> ▪ Must facilitate peak match and data analysis ▪ PDF4/PDF4+ or higher with 5-year license also required 	
		Rietveld Refinement Software	Required for rietveld refinement of collected data	
		Accessories Required	<ul style="list-style-type: none"> ▪ Sample Holder for powders – 2 or more ▪ Sample holder for solid samples – 2 or more ▪ Reference Sample (1 or more) 	
		Local warranty and Service	12 Months from the date of installation with vendor having good local reputation for providing high quality equipment. Must have well-trained engineers. Engineers must have been trained by the OEM with proof of trainings by the OEM.	
		Installation and Training	1-person advanced training (Operations, Trouble Shooting etc.) at Original Equipment Manufacturer site (travel & accommodation included)	
11	Dynamic Mechanical Analyzer (DMA)	Purpose	To study and characterize materials. It is most useful for studying the viscoelastic behavior of polymers, Dynamic moduli of polymers, Measuring glass transition temperature, Polymer composition, Dynamic stress–strain studies.	01

		The system showed be provided with all accessories and liquid nitrogen cooling system	
	Temperature range	-150°C- 600°C or better	
	Force range	0.001-10N or better	
	Heating rate	0.1 to 10 °C /min or better	
	cooling rate	0.1 to 10 °C /min or better	
	Force resolution	0.002N or better	
	Modulus range	10 ³ -10 ⁶ or better	
	frequency	0.01 to 100 Hz or better	
	Deformation range	0.005 to 50 or better	
	Cooling system	Automatic Liquid nitrogen system for cooling of system with 35 litre stock tank minimum	01
	Measurement modes:	Three-point bending Single- and dual cantilever bending Linear shearing Compression /penetration Tension	
	Sample holder accessories	Sample holder accessories For measuring the below properties in light of ISO standards	01 each
		Three-point bending	
		Single- and dual cantilever bending	
		Linear shearing	
		Compression /penetration Tension	
	Operation modes	Temperature/frequency sweep	
		Relaxation	
		Isostrain	
		Strain sweep	
		Stress sweep	
	photo accessory	Suitable for use with standard temperature furnace	01
		Contains UV source	
		Power adapter	
	Calibration sample kit	Calibration sample kits with ISO standards	01
	Computer and software's	Desktop PC required. Of specifications recommended by Original Equipment Manufacturer. With original windows with full range of	01

			software packages and power backup with laser printer		
		Gas cylinders	Air gas cylinder with double regulator and certified (pressure rated and tested)	01	
			Helium gas cylinder with double regulator and certified (pressure rated and tested)	01	
			Argon gas cylinder with double regulator and certified (pressure rated and tested)	01	
			Nitrogen gas cylinder with double regulator and certified (pressure rated and tested)	01	
			2 stage moisture trappers for gas cylinders	04	
		Power backup with additional Servo Stabilizer.	online pure sinewave UPS built in AVR capable of regulating ± 30 volts Power factor ≥ 0.95 Power backup in case of power failure for at least 30 mins	01	
			Lead acid free dry battery (1 year warranty) OR A better alternative as recommended by OEM for optimum operations		
		Warranty	12 Months from the date of installation with vendor having good local reputation for providing high quality equipment. Must have well-trained engineers. Engineers must have been trained by the OEM with proof of trainings by the OEM.		
		Installation and Training	1-person advanced training (Operations, Trouble Shooting etc.) at Original Equipment Manufacturer site (travel & accommodation included)		
12	Helium Pycnometer	General features	For measuring density and porosity of the samples	01	
			Minimum 05 analysis ports for simultaneous sample preparation and sequential analysis, and automatic repeat measurement mode		

	Sample cells	<ul style="list-style-type: none"> ▪ Capacity: between 1-to 350cc ▪ 4 variable sizes ▪ Calibration standards for each size 	
	Gas compressor	range 1-20 psi	01
		Joints	
		Traps for moisture	
	Vacuum pump	Upto 20 mbar or better	01
	Purge modes	Continuous flow with user selectable time and Pulse with user selectable number of pressurization/depressurization cycles	
		Vacuum for user selectable time with automatic valve configuration.	
	Temperature Control	Circulator with -20 °C to 150 °C or better	
	Operation	Digital display on machine with all important information. Also attachable with computer for data transfer and operation through software.	
	Weighing balance	Sensitivity 0.1 mg	01
		stander weights for calibration	
		Airproof chamber	
	Accessories	Computer compatible with system and recommended by OEM with genuine windows	01
		Laser printer	01
		Installation/ operation / Onsite Training	
	Power backup with additional Servo Stabilizer	online pure sinewave UPS	01
		built in AVR capable of regulating ± 30 volts	
		Power factor ≥ 0.95	
		Power backup in case of power failure for at least 30 mins	
		Lead acid free dry battery (1 year warranty)	
		OR A better alternative as recommended and provided by OEM for optimum operations	
	others	Helium gas cylinder with double regulator and certified (pressure rated and tested)	01

			Nitrogen gas cylinder with double regulator and certified (pressure rated and tested)	01	
			2 stage moisture trappers for gas cylinders	01	
		warranty	12 Months from the date of installation with vendor having good local reputation for providing high quality equipment. Must have well-trained engineers.		
13	Differential Scanning Calorimeter (DSC)	Purpose	Use for studying phase transition such as melting, Glass Transitions and exothermic decompositions	01	
		Temperature Range	-170°C or less to 700 °C or more		
		Temperature Accuracy	0.1 °C or better		
		Temperature Precision	0.01 °C or better		
		Heating Rate	(0.01 °C/min or less to 100 °C/min or more)		
		Cooling Rate	(0.01 °C/min or less to 100 °C/min or more)		
		Cooling accessory	<ul style="list-style-type: none"> To attain minimum temperature as required (-170°C or less) 		
			<ul style="list-style-type: none"> System based on liquid nitrogen 		
			<ul style="list-style-type: none"> Capacity:35 lite or more 		
		Software	<ul style="list-style-type: none"> Must be compatible with all provided hardware Unlimited licenses and free lifetime software upgrades. 		
		computer	Computer compatible with system and recommended by OEM with genuine windows	01	
			Laser printer	01	
		Accessories	Set of standard samples for calibration measurements (Cp or sensitivity/enthalpy), with purity certificate.	02	
<ul style="list-style-type: none"> Press and Die Sets Kit 	04				
<ul style="list-style-type: none"> Aluminium pans and lids 	50				
<ul style="list-style-type: none"> Reusable Alumina pans 	10				
	<ul style="list-style-type: none"> Reusable Platinum pans 	03			

			<ul style="list-style-type: none"> • pans for aqueous solutions 	02	
			<ul style="list-style-type: none"> • Pans for samples which react with Aluminum 	02	
			Installation/ operation / Onsite Training	01	
		Power backup with additional Servo Stabilizer	online pure sinewave UPS	01	
			Lead acid free dry battery (1 year warranty)		
			built in AVR capable of regulating ± 30 volts		
			Power factor ≥ 0.95		
			Power backup in case of power failure for at least 30 mins		
			Including lead Acid free batteries		
			OR A better alternative as recommended by OEM for optimum operations		
others	Argon gas cylinder with double regulator and certified (pressure rated and tested)	01			
	Nitrogen gas cylinder with double regulator and certified (pressure rated and tested)	01			
	2 stage moisture trappers for gas cylinders	01			
	warranty	12 Months from the date of installation with vendor having good local reputation for providing high quality equipment. Must have well-trained engineers. Engineers must have been trained by the OEM with proof of trainings by the OEM.			
14	Fourier transform infrared spectrometer (FTIR)	Purpose of FTIR	This instrument used infrared light to scan test samples and identify molecular components/ functional groups / and structures of materials	01	
		Components	Sources; Detectors; Beam splitters		
		spectral range	7,500 to 350cm ⁻¹		
		Spectral Resolution	0.2 cm ⁻¹ or preferably better		
		Signal to Noise	<ul style="list-style-type: none"> ▪ 50,000:1 or better - 1-minute sample measurement, 4 cm⁻¹ ▪ 13,000:1 or better - 5-second sample measurement, 4 cm⁻¹ 		

	Wavenumber accuracy:	0.01 cm ⁻¹ or better	
	Interferometer	Permanently/dynamically aligned	
	Rapid-Scan:	60 spectra /second [@ 16 cm ⁻¹] or better	
	Optics bench	Super Sealed & desiccated and/or purgeable	
	Desiccants Reagent	Two Boxes	
	Multi detector unit	With all requisite accessories to ensure they are mounted and installed completely	
	Automated multi-detector unit (two detectors)	1. DLaTGS detector, Room temperature, Wide range (12,000-350 cm ⁻¹)	01
		2. MCT Detector, Wide Range non cryogenic or cryogenic (10,000-400 cm ⁻¹) with all requisite accessories including Liquid N ₂ Cool jacket, Transfer Dewar	01
	Upgradeable system	<ul style="list-style-type: none"> ▪ Mount for InGaAs detector ▪ Attachable to Raman module/component 	
	IR source	Lifetime Infrared Source with 5 years warranty or better	
	Beam-splitter	broadband: 400 cm ⁻¹ [or less] to 10,000 cm ⁻¹ [or more]	
	Diamond ATR Accessory	400 cm ⁻¹ [or lower] to 5000 cm ⁻¹ [or higher]	01
	Photoacoustic cell	With all requisite accessories	01
		Carbon reference sample x 1	01
	Transmission Module	Yes, capable of holding different kinds of flat solid samples, membranes, liquid and gas samples. Required with all accessories for quick IR measurements	01
	Transmission Kit	<ul style="list-style-type: none"> ▪ Pellet holders ▪ Magnetic holder for films ▪ Clamp holders/windows for different kinds of flat solid samples ▪ Liquid and gas cells ▪ Press and Die Set for use in press (to make discs) 	01
	Gas Flow & Purging	<ul style="list-style-type: none"> ▪ Nitrogen gas cylinder x 1 ▪ Helium gas cylinder x 1 ▪ All gas cylinders required with double regulator and 	

			<p>certification (pressure rated & tested)</p> <ul style="list-style-type: none"> ▪ All gas lines required with 2 stage moisture trappers ▪ Purge Regulator, tubing and all requisite connectors 		
		standard Spectroscopy software	Multi user license and installation files with free upgrades		
			Atmospheric suppression to remove H ₂ O and CO ₂		
			With infrared spectra library in high resolution format for General Chemicals, polymers, plasticizers, additives etc.		
		Principal component analysis software	For statistical analysis of data		
		Power backup with additional Servo Stabilizer	<ul style="list-style-type: none"> ▪ online pure sinewave UPS ▪ Lead acid free dry battery (1 year warranty) ▪ built in AVR capable of regulating ± 30 volts ▪ Power factor ≥ 0.95 ▪ Power backup in case of power failure for at least 30 mins ▪ Including lead Acid free batteries <p>OR</p> <ul style="list-style-type: none"> ▪ A better alternative as recommended by OEM for optimum operations 	01	
		computer	Computer compatible with system and recommended by OEM with genuine windows	01	
		printer	Laser printer	01	
		Warranty	12 Months from the date of installation with vendor having good local reputation with running machines and well-trained engineers		
15	Universal Testing Machine (UTM)	Purpose of the Universal Testing Machine	A tabletop electromechanical universal testing machine capable of testing metals, ceramic and polymers under static uniaxial testing complete with all accessories and grips including power backup. Accuracy of the machine should be according to ISO7500-1	01	

	Load Cell	±100 KN with Valid calibration Certificate ISO17025	
	Force Measuring Accuracy	Grade 0.5	
	Crosshead Speed	0.0005 - 400 mm/min or better	
	Crosshead Repeatability	± 2µm or better	
	Test area height	1500 mm or higher	
	Testing area height between connectors	1300 mm or better	
	Test Area Width	600 mm or higher	
	Load frame stiffness	230 KN/mm or better	
	Testing Mode	Tension, Compression, Bending	
	Power	2.5 kW or less	
	Grips	<ul style="list-style-type: none"> • Round Sample universal grip for variable samples 	1
		<ul style="list-style-type: none"> • Flat sample grips for metals 	1
		<ul style="list-style-type: none"> • Grips for polymeric materials self-tightening 	1
		<ul style="list-style-type: none"> • 3 and 4 point bending fixtures 	1
		<ul style="list-style-type: none"> • Compression plates 	1
		<ul style="list-style-type: none"> • Standard sample for calculating machine stiffness of the grips 	1
	Extensometer	<ul style="list-style-type: none"> • Axial Extensometer clip on gauges for flat sample 	1
		<ul style="list-style-type: none"> • Axial Extensometer Clip on gauges for rough samples 	1
	Software	<ul style="list-style-type: none"> • Fully operable through graphical interface. • Complete software with programing option for tailoring the test based on need. • Multiple sequences and program and profile saving options. 	

			<ul style="list-style-type: none"> • Full licensed and free upgradeable 		
		Computer	Computer compatible with system and recommended by OEM with genuine windows	01	
		Power backup with additional Servo Stabilizer	<p>Pure sign wave online UPS power backup suitable to the machine load. Load backup = 10 minutes at full load AVR range = ± 40 Volts Including lead Acid free batteries</p> <p>OR</p> <p>A better alternative as recommended by OEM for optimum operations</p>	01	
		Warranty	12 Months from the date of installation with vendor having good local reputation with running machines and well-trained engineers		
16	Nanoindenter	Purpose of Nanoindenter	It is to be a compact indentation system capable of testing metals, ceramic, polymers and biomaterials. The system should be capable of operation in load control and frequency-based modes. The indentation system should be capable to perform nanoindentation, scratch test with a software-based control for determining mechanical properties in load control and dynamic modes. The instrument should also be capable of determining dynamic mechanical properties of soft materials e.g. biomaterials, tissues and polymers	01	
		Main Features	Actuator Load Range 50 mN to 200 mN		
			Load Resolution 4 nN or better		
			Damping Coefficient 0.05 N-s/m or better		
			Resonant Frequency 100 KHz or Higher		
			Drift Rate 0.05 nm/s or better		
			Displacement Monitoring Linear Capacitive		

			<p>Displacement 50 microns or higher</p>		
			<p>Displacement Resolution 0.004 nm or better</p>		
			<p>Indenter Stiffness 80 N/m or higher</p>		
			<p>Sample Stage X-axis = 75 mm or higher Y-axis = 75 mm or higher Z-axis = 25 mm or higher</p>		
			<p>Optical Colored Videoscope with Digital Zoom 20 to 800x or higher</p>		
			<p>Testing features</p>	<ul style="list-style-type: none"> • Scratch Testing capability 	
				<ul style="list-style-type: none"> • Frequency Specific determination of mechanical properties e.g Storage & loss Modulus of polymers and biomaterials 	
				<ul style="list-style-type: none"> • Constant strain rate testing 	
				<ul style="list-style-type: none"> • Multiple/single actuators for testing all material range if single actuators cant perform dynamic mechanical testing & scratch/wear testing e.g. gels, tissues and polymers, biomaterials and their blends 	
				<ul style="list-style-type: none"> • Fast indentation capability of mapping topographic features of the surfaces (optional) 	
				<p>Setup should be provided with isolation chamber suitable to avoid environmental vibrational and noise effects</p>	
				<ul style="list-style-type: none"> • Berkovich indenter • Cube Corner • Flat punch • Ball indenter 	<p>1 pcs 1 pcs 1 pcs 1 pc</p>
<ul style="list-style-type: none"> • Provision of sample holder suitable for 	<p>2 pcs</p>				

			testing wet samples e.g. tissues and sample in SBF		
			Data acquisition rate 1KHz or higher		
			<ul style="list-style-type: none"> Computer compatible with system and recommended by OEM with genuine windows Laser Printer 	01	
			<ul style="list-style-type: none"> Power backup with additional Servo Stabilizer Pure sine wave online UPS 2 KVA Output efficiency ≥ 0.95 AVR range = ± 40 V Backup time = ≥ 1 hour OEM, Maintenance free Sealed Lead Acid & Leak Proof Battery or A better alternative as recommended by OEM for optimum operations 	01	
		Warranty	12 Months from the date of installation with vendor having good local reputation with running machines and well-trained engineers		
17	Screen Printer	General features	To print disposable screen printed electrode on various substrates including pvc, paper, cloth and conducting films	1	
			Automatic feeder with touch control panel / Static eliminator / Auto registration for printing / Auto delivery.		
		Printing area mm	610*610 or better		
		Printing speed	300 p/h or better		
		Screen frame thickness(mm)	20-30 or better		
		Off-contact height (mm)	0.05 – 6 mm or better		

		Squeegee/coater speed (mm/sec.)	0-800 or better		
		Squeegee/coater angle adjustment	22±15° or better		
		Power source (single phase)	220V, 4.5kw		
		Others	Machine body is with powder coating.		
			corrosion and rust resistant printing table		
			powder coated body		
			capable of printing with variety of inks including composite materials and conducting pastes		
			capable of printing on variety of substrates including paper, glass and plastic sheets and cloths		
			Safety light barrier		
			Motor controlled in 3 axis movement		
			Touch screen control air pressure for squeegee and flood coater		
		accessories	Squeegee holders 650 mm	1	
			Squeegee holders 550 mm	1	
			Squeegee holders 450 mm	1	
			Flood coater 700 mm	01	
			Flood coater 500 mm	01	
			silver paste	250g	
			Carbon paste	1kg	
		Power backup with additional Servo Stabilizer	online pure sinewave UPS	01	
			built in AVR capable of regulating ± 30 volts		
			Power factor ≥ 0.95		
			Power backup in case of power failure for at least 30 mins		
			Including lead Acid free batteries		
		OR			
			A better alternative as recommended by OEM for optimum operations		
		Warranty	12 Months from the date of installation with vendor having good local reputation with running machines and well-trained engineers		

18	Field Emission Scanning Electron Microscope (FE-SEM)	Scope		The Field-emission scanning electron microscope With EBSD must be capable of use in variable pressure, with low and high vacuum mode with suitable detectors along with analytical capabilities of chemical and structural properties (optional). The equipment must be complete in all aspect including water chiller, power backup, gas cylinder/s with regulators and moisture filters and compressor system if required for its operation.	01
		Electronic Features	Electron Gun	Schottky Thermal Field Emitter	
			Resolution	High Voltage @ 15 KV (0.8 nm or better)	
				Low Voltage @ 1 KV (1.5 nm or better)	
				STEM @ 30KV (0.8 nm or better)	
				Low Vacuum (1.5 nm or better)	
			Accelerating voltage	0.2 to 30kV (or better)	
			Probe Current	Up to 100 nA or higher	
			Magnification	10 to 1,000,000 x or better	
		Vacuum System	Low vacuum range	133 Pa or higher pressure	
			Vacuum System	Oil Free	
		Specimen Stage	Eucentric Stage	<ul style="list-style-type: none"> ▪ Fully motorized ▪ X = 100 mm or more ▪ Y = 100 mm or more ▪ Z = 50 mm or more ▪ Rotation = 360° continuous, ▪ Tilt = -4° to +70° or wider 	
Ports & Detectors	Ports	Minimum 10 or more			
	Column	InLens and In-column detection with multiple detectors including InLens SE			

			and BSE (electrostatic and magnetic field free)	
		Cameras	<ul style="list-style-type: none"> ▪ For Sample view (& stage navigation) with display on the SEM display monitor ▪ For internal chamber view with display on the SEM display monitor 	
		Detect ors	InLens SE detector/detectors	
			Inlens BSE detector	
			In chamber SE detector for high vacuum	
			Low vacuum in chamber SE detector or comparable alternative	
			Retractable solid-state segmented BSD detector for low and high vacuum	
			Retractable STEM Detector (bright-field, dark-field and high-angle dark-field modes)	
	Software	Image Acquisition	<ul style="list-style-type: none"> ▪ Multidetector image capture at single instance in multiple resolutions ▪ Live video acquisition options ▪ Drift corrected Frame Image acquisition 	
		Acquisition Software	<ul style="list-style-type: none"> ▪ Fully customized software for user specific routines ▪ Suitable CPU with monitors & keyboards and mouse/trackball. 	
	EDS	EDS Detector	<ul style="list-style-type: none"> ▪ EDS (100 mm² or better active area), 129 eV or better, capability to Automatically record live processing ▪ Low acceleration voltage capability ▪ Input count rates 800,000 cps or better 	
		Acquisition Software	<ul style="list-style-type: none"> ▪ Fully licensed software with built-in library for elemental and compositional analysis ▪ Complete with installation CDs/drives 	
	EBSD	EBSD Detector	<ul style="list-style-type: none"> ▪ Acquisition speed of up to 400 fps or better ▪ Diffraction pattern image resolution 300 x 200 pixel or better 	01

			<ul style="list-style-type: none"> ▪ EBSD workstation for fast data storage and acquisition 		
		Software	<ul style="list-style-type: none"> • Fully licensed software with built-in library for structural and crystallographic analysis 		
		Power backup with additional Servo Stabilizer	<ul style="list-style-type: none"> ▪ 10KVa pure sine wave UPS with isolation transformer or better ▪ Built in AVR ± 40 V ▪ Lead acid free dry batteries from UPS OEM ▪ Overvoltage protecting relay ▪ Voltage surge protection relays ▪ Phase sequencer for automatic phase sequencing ▪ one-year warranty with minimum 30 mins backup to all system including instrument, computer etc. <p>OR</p> <ul style="list-style-type: none"> • A better alternative as recommended by OEM for optimum operations. 	01	
		Workstations	<ul style="list-style-type: none"> ▪ Suitable Workstations for FE-SEM operation, EDS Analysis or any other application. If any aspect requires additional workstations, they should be included 	01	
		Accessories	<ul style="list-style-type: none"> • Extra Schottky Thermal Field Emitter 	01	
			<ul style="list-style-type: none"> • Double sided Carbon tape 	10	
			<ul style="list-style-type: none"> • Silver paste bottles 	5	
			<ul style="list-style-type: none"> • Set of standard samples for EDS detector calibration (gold, copper, platinum standards) 	1 each	
			<ul style="list-style-type: none"> • Set of all replaceable vacuum o-rings 	1 set	
			<ul style="list-style-type: none"> • Vacuum grease 	5 units	
			<ul style="list-style-type: none"> • Sample holder for multiple specimen stubs 	5	
			<ul style="list-style-type: none"> • SEM stubs 	50	
			<ul style="list-style-type: none"> ▪ Set of stainless-steel and polymeric forceps 	1 pack	

			<ul style="list-style-type: none"> Gas cylinder with certified regulator along with moisture filters 	1	
			<ul style="list-style-type: none"> Air compressor if required 	1	
			<ul style="list-style-type: none"> Chiller, if required for operations 	1	
		Warranty & Others	<ul style="list-style-type: none"> 1-year standard warranty 		
<ul style="list-style-type: none"> Enabled with Remote Access feature for troubleshooting and identification of the routine problems Installation, operation & onsite demonstration of all capabilities with on-site training 1-person advanced training (Operations, Trouble Shooting etc.) at Original Equipment Manufacturer site (travel & accommodation included) 					
18.1	Field Emission Scanning Electron Microscope (FE-SEM)	Scope	The Field-emission scanning electron microscope must be capable of use in variable pressure, with low and high vacuum mode with suitable detectors along with analytical capabilities of chemical and structural properties (optional). The equipment must be complete in all aspect including water chiller, power backup, gas cylinder/s with regulators and moisture filters and compressor system if required for its operation.		01
			Electronic Features	Electron Gun	
		Resolution		High Voltage @ 15 KV (0.8 nm or better)	
				Low Voltage @ 1 KV (1.5 nm or better)	
				STEM @ 30KV (0.8 nm or better)	
				Low Vacuum (1.5 nm or better)	
		Accelerating voltage		0.2 to 30kV (or better)	
Probe Current	Up to 100 nA or higher				

			Magnification	10 to 1,000,000 x or better	
		Vacuum System	Low vacuum range	133 Pa or higher pressure	
			Vacuum System	Oil Free	01
		Specimen Stage	Eucentric Stage	<ul style="list-style-type: none"> ▪ Fully motorized ▪ X = 100 mm or more ▪ Y = 100 mm or more ▪ Z = 50 mm or more ▪ Rotation = 360° continuous, ▪ Tilt = -4° to +70° or wider 	
		Ports & Detectors	Ports	Minimum 10 or more	
			Column	InLens and In-column detection with multiple detectors including InLens SE and BSE (electrostatic and magnetic field free)	
			Cameras	<ul style="list-style-type: none"> ▪ For Sample view (& stage navigation) with display on the SEM display monitor ▪ For internal chamber view with display on the SEM display monitor 	
			Detectors	InLens SE detector/detectors	
				Inlens BSE detector	
				In chamber SE detector for high vacuum	
				Low vacuum in chamber SE detector or comparable alternative	
		Retractable solid-state segmented BSD detector for low and high vacuum			
			Retractable STEM Detector (bright-field, dark-field and high-angle dark-field modes)		
		Software	Image Acquisition	<ul style="list-style-type: none"> ▪ Multidetector image capture at single instance in multiple resolutions ▪ Live video acquisition options ▪ Drift corrected Frame Image acquisition 	
			Acquisition Software	<ul style="list-style-type: none"> ▪ Fully customized software for user specific routines ▪ Suitable CPU with monitors & keyboards and mouse/trackball. 	

	EDS	EDS Detector	<ul style="list-style-type: none"> ▪ EDS (100 mm² or better active area), 129 eV or better, capability to Automatically record live processing ▪ Low acceleration voltage capability ▪ Input count rates 800,000 cps or better 	
		Acquisition Software	<ul style="list-style-type: none"> ▪ Fully licensed software with built-in library for elemental and compositional analysis ▪ Complete with installation CDs/drives 	
	Power backup with additional Servo Stabilizer	<ul style="list-style-type: none"> ▪ 10KVa pure sine wave UPS with isolation transformer or better ▪ Built in AVR ± 40 V ▪ Lead acid free dry batteries from UPS OEM ▪ Overvoltage protecting relay ▪ Voltage surge protection relays ▪ Phase sequencer for automatic phase sequencing ▪ one-year warranty with minimum 30 mints backup to all system including instrument, computer etc. <p>OR</p> <ul style="list-style-type: none"> • A better alternative as recommended by OEM for optimum operations. 	01	
	Workstations	<ul style="list-style-type: none"> ▪ Suitable Workstations for FE-SEM operation, EDS Analysis or any other application. If any aspect requires additional workstations, they should be included 	01	
	Accessories	<ul style="list-style-type: none"> • Extra Schottky Thermal Field Emitter 	01	
		<ul style="list-style-type: none"> • Double sided Carbon tape 	10	
		<ul style="list-style-type: none"> • Silver paste bottles 	5	
<ul style="list-style-type: none"> • Set of standard samples for EDS detector calibration (gold, copper, platinum standards) 		1 each		
<ul style="list-style-type: none"> • Set of all replaceable vacuum o-rings 		1 set		
<ul style="list-style-type: none"> • Vacuum grease 	5 units			

			<ul style="list-style-type: none"> • Sample holder for multiple specimen stubs 	5	
			<ul style="list-style-type: none"> • SEM stubs 	50	
			<ul style="list-style-type: none"> ▪ Set of stainless-steel and polymeric forceps 	1 pack	
			<ul style="list-style-type: none"> ▪ Gas cylinder with certified regulator along with moisture filters 	1	
			<ul style="list-style-type: none"> ▪ Air compressor if required 	1	
			<ul style="list-style-type: none"> ▪ Chiller, if required for operations 	1	
		Warranty & Others	<ul style="list-style-type: none"> ▪ 1-year standard warranty 		
			<ul style="list-style-type: none"> ▪ Enabled with Remote Access feature for troubleshooting and identification of the routine problems 		
			<ul style="list-style-type: none"> ▪ Installation, operation & onsite demonstration of all capabilities with on-site training 		
			<ul style="list-style-type: none"> ▪ 1-person advanced training (Operations, Trouble Shooting etc.) at Original Equipment Manufacturer site (travel & accommodation included) 		
19	Freeze Dryer	Purpose of the Benchtop Laboratory Freeze Dryer	Compact benchtop model capable of removing water, acetonitrile, ethanol and methanol from samples	02	
		Exterior	Powder coated stainless-steel		
		Temperature	-85 °C or below		
		Water capture capacity	4 Kg/24 h or above		
		Freeze drying time	24 h		
		Solvents	Water, acetonitrile, methanol, ethanol		
		Drying Chamber	<ul style="list-style-type: none"> • Stainless steel drying chamber • Transparent acrylic lid for connection of drying chamber • Adjustable 4 trays/shelves • Polish SS304 stainless steel shelves 		
		Condenser	<ul style="list-style-type: none"> • stainless-steel collector coil condenser • Electric heating defrost 		
Cold trap	<ul style="list-style-type: none"> • Cold trap temperature ≤ -50 °C 				

			<ul style="list-style-type: none"> • Cold trap capacity 5-10 L • Total loading capacity (liquid) 1.2L 		
		Refrigeration system	<ul style="list-style-type: none"> • Dual 1/3 hp refrigeration compressor • CFC-free • Cooling type: Air cooled • Refrigerant: R600a+R290+R23 		
		Vacuum system	<ul style="list-style-type: none"> • two stage Rotary Vane vacuum pump • Displacement capacity: 80-90 L/min • Ultimate vacuum: ≤ 0.002 mBar 		
		Control panel	<ul style="list-style-type: none"> • LCD touch screen display panel • Show operating parameters, set-up parameters and alarm messages • user-configured to display vacuum in mBar, Pa or Torr and temperature in $^{\circ}$ F or $^{\circ}$ C 		
		Safety controls	<ul style="list-style-type: none"> • Vacuum control option to maintain set point vacuum level • special arrangement for preventing the oil back-streaming into the collector chamber during the power outage • auto restore functions in case of power failure 		
		Electrical requirements	<ul style="list-style-type: none"> • Power supply 220V/50Hz,60Hz (single phase) 		
		Accessories	<ul style="list-style-type: none"> • Freeze drying flasks 100ml (06 Nos) 		
		Warranty	<ul style="list-style-type: none"> • 12 Months from the date of installation with vendor having good local reputation with running machines and well-trained engineers 		
20	Fatigue Testing Machine	Purpose of the Fatigue Testing Machine	<p>Multipurpose bi-axial servo-hydraulic fatigue testing system with axial/torsion drive for static and dynamic tests in axial and torsional mode. The machine should meet conditions for fatigue testing of Hip Stem Fatigue, Dental Implant Wear, Spinal Vertebrectomy implants, Prosthetic limbs implants as</p>	01	

Signature & Stamp of Bidder

		per relevant ISO standard. Materials to be used will be metals, ceramics, polymers and composites. The machine should include all accessories required for its operation e.g. chillers and power backup. The software should have built-in programs examples to test implants according to ISO7206-4, ISO7206-6, ISO 12189, ASTM F2193, ASTM F1798.	
	Load Cell	10 kN according to EN-ISO 7500-1 class 0.5 with valid calibration Certificate	
	Axial Dynamic Performance	30 Hz @ ± 3 mm or better	
	Torsion Dynamic Performance	10Hz @ 3° or better	
	Mode of operation	Electrically powered with integrated servo-hydraulic	
	Test area height	1200 mm or above	
	Testing actuator stroke	100 mm or better	
	Displacement/Deformation Accuracy	As per EN 10002-4	
	Torsion fatigue capacity	100 N/m or above	
	Torsion	Total 100° or better	
	Testing Mode	Tension, Compression, Axial Fatigue & Torsion Fatigue	
	Wave Forms Capability	Ramp, Holding, Sinusoidal, Triangular, Square, Trapezoidal, virtual channels etc. in both axial and torsional axes	
	Phase Angle	Axial and torsional waveform superposition in both in-phase and out of phase. Provision available for conducting test at any quadrants of cycles	
	Testing bed	T-Slot platen base platform for easy mounting of different jigs.	
	Grips	Compression plates	1 set
		Standard tensile grips for flat and round samples (suitable upto 10kN)	1 set
		3 & 4 point bending fixtures	1 set
	Chiller	To provide cooling to hydraulic system (if required)	1

	Standard Tool Kit	For regular inspection and maintenance	1	
	Power backup with additional Servo Stabilizer	Pure sign wave online UPS power backup suitable to the machine load. Load backup = 10 minutes at full load AVR range = ± 40 Volts Lead acid free dry batteries OR A better alternative as recommended by OEM for optimum operations	1	
	Training	1-person advanced training (Operations, Trouble Shooting etc.) at Original Equipment Manufacturer site (travel & accommodation included)	1	
	Warranty	12 Months from the date of installation with vendor having good local reputation with running machines and well-trained engineers		

Bid Evaluation Criteria

All bids shall be evaluated in accordance with the following evaluation criteria and other terms & conditions set forth in this bidding document.

- a. The bids shall be evaluated to strictly ensure that the quoted brand/ model meet all the BoQ/ specification requirements given in the tender document for each item.**
- b. In addition to the BoQ requirements, vendors must meet the vendor qualification criteria /company profile requirements (if any), as set forth in this tender document.**
- c. Supporting literature of the quoted model must be attached for verification & technical evaluation of the required specification by the technical committee. In case of any clash is found between the quoted model and the supported literature may lead to rejection of bid.**
- d. The vendor must have an authorized dealer certificate of the quoted Product/Item (Certificate with current year's validity) of Original Manufacturer for all Equipment which shall be also verifiable from the Principal / Manufacture Website or through email. It must be attached with bid otherwise such item/bid may be rejected.**

Financial Portion (Price and Brand/Model to be mention only in Financial Proposal in a separate sealed envelope) Strictly on our BoQs Form.

Vendors are required to provide both unit and total price of each item and calculations must be made carefully to avoid mistakes. However, in case, total price does not match with the unit price and quantity due to calculation error or typo error, any of the following can be opted

1. The bid may be rejected on the reason of ambiguity (OR)
2. Unit price will be considered as final and total price of the respective item will be calculated by multiplying it with the quantity required. Sub-totals and grand total will also be corrected accordingly.

No change in the BoQs (Specs & Qty.) of CUI-Lahore Campus, as detailed below, is allowed. Any additional information may be mentioned in the blank columns (i.e. model / brand or Price). Any modification in CUI-Lahore Campus BoQ may lead to rejection of bid (fully or partially).

Prices to be quoted in C&F with all freight & packing charges at Lahore Airport

Sr. #	Equipment Name	Required Specifications		Qty	Quoted Model / Brand	Unit Price (C&F Lahore Airport) with mentioning of Quoted Currency	Total Price (C&F Lahore Airport) with mentioning of Quoted Currency
1	Atomic Absorption spectrophotometer with Graphite Furnace	Purpose of the Atomic Absorption spectrophotometer	For multi element analysis using atomic absorption spectrometer technique	1			
		Light source	Continuum light source				
		Lamp	Lamp for multi elemental analysis with cooling				
		Flame technique	Burner head 100 mm and 50 mm				
			O ring for organic samples				
			Automatic adjustment				
			Nebulizer with platinum/rhodium capillary				
		Graphite furnace	Automatic calibration				
			Autosampler				
			Integrated cooling system				
			Camera with integrated vision tool				
		Hydride system	For analysis of hydride and Hg				
			Cooling tube for graphite connection				
			Iridium standard (100mL)				
Auto sampler	For automatic analysis of samples and standards						

			Rack with minimum 54 positions			
			75 pieces of 50 ml sample vials			
			Automatic dilution			
		software	Integrated software to run all the accessories			
		Air compressor	At least 50 Hz for dust, oil and water free air			
		Computer With Power Backup	Specifications As recommended by OEM with genuine windows	01		
			Laser printer	01		
		accessories	Cleaning strips	150 Nos.		
			set of sealing rings mixing chamber nebulizer system	03		
			intake ptfе tubes with 0.5mm diameter	02		
			intake tubes for autosampler	02		
			wash bottles	3		
			IC graphite tubes coated	10		
			IC graphite inserts	10		
			Pieces sample cup of polysterol 1.5ml	2000		
			PTFE 2ml cup	20		
			20 pieces polypropylene special cup 5 ml	20		
			Pump tube	2		
			Sample tube	12		
			Acid tubes	4		
			Connection tube 01	01		
			Connection tube from reactor to double valve	2		
			reactor tube	2		
			drying tube	2		
			Hg drying membrane hybrid	2		
			predry tube	2		
		Power backup with additional Servo Stabilizer	online pure sinewave UPS	01		
			built in AVR capable of regulating ± 30 volts			
			Power factor ≥ 0.95			
			Power backup in case of power failure for at least 30 mins			
			Including lead Acid free dry batteries			
			OR			

			A better alternative as recommended and provided by OEM for optimum operations			
		others	Argon gas cylinder with double regulator and certified (pressure rated and tested)	01		
			Acetylene gas cylinder with double regulator and certified (pressure rated and tested)	01		
			Nitrous oxide gas cylinder with double regulator and certified (pressure rated and tested)	01		
			2 stage moisture trappers for gas cylinders	03		
			Exhaust assembly	01		
			Air compressor	01		
			Warranty	12 Months from the date of installation with vendor having good local reputation with running machines and well-trained engineers		
2	Micro-CT	Purpose of the Micro-CT	Micro-computed tomography of ceramics, polymers, composites, bone and tissue.	01 No.		
		X-ray source	100 kV or better, 10 W or better			
		Spot size	5 µm or better			
		X-ray detector	11 MP or better			
		Frame rate	4x4 binning or better			
		Scanning object size	75x70 (D x L) mm or higher			
		Resolution/ detectability	0.45 µm voxel size or better			
		Image matrix /Reconstruction array	12k x 12k pixel or above, isotropic grid			
		adjustment of geometry/ Fixed	Automatic			
		Software	Volumetric reconstruction, visualization software, Morphology analysis software (2D/3D quantitative analysis), Realistic surface			

		rendering visualization, realistic volume rendering software, /softwares recommended by OEM				
		Format converter to TIFF, BMP, JPEG				
	Reconstruction workstation (Computer) With Power backup	Specifications as recommended by OEM With color laser printer				
	Radiation safety	<1 µSv/h				
	Compressor	oil, moisture and particle filter particles size > 10 microns if needed	01 No.			
	others	Artifact to calibrate the equipment	01 No.			
		Integrated stage				
		sample holders/mount for different size samples	01 No.			
		calibration rods for 2-4 mm for BMD and/ TMD	01 No.			
		calibration rods for 8-16 mm for BMD and/ TMD	01 No.			
		calibration rods for 32mm for BMD and/ TMD	01 No. 01 No.			
	Power backup with additional Servo Stabilizer	online pure sinewave UPS	01 No.			
		built in AVR capable of regulating ± 30 volts				
		Power factor ≥ 0.95				
		Power backup in case of power failure for at least 30 mins				
		Including lead free dry batteries				
		OR A better alternative as recommended and provided by OEM for optimum operations				
	Warranty, Training & Others	12 Months from the date of installation with vendor having good local reputation with running machines and well- trained engineers				
		Enabled with Remote Access feature for				

			troubleshooting and identification of the routine problems				
			2-persons advanced training (Operations, Trouble Shooting etc.) at Original Equipment Manufacturer site (travel & accommodation included)				
3	Real-time PCR	Thermal cycler	Reactions/wells: 96	01 No.			
			Scan format: SYBR® Green & FAM				
			Thermal block: should accommodate 96 well plate, 8X12 strips, 0.2ml tubes				
			Lid heating limits: Heat up to 105°C				
			Range: 0-100°C				
			Filters: 6 Excitations, 6 Emissions				
			Run time: 30min-40min				
			Sample size volumes: 10-100 µL				
			Automation compatible: Yes				
			Remote monitoring: Yes				
			On-Board memory: Yes				
			Dynamic range: Up to 10 logs				
			Collaboration Features				
			IP connectivity				
		Strong Password Requirements					
		Multiplex: 5-21 targets combinations					
		Flexibility	Flexible for passive reference dye (can be use with or without reference dye)				
Sensitivity	Temperature uniformity: up to ± 0.5°C Sensitivity: Detect down to 1 copy						
Accuracy	±0.2 °C						
Optical Detection	Excitation source: LED light of enhanced System						
	Filters range excitation/emission: 6X6 filters (450–720 nm)						
Computer	Specifications as recommended by OEM with genuine windows	01					

			with [power backup of 30 minutes					
		Power backup with additional Servo Stabilizer	online pure sinewave UPS	01				
			built in AVR capable of regulating ± 30 volts					
			Power factor ≥ 0.95					
			Power backup in case of power failure for at least 30 mins					
			Including lead Acid free dry batteries					
			OR A better alternative as recommended and provided by OEM for optimum operations					
		Applications	Gene Expression, Protein Detection, Genotyping, MicroRNA, Copy Number Variation, High Resolution Melt					
		Accessories	Interchangeable Trays: for using plates, strips, or tubes	01 each				
			Samples mixing shaker: For 96 well plates and 8 well strips	01				
			PCR Tubes (0.2ml): 1000 tubes	1000				
			PCR strips (0.2ml): 1000 strips with caps	1000				
			Micropipettes: 0.1-2.5 μ l, 0.5-10 μ l, 10-100 μ l (pipette should have calibration window along with volume window and spring-loaded tip cone)	01 each				
		Warranty	12 Months from the date of installation with vendor having good local reputation with running machines and well-trained engineers					
4	Electrospinning with power supply and syringe pumps	Purpose	Fabrication of electrospun mats and electrospaying of solutions for specifically biomedical applications	01				
		For biological purposes	Complete electrospinning setup with single benchtop compartment having digital display of pump					

			<p>and power supply operations.</p> <p>The compartment should be made up of stainless steel with proper insulation with climate control chamber</p> <p>Overall the equipment should be designed for fabrication of fiber for biomedical applications.</p>			
		Syringe pump	<p>Channels</p> <p>Four-channel pump: can be controlled independently for individual syringe Flow rate, volume and time of infusion can be controlled precisely. Compatible to work under high voltage.</p> <p>Working temperature 5-40 °C (or better range)</p> <p>Pumping rate</p> <p>50ml syringe : 0.1ml/h ~1500ml/h</p> <p>30ml syringe : 0.1ml/h ~900ml/h</p> <p>20ml syringe : 0.1ml/h ~600ml/h</p> <p>10ml syringe : 0.1ml/h ~400ml/h</p> <p>Pump rate accuracy : +/- 2%</p>			
		Climate control chamber	<p>Controllable temperature Ambient to 40 °C or better</p> <p>Humidity control 10 to 90% or better</p>			
		Power supply	<p>Output Current Upto 1mA</p> <p>Voltages Up to 30KV or higher</p> <p>Over voltage protection</p> <p>Over current protection</p> <p>Protection against output short circuit</p> <p>Over temperature protection</p> <p>Manual recovery after cutoff</p>			
		Collectors	<p>Drum collector (1-5000rpm, +/- 1rpm)</p>	01		
			<p>disk collector</p>	01		

			Plate collector	01			
			Grooved collector	01			
		Accessories	Needle sets 11 g to 27 g	05			
			Multi option coaxial needle set ranging from 11g to 27g	02			
			Triaxial spinneret Needle length should be 6cm with inner 22g, middle 18g and outer 14g	02			
			Triaxial spinneret Needle length should be 6cm with inner 22g, middle 18g and outer 15g	02			
			Triaxial spinneret Needle length should be 6cm with inner 22g, middle 18g and outer 16g	02			
			Tri-channel spinneret	02			
			Multi-nozzle spinnerets also called islands in the sea spinneret	02			
			Cold light source for observing the electrospinning process	01			
			Exhaust fan to cool down the equipment in working process and solvent vaporization. Should be controlled by control panel	01			
			HD Camera for observation (3 MP or higher)	01			
			Syringe heater Two-channel heater : 2 syringes can be heated at the same time. Up to 250°C or higher	01			
			50ml Glass syringes	05			
			20ml Glass syringes	05			
			10ml Glass syringes	10			
			5ml Glass syringes	10			
			2ml Glass syringes	10			
		Power backup with additional Servo Stabilizer	as recommended by OEM for optimum operations	01			
		Warranty	12 Months from the date of installation				

5	Electrospinning with power supply and syringe pumps	Basic setup	Fabrication of electrospun mats and electrospaying of solutions	02			
		General features	Complete electrospinning setup with plate and rotating drum collector in single benchtop compartment having digital display of pump and power supply operations.				
		Syringe pump	Channels 02-channel pump: can be controlled independently for individual syringe Flow rate, volume and time of infusion can be controlled precisely. Compatible to work under high voltage.				
			Working temperature 5-40 °C (or better range)				
			Pumping rate (or better) 50ml syringe : 0.1ml/h ~1500ml/h 30ml syringe : 0.1ml/h ~900ml/h 20ml syringe : 0.1ml/h ~600ml/h 10ml syringe : 0.1ml/h ~400ml/h				
			Pump rate accuracy : +/- 2%				
		Power supply	Voltages Up to 30KV or higher				
			Output Current Upto 1mA				
			Over voltage protection Over current protection Protection against output short circuit Over temperature protection Manual recovery after cutoff				
		Collectors	Drum collector (1-3000rpm, +/- 1rpm) or higher				
disk collector	02						
Accessories	Needle sets 11 gauge to 27 gauge	05					
	Multi option coaxial needle set	05					

			ranging from 11 gauge to 27 gauge				
			Cold light source for observing the electrospinning process	02			
			Exhaust fan to cool down the equipment in working process and solvent vaporization. Should be controlled by control panel	02			
			Syringe heater Two-channel heater : 2 syringes can be heated at the same time. Up to 250°C or higher	02			
			50ml Glass syringes	05			
			20ml Glass syringes	05			
			10ml Glass syringes	10			
			5ml Glass syringes	10			
			2ml Glass syringes	10			
		Power backup with additional Servo Stabilizer	online pure sinewave UPS	01			
			built in AVR capable of regulating ± 30 volts				
			Power factor ≥ 0.95				
			Power backup in case of power failure for at least 30 mins				
			Including lead free Acid dry batteries				
			OR A better alternative as recommended by OEM for optimum operations				
		Warranty	12 Months from the date of installation				
6	Particle size analyzer (with zeta potential)	General features	Needed for the measurement of size, molecular weight, mobility, transmittance and zeta potential, with complete package for liquid and solid samples. The system should provide the results for diluted and concentrated liquids samples, solid samples. User friendly interface for measurement control and data analysis	01			
			Measuring size range; 0.5 nm-10 μM or better				

			<p>Molecular weight measurement range; 900 Da⁻² x 107 Da or better</p> <p>Zeta potential Range; >+/- 400mV or better</p> <p>Mobility Range: >+/- 15 μ. cm/V.s or better</p> <p>Accuracy should be better than ± 3 % on NIST traceable standards</p> <p>Reproducibility should be better than ± 3 % on NIST traceable standards</p> <p>Sensitivity should be better than 0.5 mg/mL of standard protein</p> <p>Software should include the off line data analysis option too</p>			
		Polystyrene cuvettes	Polystyrene cuvettes (12 mm) with stoppers, compatible and suitable with the above mentioned specs instrument	200 pieces		
		Low volume quartz cuvette	<p>Quartz cuvette; compatible with the above mentioned specs instrument</p> <p>Should be suitable to perform all type of above mentioned measurements</p> <p>Sample volume range should be;</p> <p>Minimum; 15 μL</p> <p>Maximum; above 50 μL</p>	4		
		Accessory for aqueous and non-aqueous sample	<p>A kit to perform all above mentioned measurements for aqueous and non-aqueous samples such as non-polar dispersants such as hydrocarbons.</p> <p>Compatible with the above mentioned cuvettes or compatible cuvettes should be provided in the package.</p> <p>Should be compatible with the above mentioned specs instrument.</p>	01		

			Cuvettes should be compatible with the above mentioned specs instrument, in case of separately provided cuvettes			
		Accessory for high concentrated sample	A kit to perform all above mentioned measurements for high concentrated sample. Compatible with the above mentioned cuvettes or compatible cuvettes should be provided in the package. Should be compatible with the above mentioned specs instrument. Cuvettes should be compatible with the above mentioned specs instrument, in case of separately provided cuvettes	01		
		Accessory for solid sample	A kit to perform all above mentioned measurements for solid sample surfaces. Compatible with the above mentioned cuvettes or compatible cuvettes should be provided in the package. Should be compatible with the above mentioned specs instrument. Cuvettes should be compatible with the above mentioned specs instrument, in case of separately provided cuvettes. In case of unsuitable of main instrument software for solid samples, a separate software compatible for solid samples, compatible with the above mentioned specs instruments should be included in the package.	01		
		Computer with power backup	Specifications as recommended by OEM	01		

			with genuine windows				
		LaserJet Printer	To print the output results	01			
		Power backup with additional Servo Stabilizer	online pure sinewave UPS	01			
			built in AVR capable of regulating ± 30 volts				
			Power factor ≥ 0.95				
			Power backup in case of power failure for at least 30 mins				
			Including lead free Acid dry batteries				
			OR A better alternative as recommended by OEM for optimum operations				
		Warranty	12 Months from the date of installation with vendor having good local reputation with running machines and well-trained engineers				
7	Freeze Dryer	Console Laboratory Freeze Dryer	Upright model capable of removing water and acetonitrile from samples	01			
		Exterior	Upright powder coated stainless-steel				
		Temperature	-55 °C or below				
		Water capture capacity	4 Kg/24 h or above				
		Solvents	Water, acetonitrile				
		Drying Chamber	• 6-12 or more port transparent acrylic drying chamber				
			• Adjustable 4 trays/shelves or more				
			• Polished SS304 stainless steel shelves				
		Condenser	• stainless-steel collector coil condenser				
			• Electric heating defrost				
Cold trap	• Cold trap temperature ≤ -50 °C • Cold trap capacity 5-10 L • Total loading capacity (liquid) 1.2L or better						
Refrigeration system	• Dual 1/3 hp refrigeration compressor • CFC-free						

			<ul style="list-style-type: none"> • Cooling type: Air cooled 				
		Vacuum system	<ul style="list-style-type: none"> • two stage Rotary Vane vacuum pump • Displacement capacity: 80-90 L/min • Ultimate vacuum: \leq 0.002 mBar 				
		Control panel	<ul style="list-style-type: none"> • LCD touch screen display panel • Show operating parameters, set-up parameters and alarm messages • user-configured to display vacuum in mBar, Pa or Torr and temperature in $^{\circ}$ F or $^{\circ}$ C • Display time of refrigeration system operation, time since the refrigeration system was serviced, time of vacuum pump operation and time since the vacuum pump was serviced 				
		Safety controls	<ul style="list-style-type: none"> • Vacuum control option to maintain set point vacuum level • special arrangement for preventing the oil back-streaming into the collector chamber during the power outage • auto restore functions in case of power failure 				
		Electrical requirements	<ul style="list-style-type: none"> • Power supply 20V/50Hz,60Hz (single phase) 				
		Accessories	<ul style="list-style-type: none"> • Freeze drying flasks 100ml (06 Qty) • Cone connectors (06 Qty) • power supply • power stabilizer (01) 				
		Warranty	12 Months from the date of installation				

8	Thermogravimetric Analyzer (TGA)	Purpose	<p>Used to determine characteristics of materials such as Sample Volatility, Moisture Content, Oxidation Stability, Decomposition Temperature and Flammability Studies. It should measure</p> <ul style="list-style-type: none"> • changes in weight in relation to change in temperature extremely precisely and accurately. • The level of inorganic and organic components in materials • Absorbed moisture content of materials, • Determine degradation temperatures of polymers 	01		
		Temperature Range	(from ambient to 1000 °C or more)			
		Temperature Precision	1 °C or better			
		Heating rate	0.1 to 100°C/min or better			
		Sample Weight Capacity	1000 mg or more			
		Weighing Precision	±0.01 % or better			
		Autosampler	<p>For multiple sample analysis</p> <p>Sample position ≥ 20</p>			
		Features	<ul style="list-style-type: none"> • Low Mass Furnace • Hi-Resolution • Modulated Auto-Stepwise • DTA Signal • App-Style Touch Screen • Temperature Calibration • Customizable program with multiple cooling and heating steps 			
Software	<ul style="list-style-type: none"> • Unlimited licenses and free lifetime software upgrades. • Advanced custom analysis with user- 					

			<p>defined variables and models</p> <ul style="list-style-type: none"> • Must be compatible with all provided hardware 			
		Power backup with additional Servo Stabilizer	online pure sinewave UPS	01		
			built in AVR capable of regulating ± 30 volts			
			Power factor ≥ 0.95			
			Power backup in case of power failure for at least 30 mins			
			Lead acid free dry battery (1 year warranty)			
			OR A better alternative as recommended by OEM for optimum operations			
			12 Months from the date of installation with vendor having good local reputation with running machines and well-trained engineers			
		Computer With power backup	<ul style="list-style-type: none"> • Computer compatible with system and recommended by OEM with genuine windows • Laser printer 	01		
		Accessories	<ul style="list-style-type: none"> • Set of standard samples for calibration measurements with purity certificate 	01		
			<ul style="list-style-type: none"> • Aluminum Pans with lids 	50		
			<ul style="list-style-type: none"> • Platinum reusable pans 	03		
			<ul style="list-style-type: none"> • Alumina reusable pans 	10		
		others	Argon gas cylinder with double regulator and certified (pressure rated and tested)	01		
			Nitrogen gas cylinder with double regulator and certified (pressure rated and tested)	01		

			2 stage moisture trappers for gas cylinders	02			
		Installation	Complete Installation, operation, Onsite Training				
		Warranty	12 Months from the date of installation with vendor having good local reputation for providing high quality equipment. Must have well-trained engineers. Engineers must have been trained by the OEM with proof of trainings by the OEM.				
9	Surface area and porosity measurement	General Requirement	System that allows physisorption for specific surface area with single point and multiple points (BET), pore size, pore diameter for mesoporous and microporous materials and DFT calculations etc. Chemisorption with analysis for metal area, crystallite size, active metal dispersion, activation energy, Temperature Programmed Reduction, Temperature Programmed Oxidation, Temperature Programmed Desorption with inbuilt analysis and programmable multiple degassing units	01			
		Operating Specifications	Surface area range :0.01 m ² /g or better				
			Pore Diameter Range: 17-5000 A° or better				
			Pressure range: 0-950 mmHg or more				
			Degassing range: Ambient to 450 °C or more				
			Multiple Physisorption stations with Dewar and elevator				
			High temperature furnace with minimum				

		1100 °C with forced air cooling			
		Multiple gas inputs for different gases			
		Inbuilt programmable degassing stations (2-4 stations or more)			
	Analysis gases	N ₂ , O ₂ , Ar, Kr, CO ₂ , CO, H ₂ , Butane or any non-corrosive gases			
	Available Techniques and Reports:	Physiosorption Report: Specific Surface area (single point and multiple point) Pore volume Pore Size Langmuir plot t-plot DFT Calculations Chemisorption Report: Active metal area dispersion Crystallite Size Monolayer Capacity Activation energy, Temperature Programmed Reduction, Temperature Programmed Oxidation, Temperature Programmed Desorption			
	Oil free Vacuum Pump system	High vacuum with no oil contamination or back streaming	01		
	Regulator Expansion Kit	Expands regulator's single outlet into two (2) outlets, each with an isolation valve.	01		
	Accessories	Surface area reference materials	one		
		Micropore reference materials	one		
		Active surface area reference material	one		
		O-rings compatible with analysis tubes	15		
		Analysis quartz Tubes	10		
		Glass Rods for samples analysis	10		
	Software	Software for Data collection and analysis			
	Computer With power backup	○ Computer Specifications as recommended by	01		

			<p>OEM with Genuine windows</p> <ul style="list-style-type: none"> • Laser printer • Power backup 			
		Gas Cylinders	Helium gas cylinder with double regulator and certified (pressure rated and tested)	01		
			Nitrogen gas cylinder with double regulator and certified (pressure rated and tested)	01		
			2 stage moisture trappers for gas cylinders	02		
		Kit for sample transfer from Degassing unit to Analysis unit under vacuum	Device which enables transfer of physisorption sample tubes while under vacuum from degas to analysis port.	01		
		Installation and Training	1-person advanced training (Operations, Trouble Shooting etc.) at Original Equipment Manufacturer site (travel & accommodation included)			
		Power backup with additional Servo Stabilizer	online pure sinewave UPS	01		
			built in AVR capable of regulating ± 30 volts			
			Power factor ≥ 0.95			
			Power backup in case of power failure for at least 30 mins			
			Including lead Acid free dry batteries			
			OR A better alternative as recommended by OEM for optimum operations			
		Warranty and Services	12 Months from the date of installation with vendor having good local reputation for providing high quality equipment. Must have well-trained engineers. Engineers must have been trained by the OEM with proof of trainings by the OEM.			

10	X-ray Diffracto meter (XRD)	Functional Specifications	<ul style="list-style-type: none"> ▪ Phase identification ▪ Quantitative phase analysis ▪ Crystallinity ▪ Crystallite size & strain ▪ Rietveld refinement ▪ Powders, solids and metals ▪ Structure analysis 	01			
		X-ray Generation	Rated output – 600 W or higher				
			Voltage – up to 30 KV or higher				
			Current – up to 10 mA or higher				
			Tube – Copper radiation				
			Full safety shielding				
		Goniometer	Vertical type - θ - θ or θ -2 θ				
			-3° (or less) to 140° (or higher) 2 θ range				
			Accuracy – 0.02° (2 θ) or better				
		Optics	Fixed/variable Divergence, scatter/anti-scatter, receiving, soller slits				
		Detector	<ul style="list-style-type: none"> ▪ Capable of 0D, 1D & 2D modes ▪ High speed data acquisition 				
		Sample stage	Multipurpose sample stage and holders with zero low background				
		Sample Changer	Multiple position sample changer with sample holders				
Desktop Computer and printer	Specifications recommended by OEM with genuine windows						
Cooling system	In-built or external cooling system (if required) for temperature control. Must provide optimum cooling for operation in local Pakistani conditions.						
Power backup with additional Servo Stabilizer	online pure sinewave UPS						
	built in AVR capable of regulating ± 30 volts						
	Power factor ≥ 0.95						

		<p>Power backup in case of power failure for at least 30 mins</p> <p>Including lead Acid free dry batteries</p> <p>OR</p> <p>A better alternative as recommended by OEM for optimum operations</p>			
	Software for data collection	Needed for data acquisition along with license and installer disk/storage			
	Software for Analysis and Library	<ul style="list-style-type: none"> ▪ Must facilitate peak match and data analysis ▪ PDF4/PDF4+ or higher with 5-year license also required 			
	Rietveld Refinement Software	Required for rietveld refinement of collected data			
	Accessories Required	<ul style="list-style-type: none"> ▪ Sample Holder for powders – 2 or more ▪ Sample holder for solid samples – 2 or more ▪ Reference Sample (1 or more) 			
	Local warranty and Service	12 Months from the date of installation with vendor having good local reputation for providing high quality equipment. Must have well-trained engineers. Engineers must have been trained by the OEM with proof of trainings by the OEM.			
	Installation and Training	1-person advanced training (Operations, Trouble Shooting etc.) at Original Equipment Manufacturer site (travel & accommodation included)			

11	Dynamic Mechanical Analyzer (DMA)	Purpose	To study and characterize materials. It is most useful for studying the viscoelastic behavior of polymers, Dynamic moduli of polymers, Measuring glass transition temperature, Polymer composition, Dynamic stress-strain studies. The system showed be provided with all accessories and liquid nitrogen cooling system	01		
		Temperature range	-150°C- 600°C or better			
		Force range	0.001-10N or better			
		Heating rate	0.1 to 10 °C /min or better			
		cooling rate	0.1 to 10 °C /min or better			
		Force resolution	0.002N or better			
		Modulus range	10 ³ -10 ⁶ or better			
		frequency	0.01 to 100 Hz or better			
		Deformation range	0.005 to 50 or better	01		
		Cooling system	Automatic Liquid nitrogen system for cooling of system with 35 litre stock tank minimum			
		Measurement modes:	Three-point bending Single- and dual cantilever bending Linear shearing Compression /penetration Tension			
		Sample holder accessories	Sample holder accessories For measuring the below properties in light of ISO standards	01 each		
			Three-point bending			
			Single- and dual cantilever bending			
			Linear shearing			
Compression /penetration Tension						
Operation modes	Temperature/frequency sweep					
	Relaxation					
	Isostrain					

			Strain sweep					
			Stress sweep					
		photo accessory	Suitable for use with standard temperature furnace	01				
			Contains UV source					
			Power adapter					
		Calibration sample kit	Calibration sample kits with ISO standards	01				
		Computer and software's	Desktop PC required. Of specifications recommended by Original Equipment Manufacturer. With original windows with full range of software packages and power backup with laser printer	01				
		Gas cylinders	Air gas cylinder with double regulator and certified (pressure rated and tested)	01				
			Helium gas cylinder with double regulator and certified (pressure rated and tested)	01				
			Argon gas cylinder with double regulator and certified (pressure rated and tested)	01				
			Nitrogen gas cylinder with double regulator and certified (pressure rated and tested)	01				
			2 stage moisture trappers for gas cylinders	04				
			Power backup with additional Servo Stabilizer.	online pure sinewave UPS	01			
		built in AVR capable of regulating ± 30 volts						
		Power factor ≥ 0.95						
		Power backup in case of power failure for at least 30 mins						
		Lead acid free dry battery (1 year warranty)						
		OR A better alternative as recommended by OEM for optimum operations						

		Warranty	12 Months from the date of installation with vendor having good local reputation for providing high quality equipment. Must have well-trained engineers. Engineers must have been trained by the OEM with proof of trainings by the OEM.					
		Installation and Training	1-person advanced training (Operations, Trouble Shooting etc.) at Original Equipment Manufacturer site (travel & accommodation included)					
12	Helium Pycnometer	General features	For measuring density and porosity of the samples	01				
			Minimum 05 analysis ports for simultaneous sample preparation and sequential analysis, and automatic repeat measurement mode					
			<ul style="list-style-type: none"> ▪ Capacity: between 1-to 350cc ▪ 4 variable sizes ▪ Calibration standards for each size 					
		Gas compressor	range 1-20 psi	01				
			Joints					
			Traps for moisture					
		Vacuum pump	Upto 20 mbar or better	01				
		Purge modes	Continuous flow with user selectable time and Pulse with user selectable number of pressurization/depressurization cycles					
			Vacuum for user selectable time with automatic valve configuration.					
Temperature Control	Circulator with -20 °C to 150 °C or better							
Operation	Digital display on machine with all important information. Also attachable with computer for data							

			transfer and operation through software.				
		Weighing balance	Sensitivity 0.1 mg	01			
			stander weights for calibration				
			Airproof chamber				
		Accessories	Computer compatible with system and recommended by OEM with genuine windows	01			
			Laser printer	01			
			Installation/ operation / Onsite Training				
		Power backup with additional Servo Stabilizer	online pure sinewave UPS	01			
			built in AVR capable of regulating ± 30 volts				
			Power factor ≥ 0.95				
			Power backup in case of power failure for at least 30 mins				
			Lead acid free dry battery (1 year warranty)				
			OR A better alternative as recommended and provided by OEM for optimum operations				
		others	Helium gas cylinder with double regulator and certified (pressure rated and tested)	01			
			Nitrogen gas cylinder with double regulator and certified (pressure rated and tested)	01			
			2 stage moisture trappers for gas cylinders	01			
		warranty	12 Months from the date of installation with vendor having good local reputation for providing high quality equipment. Must have well-trained engineers.				

13	Differential Scanning Calorimeter (DSC)	Purpose	Use for studying phase transition such as melting, Transitions and exothermic decompositions	01			
		Temperature Range	-170°C or less to 700 °C or more				
		Temperature Accuracy	0.1 °C or better				
		Temperature Precision	0.01 °C or better				
		Heating Rate	(0.01 °C/min or less to 100 °C/min or more				
		Cooling Rate	(0.01 °C/min or less to 100 °C/min or more)				
		Cooling accessory	<ul style="list-style-type: none"> To attain minimum temperature as required (-170°C or less) 				
			<ul style="list-style-type: none"> System based on liquid nitrogen 				
			<ul style="list-style-type: none"> Capacity:35 lite or more 				
		Software	<ul style="list-style-type: none"> Must be compatible with all provided hardware Unlimited licenses and free lifetime software upgrades. 	01			
		computer	Computer compatible with system and recommended by OEM with genuine windows				
		Accessories	Laser printer	01			
			Set of standard samples for calibration measurements (Cp or sensitivity/enthalpy), with purity certificate.	02			
			<ul style="list-style-type: none"> Press and Die Sets Kit 	04			
			<ul style="list-style-type: none"> Aluminium pans and lids 	50			
<ul style="list-style-type: none"> Reusable Alumina pans 	10						
<ul style="list-style-type: none"> Reusable Platinum pans 	03						
<ul style="list-style-type: none"> pans for aqueous solutions 	02						

			<ul style="list-style-type: none"> Pans for samples which react with Aluminum 	02				
			Installation/ operation / Onsite Training	01				
		Power backup with additional Servo Stabilizer	online pure sinewave UPS	01				
			Lead acid free dry battery (1 year warranty)					
			built in AVR capable of regulating ± 30 volts					
			Power factor ≥ 0.95					
			Power backup in case of power failure for at least 30 mins					
			Including lead Acid free batteries					
			OR A better alternative as recommended by OEM for optimum operations					
		others	Argon gas cylinder with double regulator and certified (pressure rated and tested)	01				
			Nitrogen gas cylinder with double regulator and certified (pressure rated and tested)	01				
			2 stage moisture trappers for gas cylinders	01				
		warranty	12 Months from the date of installation with vendor having good local reputation for providing high quality equipment. Must have well-trained engineers. Engineers must have been trained by the OEM with proof of trainings by the OEM.					
14	Fourier transformation infrared spectrometer (FTIR)	Purpose of FTIR	This instrument used infrared light to scan test samples and identify molecular components/ functional groups / and structures of materials	01				
		Components	Sources; Detectors; Beam splitters					
		spectral range	7,500 to 350cm ⁻¹					
		Spectral Resolution	0.2 cm ⁻¹ or preferably better					

		<ul style="list-style-type: none"> ▪ 50,000:1 or better - 1-minute sample measurement, 4 cm⁻¹ ▪ 13,000:1 or better - 5-second sample measurement, 4 cm⁻¹ 			
		Wavenumber accuracy:	0.01 cm ⁻¹ or better		
		Interferometer	Permanently/dynamically aligned		
		Rapid-Scan:	60 spectra /second [@ 16 cm ⁻¹] or better		
		Optics bench	Super Sealed & desiccated and/or purgeable		
		Desiccants Reagent	Two Boxes		
		Multi detector unit	With all requisite accessories to ensure they are mounted and installed completely		
		Automated multi-detector unit (two detectors)	3. DLaTGS detector, Room temperature, Wide range (12,000-350 cm ⁻¹)	01	
			4. MCT Detector, Wide Range non cryogenic or cryogenic (10,000-400 cm ⁻¹) with all requisite accessories including Liquid N ₂ Cool jacket, Transfer Dewar	01	
		Upgradeable system	<ul style="list-style-type: none"> ▪ Mount for InGaAs detector ▪ Attachable to Raman module/component 		
		IR source	Lifetime Infrared Source with 5 years warranty or better		
		Beam-splitter	broadband: 400 cm ⁻¹ [or less] to 10,000 cm ⁻¹ [or more]		
		Diamond ATR Accessory	400 cm ⁻¹ [or lower] to 5000 cm ⁻¹ [or higher]	01	
		Photoacoustic cell	With all requisite accessories	01	
			Carbon reference sample x 1	01	
		Transmission Module	Yes, capable of holding different kinds of flat solid samples,	01	

			membranes, liquid and gas samples. Required with all accessories for quick IR measurements				
		Transmission Kit	<ul style="list-style-type: none"> ▪ Pellet holders ▪ Magnetic holder for films ▪ Clamp holders/windows for different kinds of flat solid samples ▪ Liquid and gas cells ▪ Press and Die Set for use in press (to make discs) 	01			
		Gas Flow & Purging	<ul style="list-style-type: none"> ▪ Nitrogen gas cylinder x 1 ▪ Helium gas cylinder x 1 ▪ All gas cylinders required with double regulator and certification (pressure rated & tested) ▪ All gas lines required with 2 stage moisture trappers ▪ Purge Regulator, tubing and all requisite connectors 				
		standard Spectroscopy software	Multi user license and installation files with free upgrades				
			Atmospheric suppression to remove H ₂ O and CO ₂				
			With infrared spectra library in high resolution format for General Chemicals, polymers, plasticizers, additives etc.				
		Principal component analysis software	For statistical analysis of data				
		Power backup with additional Servo Stabilizer	<ul style="list-style-type: none"> ▪ online pure sinewave UPS ▪ Lead acid free dry battery (1 year warranty) ▪ built in AVR capable of regulating ± 30 volts ▪ Power factor ≥ 0.95 	01			

			<ul style="list-style-type: none"> ▪ Power backup in case of power failure for at least 30 mins ▪ Including lead Acid free batteries <p>OR</p> <ul style="list-style-type: none"> ▪ A better alternative as recommended by OEM for optimum operations 			
		computer	Computer compatible with system and recommended by OEM with genuine windows	01		
		printer	Laser printer	01		
		Warranty	12 Months from the date of installation with vendor having good local reputation with running machines and well-trained engineers			
15	Universal Testing Machine (UTM)	Purpose of the Universal Testing Machine	A tabletop electromechanical universal testing machine capable of testing metals, ceramic and polymers under static uniaxial testing complete with all accessories and grips including power backup. Accuracy of the machine should be according to ISO7500-1	01		
		Load Cell	±100 KN with Valid calibration Certificate ISO17025			
		Force Measuring Accuracy	Grade 0.5			
		Crosshead Speed	0.0005 - 400 mm/min or better			
		Crosshead Repeatability	± 2µm or better			
		Test area height	1500 mm or higher			
		Testing area height between connectors	1300 mm or better			
		Test Area Width	600 mm or higher			
		Load frame stiffness	230 KN/mm or better			

	Testing Mode	Tension, Compression, Bending			
	Power	2.5 kW or less			
	Grips	<ul style="list-style-type: none"> • Round Sample universal grip for variable samples 	1		
		<ul style="list-style-type: none"> • Flat sample grips for metals 	1		
		<ul style="list-style-type: none"> • Grips for polymeric materials self-tightening 	1		
		<ul style="list-style-type: none"> • 3 and 4 point bending fixtures 	1		
		<ul style="list-style-type: none"> • Compression plates 	1		
		<ul style="list-style-type: none"> • Standard sample for calculating machine stiffness of the grips 	1		
	Extensometer	<ul style="list-style-type: none"> • Axial Extensometer clip on gauges for flat sample 	1		
		<ul style="list-style-type: none"> • Axial Extensometer Clip on gauges for rough samples 	1		
	Software	<ul style="list-style-type: none"> • Fully operable through graphical interface. • Complete software with programing option for tailoring the test based on need. • Multiple sequences and program and profile saving options. • Full licensed and free upgradeable 			
	Computer	Computer compatible with system and recommended by OEM with genuine windows	01		

		<p>Power backup with additional Servo Stabilizer</p>	<p>Pure sign wave online UPS power backup suitable to the machine load. Load backup = 10 minutes at full load AVR range = ± 40 Volts Including lead Acid free batteries OR A better alternative as recommended by OEM for optimum operations</p>	01		
		<p>Warranty</p>	<p>12 Months from the date of installation with vendor having good local reputation with running machines and well-trained engineers</p>			
16	Nanoindenter	<p>Purpose of Nanoindenter</p>	<p>It is to be a compact indentation system capable of testing metals, ceramic, polymers and biomaterials. The system should be capable of operation in load control and frequency-based modes. The indentation system should be capable to perform nanoindentation, scratch test with a software-based control for determining mechanical properties in load control and dynamic modes. The instrument should also be capable of determining dynamic mechanical properties of soft materials e.g. biomaterials, tissues and polymers</p>	01		
		<p>Main Features</p>	<p>Actuator Load Range 50 mN to 200 mN</p>			
			<p>Load Resolution 4 nN or better</p>			
			<p>Damping Coefficient 0.05 N-s/m or better</p>			
			<p>Resonant Frequency 100 KHz or Higher</p>			
			<p>Drift Rate 0.05 nm/s or better</p>			
			<p>Displacement Monitoring Linear Capacitive</p>			

			<p>Displacement 50 microns or higher</p>			
			<p>Displacement Resolution 0.004 nm or better</p>			
			<p>Indenter Stiffness 80 N/m or higher</p>			
			<p>Sample Stage X-axis = 75 mm or higher Y-axis = 75 mm or higher Z-axis = 25 mm or higher</p>			
			<p>Optical Colored Videoscope with Digital Zoom 20 to 800x or higher</p>			
		<p>Testing features</p>	<ul style="list-style-type: none"> • Scratch Testing capability 			
			<ul style="list-style-type: none"> • Frequency Specific determination of mechanical properties e.g Storage & loss Modulus of polymers and biomaterials 			
			<ul style="list-style-type: none"> • Constant strain rate testing 			
			<ul style="list-style-type: none"> • Multiple/single actuators for testing all material range if single actuators cant perform dynamic mechanical testing & scratch/wear testing e.g. gels, tissues and polymers, biomaterials and their blends 			
			<ul style="list-style-type: none"> • Fast indentation capability of mapping topographic features of the surfaces (optional) 			
			<p>Setup should be provided with isolation</p>			

			chamber suitable to avoid environmental vibrational and noise effects			
			<ul style="list-style-type: none"> • Berkovich indenter • Cube Corner • Flat punch • Ball indenter 	1 pcs 1 pcs 1 pcs 1 pc		
			<ul style="list-style-type: none"> • Provision of sample holder suitable for testing wet samples e.g. tissues and sample in SBF 	2 pcs		
			Data acquisition rate 1KHz or higher			
			<ul style="list-style-type: none"> • Computer compatible with system and recommended by OEM with genuine windows • Laser Printer 	01		
			<ul style="list-style-type: none"> • Power backup with additional Servo Stabilizer • Pure sine wave online UPS 2 KVA • Output efficiency ≥ 0.95 • AVR range = ± 40 V • Backup time = ≥ 1 hour • OEM, Maintenance free Sealed Lead Acid & Leak Proof Battery or • A better alternative as recommended by OEM for optimum operations 	01		

		Warranty	12 Months from the date of installation with vendor having good local reputation with running machines and well-trained engineers				
17	Screen Printer	General features	To print disposable screen printed electrode on various substrates including pvc, paper, cloth and conducting films	1			
			Automatic feeder with touch control panel / Static eliminator / Auto registration for printing / Auto delivery.				
		Printing area mm	610*610 or better				
		Printing speed	300 p/h or better				
		Screen frame thickness(mm)	20-30 or better				
		Off-contact height (mm)	0.05 – 6 mm or better				
		Squeegee/coater speed (mm/sec.)	0-800 or better				
		Squeegee/coater angle adjustment	22±15° or better				
		Power source (single phase)	220V, 4.5kw				
		Others	Machine body is with powder coating.				
			corrosion and rust resistant printing table				
powder coated body							
capable of printing with variety of inks including composite materials and conducting pastes							
capable of printing on variety of substrates including paper, glass and plastic sheets and cloths							
Safety light barrier							
	Motor controlled in 3 axis movement						

			Touch screen control air pressure for squeegee and flood coater				
		accessories	Squeegee holders 650 mm	1			
			Squeegee holders 550 mm	1			
			Squeegee holders 450 mm	1			
			Flood coater 700 mm	01			
			Flood coater 500 mm	01			
			silver paste	250g			
			Carbon paste	1kg			
		Power backup with additional Servo Stabilizer	online pure sinewave UPS	01			
			built in AVR capable of regulating ± 30 volts				
			Power factor ≥ 0.95				
			Power backup in case of power failure for at least 30 mins				
			Including lead Acid free batteries				
			OR A better alternative as recommended by OEM for optimum operations				
		Warranty	12 Months from the date of installation with vendor having good local reputation with running machines and well-trained engineers				
18	Field Emission Scanning Electron Microscope (FE-SEM)	Scope	The Field-emission scanning electron microscope With EBSD must be capable of use in variable pressure, with low and high vacuum mode with suitable detectors along with analytical capabilities of chemical and structural properties (optional). The equipment must be complete in all aspect including water chiller, power backup, gas cylinder/s with regulators and moisture filters and compressor system if required for its operation.	01			

	Electronic Features	Electron Gun	Schottky Thermal Field Emitter		
		Resolution	High Voltage @ 15 KV (0.8 nm or better)		
			Low Voltage @ 1 KV (1.5 nm or better)		
			STEM @ 30KV (0.8 nm or better)		
			Low Vacuum (1.5 nm or better)		
		Accelerating voltage	0.2 to 30kV (or better)		
		Probe Current	Up to 100 nA or higher		
		Magnification	10 to 1,000,000 x or better		
	Vacuum System	Low vacuum range	133 Pa or higher pressure	01	
		Vacuum System	Oil Free		
	Specimen Stage	Eucentric Stage	<ul style="list-style-type: none"> ▪ Fully motorized ▪ X = 100 mm or more ▪ Y = 100 mm or more ▪ Z = 50 mm or more ▪ Rotation = 360° continuous, ▪ Tilt = -4° to +70° or wider 		
	Ports & Detectors	Ports	Minimum 10 or more		
		Column	InLens and In-column detection with multiple detectors including InLens SE and BSE (electrostatic and magnetic field free)		
Cameras		<ul style="list-style-type: none"> ▪ For Sample view (& stage navigation) with display on the SEM display monitor ▪ For internal chamber view with display on the SEM display monitor 			
Detectors		InLens SE detector/detectors			
	Inlens BSE detector				

			<p>In chamber SE detector for high vacuum</p> <p>Low vacuum in chamber SE detector or comparable alternative</p> <p>Retractable solid-state segmented BSD detector for low and high vacuum</p> <p>Retractable STEM Detector (bright-field, dark-field and high-angle dark-field modes)</p>			
	Software	Image Acquisition	<ul style="list-style-type: none"> ▪ Multidetector image capture at single instance in multiple resolutions ▪ Live video acquisition options ▪ Drift corrected Frame Image acquisition 			
		Acquisition Software	<ul style="list-style-type: none"> ▪ Fully customized software for user specific routines ▪ Suitable CPU with monitors & keyboards and mouse/trackball. 			
	EDS	EDS Detector	<ul style="list-style-type: none"> ▪ EDS (100 mm² or better active area), 129 eV or better, capability to Automatically record live processing ▪ Low acceleration voltage capability ▪ Input count rates 800,000 cps or better 			
		Acquisition Software	<ul style="list-style-type: none"> ▪ Fully licensed software with built-in library for elemental and compositional analysis ▪ Complete with installation CDs/drives 			
	EBSD	EBSD Detector	<ul style="list-style-type: none"> ▪ Acquisition speed of up to 400 fps or better ▪ Diffraction pattern image resolution 300 x 200 pixel or better ▪ EBSD workstation for fast data storage and acquisition 	01		

			Software	<ul style="list-style-type: none"> Fully licensed software with built-in library for structural and crystallographic analysis 				
			Power backup with additional Servo Stabilizer	<ul style="list-style-type: none"> 10KVa pure sine wave UPS with isolation transformer or better Built in AVR ± 40 V Lead acid free dry batteries from UPS OEM Overtoltage protecting relay Voltage surge protection relays Phase sequencer for automatic phase sequencing one-year warranty with minimum 30 mins backup to all system including instrument, computer etc. <p>OR</p> <ul style="list-style-type: none"> A better alternative as recommended by OEM for optimum operations. 	01			
			Workstations	<ul style="list-style-type: none"> Suitable Workstations for FE-SEM operation, EDS Analysis or any other application. If any aspect requires additional workstations, they should be included 	01			
			Accessories	<ul style="list-style-type: none"> Extra Schottky Thermal Field Emitter 	01			
				<ul style="list-style-type: none"> Double sided Carbon tape 	10			
				<ul style="list-style-type: none"> Silver paste bottles 	5			
				<ul style="list-style-type: none"> Set of standard samples for EDS detector calibration (gold, copper, platinum standards) 	1 each			
				<ul style="list-style-type: none"> Set of all replaceable vacuum o-rings 	1 set			
				<ul style="list-style-type: none"> Vacuum grease 	5 units			

			<ul style="list-style-type: none"> • Sample holder for multiple specimen stubs 5 • SEM stubs 50 ▪ Set of stainless-steel and polymeric forceps 1 pack ▪ Gas cylinder with certified regulator along with moisture filters 1 ▪ Air compressor if required 1 ▪ Chiller, if required for operations 1 				
		<p style="text-align: center;">Warranty & Others</p>	<ul style="list-style-type: none"> ▪ 1-year standard warranty ▪ Enabled with Remote Access feature for troubleshooting and identification of the routine problems ▪ Installation, operation & onsite demonstration of all capabilities with on-site training ▪ 1-person advanced training (Operations, Trouble Shooting etc.) at Original Equipment Manufacturer site (travel & accommodation included) 				
<p style="text-align: center;">18.1</p>	<p style="text-align: center;">Field Emission Scanning Electron Microscope (FE-SEM)</p>	<p style="text-align: center;">Scope</p>	<p>The Field-emission scanning electron microscope must be capable of use in variable pressure, with low and high vacuum mode with suitable detectors along with analytical capabilities of chemical and structural properties (optional). The equipment must be complete in all aspect including water chiller, power backup, gas cylinder/s with regulators and moisture filters and compressor system if</p>	<p style="text-align: center;">01</p>			

			required for its operation.			
	Electronic Features	Electron Gun	Schottky Thermal Field Emitter			
		Resolution	High Voltage @ 15 KV (0.8 nm or better)			
			Low Voltage @ 1 KV (1.5 nm or better)			
			STEM @ 30KV (0.8 nm or better)			
			Low Vacuum (1.5 nm or better)			
		Accelerating voltage	0.2 to 30kV (or better)			
		Probe Current	Up to 100 nA or higher			
		Magnification	10 to 1,000,000 x or better			
	Vacuum System	Low vacuum range	133 Pa or higher pressure			
		Vacuum System	Oil Free	01		
Specimen Stage	Eucentric Stage	<ul style="list-style-type: none"> ▪ Fully motorized ▪ X = 100 mm or more ▪ Y = 100 mm or more ▪ Z = 50 mm or more ▪ Rotation = 360° continuous, ▪ Tilt = -4° to +70° or wider 				
Ports & Detectors	Ports	Minimum 10 or more				
	Column	InLens and In-column detection with multiple detectors including InLens SE and BSE (electrostatic and magnetic field free)				
	Cameras	<ul style="list-style-type: none"> ▪ For Sample view (& stage navigation) with display on the SEM display monitor ▪ For internal chamber view with display on the SEM display monitor 				

			<p>InLens SE detector/detectors</p> <p>Inlens BSE detector</p> <p>In chamber SE detector for high vacuum</p> <p>Low vacuum in chamber SE detector or comparable alternative</p> <p>Retractable solid-state segmented BSD detector for low and high vacuum</p> <p>Retractable STEM Detector (bright-field, dark-field and high-angle dark-field modes)</p>			
	Software	Image Acquisition	<ul style="list-style-type: none"> ▪ Multidetector image capture at single instance in multiple resolutions ▪ Live video acquisition options ▪ Drift corrected Frame Image acquisition 			
		Acquisition Software	<ul style="list-style-type: none"> ▪ Fully customized software for user specific routines ▪ Suitable CPU with monitors & keyboards and mouse/trackball. 			
	EDS	EDS Detector	<ul style="list-style-type: none"> ▪ EDS (100 mm² or better active area), 129 eV or better, capability to Automatically record live processing ▪ Low acceleration voltage capability ▪ Input count rates 800,000 cps or better 			
		Acquisition Software	<ul style="list-style-type: none"> ▪ Fully licensed software with built-in library for elemental and compositional analysis ▪ Complete with installation CDs/drives 			
		Power backup with additional Servo Stabilizer	<ul style="list-style-type: none"> ▪ 10KVa pure sine wave UPS with isolation transformer or better ▪ Built in AVR ±40 V 	01		

		<ul style="list-style-type: none"> ▪ Lead acid free dry batteries from UPS OEM ▪ Overvoltage protecting relay ▪ Voltage surge protection relays ▪ Phase sequencer for automatic phase sequencing ▪ one-year warranty with minimum 30 mints backup to all system including instrument, computer etc. <p>OR</p> <ul style="list-style-type: none"> • A better alternative as recommended by OEM for optimum operations. 				
	Workstations	<ul style="list-style-type: none"> ▪ Suitable Workstations for FE-SEM operation, EDS Analysis or any other application. If any aspect requires additional workstations, they should be included 	01			
	Accessories	<ul style="list-style-type: none"> • Extra Schottky Thermal Field Emitter • Double sided Carbon tape • Silver paste bottles • Set of standard samples for EDS detector calibration (gold, copper, platinum standards) • Set of all replaceable vacuum o-rings • Vacuum grease • Sample holder for multiple specimen stubs • SEM stubs ▪ Set of stainless-steel and polymeric forceps ▪ Gas cylinder with certified regulator 	<p>01</p> <p>10</p> <p>5</p> <p>1 each</p> <p>1 set</p> <p>5 units</p> <p>5</p> <p>50</p> <p>1 pack</p> <p>1</p>			

			<p>along with moisture filters</p> <ul style="list-style-type: none"> ▪ Air compressor if required ▪ Chiller, if required for operations 	<p>1</p> <p>1</p>			
		Warranty & Others	<ul style="list-style-type: none"> ▪ 1-year standard warranty ▪ Enabled with Remote Access feature for troubleshooting and identification of the routine problems ▪ Installation, operation & onsite demonstration of all capabilities with on-site training ▪ 1-person advanced training (Operations, Trouble Shooting etc.) at Original Equipment Manufacturer site (travel & accommodation included) 				
19	Freeze Dryer	<p>Purpose of the Benchtop Laboratory Freeze Dryer</p> <p>Exterior</p> <p>Temperature</p> <p>Water capture capacity</p> <p>Freeze drying time</p> <p>Solvents</p> <p>Drying Chamber</p> <p>Condenser</p> <p>Cold trap</p>	<p>Compact benchtop model capable of removing water, acetonitrile, ethanol and methanol from samples</p> <p>Powder coated stainless-steel</p> <p>-85 °C or below</p> <p>4 Kg/24 h or above</p> <p>24 h</p> <p>Water, acetonitrile, methanol, ethanol</p> <ul style="list-style-type: none"> • Stainless steel drying chamber • Transparent acrylic lid for connection of drying chamber • Adjustable 4 trays/shelves • Polish SS304 stainless steel shelves • stainless-steel collector coil condenser • Electric heating defrost • Cold trap temperature ≤ -50 °C 	02			

			<ul style="list-style-type: none"> • Cold trap capacity 5-10 L • Total loading capacity (liquid) 1.2L 			
		Refrigeration system	<ul style="list-style-type: none"> • Dual 1/3 hp refrigeration compressor • CFC-free • Cooling type: Air cooled • Refrigerant: R600a+R290+R23 			
		Vacuum system	<ul style="list-style-type: none"> • two stage Rotary Vane vacuum pump • Displacement capacity: 80-90 L/min • Ultimate vacuum: \leq 0.002 mBar 			
		Control panel	<ul style="list-style-type: none"> • LCD touch screen display panel • Show operating parameters, set-up parameters and alarm messages • user-configured to display vacuum in mBar, Pa or Torr and temperature in $^{\circ}$ F or $^{\circ}$ C 			
		Safety controls	<ul style="list-style-type: none"> • Vacuum control option to maintain set point vacuum level • special arrangement for preventing the oil back-streaming into the collector chamber during the power outage • auto restore functions in case of power failure 			
		Electrical requirements	<ul style="list-style-type: none"> • Power supply 220V/50Hz,60Hz (single phase) 			
		Accessories	<ul style="list-style-type: none"> • Freeze drying flasks 100ml (06 Nos) 			
		Warranty	<ul style="list-style-type: none"> • 12 Months from the date of installation with vendor having good local reputation with running machines and well-trained engineers 			

20	Fatigue Testing Machine	Purpose of the Fatigue Testing Machine	Multipurpose bi-axial servo-hydraulic fatigue testing system with axial/torsion drive for static and dynamic tests in axial and torsional mode. The machine should meet conditions for fatigue testing of Hip Stem Fatigue, Dental Implant Wear, Spinal Vertebrectomy implants, Prosthetic limbs implants as per relevant ISO standard. Materials to be used will be metals, ceramics, polymers and composites. The machine should include all accessories required for its operation e.g. chillers and power backup. The software should have built-in programs examples to test implants according to ISO7206-4, ISO7206-6, ISO 12189, ASTM F2193, ASTM F1798.	01		
		Load Cell	10 kN according to EN-ISO 7500-1 class 0.5 with valid calibration Certificate			
		Axial Dynamic Performance	30 Hz @ ± 3 mm or better			
		Torsion Dynamic Performance	10Hz @ 3° or better			
		Mode of operation	Electrically powered with integrated servo-hydraulic			
		Test area height	1200 mm or above			
		Testing actuator stroke	100 mm or better			
		Displacement/Deformation Accuracy	As per EN 10002-4			
		Torsion fatigue capacity	100 N/m or above			
		Torsion	Total 100° or better			
		Testing Mode	Tension, Compression, Axial Fatigue & Torsion Fatigue			

		Wave Forms Capability	Ramp, Holding, Sinusoidal, Triangular, Square, Trapezoidal, virtual channels etc. in both axial and torsional axes				
		Phase Angle	Axial and torsional waveform superposition in both in-phase and out of phase. Provision available for conducting test at any quadrants of cycles				
		Testing bed	T-Slot platen base platform for easy mounting of different jigs.				
		Grips	Compression plates	1 set			
	Standard tensile grips for flat and round samples (suitable upto 10kN)		1 set				
	3 & 4 point bending fixtures		1 set				
		Chiller	To provide cooling to hydraulic system (if required)	1			
		Standard Tool Kit	For regular inspection and maintenance	1			
		Power backup with additional Servo Stabilizer	Pure sign wave online UPS power backup suitable to the machine load. Load backup = 10 minutes at full load AVR range = ± 40 Volts Lead acid free dry batteries OR A better alternative as recommended by OEM for optimum operations	1			
		Training	1-person advanced training (Operations, Trouble Shooting etc.) at Original Equipment Manufacturer site (travel & accommodation included)	1			
		Warranty	12 Months from the date of installation with vendor having good local reputation with running machines and well-trained engineers				

Special Terms and conditions:

- i. Please submit the technical and financial bid (rates) on our prescribed BoQs Form and clearly mention the quoted model / brands, with complete terms and conditions signed, stamped with both bids, otherwise your bid (s) may be rejected.
- ii. Vendor will be responsible for Onsite Installation, Commissioning & Training of the delivered equipment's.
- iii. CUI Lahore campus prefers to procure item at Sr.# 18 i.e. FE-SEM with EBSD. However, in case, the cost of quoted item at Sr. # 18 exceeds the budget limitations, CUI may opt for item at 18.1 i.e. FE-SEM without EBSD.
- iv. Purchase / work order (s) will be awarded on **Item wise Basis.**
- v. Kindly attach the **Tender fee with Technical Bid** and **Bid money / CDR with Financial Bid.**
- vi. **Multiple rates of an item may also lead to the rejection of bid / item.**