BRAHMANBARIA MEDICAL COLLEGE HOSPITAL

Standard Operating Procedure (SOP) & Clinical Biochemistry User Manual

Hospital Service Laboratory — Department of Laboratory Medicine & Department of Biochemistry

Ghatura, Comilla–Sylhet Highway, Brahmanbaria Sadar, Brahmanbaria-3400, Bangladesh • Affiliated with Chittagong Medical University

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Service Location	Clinical Laboratory, Medicine Building	**Laboratory In-Charge**	Md. Ohedul Hoque Sarker
Prepared By	Department of Laboratory Medicine & Biochemistry	**Approved By**	[Director / Managing Director, BMCH]

1. Institutional Directory, Contacts & Service Hours

The Clinical Biochemistry Unit of the Hospital Service Laboratory operates round-the-clock within the Department of Laboratory Medicine (Medicine Building) at Brahmanbaria Medical College & Hospital. The laboratory supports outpatient (OPD), inpatient (IPD), Emergency, ICU, CCU, and NICU services with automated clinical chemistry, electrolyte, blood gas, specific protein, and immunoassay testing.

Service / Desk	Contact Details & Operational Information
Hospital Address	Ghatura, Comilla–Sylhet Highway, Brahmanbaria Sadar, Brahmanbaria-3400, Bangladesh
Laboratory Location	Department of Laboratory Medicine, Medicine Building, BMCH
Diagnostic Inquiries	01332-556135
Hospital 24/7 Hotline	+880 1733-382344, +880 1733-382345
College Direct Line	+880 1733-382315–17

Service / Desk	Contact Details & Operational Information
Official E-mail & Web	bmchlimited@gmail.com • bbariamedicalcollege@gmail.com • hospital.bmchbd.com
Operating Hours	**24 Hours a Day, 7 Days a Week** (with on-duty medical technologists; walk-in accepted for routine blood investigations with physician prescription)

1.1 Departmental Leadership & Technical Supervision

Clinical biochemistry services are overseen by the academic faculty of the Department of Biochemistry and managed operationally by the Laboratory In-Charge of the Department of Laboratory Medicine.

Name	Designation	Qualifications	Room / Unit
Prof. Dr. Abu Hena Mostafa Kamal	Professor & Head, Dept. of Biochemistry	MBBS, M.Phil	[Room No.]
Dr. Sheikh Mst. Khadija Akter Meeli	Assistant Professor, Dept. of Biochemistry	MBBS, M.Phil	[Room No.]
Prof. Dr. Abdus Samad	Professor (Guest Teacher), Biochemistry	MBBS, M.Phil	[Room No.]
Dr. Shah Poran Jibon, Dr. Rifat Sarkar, Dr. Sadia Jahan, Dr. Akhi Sultana Asha	Lecturers, Dept. of Biochemistry	MBBS	Dept. of Biochemistry
Md. Ohedul Hoque Sarker	Laboratory In-Charge (Clinical Laboratory)	[Qualification]	Medicine Building

2. Preface, Purpose & Scope

Accurate, timely, and reproducible biochemical testing is foundational to clinical diagnosis, therapeutic monitoring, and critical care decision-making. Even the most advanced automated clinical chemistry analyzer cannot produce reliable results if patient preparation, specimen collection, transport, or quality control are compromised. Studies in laboratory medicine consistently demonstrate that the majority of laboratory errors originate in the pre-analytical phase.

This manual serves a dual role at Brahmanbaria Medical College & Hospital:

- **As a User Manual:** It provides clinicians, resident doctors, nurses, ward staff, and phlebotomists with standardized guidance on available biochemistry investigations, patient preparation, specimen container selection, request documentation, turnaround times, and critical value communication.
- **As a Standard Operating Procedure (SOP):** It establishes mandatory technical protocols for laboratory technologists covering specimen accessioning, rejection criteria, analyzer startup, internal quality control (IQC), result verification, equipment maintenance, biosafety, and biomedical waste disposal.

Compliance with this document is mandatory for all personnel involved in ordering, collecting, transporting, processing, and reporting clinical biochemistry specimens at BMCH. All procedures are aligned with good clinical laboratory practice and ISO 15189 quality principles.

3. Clinical Biochemistry Test Directory & Specimen Requirements

The table below lists all 32 routine and specialized clinical biochemistry investigations performed in the Hospital Service Laboratory, together with the required specimen type, collection container, and patient preparation instructions.

No.	Investigation / Test Name	Specimen & Tube Type	Patient Preparation & Special Notes	Priority
01	**Blood Sugar (RBS + FBS)**	Plasma (Sodium Fluoride / Potassium Oxalate — Gray top) or Serum (SST)	FBS: 8–12 hours overnight fasting (water allowed). RBS: Any time regardless of meal.	Routine / STAT
02	**OGTT (Oral Glucose Tolerance Test)**	Fluoride Plasma (Gray top) at 0 hr and 2 hr (or 1 hr & 2 hr in pregnancy)	8–12 hr fasting; administer 75 g anhydrous glucose in 250–300 mL water over 5 min; patient remains seated.	Routine
03	**HbA1c**	Whole Blood (K_2-EDTA — Lavender/Purple top)	No fasting required. Mix gently by inversion 8–10 times; do not centrifuge.	Routine
04	**Blood Gas Analysis (ABG)**	Arterial Whole Blood (Pre-heparinized ABG syringe)	Expel air bubbles immediately; cap tightly; transport on ice slurry and analyze within 15–30 minutes.	STAT
05	**S. Creatinine**	Serum (Plain Red top or SST Yellow top)	Avoid strenuous exercise prior to sampling; fasting not mandatory.	Routine / STAT
06	**Blood Urea**	Serum (Plain Red top or SST Yellow top)	Fasting not mandatory. Separate serum promptly after clotting.	Routine / STAT
07	**S. Uric Acid**	Serum (Plain Red top or SST Yellow top)	Fasting preferred (not strictly mandatory); avoid high-purine meal immediately before test.	Routine
08	**Full LFT (Liver Function Test)**	Serum (Plain Red top or SST Yellow top)	Fasting preferred. Avoid hemolysis; protect sample from direct light (bilirubin stability).	Routine
09	**RFT (Renal Function Test)**	Serum (Plain Red top or SST Yellow top)	Includes Urea, Creatinine, Electrolytes (as ordered). Avoid hemolysis.	Routine / STAT
10	**S. Bilirubin (Total)**	Serum (Plain Red top or SST Yellow top)	Protect specimen from direct light; avoid hemolysis.	Routine / STAT

No.	Investigation / Test Name	Specimen & Tube Type	Patient Preparation & Special Notes	Priority
11	**S. Bilirubin (Direct + Indirect)**	Serum (Plain Red top or SST Yellow top)	Protect specimen from light; transport promptly to prevent photodegradation.	Routine / STAT
12	**SGPT (ALT)**	Serum (Plain Red top or SST Yellow top)	Avoid hemolysis (falsely elevates enzyme activity).	Routine
13	**SGOT (AST)**	Serum (Plain Red top or SST Yellow top)	Strictly avoid hemolysis (high intracellular AST in RBCs).	Routine
14	**ALP (Alkaline Phosphatase)**	Serum (Plain Red top or SST Yellow top)	Do not use EDTA or citrate plasma (chelates Mg^{2+}/Zn^{2+} cofactors).	Routine
15	**S. Total Protein**	Serum (Plain Red top or SST Yellow top)	Avoid prolonged tourniquet application (>1 minute), which causes hemoconcentration.	Routine
16	**S. Albumin**	Serum (Plain Red top or SST Yellow top)	Avoid prolonged tourniquet stasis; avoid hemolysis.	Routine
17	**Prothrombin Time (PT / INR)**	Citrated Plasma (3.2% Sodium Citrate — Light Blue top)	Exact 9:1 blood-to-anticoagulant fill line is mandatory. Mix gently 3–4 times; note anticoagulant therapy.	Routine / STAT
18	**APTT**	Citrated Plasma (3.2% Sodium Citrate — Light Blue top)	Exact fill line mandatory. Avoid heparinized line draws; analyze within 4 hours of collection.	Routine / STAT
19	**Lipid Profile & Fasting**	Serum (Plain Red top or SST Yellow top)	**8–12 hours overnight fasting mandatory** (plain water allowed; avoid alcohol 24 hr prior).	Routine
20	**S. Cholesterol**	Serum (Plain Red top or SST Yellow top)	Fasting preferred (especially when evaluated alongside triglycerides).	Routine
21	**S. Triglyceride**	Serum (Plain Red top or SST Yellow top)	**8–12 hours overnight fasting mandatory** to prevent postprandial chylomicronemia.	Routine
22	**S. Amylase**	Serum (Plain Red top or SST Yellow top)	Avoid saliva contamination; do not use EDTA/citrate/oxalate tubes.	Routine / STAT
23	**S. Lipase**	Serum (Plain Red top or SST Yellow top)	Fasting preferred in non-urgent cases; STAT acceptable in acute abdominal pain.	Routine / STAT
24	**S. Calcium**	Serum (Plain Red top or SST Yellow top)	Avoid prolonged tourniquet stasis; never collect in EDTA/citrate/oxalate tubes.	Routine / STAT

No.	Investigation / Test Name	Specimen & Tube Type	Patient Preparation & Special Notes	Priority
25	**S. Electrolytes (Na^+, K^+, Cl^-)**	Serum (Plain Red/SST) or Lithium Heparin Plasma	Avoid fist-pumping and hemolysis (causes spurious hyperkalemia); never draw from IV infusion arm.	Routine / STAT
26	**Iron Profile**	Serum (Plain Red top or SST Yellow top)	Morning fasting sample preferred due to diurnal variation; avoid iron supplements 24 hr prior if advised.	Routine
27	**S. Ferritin**	Serum (Plain Red top or SST Yellow top)	No strict fasting required; avoid hemolysis.	Routine
28	**S. Iron**	Serum (Plain Red top or SST Yellow top)	Morning fasting specimen recommended; avoid hemolysis.	Routine
29	**TIBC (Total Iron Binding Capacity)**	Serum (Plain Red top or SST Yellow top)	Collect alongside S. Iron in morning fasting state; avoid hemolysis.	Routine
30	**AFP (Alpha-Fetoprotein)**	Serum (Plain Red top or SST Yellow top)	Note clinical indication (hepatic/oncology vs. obstetric gestational age) on request form.	Routine
31	**S. Phosphate**	Serum (Plain Red top or SST Yellow top)	Morning fasting sample preferred; separate serum from cells promptly to avoid RBC phosphate leak.	Routine
32	**S. Cortisol**	Serum (Plain Red top or SST Yellow top)	**Time-specific collection required:** Morning (8:00 AM) or Evening (4:00 PM) as ordered; record exact collection time.	Routine

4. Pre-Analytical Standard Operating Procedure

4.1 Test Requisition & Documentation

Every specimen submitted to the Clinical Biochemistry Laboratory must be accompanied by a legible, duly completed Laboratory Request Form (or electronic hospital order). Incomplete requisitions delay processing and compromise patient safety. The requesting physician or ward nurse must ensure the following details are recorded:

- Patient's full name (spelled accurately), age, and sex.
- Unique Hospital Registration Number (OPD/IPD ID) and Ward / Bed number (for inpatients).
- Specific biochemical tests requested and priority status (Routine or STAT / Emergency).
- Brief clinical history, provisional diagnosis, and relevant medications (e.g., anticoagulants for PT/INR, insulin, steroids, or IV fluids).
- Exact date and time of specimen collection (critical for FBS, OGTT, ABG, and Serum Cortisol).
- Requesting physician's name, designation, and signature, plus phlebotomist's initials.

4.2 Patient Identification, Phlebotomy & Order of Draw

Before venipuncture, the phlebotomist must positively identify the patient using at least **two independent identifiers** (Patient's full name and Hospital ID / Date of Birth or Mobile Number) by asking the patient (or attendant in unconscious/pediatric patients) and cross-checking against the requisition form and inpatient wristband.

Apply the tourniquet 7–10 cm above the venipuncture site for **no longer than 1 minute** to prevent venous stasis and hemoconcentration. Disinfect the site with 70% isopropyl alcohol and allow it to air-dry completely before puncture. Never draw blood proximal to an active intravenous infusion site. When multiple tubes are collected during a single venipuncture, follow the standard Clinical and Laboratory Standards Institute (CLSI) **Order of Draw** to prevent additive carryover:

Order	Tube Cap Color	Additive	Inversions	Primary Biochemistry Use
1	Light Blue	3.2% Sodium Citrate	3–4 gentle	PT/INR, APTT (fill exactly to mark)
2	Red / Yellow (SST)	No additive / Clot activator & gel	5 gentle (SST)	Routine Biochemistry, LFT, RFT, Lipids, Hormones
3	Green	Lithium or Sodium Heparin	8–10 gentle	STAT Electrolytes, Plasma Biochemistry, ABG syringe
4	Lavender / Purple	K_2-EDTA	8–10 gentle	HbA1c (never use for Calcium, ALP, or Potassium)
5	Gray	Sodium Fluoride / Potassium Oxalate	8–10 gentle	FBS, RBS, OGTT (glycolysis inhibitor)

4.3 Specimen Labeling Rule

Never pre-label empty tubes prior to specimen collection. Labeling must be performed immediately at the bedside or phlebotomy chair after filling the tube, in the presence of the patient. Every primary container must carry at least **two patient identifiers** (Patient Name and Hospital/Lab ID) along with collection date and time.

4.4 Specimen Transport, Centrifugation & Serum Separation

- Transport specimens upright in leak-proof biohazard transport racks to the Medicine Building Clinical Laboratory as soon as possible (ideally within 30–60 minutes of collection).
- **ABG specimens** must be transported immediately on an ice slurry and analyzed within 15–30 minutes.
- Allow plain/SST serum tubes to clot undisturbed in an upright position for 20–30 minutes at room temperature before centrifugation (avoid premature spinning, which causes fibrin strands that clog analyzer probes).
- Centrifuge specimens in a balanced centrifuge at **3,000–3,500 rpm (approximately 1,500–2,000 × g) for 10 minutes**. Visually inspect separated serum/plasma for hemolysis, lipemia, or icterus prior to analysis.

4.5 Specimen Rejection Criteria

To safeguard diagnostic accuracy, the receiving technologist must inspect every specimen upon arrival. Any specimen meeting the criteria below must be rejected, logged in the **Specimen Rejection Register**, and communicated immediately to the ordering ward or clinician for recollection.

Rejection Criterion	Clinical / Analytical Impact	Mandatory Corrective Action
Unlabeled or Mislabeled Tube	High risk of patient misidentification and wrong clinical management.	Reject immediately; never relabel a tube retrospectively. Request fresh sample.
Gross Hemolysis	Falsely elevates K^+, SGOT (AST), Phosphate, Iron; interferes optically with Bilirubin and enzymes.	Reject for K^+, AST, Iron, Phosphate, Bilirubin; notify ward for gentle recollection.
Wrong Anticoagulant / Tube	EDTA falsely lowers Ca^{2+} and ALP and severely elevates K^+; fluoride inhibits enzymatic assays.	Reject immediately; instruct collector on correct tube per Section 3.
Under-filled Citrate Tube / Clotted Anticoagulated Sample	Altered blood-to-citrate ratio invalidates PT/INR and APTT; microclots block analyzer probes.	Reject immediately; recollect to exact fill line with gentle inversion.
Quantity Not Sufficient (QNS)	Insufficient serum/plasma volume to complete requested panel and repeat checks.	Contact clinician to prioritize critical analytes or recollect adequate volume.
Delayed / Improper Transport	Glycolysis lowers glucose; prolonged cell contact elevates K^+ and phosphate; air bubbles invalidate ABG.	Reject affected tests (especially ABG, Glucose, K^+); request fresh specimen.

5. Analytical Standard Operating Procedure

5.1 Daily Analyzer Startup & Calibration

At the start of every shift (and prior to routine batch runs), the duty medical technologist must execute the manufacturer-specified startup checklist for each biochemistry analyzer (MISPA CXL PRO, AGAPPE MISPA CX4, SELECTRA PRO M, MISPA i2, Easy Lyte Plus, Blood Gas Analyzer, and VIDAS):

1. Verify laboratory ambient temperature (18–25 °C) and refrigerator/reagent storage temperatures (2–8 °C) and record values in the **Temperature Monitoring Log**.
2. Verify adequate supply of deionized/distilled water from the Distilled Water Plant and empty liquid waste containers safely.
3. Inspect sample probes, reagent probes, cuvettes, and tubing for cleanliness, air bubbles, or crystal deposits; perform automated wash/priming cycles.
4. Check on-board reagent inventory, open-vial stability, and expiration dates. Never mix reagents from different lot numbers.
5. Perform reagent blanking and calibration whenever: (a) a new reagent lot is introduced, (b) major preventive maintenance or part replacement occurs, (c) internal quality control shows a systematic shift or trend, or (d) calibration stability period expires.

5.2 Internal Quality Control (IQC) & External Quality Assessment (EQA)

Patient samples must **not** be analyzed or reported until daily Internal Quality Control passes acceptance criteria.

- **IQC Frequency:** Run at least two levels of commercial control material (Normal / Level 1 and Pathological / Level 2) daily for every active biochemistry parameter, and after every calibration or maintenance event.
- **Westgard Multi-Rule Evaluation:** Plot control values on Levey–Jennings (L–J) charts and apply Westgard rules:
  - **1_{2s} (Warning):** One control exceeds ±2 SD from the mean — inspect other rules carefully.
  - **1_{3s} (Reject — Random Error):** One control exceeds ±3 SD.
  - **2_{2s} (Reject — Systematic Error):** Two consecutive controls exceed ±2 SD on the same side of the mean.
  - **R_{4s} (Reject — Random Error):** Difference between two controls within a run exceeds 4 SD.
  - **4_{1s} / 10_{x} (Reject — Systematic Drift):** Four consecutive controls exceed ±1 SD on the same side, or ten consecutive controls fall on one side of the mean.
- **Out-of-Control Action:** Halt patient testing for the affected analyte, inspect reagent/control integrity, prepare fresh control aliquot, recalibrate if necessary, document root cause in the **QC Corrective Action Log**, and re-verify IQC before resuming patient runs.

- **EQA / Proficiency Testing:** The laboratory participates in recognized External Quality Assessment schemes (and inter-laboratory comparisons) to verify long-term analytical accuracy against peer laboratories.

5.3 Sample Processing & Analytical Precautions

Verify sample ID against the analyzer worklist before loading. Prioritize STAT specimens (ABG, Electrolytes, Blood Sugar, Bilirubin, Amylase, PT/INR) using dedicated STAT positions. Results exceeding the linear measurement range of the assay must be automatically or manually diluted with the manufacturer-recommended diluent, re-assayed, and multiplied by the dilution factor. Unexpected values or significant delta-check discrepancies from a patient's previous results must be re-checked for specimen integrity (clots, bubbles, hemolysis, lipemia) and re-run prior to release.

6. Post-Analytical SOP — Verification, Reporting & Retention

6.1 Double Verification & Report Authorization

BMCH maintains a strict **double-verification workflow** for all clinical biochemistry reports:

1. **Technical Validation:** The performing medical technologist reviews analyzer flags, IQC pass status, sample integrity, dilution calculations, and clinical plausibility before releasing results for medical review.
2. **Clinical Verification & Sign-Off:** Qualified Consultant Biochemists / Pathologists review and authorize diagnostic reports, correlating abnormal findings with available clinical history and previous trends before final print or digital release.

6.2 Turnaround Time (TAT) & Report Delivery

- **STAT / Emergency Critical Markers:** Processed on highest priority; critical investigations (ABG, Serum Electrolytes, Blood Glucose, emergency profiles) are delivered within **30 to 45 minutes** (critical emergency markers targeted in under 30 minutes).
- **Routine Biochemistry Investigations:** Delivered on the same day according to the laboratory collection batch schedule ([Insert exact routine report delivery hours]).
- **Report Access:** Printed reports are issued from the Diagnostic Report Delivery Counter upon presentation of the receipt, supported by prompt SMS notification and online report availability.

6.3 Critical (Panic) Value Reporting Protocol

> **MANDATORY READ-BACK POLICY:** Any biochemical result falling within a life-threatening critical range must be telephoned **immediately** upon verification to the requesting physician or responsible ward/ICU nurse. The recipient must read back the patient's full name, Hospital ID, analyte name, and exact numerical value. All critical calls must be documented in the **Critical Value Register** (date, time, caller name, recipient name, result, and read-back confirmation).

Analyte	Critical Low (Alert)	Critical High (Alert)	Clinical Urgency
Blood Glucose	< 2.8 mmol/L (< 50 mg/dL)	> 25.0 mmol/L (> 450 mg/dL)	Hypoglycemia / DKA / HHS
Serum Potassium (K^+)	< 2.8 mmol/L	> 6.0 mmol/L	Cardiac arrhythmia risk
Serum Sodium (Na^+)	< 120 mmol/L	> 160 mmol/L	Cerebral edema / seizure risk
Serum Calcium (Total)	< 6.5 mg/dL	> 13.0 mg/dL	Tetany / arrhythmia / crisis
Arterial Blood pH (ABG)	< 7.20	> 7.60	Severe acid–base derangement
Arterial pO_2 / pCO_2	pO_2 < 50 mmHg	pCO_2 > 65 mmHg	Acute respiratory failure
Neonatal S. Bilirubin	—	> 15.0 mg/dL (age-dependent)	Kernicterus risk
PT / INR	—	INR > 5.0	Severe hemorrhage risk

Note: Standard clinical reference thresholds are shown above; final institutional critical limits are subject to periodic approval by the BMCH Medical Board and Department of Biochemistry.

6.4 Specimen Retention, Record Archiving & Confidentiality

- **Post-Analysis Specimens:** Separated serum/plasma specimens are capped and stored at 2–8 °C for **48–72 hours** ([Confirm institutional retention period]) to permit repeat verification or clinician-requested add-on testing, after which they are autoclaved/disinfected and discarded as infectious waste.
- **Records & Logs:** Laboratory registers, IQC charts, calibration records, equipment maintenance logs, and archived electronic patient reports are retained securely in compliance with institutional policy and national healthcare regulations ([Insert retention duration, e.g., 2–5 years]).
- **Confidentiality:** Patient test results are strictly confidential and may only be released to the patient, authorized representative with valid receipt, or the treating clinical team.

7. Biochemistry Equipment Inventory & Maintenance SOP

The Clinical Biochemistry and Hospital Service Laboratory operates automated and semi-automated analyzers supported by dedicated water purification and sample preparation equipment. Every instrument maintains an individual **Equipment Logbook** documenting daily maintenance, preventive service, and breakdown repairs.

Analyzer / Equipment	Category & Principal	Importer / Vendor	Installed Date	Service Engineer
MISPA CXL PRO	Fully Automated Clinical Chemistry Analyzer (Agappe Diagnostics, Switzerland)	Tradesworth LTD.	01-11-2023	Nazmul Islam +8801819-230957
AGAPPE MISPA CX4	Auto Biochemistry Analyzer (Agappe Diagnostics, Switzerland)	Tradesworth LTD.	25-08-2026	Nazmul Islam +8801819-230957
SELECTRA PRO M	Auto Biochemistry Analyzer (Elitech Group, France)	Tradesworth LTD.	15-12-2018	Nazmul Islam +8801819-230957
BAS-150 TS	Semi-Auto Biochemistry Analyzer	ABC Corporation	—	Munna
MISPA i2	Fully Automated Specific Protein Analyzer (Agappe Diagnostics, Switzerland)	Tradesworth LTD.	11-03-2021 / 19-09-2024	Nazmul Islam +8801819-230957
EASY LYTE PLUS	Fully Automated Electrolyte Analyzer (Medica Corporation, USA)	Tradesworth LTD.	06-04-2010 / 19-09-2024	Nazmul Islam +8801819-230957
Blood Gas Analyzer	Arterial Blood Gas (ABG) Analyzer	Medisolve	28-08-2024	[Medisolve Support]
VIDAS & Hormone Analyzer	Fully Automated Hormone / Immunoassay Analyzer (bioMérieux, France)	Tradesworth LTD.	03-11-2022 / 27-04-2025	Nazmul Islam +8801819-230957
Lifotronic Analyzer	Automated Clinical Analyzer	ABC Corporation	02-11-2026	Md. Ali Hasan +8801730-773569
Distilled Water Plant	Laboratory Grade Water Purification	Osmonic Corporation	18-08-2026	Alamgir Hossain +01710006310
Centrifuge, Roller Mixer & Lab Rotator	Specimen Preparation Equipment	CBC International	28-08-2024	[Vendor Support]
Water Bath & Hot Air Oven	Thermal Incubation & Sterilization	Tradesworth LTD. / CBC International	03-11-2015 / 05-11-2018 / 28-08-2024	Nazmul Islam +8801819-230957

7.1 Preventive Maintenance & Breakdown Escalation

- **Daily Maintenance:** Probe exterior/interior wash, cuvette blank check, ISE electrode conditioning (Easy Lyte Plus), distilled water conductivity check, and surface disinfection with 70% ethanol or 0.5% hypochlorite.
- **Weekly / Monthly Maintenance:** Deep cleaning of reaction rotor/cuvettes, fluidic line flushing, peristaltic tubing inspection, fan filter cleaning, and centrifuge rotor disinfection.
- **Breakdown Protocol:** Immediately label malfunctioning equipment as *"OUT OF SERVICE"*, notify the Laboratory In-Charge (Md. Ohedul Hoque Sarker), shift active testing to the backup biochemistry analyzer (e.g., MISPA CX4 / MISPA CXL PRO / SELECTRA PRO M), log the fault, and contact the designated Service Engineer. Verify calibration and IQC before returning any repaired instrument to clinical service.

8. Laboratory Biosafety, Spill Management & Waste Disposal

8.1 Universal Precautions & Personal Protective Equipment (PPE)

All blood and body fluid specimens must be handled as potentially infectious (HBV, HCV, HIV, and other bloodborne pathogens). All laboratory personnel must strictly observe:

- Wear buttoned laboratory coats, disposable powder-free nitrile gloves, and closed-toe shoes at all times inside technical areas; use face shields or goggles when decapping tubes or handling corrosive reagents.
- **Strictly prohibited** inside laboratory work areas: eating, drinking, smoking, applying cosmetics, mouth pipetting, and using personal mobile phones while wearing contaminated gloves.
- Never recap used needles. Dispose of needles and lancets immediately into puncture-proof sharps containers.
- Wash hands thoroughly with soap and water (or alcohol-based hand rub) immediately after removing gloves and before leaving the laboratory.
- Report any needle-stick injury, splash exposure, or laboratory accident immediately to the Laboratory In-Charge for prompt Post-Exposure Prophylaxis (PEP) evaluation.

8.2 Biological Spill Management

In the event of a blood or serum spill: (1) alert nearby staff and don fresh gloves and PPE; (2) cover the spill with absorbent paper towels; (3) pour freshly prepared **1% sodium hypochlorite** solution gently from the outer perimeter inward; (4) allow a minimum **15–20 minutes contact time**; (5) collect soaked material with forceps/scoop into a Yellow infectious waste bag; (6) wipe the surface again with disinfectant and rinse with clean water; and (7) document the incident in the Safety Log.

8.3 Color-Coded Biomedical Waste Segregation

All waste generated in the Clinical Biochemistry Laboratory is segregated at the point of generation in accordance with national hospital biomedical waste management standards:

Bin Color	Waste Category & Examples	Handling & Disposal
Yellow	Infectious & biohazardous waste: used vacutainers, blood-stained swabs/cotton, gloves, pipette tips, specimen cups.	Seal at 3/4 full; autoclave/disinfect and transfer to authorized biomedical waste treatment.
Red (Puncture-Proof)	Sharps waste: used needles, lancets, broken glass slides, glass reagent vials.	Never overfill or recap; seal permanently and send for sharps destruction/encapsulation.
Black	General non-infectious waste: paper, cardboard reagent boxes, outer packaging, office waste.	Dispose through routine municipal/hospital general waste collection.
Liquid Waste	Analyzer effluent, discarded serum/plasma, chemical wash solutions.	Treat infectious liquid with 1% sodium hypochlorite (30 min) prior to controlled effluent drainage per hospital ETP protocol.

9. Document Approval & Authorization

This Standard Operating Procedure and Clinical Biochemistry User Manual has been reviewed for technical accuracy and institutional alignment and is approved for immediate implementation in the Hospital Service Laboratory of Brahmanbaria Medical College & Hospital.

Prepared By	Reviewed By	Approved By
_____ **Md. Ohedul Hoque Sarker** Lab In-Charge, Dept. of Laboratory Medicine Date: _____	_____ **Prof. Dr. Abu Hena Mostafa Kamal** Professor & Head, Dept. of Biochemistry Date: _____	_____ **Director / Managing Director** Brahmanbaria Medical College & Hospital Date: _____