List of proposed equipment for financial approval for the year 2022-2023

Sl. No.	Instrument Name	Justification	Qty (Nos)	
1	Nano-LC coupled with orbitrap technology	Nano-LC coupled with bench top orbitrap system is a state-of-the-art equipment for doing proteomics and metabolomics research. Life Science research at Bose Institute, working intensely on proteomics and metabolomics is largely getting stucked and as such could not explore wealth of data for the inavailability of this only dedicated instrument to meet the purpose. With the installation of all available sofwares, this instrument equipped with UPLC system can efficiently analyze various compound including small molecule and intact protein mass detection, besides denovo sequencing of peptides with a very minimum sample concentration. One such complete system will be an asset to Bose Institute and can cater the need of exploring modern technological knowhow for inhouse researchers and also for researchers in this part of the country.	1	
2	TRIPLE QUADRUPOLE GC-MS/MS SYSTEM WITH ACCESSORIES	GC-MS is one of the most versatile instruments for the analysis (resolve and characterize)of organic compounds present in a mixture used in chemical as well as biological research on regular basis. We had one such system, procured 10+ years back and from last year the system has not been working and beyond repairable as the same has been categorized as obsolate model by the company. At this moment, we are in dire need to procure one such updated GC-MS system to cater our research endeavor. his instrument caters the needs of many outside users from various institutes, unversity and colleges in this region.	1	
3	600 MHz Biomolecular NMR facility to catalyze Translational Research	This is versatile NMR system capable of serving both chemical and biological sciences at different levels. • This facility will be used by the Scientists of Chemical sciences in Bose Institute as well as other Institutes in the Eastern region of the country for the structural analysis of synthetic and natural product derived small molecules. • This facility will also be used for the material and nano-science research. • The same spectrometer can be switched over to analyze tissue or soft biomaterials using HR MAS. • Solid-state NMR is quint-essential for the scientists who are working in the field of membrane proteins and nano-particles etc. Since there are several scientists in Kolkata and the North Eastern region who are working on characterization of nano-particle/Glass/metal materials, it is	1	

		necessary to procure solid state NMR to advance academic research as well as generate revenues through supporting R&D industries. • This facility can be used for biomolecular research of metabolomics. Existing NMR system is quite old, difficult to get spares for any breakdown and largely capable of catering small molecules. So procurement of a versatile NMR, as suggested above, will help both inhouse and outside researchers to explore this technology at the highest level.		
4	A high end computing and data repository facility (Comprising Master node, computer node with GPU, data storage facility for web server and various management tools and softwares)	**Justification of procurement:** Computation is an essential part of almost all types of interdisciplinary work, even for the full time experimentalists. But currently we do not have any core facility that can cater services to all the willing users of Bose Institute. It is worthy to have a central facility instead of spending money for smaller systems in individual laboratories. In a shared facility everyone would have a shared access to high-end facilities which would increase quality of research also. If necessary, a more detailed justification would be discussed in a meeting. **List of in-house users:** Tentative and minimum number of PIs, department/division wise – Bioinformatics (3), Biophysics (3), Physics (5-6), Chemistry (1), Biochemistry (1), Microbiology (1) and others. The actual number of users would be more, depending on the number of students under each PI. **Maintenance cost:** Other than electricity to run computers, there would be no special cost of maintenance for the first 5 years covered under comprehensive warranty. The UAC already has a equipped server room and therefore no other special arrangement would be required. Beyond 5 years there would be AMC charges for the duration we decide. **Possible revenue generation:** We can offer some computing time (10-20%) to the users from other institutes through highly secured remote access. It would be a lucrative offer for many research labs in the eastern India because such a facility is not available in this way around Kolkata. This would generate revenue. Amount of annual revenue would depend on the charges set by the BDC of BI.	1	
5	SEC MALS	Multi-angle light scattering coupled with size exclusion chromatography (SEC-MALS) is a standard and common approach for characterizing protein mass, overall shape, aggregation, oligomerization, interactions and purity. The limited resolution of analytical SEC restricts in some instances the accurate analysis that can be accomplished by MALS. These include mixtures of protein populations with identical or very similar molecular masses, oligomers with poor separation and short peptides. As the resolution of this instrument is a key factor that	1	

		determines the quality of data. No such nstrument is availablle at Bose Institute while procurement of this facility will be helpful to aost of the inhouse life science researchers and also to outsiders working in relevant field of research.		
6	Cell Disruptor Multicycle 40KSI	Cell disruption facility is unique for protein research, which is common in almost all life science laboratories. This cell disrution system, popularly known as French Press can efficiently disrupt all sorts of microbes apart from Gram negative bacteria using adjustable pressure. Currently, we have one such small system (more than 10 years old), which is out of order. So, dealing protein chemistry which integral part of most of life science research, we need two such system capable of disruting varying volume of microbial culture irrespective cell types.	2	
7	Ultracentrifuge	One of the verstile equipment in biological research. Most of the ultracentrifuges procure at Bose Institute are couple of decdes old and no longer functional. One such ultracentrifuge is most essential at this point of time, which will be used central facility instrument. Almost all scientists/students working in the field of biological sciences will be benefitted from this procurement.	1	
8	MicroScale Thermophoresis (MST) Equipment with accessories	• MicroScale Thermophoresis detects interactions between any kind of biomolecules thus providing a large application range, from ions and small molecules to high molecular weight and multi-protein complexes. Thermophoresis, the movement of molecules in temperature gradients, is not only dependent on the size, but also on the charge and the hydration shell of the molecule of interest. Therefore, binding events can be detected even without an apparent increase in size or mass upon complex formation. MST is performed free in solution without any surface immobilization, also bulky or sensitive molecule assemblies such as liposomes, Nano discs or membrane proteins can be investigated without immomobilzation derived artefacts. • The protein quality assessment equipment quickly identifies the quality of any protein sample in 3 minutes using only microliters of sample. It's a label-free and buffer-independent detection which tests integrity, similarity, purity, functionality and concentration all in one experiment and makes the purification and characterization workflows quite efficient.	1	
9	Differential Scanning Fluorimeter Equipment	• nanoDSF is an advanced Differential Scanning Fluorimetry technology. It detects smallest changes in the fluorescence of tryptophan and tyrosine residues present in virtually all proteins. The fluorescence of tryptophans and tyrosines in a protein is strongly dependent on their close surroundings. When located in the hydrophobic core of proteins, tryptophan is shielded from the surrounding aqueous solvent that becomes exposed upon unfolding. This change in tryptophan	1	

		surroundings alters its photo-physical properties. By following changes in fluorescence, the unfolding of proteins can be monitored in real time in a truly label-free fashion. • Thermal and chemical unfolding experiments are widely practiced and highly-appreciated methods to quantify protein stability. While thermal unfolding experiments use a temperature ramp to monitor protein conformational changes, chemical unfolding experiments use chaotropic agents such as urea and GdnCl to unfold proteins. Both types of experiments are easily done with this instrument. In addition, refolding experiments can be performed to determine refolding transition points. • The instrument can be equipped with an optional Aggregation Optics, scattering information is collected simultaneously and with equal data point density.		
10	Assorted equipment for M.Sc.-Ph.D. Physics laboratory	See **Annexure I** for detail list of equipment, which are essential for practical training of M.Sc.-Ph.D students	1 set	
11	Assorted equipment for M.Sc.-Ph.D. Life Science research laboratory	See **Annexure II** for detail list of equipment, which are essential for practical training of M.Sc.-Ph.D students	1 set	
12	Microplate fluorescence workstation supported computer workstation	This versatile equipment is capable of medium throughput assay for analyzing structural data at the finest level. Procurement of this equipment will be an asset to Bose Institute catering many of the in-house structural biologists and those of outside on this region of Eastern India.	1	
13	Lyophilizer	Lyophilization is a method of sample preservation that significantly reduces damage to biological samples. This is essential for long-term storage of samples, processing extracts for mass spectrometry and also for exchange of materials with other research institutions via shipping under sub-zero temperatures. Currently, we do not have lyophilizers to serve our need	5	

		and the ones we have are very old, most of them are not in working condition and the rest are have very poor efficiency. Thus five new lyophilizers are needed to serve our routine research.		
14	Ice Flaker	Flaked ice is indispensable for routine molecular biology and biochemical techniques. This instrument will be needed daily for all life science laboratories. Currently, we have inadequate number of such system and many of them are quite old and inefficient. Thus five new Ice Flake machines are needed to serve our routine biological research catering the needs of various departments lactaed at different floors of this campus..	5	
15	Triple-deck Room Shaker	Apart from microbiological research culturing various microbes of interest, all life science laboratories need to culture E. coli almost every day, for both recombinant DNA techniques and protein expression. Since cultures of very large volumes are often needed, robust, heavy-duty room shakers, which can accommodate large number of samples of varying volumes, are needed on every life science floor.	6	
16	Oligo Synthesizer	In biological research oligo synthesis is most common to explore science at the genetic level and till date, all of us are dependent on various companies to procure our designed oligos for molecular biology research. This instrument cater our following needs: (i) Short to long DNA and RNA can be synthesized in this platform, R & D scale solid phase oligo synthesizer. (ii) DNA and RNA Primers can be easily made which will be highly cost effective and can be made in bulk amounts which will facilitate faster research and save huge amount of money. (iii) We can regularly synthesize primers for other institutes and sell. (iv) Any modification (Fluorophore) for structural and Gel assay analysis at 5'-, 3', intermediate can be possible by this oligo-synthesizer. (v) siRNA, ant other short RNAs like miRNAs, RNAi, CRISPR RNAS can be synthesized by this synthetic plat forms. (vi) 15N and 13C labelled nucleotides can be incorporated for NMR structure determination And nucleic acid relaxation measurements. (vii) In addition other spectroscopic, calorimetric studies including CD, UV, Fluorescence, ITC, DSC, DTA can also be performed with the synthesized oligos. One such system will be an asset to Bose Institute and can cater the need of inhouse researchers and also for researchers in this part of the country.	1	

17	X-ray irradiation facility [X-ray generator and Lead room of dimension 6 ft X 6 ft X 7 ft (weight approx. 1000 kg)]	This facility with X-ray of energy ~ 5-10 keV and intensity 10^6 Hz/sq. mm can be used to irradiate detectors for characterization or for any other purpose. No such facility is availablle at Bose Institute while procurement of this facility will be helpful to aost of the inhouse scientists f Physics department and also to outsiders working in relevant field of research.	1	
18	Micro-Pulse Lidar	From enhancing research ability on aerosol-cloud interactions and weather forecasts to monitoring air quality, Micro-Pulse LiDAR (MPL) is a remote atmospheric monitoring, which is providing data in real time and the sophisticated laser remote sensing system uses the most advanced single-photon-counting detectors trusted by NASA. It is the fastest and most accurate decisions based on the reliable information from the MPL's continuous and autonomous monitoring the vertical structure of atmosphere. Most importantly, if it is installed at Bose Institute, Kolkata in near future, then it will be the first lidar in Eastern India and helps doing research on 'Asian Haze', air quality and its effects on health, and forecasting on monsoonal rain. No such instrument is availablle at Bose Institute while procurement of this instrument will be helpful to all the scientists who are working on atmospheric sciences. This instrument can also be used in Integrated MSc courses. Revenue generation is also possible.	1	
19	OC-EC analyser	Lab-based Organic Carbon coming living and non-living organisms can measure very accurately (0.2-600 microgram/cm2) to understand their role in cloud formation. This instrument has been used to analyse a wide variety of sample types, including: ambient urban and rural areas, forest fire plumes, Himalayan forest emitted organic material, marine organic material. No such instrument is availablle at Bose Institute while procurement of this instrument will be helpful to all the scientists who are working on atmospheric sciences. This instrument can also be used in Integrated MSc courses. Revenue generation is also possible.	1	
20	Ceilometer	Ceilometer measures cloud height and vertical visibility for meteorological and aviation applications. The instrument transmits fast, low-power laser pulses into the atmosphere and detects back-scattered returns from clouds and aerosols above the instrument. It can be used the investigation of cloud properties associated with Micro-Rain Radar and Micro-Pulse LiDAR. No such instrument is availablle at Bose Institute while procurement of this instrument will be	1	

		helpful to all the scientists who are working on environmental sciences. This instrument can also be used in Integrated MSc courses. Revenue generation is also possible.		
21	CCN 200 counter	The CCN 200 measures the count and size of individual aerosol particles that can form into cloud droplets. Its fast response time allows use in either airborne or ground-based stations. The CCN is available in dual-column (CCN-200) versions. The CCN-200 enables the user to measure two supersaturations simultaneously – a critical capability for droplet activation kinetics of aerosols and split sample experiments comparing the response of aerosols. No such instrument is availablle at Bose Institute while procurement of this instrument will be helpful to all the scientists who are working oncloud formation including atmospheric scientists and microbiologist. This instrument can also be used in Integrated MSc courses. Revenue generation is also possible.	1	
22	Scanning Mobility Particle Sizer	The SMPS spectrometer is a real-time nanoparticle sizer capable of measuring the size distribution of airborne submicron particles with accuracy and precision in every 1-min interval. It combines electrical mobility sizing with single-particle counting to deliver nanoparticle concentrations in discrete size channels. The size resolution capability of the SMPS is as high as 128 channels per decade, resulting in up to 192 channels in total. No such instrument is availablle at Bose Institute while procurement of this instrument will be helpful to all the scientists who are working on Atmospheric, environment sciences and health related issues. This instrument can also be used in Integrated MSc courses.	1	
23	“Next Generation” Aethalometer	The 'Next Generation' Model Aethalometer continuously analyses a sample air stream for the Black Carbon (BC) component of aerosol particulate Matter (PM). The analysis is performed by the measurement of optical absorption, simultaneously at 7 wavelengths from 370 nm to 950 nm on a time base of 1 second or 1 minute. The instrument is self-contained with an internal pump and graphical touch-screen interface to the full-featured computer providing measurement, analysis, network communications, internal diagnostics and data storage. No such instrument is availablle at Bose Institute while procurement of this instrument will be helpful to all the scientists who are working on carbonaceous particle (black Carbon and brown carbon), global warming, cloud formation and raindrops evaporation, air quality and health. Revenue generation is possible.	1	
24	Sun-tracker, Pyrheliometer	A solar tracker is a device that orients a payload toward the Sun. This set of instruments will help to calculate Earth’s radiation budget and cloud burn off process and global warming with many climate change processes. No such instrument is availablle at Bose Institute while	1	

	and Pyrgeometer	procurement of this instrument will be helpful to all the scientists who are working on environmental sciences. This instrument can also be used in Integrated MSc courses.		
	Cryo-electron microscope	High resolution imaging of macromolecular complexes using Cryo-electron microscope (CryoEM) is currently the most favoured method to determine structures of biomolecules in their native, hydrated states. The advantage of this method is manifold, low sample requirement and low turn-around time being the most notable. It can also provide high resolution structural information of macromolecular assemblies in their native habitats like the cells and/or tissues. This instrument is going to be used by researchers from multiple walks of life sciences from various institutes in the region.	1	
	CD spectrometer	Circular dichroism is one of the most heavily used techniques in understanding the changes in structures of biomolecules at low resolution. This method is used to rapidly detect changes or content of secondary structures in protein and nucleic acids. It can also be used to investigate charge transfer or electronic transfer processes. It can also inform about large changes in tertiary structures of proteins. There are multiple users for the same in BI. We have also witnessed rush of users for the CD instrument from adjoining institutes/universities in the city.	1	
	Peptide synthesizer	Peptides are important tools in different aspects of life science research. They can be used as antimicrobial agents, can be used as drugs, may be used as model systems to study fibril formation etc. To achieve such goals researchers need to synthesize many different variants of peptides, often with unnatural amino acids or containing unnatural linkages. There are multiple users from the institute as well as from other organisations in the region.	1	
	Tip-Enhanced Raman Spectroscopy (TERS)	TERS is a state-of-the-art Raman facility for label-free super-resolution physical and chemical imaging of nanomaterials and biological samples. The new facility will provide a platform for interfacial research on nanobiology. This will be a unique facility at Bose Institute. This new facility will be used by the scientists of physical, chemical and biological sciences in Bose Institute.	1	

Annexure I

List of instruments to be procured for M.Sc.-Ph.D. (Physical Sciences)

Serial Number	Items / Instruments		Units Required	
1.	Millikan's oil drop apparatus		01	
2.	Michelson interferometer		01	
3.	Spectrometer-Goniometer		01	
4.	Optical Fiber Characterization Apparatus - Breadboard Based		01	
5.	Zeeman Effect Apparatus		01	
6.	Spectrometer		02	
7.	50 MHz digital storage oscilloscope		15	
8.	Digital Multimeter		20	

9.	**3/10 MHz AM/FM Function-Pulse generators with 40 MHz Frequency Counter**		**05**	
10.	**Combined Pressure Meter Gauge (For Plasma Lab)**		**01**	
11.	**Consumables**			
12.	**Travelling Microscope**		**02**	
13.	**Vertical Microscope**		**02**	
14.	**Acousto-Optic Effect (Ultrasonic Diffraction)**		**01**	
15.	**Mach-Zehnder Interferometer**		**01**	
16.	**Laser Optics experiment Set**		**01**	
17.	**Audio Oscillator**		**05**	
18.	**AC mili voltmeter**		**05**	
19.	**Prism (32mmx32mm)**		**05**	
20.	**Grating (600 lines/mm)**		**05**	
21.	**Alpha Spectrometer**		**01**	

22.	**Alpha Spectrometer accessories (Electroplating station for alpha sample preparations for Alpha Spectrometer: Platinum Wire, Teflon Cell, SS316 discs)**		**01**	
23.	**Alpha Spectrometer accessories (Electroplating stand and base plate and height gauge)**		**01**	
24.	**Alpha Spectrometer accessories (Constant voltage/constant current power supply)**		**01**	
25.	**Gamma spectrometry with scintillation detectors and single-channel analysers**		**01**	
26.	**Gamma spectrometry with scintillation detectors and multichannel analysers**		**01**	
27.	**Ionisation chamber**		**01**	
28.	**Beta particle absorption using GM counting system**		**01**	

29.	**Beta spectrometry with scintillation detectors and multichannel analysers**		**01**	
GRAND TOTAL				

Annexure II

List of Equipment /Instruments required for Integrated M.Sc.-Ph.D Programme (Life Sciences)

Sl	Particulars of Assets	Qty	
1	Autoclave small (20- 25 ltr)	1	
2	Autoclave medium (40-60 ltr)	1	
3	Autoclave large (80 - 100 ltr)	1	
4	Refrigerated Micro fuge	2	
5	Non refrigerated micro fuge table top	2	
6	Desktop Computers	10	
7	LED TV 49”	2	
8	Water Distillation Unit ~~with R/O~~ (1-10 ltr. Capacity)	1	
9	4^{o}C Cold Cabinet small (1^{o}C to 8^{o}C throughout the	2	
10	Ice Maker	1	
11	Table for Desktop Computer	10	
12	Mini Dual Vertical Electrophoresis Unit	2	
13	Mini Electrophoresis Submarine Cell Tarson – Medium	2	
14	Mini Electrophoresis Submarine Cell Tarson – Small	4	
15	Mini Electrophoresis Submarine Cell Tarson – Small	4	
16	Electrophoresis Power Supply Unit	3	
17	Vacuum Pump capacity 45 ltr	2	
18	UV Trans illuminator	2	
19	Shaker Incubator	2	
20	Analytical Balance Sartorius - (252 gm)	1	
21	Analytical Balance Sartorius (220 gm)	1	
22	Spectrophotometer	2	

23	Accu Pipette set	1	
24	Magnetic Starrer	2	
25	Hot Air Oven	1	
26	ROCKING PLATFORM tray (not in GeM)	2	
27	Plant Growth Chamber	1	
28	Spinix vortex mixture (3020) – (2)	3	
29	Refrigerator 250 Ltr	1	
30	Haemocytometer with micropipettes	4	
31	Haemocytometer with 50 coverslips	4	
	Total =		