

PROCUREMENT OF MEDICAL & LAB EQUIPMENT

Physics Department

Apparatus List for Experimental Labs (BS 4 years)

S/No	Name of Equipment	Specifications	Required Brand	Quantity	Unit Price (w/o GST)	17% GST	Unit Price with GST	G. Total (with GST)
1	Determine wavelength of sodium light by Newton's Rings	<p>Compact Set with</p> <ul style="list-style-type: none">➤ Plano Convex Lens➤ Plane Glass Plate➤ Travelling microscope for measuring diameter of rings (Imported)➤ Sodium lamp with power supply➤ Spherometer➤ Complete set with all other necessary accessories➤ Sensitive component, Vacuum photo-tube.➤ Light source: 12V/35W halogen tungsten➤ (Local)	Imported	3				
2	Determination of Planck's constant by studying photoelectric effect	<ul style="list-style-type: none">➤ Lamp➤ Length of Guide: 395mm➤ Dark current $\leq 0.003\mu\text{A}$➤ Precision of accelerated voltage $\leq 2\%$➤ Set of 5 different color filters➤ Complete set with all other necessary Accessories➤ Imported: China	Imported	2				

PROCUREMENT OF MEDICAL & LAB EQUIPMENT

Physics Department

3	BH Curve / Hysteresis Curve	<ul style="list-style-type: none"> ➤ Hysteresis curve kit consisting of Base plate with coil and holders for Hall sensors, Samples of iron, Measuring resistor, 4mm ground socket for connecting Oscilloscope, 4mm socket for connecting function generator ➤ Magnetic Field sensor ➤ Tesla meter ➤ Safety Experiment Leads ➤ Analog Oscilloscope ➤ Function Generator ➤ Digital multi meter ➤ DC Power Supply (20V, 5A) ➤ Imported: USA/Germany/Japan 	Imported	2				
4	To determine characteristics of G.M Tube. To find out the maximum energy and range of α , β and gamma particles	<ul style="list-style-type: none"> ➤ Radiation counter with RADEM and LABLINK ➤ GM Probe (35mm) and stand. ➤ USB Cable ➤ Calibrated Absorber Set (20) ➤ At least 3 separate radioactive sources for α, β and gamma rays. ➤ At least 3 separate tubes for α, β and gamma rays detection. ➤ Imported: USA/Germany/Japan 	Imported	2				
5	Determine the Cauchy's Constant using Spectrometer	<ul style="list-style-type: none"> ➤ Spectrometer / Goniometer with 2 vernier scales ➤ Mercury Source ➤ Diffraction Grating ➤ Prism: flint glass (60 degree) ➤ Imported: USA/Germany/Japan 	Imported	2				

PROCUREMENT OF MEDICAL & LAB EQUIPMENT

Physics Department

6	Franck Hertz Experiment	<ul style="list-style-type: none"> ➤ Franck Hertz Experiment Heater (230V, 50/60 Hz) <ul style="list-style-type: none"> • Heater voltage: 4 – 12 V • Grid voltage: 0 – 70 V • Suppressor voltage: 1.5V approx. • Tube dimensions: 130 mm x 26 mm dia. approx. • Heater output: 400W • Temperature range: 160° – 240°C • Temperature constancy: ±1°C approx. ➤ Power Supply (230V, 50/60 Hz) ➤ Digital Oscilloscope ➤ Digital Multi-meter ➤ HF Patch Cord(1m) ➤ HF Patch Cord (BNC/4mm Plug) ➤ Set of experiment leads ➤ Imported: USA/Germany/Japan 	Imported	1				
7	Millikan's Oil Drop Experiment	<ul style="list-style-type: none"> ➤ Basic apparatus with experiment chamber and display unit consisting of Cover, Hole for oil Atomizer, Top capacitor plate, Observation window, Vertical adjustment knob for head of microscope, standrod for measuring microscope ➤ Measuring microscope ➤ Eye piece WF 15x with scale ➤ Oil Atomizer ➤ Rubber bulb with hose ➤ Spirit level ➤ Adjustment needle 	Imported	2				

PROCUREMENT OF MEDICAL & LAB EQUIPMENT

Physics Department

		<ul style="list-style-type: none"> ➤ Plug-in power supply, 12V AC, 200mA ➤ Oil for Millikan's apparatus, 50ml ➤ Imported: USA/Germany/Japan 						
8	Determination of velocity of light	<ul style="list-style-type: none"> ➤ Speed of light circuit unit with fuse ➤ Digital storage oscilloscope ➤ 20m and 15cm optical fiber cables ➤ 50 ohm splitter ➤ Oscilloscope Probe ➤ AC Adapter ➤ Imported: China 	Imported	1				
9	Zeeman Effect	<ul style="list-style-type: none"> ➤ Electromagnet with accessories ➤ Tunable DC power supply 6 amperes ➤ Mercury Pen lamp. ➤ Polarizer. ➤ Convex Lens on Stem ➤ Interference Filter ➤ Fabry-Perot interferometer ➤ USB CMOS Camera ➤ Optical Precision Bench ➤ Support for Optical Bench ➤ Optical Rider ➤ Optical Base ➤ Complete Set with all other accessories ➤ Imported: USA/Germany 	Imported	2				

PROCUREMENT OF MEDICAL & LAB EQUIPMENT

Physics Department

10	Hall Effect Experiment	<ul style="list-style-type: none"> ➤ Hall Probe Unit, n-Semiconductor (GaAs) ➤ Hall Effect Power Supply ➤ U-Core Electromagnetic Coil ➤ Track, Length 40 cm ➤ Optical Carrier (2) ➤ Adjustable Post Holder with 9 cm post (2) ➤ Banana Cords (6) ➤ Connecting Cables for 550/850 Interface (2) ➤ Magnetic Field Sensor ➤ 550 Universal Interface ➤ Imported: USA/Germany 	Imported	2					
11	Measure work function of a metal and verification of Richardson's equation	<p>Compact apparatus consisting of</p> <ul style="list-style-type: none"> ➤ Directly heater type diode valve (4 pieces) ➤ DC Power Supply ➤ Ammeter, Voltmeter ➤ All other accessories 	Imported	2					
12	Diffraction grating of different ranges	<ul style="list-style-type: none"> ➤ 15000-20000 lines / inch (3) ➤ Imported: USA/Germany 	Imported	6					
13	Glass Prism	Standard laboratory glass prism (Local)	Imported	24					

PROCUREMENT OF MEDICAL & LAB EQUIPMENT

Physics Department

14	Michelson Interferometer	<p>Machined Base fitted with</p> <ul style="list-style-type: none"> ➤ 3-point adjustable mirror ➤ Pointed beam splitter ➤ Mounted movable mirror ➤ Accessory Mounts ➤ Viewing Screen ➤ Diffuser ➤ Double Convex lens (18mm) ➤ Compensator Lens ➤ Fitted Case ➤ Vacuum pump with gauge ➤ Gas cell ➤ Calibrated polarizer ➤ Glass Plate ➤ Rotating component holder ➤ Twyman-Green Lenses ➤ Solid state laser 488nm, 532nm, 671nm ➤ Minilaser with bracket ➤ Laser alignment bench ➤ Aluminium breadboard ➤ Bases and postholder kits ➤ Precision pinholes ➤ Lab supplies ➤ ½" posts ➤ Imported: USA/Germany 	Imported	2				
----	--------------------------	--	-----------------	---	--	--	--	--

PROCUREMENT OF MEDICAL & LAB EQUIPMENT

Physics Department

15	e/m of an electron using fine beam tube	<ul style="list-style-type: none"> ➤ Fine beam tube filled with gas ➤ Helmholtz coil pair ➤ Tunable DC (Constant Current) Power Supply ➤ Tunable DC (Constant Voltage) Power Supply II ➤ Red and Black Patch Cords ➤ Imported: USA/Germany/Japan 	Imported	1					
16	Digital Cathode Ray Oscilloscope	<ul style="list-style-type: none"> ➤ Band Width: 100 MHz ➤ Dual Channel ➤ Sample Rate: 1 GSa/s ➤ Screen size: approx. 7.5'' ➤ Color: TFT LED Display ➤ Storage Capacity: 25 kB ➤ Memory Depth: upto 2Mpts ➤ Imported: China 	Imported	4					
17	Sextant	<ul style="list-style-type: none"> ➤ Brass made with stand ➤ Imported: China 	Imported	3					
18	To study damping features of an oscillating system	<ul style="list-style-type: none"> ➤ Complete Set 	Imported	4					

DEPARTMENT OF PHYSICS

LIST OF EXPERIMENT FOR MS LABORATORY (MATERIAL SCIENCE)

S/No	Name of Equipment	Specifications	Required Brand	Quantity	Unit Price	17% GST	Unit Price	G. Total (with
------	-------------------	----------------	----------------	----------	------------	---------	------------	----------------

PROCUREMENT OF MEDICAL & LAB EQUIPMENT

Physics Department

					(w/o GST)		with GST	GST)
1.	Spectrophotometer	<p><u>UV/Vis Spectrophotometer</u></p> <p>Principle: Double beam, double monochromator, ratio recording UV/Vis/NIR spectrophotometers with microcomputer electronics, controlled by DELL™ PC or compatible personal computer. Diffuse Reflectance Spectroscopy (DRS) Analysis of thin films, crystals, coatings, high performance glass, solar, and advanced materials Samples: Solid/liquid samples. Optical System: All reflecting optical system (SiO₂ coated) with holographic grating monochromator with 1440 lines/mm UV/Vis blazed at 240 nm and 360 lines/mm NIR blazed at 1100 nm, Littrow mounting, sample thickness compensated detector optics. Beam Splitting System: Chopper (46+ Hz, Cycle: Dark/Sample/ Dark/Reference, Chopper Segment Signal Correction). Detector: Photomultiplier R6872 for high energy in the in the entire UV/Vis wavelength range. High per-Combination of high-performance Peltier-cooled InGaAs detector, 2 options: Narrow band covering 860-1800 or wide band covering 860-2500 nm and Peltiercooled PbS detector for 1800/2500-3300 nm in the NIR wavelength range. Source: Pre-aligned tungsten-halogen and deuterium. Utilizes a source doubling mirror for improved UV/Vis/NIR energy. Mode: Energy, Absorption, Transmission, Reflectance Wavelength Range (N2 purge required below 185 nm): 175 - 3300 nm Wavelength Resolution: UV/Vis/NIR: ≤0.05 nm NIR: ≤0.20 nm Wavelength accuracy UV/Vis/NIR: ±0.080 nm NIR: ±0.300 nm Automatic wavelength calibration function incorporated Wavelength reproducibility: UV/Vis (Deuterium lamp lines): ≤0.010 nm NIR (Deuterium lamp lines): ≤0.040 nm</p>	Imported	1				

PROCUREMENT OF MEDICAL & LAB EQUIPMENT

Physics Department

		<p>Standard deviation of 10 measurements UV/Vis ≤ 0.005 nm Standard deviation of 10 measurements NIR ≤ 0.020 nm</p> <p>Stray Light: At 200 nm: 12 g/l KCl USP/DAP method > 2 A At 220 nm: 10 g/l NaI ASTM method $\leq 0.00007\%T$ At 340 nm 50 mg/l NaNO₂ ASTM method $\leq 0.00007\%T$ %T At 370 nm: 50 mg/l NaNO₂ ASTM method $\leq 0.00007\%T$ At 1420 nm: H₂O 1 cm path length ≤ 0.00040 %T At 2365 nm: CHCl₃ 1 cm path length ≤ 0.00050 %T</p> <p>Photometric Accuracy: Double Aperture Method 1 A: ± 0.0003 A Double Aperture Method 0.5: A ± 0.0003 A NIST 1930D Filters 2 A: ± 0.0030 A NIST 930D Filters 1 A: ± 0.0030 A NIST 930D Filters 0.5 A: ± 0.0020 A K₂Cr₂O₇-Solution USP/DAP method: ± 0.0080 A</p> <p>Photometric Linearity: Addition of filters UV/Vis at 546.1 nm, 2 nm slit, 1 second integration time At 1.0 A: ± 0.0060 A At 2.0 A: ± 0.0160 A At 3.0 A: ± 0.0050 A NIR At 1.0 A (1200 nm): ± 0.0005 A NIR At 2.0 A (1200 nm): ± 0.0010 A</p> <p>Photometric Reproducibility: Standard deviation for 10 measurements, 2 nm slit, 1 second integration time 1 A with NIST 930D Filter at 546.1 nm: ≤ 0.00016 A 0.5 A with NIST 930D Filter at 546.1 nm: ≤ 0.00008 A 0.3 A with NIST 930D Filter at 546.1 nm: ≤ 0.00008 A</p> <p>Photometric Range: UV/Vis: 8 A, NIR: 8 A</p> <p>Photometric Display: Unlimited</p> <p>Bandpass: 0.05 nm - 5.00 nm in 0.01 nm increments UV/Vis range 0.20 nm - 20.00 nm in 0.04 nm increments NIR range Fixed resolution, constant energy or slit programming.</p> <p>Photometric Stability: After warm-up at 500 nm, 0 A, 2 nm slit, 2 second integration time, peak to peak ≤ 0.0002 A/h</p> <p>Baseline Flatness: 190 nm - 3100 nm, 2 nm slit 0.20 second integration time UV/Vis, no smoothing applied 0.24 second</p>					
--	--	--	--	--	--	--	--

PROCUREMENT OF MEDICAL & LAB EQUIPMENT

Physics Department

		<p>integration time NIR, no smoothing applied: ± 0.0008 A</p> <p>Samples Compartment: Primary: Dimensions (W x D x H) 200 mm x 300 mm x 220 mm Secondary: Dimensions (W x D x H) 480 mm x 300 mm x 220 mm Light Beam: 90 mm above the base plate, 120 mm beam separation, 3 mm - 12 mm beam height Spectral bandwidth: Fix 1.4 nm Scanning speed: 12000 nm/min Cell holder: Single Cell holder Display: on Computer Cuvettes: 2 glass and 2 Quartz cell Complete with software, Computer & Laser Printer 1 Year Warranty & Long term Repair/Services included Country of Origin: US/Japan/Germany</p>						
2.	FURNACE	<p>Furnace Muffle digital temperature: Range up to 1650°C, digital single set point, large Chamber Ceramic Fiber embedded Heating Wire, MoSi2 Heater, 4-Side Heating</p> <p>Application & Features: Designed for Ash-Determinations, Enameling, Fusions, Ignitions, and Precipitate Drying. Ceramic Fiber embeded Heating Wire, 4-Side Heating. Ceramic Plate is Provided. (FH-model only) Short Heating-Up Time. Over Temperature & Over Current Protection, Sensor Error Detection Low Weight and High-Grade Insulation. High Quality / Low Price.CE Certified. Digital Timer Function: 99 hr 59 min and Digital LCD Display with Back-Light Function PL (Product Liability) Insurance with Certificate & Traceability: Controlled by Serial Number, Certificate, Delivery-information, and Traceable Data Base System Digital PID Programmable Controller: 2 Patterns with 10 Segments,</p>	Imported	2				

PROCUREMENT OF MEDICAL & LAB EQUIPMENT

Physics Department

		<p>High Quality Insulation: Ceramic Fiber Board Safety Door Lock System, Excluding Ceramic Fiber Plate, Ceramic Fiber Exposed Heating Wire, Safety Switch for Door Opening Size: Internal (mm) 200x270x200 (8" x 9" x 9") External (mm) 980x670x765 fitted with high performance HYBRID Muffle longer Life, Operated on 220v, 1300-Watt, 6 Amp. Required time to be reached to 800 °C: 16 min Country of Origin: USA/Germany/Japan</p>						
3.	Probe Sonicator	<p><u>SONICATION APPARATUS SPECIFICATIONS</u> Power Supply: Net power output: VCX 500 - 500 Watts. Frequency: 20 kHz Remote actuation compatible Dimensions (H x W x D) 9 1/4" x 7 1/2" x 13 1/2", (235 x 190 x 340 mm) Weight: 15 lbs. (6.8 kg) Converter Cable: Cable length: 6' (1.8 m). Part No. 201-0300 Standard Probe: Tip diameter: 1/2" (13 mm) with and replaceable tip Part No. 630-0220 Operated on 220 Volts Country of Origin: USA/Germany/Japan</p>	Imported	1				
4.	FTIR	<p><u>FT-IR Spectrometer with built in Zinc Seleni optics</u> Specifications: Spectral range: 15 – 7500 cm⁻¹ with standard KBr beam splitter, 500- 6000 cm⁻¹ with high humidity ZnSe Optics Detector Type: Up to 9 user-selectable detectors Accepts: SMART Accessories, TGA-IR, Continuum Microscope, Photoacoustic, Most standard accessories; Gas Cells; GC-IR; FT- Raman; ABX; NIR; Built-in ATR Applications: Materials & Chemicals, Academia. Humidity: Tightly sealed to resist ambient humidity. Interface: PC USB 2.0, Ethernet Beam Splitter: Automated Beamsplitter Exchanger (ABX) Laser: HeNe Performance Verification: ASTM E1421 to meet customer ISO/GLP requirements,</p>	Imported	1				

PROCUREMENT OF MEDICAL & LAB EQUIPMENT

Physics Department

		<p>Components Sources; Detectors; Beam splitters Depth (English) 27 in. Depth (Metric) 69.8cm Source Type Dual Source capable: Polaris™ long-life IR source Spectral Resolution Better than 0.09cm⁻¹ Signal-to-noise ratio: typically > 50,000:1 Sensitivity: 0.125 cm⁻¹ Wavenumber accuracy: <0.05 cm⁻¹ @ 2000 cm Wavenumber precision: <0.0005 cm⁻¹ @ 2000 10 repeat measurement) Photometric accuracy: better than 0.1% T Interferometer: Rock Solid, Permanent aligned, high stability Optics: Sealed and desiccated, all mirrors gold coated Detector: High sensitivity DLATGS Operating system: Windows 1 Year Warranty & Long-term Repair/Services included Spectrometer power: 100 – 240 VAC, 50 – 60 Hz, 20 W (low energy consumption) <u>O/MENTOR+ OPUS/Mentor Software Package</u></p> <ul style="list-style-type: none"> • Package With • Display, Computer, Software and Printer • Intuitive comprehensible software with integrated calibration module & library search module <p>Country of Origin USA/Germany/Japan</p>					
5.	CENTRIFUGE	<p>Centrifuge Machine Angle Rotor Capacity 12 x 15ml tubes, and 6x 50ml digital microprocessor controlled Speed range 200 to 6000 rpm, digital display of preset and actual speeds, timer range 0 – 99hr 59 minutes and continuous run with lid lock system, automatic imbalance indication with safety shut off, ABS housing Country of Origin: USA/Germany/Japan</p>	Imported	1			
6.	Analytical Balance	<p>Electronic Analytical Balance Digital Microprocessor Controlled with Latest Uni Block Technology, Un iBlock designs replaces 70 parts of Electromagnetic balances and ensures stable results. Technical Specification: Weighting Capacity: 220gm</p>	Imported	1			

PROCUREMENT OF MEDICAL & LAB EQUIPMENT

Physics Department

		Minimum display: 0.1mg Pan size (mm): Ø91 approx. Country of Origin: USA/Germany/Japan						
7.	Fume Hood	Local made for nano lab With complete exhaust system and other necessary requirements for safe outflow of dangerous substances. Country of Origin: Pakistan/China	Imported	1				
8.	OVEN	Universal Oven Precise drying, Adaptive Multifunctional Digital PID-microprocessor Controller with High-Definition TFT-Color Displays Temperature range 5°C above ambient up to +300°C Single DISPLAY natural convection. Operated on 220volts: Capacity 108 Lit, interior dimension: 560 x 480 x 400 mm, with two stainless steel trays Country of Origin: USA/Germany/Japan	Imported	1				
9.	DIGITAL HOT PLATE	<u>Magnetic Stirrer with Ceramic Hotplate (Digital)</u> Ceramic Top plate, extremely resistant to corrosion Dimension (mm) 180 x 180mm, ceramic coated, Temperature range up to 550°C, Stirring volume up to 15 Lit Electronic speed regulation up to 1500 rpm Control knob for stirrer and digital temperature, operated on 220 Volts, 800W. Model AREC.X, With PT1000 Probe Country of Origin: USA/Germany/Japan/Italy	Imported	2				