

# TEZPUR UNIVERSITY

(A Central University)

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## Notice Inviting Quotations

TU/11-24/Pur/Qtn/2015/ *1780-A* Dt.- *30.07.2018*

Sealed quotations are invited from reputed manufacturers/ authorized dealers etc. for supply and installation of following equipment-

- 1) Equipment-Electrospinning unit, Table Top Refrigerated centrifuge, Laboratory Fume Hood, Digital Mass Flow controller, Rotameter, Probe Sonicator, Vacuum Oven, Freeze Dryer, Digital Oscilloscope, High voltage probe and Current probe for **SERB DST sponsored project of Dr. Arup Jyoti Choudhury, Dept. of Physics.**
- 2) Rotary Vacuum Evaporator for SERB project of **Dr. R. C. Deka, Dept. of Chemical Scs.**
- 3) Equipment-Photoresist Spin coating System, pH meter, UV Vis spectrophotometer and Multimeter for **DoRD project work of Poonam Mishra, Dept. of Food Engineering and Technology.**
- 4) UV-VIS Double Beam Spectrophotometer for DRDO project of Dr. S.C. Deka, Department of Food Engineering Technology (**Re-tendering against our earlier notice no.-TU/11-24/Pur/Qtn/2018-19/608-A, dt-9/5/18**, the earlier participant can submit their fresh offer, however they need not submit the EMD and Tender fee again)

Quotation should be submitted in the Drop Box/ Tender Box placed in the reception area of the Administrative building of this University within **3:00 PM of 30/08/18**. If posted/ couriered, should reach within the specified time and date, addressed to "The Assistant Registrar-GA, Tezpur University". The quotation notice number and date should clearly be mentioned in the envelope containing the quotation. The quotations will be opened on the **same day at 3:30 PM**.

Specifications are enclosed herewith

### Terms & Conditions

1. No. separate tender paper will be issued from the office; one should download the specifications/List of items from the website.
2. The rates should be preferable quoted in Indian Rupees (FOR). Charges for clearing and transportation will be liabilities of the supplier.
3. Quotations should be accompanied by i) An EMD(in the form of Demand Draft/ Call deposit/TDR) of Rs. 5,000/-, drawn in the name of Registrar, Payable at Tezpur(Earlier deposited EMD will not be considered).  
ii) A non-refundable tender fee of Rs. 1,000/-(Demand Draft only).
4. The rates should be exclusive of taxes and the applicable tax should clearly be mentioned.
5. Quoted rates should be valid preferably for a period of 01 year.
6. The rates should be quoted along with supporting documents of specifications and technical features and list of users.
7. Details of availability of after sales support will have to be furnished. After sales support directly from manufacturer and from Assam(Guwahati/Tezpur) will be preferred.
8. The University is exempted from paying Custom and Excise duty(Registered under DSIR, Govt. of India)

9. Proprietary items should be quoted along with sole Manufacturer/ Distributorship certificate.
10. Warranty/ Guarantee period should be specifically mentioned in the quotation.
11. No advance payment will be made. However, for foreign supplier, advance payment will be made either by FDD/Wire transfer/LC. In such cases 10% performance Bank Guarantee should be submitted before issuing FDD/Wire Transfer/LC, covering the Warranty period.
12. The University reserve right to accept or reject any or all the quotation without assigning any reason.
13. Application for releasing the EMD should be submitted to the Registrar or Joint Registrar.
14. Authorization/Dealership certificate of the Company whose product has been quoted has to be provided.

  
(P. Borah) 30/7/18  
Asstt. Registrar

- Copy to: 1) Webmaster, Tezpur University for uploading the notice in T. U. Website.  
2) Dr. Arup Jyoti Choudhury, Dr. R. C. Deka, Dr. Poonam Mishra and Dr. S. C. Deka for information.  
3) Concerned file.

  
Asstt. Registrar 30/7/18

सहायक कुलसचिव (सा.प्र.)  
तेजपुर विश्वविद्यालय  
Assistant Registrar (GA)  
Tezpur University

## 1. Electrospinning unit

### Technical Specifications:

Spinning Arrangement : Horizontal and vertical

: Co-spinning "Both side horizontal"

High Voltage power supply Specifications: Input voltage: 210-240 VAC, 50/60 Hz

- Voltage range: 0-40 KV, 20W

- Output current range: 0 to 400  $\mu$ A

Control: Microprocessor based controller system

Safety: Overload trip- unit shut down if current exceeds 20% of the maximum output current,

Built-in Arc Protection Circuit, Residual Charge Discharge Stick

Syringe pump: two channels, Microprocessor based operation for precise flow control,

Infusion/withdrawal pumping system, Volume and Time control

Flow rate: 0.1  $\mu$ l/min to 3 ml/min

Chamber: halogen lighting, transparent door for monitoring electrospinning process

Collector: Stationary collector (surface area of 150 mm x 150 mm)

Drum collector two sides spinning (maximum 5000 RPM)

Rotating Thin Disc (for preparing highly aligned nanofibers, 10-5000 RPM)

Rotating collector for preparing twisted fiber yarn (10-5000 RPM)

Spinneret: Single Nozzle (Compatibility with standard needles)

Multi-nozzle (should have high fiber fabrication output covering maximum total surface area of 150 mm  $\times$  150 mm, must have access for easy cleaning,

Compatibility with standard needles)

Coaxial Nozzle (must have access for easy cleaning, Compatibility with standard needles)

Linear Stage control: X axis switch automated control

Y axis Oscillation

Z axis manual control (Horizontal)

Control panel

- Computer control operation (User friendly software with PC interfacing)

- Power light

- Main emergency stop button
- ON/OFF button
- Speed controller
- Exhaust Fan

Computer: Laptop with pre-installed software

## 2. Table Top Refrigerated Centrifuge

### Technical Specifications:

**Maximum Speed:** 12,000 rpm and 18000-20000g. Short spin key with selectable rotational speed.

Must be able to maintain at 4°C at max. speed

**Timer:** 0 to 99 min

**Temperature Control Range:** -10 °C to 40 °C. It should have CFC free refrigerant with an ozone depletion potential (ODP) of zero. Centrifuge must have a function for fast cooling. Must be able to maintain at 4°C at max. speed

### Rotors

Fixed Angle Rotor for 1.5/2 ml micro centrifuge tubes

Fixed Angle Rotor for 15 ml/50 ml centrifuge tubes

Rotor should be made of chemical resistant material (metallic/anodized aluminum)

**Motor:** Brush-less induction motor (maintenance free drive) with automatic Rotor recognition and speed limitation.

Automatic rotor imbalance detection with cutoff.

Over current overheating safety cutoff.

Low noise levels less than 63db at max speed

Must follow safety standards set by IEC 1010-2-020

Centrifuge should be IVD (In-vitro diagnostic) certified.

Built-in condensation drains to eliminate accumulated water

**Power requirements:** 230 VAC, 50/60 Hz, if stabilizer is required it must come with the instrument.

**Warranty:** 3 years warranty from installation and on-site repair services as and when required.

### 3. Laboratory Fume Hood

**Usage:** Regular usage in general chemistry

**Technical Specifications:**

**Overall dimensions with base cabinet (Exterior):** 1220 mm W X 762 mm D X 1830 mm H

**Fume hood dimensions (Exterior):** 1220 mm W X 762 mm D X 1067 mm H

**Fume hood dimensions (interior):** 991 mm W X 750 mm D X 762 mm H

**Base cabinet dimensions (Exterior):** 1220 mm W X 610 mm D X 762 mm H

**Sash arrangement:** Vertical rising sash, toughened float glass (thickness = 5 mm)

**Work top:** Chemical resistant splash & spillage proof dished 'Jet Black Granite' worktop (18 /19 mm thick). Skirting of 15 mm from all sides for no chemical spillage.

**Sink, water tap with drain arrangement:** Worktop will have sink sealed with silicon sealant for drainage with water tap on left front side of worktop

**Powder coating:** Pre-treated with 8 tank chemical processes and powder coated with highly chemical resistant epoxy colors having dry film thickness of 70 to 80 microns.

**Material for construction of superstructure:** Galvanized Iron (GI) as per IS 277: 2003 standard sheet metal paneling –thickness:  $1.0 \pm 0.1$  mm

**Airfoil:** Aerodynamic design

**Design Structure:** Aerodynamic, Floor mounted

**Wet & Dry Service valves:** Remotely operated colour coded Brass Needle Valves for fine control over utilities. Total 3 nos. service valves with PU plumbing with 6 mm internal dia, withstands up to 5 kgf pressure

- 1 for Raw water (PU)
- 1 for Nitrogen(PU)
- 1 for Vaccum (Teflon)

**Internal nozzles:** Brass powder coated fittings should be staggered in the fume hood to avoid the intermingling of the flexible hoses on the back wall. Also the taps should be tapered in shape to use with flexible tubing of sizes from ¼” to ½” in dia

**Electrical utilities:** Five in numbers, 5/15A 3-pin socket with MCB. Cables & wires 'Fire Retardant' grade

**Lighting:** Fluorescent light (40 watt) with vapor proof fitting

**Built-in Starter:** The electrical wiring will have built-in starter of “Telemecanique” make; suitable to blower motor capacity. Starter should not be mounted on the wall and it should be part of the fume hood wiring itself.

**Chemical Storage Base Cabinet:**

Base cabinet should be ready to receive the fume hood at its top. It should have following features:

- Complete rigid steel structure to support Fume hood
- Epoxy powder coated
- Cabinet Integral work walls should be special chemical and heat resistant, smooth finish, easily cleanable panels should be made of phenolic resin laminated sheets
- One removable horizontal partition to store chemicals
- Double skin hinged doors
- Latching System for the Base Cabinet doors
- Polypropylene trays for chemical storage

**Level adjusting screws:** Made of SS Bolts to adjust the fume hood level by  $\pm 10$  mm.

**Design Basis:**

American Design Standard: ASHRAE11- 1995. All tests including “Tracer gas containment test” should be passed.

European Design Standard: EN-14175- 2003 ‘Inner Plane Containment test’ should be passed. Both standards complete test report should be given.

**Exhaust Port:** Unique exhaust port design should ensure that the fumes be exhausted smoothly without any turbulence at the exhaust port. Also, it should ensure low noise level. Noise Level < 70db at 1 meter from fume hood.

**Blower /Exhaust specifications:**

**Construction:** SISW type, chemical & heat resistant PP + FRP blower with aerodynamically balanced PP impeller, with drain plug.

**Type:** Direct drive

**Motor:** ‘Crompton / LHP/Other Reputed’ make, 1 HP Motor 3 Phase TEFC, IP 55, Class F, continuous rating.

**Noise level:** < 70 decibel at 1 meter from fume hood

**Ducting:** Chemical resistant tube of 200-250 mm diameter, Duct collar: molded PP construction; rigid & flexible ductwork from Fume Hood to exhaust stack point with weatherproof canopy.

**Installation:** It will be carried out by skilled team with ductwork design, fitting, fixing of blower, commissioning & testing of the same at a fixed extra cost. Civil and plumbing work should be carried out by the same team at a fixed extra cost.

**Warranty:** 3 years comprehensive warranty from the date of installation.

#### **4. Digital mass flow controller**

**Technical Specifications:**

Argon (Ar): 0-5 slpm

Oxygen (O<sub>2</sub>): 0-5 slpm

Housing Material: 316 stainless steel

Seals: Viton-A seals

Fittings: ¼ inch compression fitting

Display: LCD display (0-5V DC)

Power supply: 230 VAC, 50/60 Hz Indian standard plug 12 VDC

#### **5. Rotameter (Variable Area Flow Meters)**

**Technical Specifications:**

Number of Tubes: 03

Gases: Argon, Oxygen, Helium

Flow rate: 0-5 slpm for each gas

Housing Material: Stainless Steel

Valve: Needle valve (inlet)

Seals: Viton-A

Fittings: ¼ inch compression fitting

#### **6. Probe sonicator**

**Technical Specifications:**

- Watts: 700-750 W

- Operating Frequency: 20 KHz
- Operation should be microprocessor based
- Amplitude control - from 10% or less to 100 % in increments of 1% or less
- Operating sample volume ranges (1) 5-50 mL and (2) 50-250 mL
- Appropriate Probes must be supplied for these volume ranges
- Converter, tool kit, power cord and other required accessories must be included
- Display: LCD or Touch Screen
- Power: 230 VAC, 50/60 Hz
- Should have Integral temperature controller and memory to prevent overheating of the sample by terminating the ultrasonic when the sample reaches a predetermined temperature limit
- Protection - Should have overload protection
- Certification - All parts and the assembly thereof should be CE compliant.
- Should have user-friendly menu
- Warranty: 3 years
- The quoted system should be certified as complete for carrying out the following experiments:  
Cell disruption, dispersing materials including nanomaterials such as carbon nanotubes, metal nanoparticles etc.

**Accessories**

1. Sound Proof Box made up of corrosion resistant durable materials, with transparent windows to see the reaction
2. Jack stand to be used inside the sound proof box
3. Microtip made of inert and durable materials such as titanium, sapphire etc. for processing ranges (1) 5-50 mL and (2) 50-250 mL
4. All necessary accessories such as wrenches, power cables, etc. should be quoted

**Optional accessories**

1. Temperature probe and feedback control using temperature probe
2. Probe for volume range 250-1000 ml



## 7. Vacuum Oven

### Technical Specifications:

- Size: Bench top Vacuum Oven, internal dimension: 300 mm × 300 mm × 300 mm
- Capacity: 15 Liters
- Vacuum range: Atmospheric pressure -  $10^{-2}$  torr or less
- Chamber: Square chamber, Rust proof and efficient Stainless-Steel Interior & Isolated Stainless-Steel Interior & Isolated Electronics.
- Number of selves: 02
- Selves material: stainless steel
- Working temperature range: 40-180 °C (temperature accuracy of  $\pm 1$  °C or better)
- Vacuum/Gas tubing connection: Stainless steel
- Insulation material: Mineral wool
- Safety: Built-in-circuit breaker, Over temperature protector
- Temperature controller: Microprocessor Based PID Digital Temperature Indicator-Cum-Controller
- Valves: Brass Valves with Teflon Seats on valves
- Air vent facility: Yes
- Vacuum connector: KF25 Flange
- Observation window: Tempered Glass
- Door gasket: Interchangeable door Gasket design, High temperature silicone rubber
- Electrical connection: 230 VAC, 50/60 Hz, Single Phase
- Vacuum Gauge: Analogue
- Pump: Oil rotary vacuum pump with a speed of 100-150 L/min, pump rotational speed: 1400 rpm, motor power 500W (220 V AC, single phase, 50/60 Hz), capability to generate ultimate vacuum of  $10^{-3}$  torr or better.

## 8. Freeze dryer (Lyophilizer)

### Technical Specifications:

- Collection chamber and condenser made of High-grade Stainless steel (Suitable for handling aqueous, organic, and inorganic solvent-based samples)

- Condenser chamber capacity: ~ 2-3 L
- Condenser temperature: approximately -85°C
- Performance: Ice removal capacity of 2 liters in 24 hours or higher capacity
- Vacuum Pump: A suitable low-decibel direct driven oil sealed vacuum pump with a suction capacity of ~90-100 liters/min or more; power-230 VAC, 50/60 Hz along with vacuum Sensor control
- Vacuum control for optimization/reduction of process times through electromagnetic pressure control valve to reduce drying process time.
- The vacuum pump should be resistant and able to handle drying of aqueous as well as organic solvent based samples (for example organic solvents like acetonitrile)
- The vacuum pump should have replaceable emission traps/exhaust filter that can trap oil mist and odors. Vacuum pump should have vacuum oil anti-backflow system.
- The vacuum pump should be supplied with all necessary vacuum hoses and connectors.
- Vacuum grease should be provided Also, extra vacuum oil, enough for two oil replacements, should be included.
- Acrylic chamber to visually see the product when drying in trays, with a minimum of 8 ports externally and with at least three shelves including a base plate for product drying inside the drying chamber.
- There should be rubber valves for connecting flasks to drying chamber and adaptors/caps and filters for at least eight ports including any accessories required to connect these flasks. • Flask capacities and numbers: 50 ml (4 numbers), 100 ml (2 numbers), 250 ml (2 numbers)
- Monitoring system should have real-time digital display of processing parameters such as vacuum pressure, cold trap temperature, sample temperature, etc.
- Easily accessible ice condenser, simple facilities for defrosting, cleaning and decontamination
- Shall have a clear warning alarm when the system operates at suboptimal parameters. • Automatic start-up switch with manual override option.
- Electric power: 230VAC, 50/60 Hz
- Free Installation. Free of charge training of students in equipment maintenance by the certified company engineers during the warranty period at Tezpur University.

## **9. Digital Oscilloscope**

### **Technical Specifications:**

- Digital Storage, 200MHz, 4 Isolated Channels, TFT Color Display, Certificate of Traceable Calibration Standard
- Bandwidth: 200MHz
- Input Impedance: 1 M $\Omega$
- Rise time: 2-3 ns
- Sample rate per channel: 1-2 GS/s
- Trigger modes: Auto, Normal, Single Sequence
- Display type: 1/4 VGA Active TFT Color LCD display
- Power source: AC adapter with Indian power cord (230V, 50/60 Hz)
- Safety: UL61010-1: 2004. CAN/CSA22.2 No. 1010.1: 2004. EN61010-1: 2001.
- Warranty: Three-year warranty

### **Accessories,**

1. Front protective cover
2. Printed user manual (English only)
3. Installation and safety manual
4. AC adapter with power cord
5. USB to RS-232 cable
6. Open Choice<sup>®</sup> PC connectivity software
7. NI Signal Express<sup>™</sup> Tek Edition software
8. NIM/NIST-Traceable Certificate of Calibration

## **10. High voltage probe**

### **Technical Specifications:**

- Probe: High-Voltage Passive Probe with compensation box (7-49 pF compensation range) and 1000X probe attenuation (100 M $\Omega$ , 3.0 pF)
- Cable: 10-ft cable and 1000X readout
- Bandwidth: 75 MHz
- Maximum input voltage: up to 40 kV (DC + peak AC)

- Input resistance/capacitance: 100 M $\Omega$ /3 pF
- Warranty: Three-year warranty

**Accessories:**

1. Ground lead and plug-on clip
2. Hook shaped probe tip
3. Banana-plug probe tip
4. Carrying case
5. Instruction manual

**11. Current probe**

**Technical Specifications:**

- Frequency range: 5 Hz to 50 kHz
- Maximum input current: 2000 A peak
- Output: 1 mV/A, 10 mV/A, 100 mV/A
- Termination: BNC
- Maximum bare-wire voltage: 600 V (CAT III)
- Safety: UL3111-2-032, CSA1010.2.032, EN61010-2-032, IEC61010-2-032
- Warranty: Three-year warranty

**Accessories:**

Adapter, lead; 18 AWG with dual insulation, BNC, female  $\times$ 4 mm dual insulation; banana jack plug

## Technical Specifications

### 1. UV-VIS double beam spectrophotometer

- Optical design Double-beam with sample and reference cuvette positions with Czerny Turner Monochromator with suitable branded PC
- Spectral Bandwidth: 0.20 – 4.00 nm, 0.1 nm steps, motor-driven
- Detector: Dual Silicon Photomultiplier
- Wavelength range: 190–900 nm
- Wavelength Accuracy:  $\pm 0.02$  nm at 656.1 nm and  $\pm 0.04$  nm at 486.0 nm
- Wavelength reproducibility :  $< 0.01$  nm
- Photometric accuracy ( NIST 930D filters at 1 Abs ) :  $\pm 0.003$  Abs or better
- Scanning Speed: Min. 3000 nm/min
- Photometric Range:  $>4$  Abs or better
- Photometric Display:  $\pm 9.9999$  Abs or better
- Photometric stability (After 2 h warm up @ 500 nm):  $< 0.0003$  Abs/h
- Photometric Noise (at 500 nm, 0 Abs) :  $\leq 0.000030$  Abs
- Baseline Flatness (200 to 850 nm):  $\pm 0.00022$  Abs or better
- Peltier Temperature Control system, Stirring bar, stirring multicell transport + Suitable cells+ cell holders with magnetic stirring
- Cuvette Holder - 10 mm Path length
- Rectangular UV Quartz cuvette: 2 pairs with PTFE lid.
- Rectangular Standard quartz cuvette: 2 pairs PTFE lid.
- Suitable software for molecular and Chemical analysis
- **3 years unconditional warranty** should be provided free of cost
- Hardware support period minimum five (5) years from date of supply/installation.

In addition

**System should be capable of determining very low concentration of biomolecule using fluorescent dyes, with an excitation wavelength of 470 nm and emission wavelengths of 520 and 560 nm**  
**2 KVA online UPS**

### Technical Specifications for Rotary Vacuum Evaporator

<b>Type</b>	1.Rotary Vacuum Evaporator consisting of vacuum pump, vacuum controller ( manual/digital),evaporating flask, 2.large vertical condenser, 3. easy-clip for fixing and removal of non sticking vapour duct and evaporation flask along with other necessary accessories. 4.Rate of evaporation : 7500 ml (Acetone) / Hour or more 5.power supply 1400 W
<b>Vertical condenser</b>	6.Vertical condenser with surface area of about 2200 cm <sup>2</sup> or more 7. Manual lift up to 150 mm or more with manual lifting of evaporating flask. 8. Rate of evaporation : 8500 ml (toluene) / Hour or more
<b>Heating bath</b>	9. capacity of 4.5 L or more 10.with heating capability up to 200 °C 11. Set and Actual digital temperature display, 12. Heating bath featured non-slip-handles with safety grip to protect from scalding bath liquid 13.A drain port can remove hot water or oil from the bath to avoid splashes and scalding, 14.Heating-bath temp control : Electronic /Digital
<b>Rotation speed</b>	15.20-280 rpm or more to be controlled electronically with LED display or manually scale
<b>Evaporation flask</b>	16.50 mL to 5000 mL or more; Different size evaporating flask are to be supplied mentioning the nos. & sizes.
<b>Sealing system</b>	17.High resistance and durable PTFE seal 18. Fluorocarbon elastomers material ( FKM) O -ring to resist harsh chemicals for longer life.
<b>Easy-clip</b>	19. Intergrated unscrew easy-clip for easy fixing and removal of vapour duct and evaporation flask.
<b>Vacuum pump</b>	20. Double stage Diaphragm Vacuum Pump 21. manual Vacuum Controller; 22. Final vacuum (absolute): 7 mbar or more; Vacuum flow rate: 2.00 m <sup>3</sup> /h or more;
<b>Vacuum controller</b>	23. Manual pressure range 0-1000mbar
<b>Compliance</b>	24. All the items should be same sources and 25. All the specifications should be reflected in printed catalogue.
<b>Warranty</b>	26. At least 3 years
<b>Performance</b>	27. As per international standard ,A safety certificate should be provided for "continuous operation and safety in laboratory" from Principal
<b>Low Temp. Circulating Chiller</b>	28. Digital displayTemperature Range: -10 to 35 °C 29. temperature stability of ±10 °C 30. cooling capacity at +200 °C : 580W, 31. display digitally set and actual temp

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## ① Specifications for Photoresist Spin Coating System

The Spin coating system should have the following features:

- 1) Table top and standalone configuration.
- 2) Stable at its highest speed and acceleration with no vibration.
- 3) Uniform coating and compatible with clean room of class 100 or better
- 4) 4" x 4" substrate to be coated
- 5) Speed up to 8000 rpm programmable with  $\pm 1$  rpm, acceleration up to 4000 rpm/s.
- 6) 1s-999s programmable with step of 1s or better
- 7) All chemicals resistant body .And process bowl must be made of PP only.
- 8) Coating Uniformity =  $\pm 5\%$  or better
- 9) Suitable vacuum on chuck using dry compressed air mechanism only without separate vacuum pump.
- 10) Feather touch screen with at least 150 storable programmable recipes with at least 30 steps in a recipe for process ramp up and down etc.The touch screen or controller must be in-built part of spin coater configuration only and not separate.
- 11) 230V $\pm$  10V. 50 Hz. single phase
- 12) Substrate heating facility
- 13) Interlock safety for open cover and vacuum failure.
- 14) Process chamber exhaust connection to be provided.
- 15) Process chamber drain in the form of collecting bottle.
- 16) There should be a PR trap in case the PR or chemicals goes into vacuum line so that vacuum line is not affected.
- 17) Must have wide base of similar installation in India.
- 18) Warranty-two year after installation and acceptance of machine.

## ② Specifications for pH meter

pH Range	0.00 to 14.00 pH
Resolution & Accuracy	0.01 & $\pm 0.01$ pH
mV Range	$\pm 199.9$ mV; $\pm 1999$ mV
Resolution & Accuracy	0.1 mV & $\pm 0.2$ mV (within $\pm 199.9$ mV); 1 mV & $\pm 2$ mV (beyond $\pm 200$ mV)
Temperature Range	0.0 to 100.0 °C
Resolution & Accuracy	0.1 °C & $\pm 0.3$ °C
pH Buffer Options	US Standard (pH 4.01, 7.00, 10.01); NIST Standard (pH 4.01, 6.86, 9.18)
Temperature Compensation	Automatic / Manual (0 to 100 °C)
Memory	50 sets
Recorder Output	Yes
Special Functions	Averaging/Stability; Self-diagnostic; Hold & pH Slope display
Power Requirements	9V AC/DC Adapter ,

### ③ Specification for UV Vis spectrophotometer

Optical Design	Dual beam—internal reference detector
Spectral Bandwidth	1.8 nm
<b>Wavelength</b>	
Range	190 to 1100 nm
Accuracy	±1.0 nm
Repeatability	±0.5 nm
Slew Speed	11,000 nm/min
Scanning Speed	10 to 4,200 nm/min
Data Interval	0.2, 0.5, 1.0, 2.0, 3.0, 5.0 nm
<b>Photometric</b>	
Measurement Modes	Absorbance, % transmittance, concentration
Range	-0.5 to 5.0 A ; -1.5 to 125 %T ; ±9999 C
Linearity	Up to 3.5 A at 260 nm
Accuracy	±0.005 A at 1.0 A, <0.00025 at 0.0 A
Noise	<0.00050 at 1.0 A, <0.00080 at 2.0 A RMS at 260 nm
Drift	<0.0005 A/hr
Connectivity	USB type A port for USB stick (front panel), USB type B port for computer (rear panel), USB type A port for printer (rear panel)
Power Requirement	100 to 240 V ; 50 to 60 Hz

### ④ Specifications for multimeter

Handheld Digital Multimeter,  
4-5 Digit Organic LED Display (OLED)

*Poonam Mishra*  
24/7/18