Guidelines

for

Competency Based Training Programme

in

DNB- BIOCHEMISTRY

NATIONAL BOARD OF EXAMINATIONS

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PROGRAMME GOAL

The postgraduate courses in Biochemistry should enable a medical graduate through exhaustive knowledge in biochemical technology both in theory and in practical so as to be in a position to apply the same and correlate the various biochemical parameters in health and disease.

PROGRAMME OBJECTIVES

A candidate upon successfully qualifying in the DNB (Biochemistry) Examinations should be able to:

1. Be a competent Biochemist
2. Work as a teacher in medical faculty both at undergraduate & postgraduate level..
3. Independently able to work on basic as well as high end automated equipment.
4. Supervise modern laboratory techniques & procedures along with total quality assurance in clinical Biochemistry in the hospital
5. Pursue her/his interest to undergo further specialization.
6. Carry out & conduct various research problems both at basic and applied level
7. Guide thesis at both post Graduate and Doctoral level
8. Suggest, evaluate, interpret Biochemical investigation in a given clinical situation and apply knowledge in clinical problems

Specific Learning Objectives

1. Understand the concept of Biochemistry regarding Biomolecules Carbohydrates, proteins, lipids, Nucleic acids, Enzymes, Minerals
2. Have knowledge of intermediary metabolism of the above & regulation of individual metabolism
3. Possess the knowledge of the impairment of metabolism including inborn errors of metabolism.
4. Understand the role of nutrition in health& disease
5. Apply biochemical knowledge in normal & diseased states
6. Have knowledge regarding the analysis of biological fluids for its chemical constituents& correlating the same in health& disease
7. Develop skills of performing biochemical, & interpreting the data
8. Suggestive technique to learning ELISA, Molecular Biology techniques, electrophoresis, chromatography and chemiluminescence

9. Basic laboratory techniques
10. Biomedical waste management
11. Knowledge of basics of educational technology

ELIGIBILITY CRITERIA FOR ADMISSIONS TO THE PROGRAMME

(A) DNB Biochemistry Course:

1. Any medical graduate with ***MBBS*** qualification , who has qualified the ***Entrance Examination*** conducted by NBE and fulfill the eligibility criteria for admission to DNB ***Broad Specialty*** courses at various NBE accredited Medical Colleges/ institutions/Hospitals in India is eligible to participate in the Centralized counseling for allocation of DNB **Biochemistry** seats purely on merit cum choice basis.

2. Admission to 3 years post MBBS DNB **Biochemistry** course is only through ***Entrance Examination*** conducted by NBE and Centralized Merit Based Counseling conducted by National Board of Examination as per prescribed guidelines.

Duration of Course: 3 Years

Every candidate admitted to the training programme shall pursue a regular course of study (on whole time basis) in the concerned recognized institution under the guidance of recognized post graduate teacher for assigned period of the course.

TEACHING AND TRAINING ACTIVITIES

The fundamental components of the teaching programme should include:

1. Case presentations & discussion- once a week
2. Seminar – Once a week
3. Journal club- Once a week
4. Grand round presentation (by rotation departments and subspecialties)- once a week
5. Faculty lecture teaching- once a month
6. Clinical Audit-Once a Month

7. A poster and have one oral presentation at least once during their training period in a recognized conference.

The rounds should include bedside sessions, file rounds & documentation of case history and examination, progress notes, round discussions, investigations and management plan) interesting and difficult case unit discussions.

The training program would focus on knowledge, skills and attitudes (behavior), all essential components of education. It is being divided into theoretical, clinical and practical in all aspects of the delivery of the rehabilitative care, including methodology of research and teaching.

Theoretical: The theoretical knowledge would be imparted to the candidates through discussions, journal clubs, symposia and seminars. The students are exposed to recent advances through discussions in journal clubs. These are considered necessary in view of an inadequate exposure to the subject in the undergraduate curriculum.

Symposia: Trainees would be required to present a minimum of 20 topics based on the curriculum in a period of three years to the combined class of teachers and students. A free discussion would be encouraged in these symposia. The topics of the symposia would be given to the trainees with the dates for presentation.

Clinical: The trainee would be attached to a faculty member to be able to pick up methods of history taking, examination, prescription writing and management in rehabilitation practice.

Bedside: The trainee would work up cases, learn management of cases by discussion with faculty of the department.

Journal Clubs: This would be a weekly academic exercise. A list of suggested Journals is given towards the end of this document. The candidate would summarize and discuss the scientific article critically. A faculty member will suggest the article and moderate the discussion, with participation by other faculty members and resident doctors. The

contributions made by the article in furtherance of the scientific knowledge and limitations, if any, will be highlighted.

Research: The student would carry out the research project and write a thesis/ dissertation in accordance with NBE guidelines. He/ she would also be given exposure to partake in the research projects going on in the departments to learn their planning, methodology and execution so as to learn various aspects of research.

SYLLABUS

Cell Biology

- **Cell Biology** Structure of the cell and different sub cellular organelles, Structure of cell membrane Movement of substances across cell membranes, Interaction between cells and environment, Glycoprotein's and proteogycans, Extracellular matrix, Integrins,Cell-cell interaction-selectins, Cadherins, Tight junctions ,Gap junctions, Intracellular traffic and sorting of proteins-endoplasmic reticulum, Golgi complex, Vesicle transport, Endocytic pathway, Protein targeting to cell surface, Nucleus, Lysosomes, Mitochondria, peroxisomes, Cytoskeleton and cell motility, Cell cycle, Muscle contraction, Hemoglobin and Myoglobin,

- **Biostatistics/research methodology** Types of study design, Calculation of adequate sample size, Students 't' test, Paired 't' test, Chi square test, Fisher's exact test, Nonparametric tests of significance, One way and two way analysis of variance, Multivariate analysis, Survival analysis-logrank test, Relative risk calculation-Odd's ratio, commonly used statistical software's, ROC, Multiple regression, coefficient of correlation and linear regression, Bioinformatics.

- **Biochemical Techniques** Centrifugation-ultracentrifugation, Optical techniques-spectrophotometery, reflectance photometry, flame photometry, atomic absorption spectrophotometery, fluorometery, phosphorescence, chemiluminescence, turbidimetery and nephelometry, Electrochemistry- chemical sensors and biosensors, Electrophoresis, Chromatography, Immunochemical techniques-immunoassays, Spectroscopic techniques-circular dichroism, electron spin resonance, nuclear magnetic resonance, Mass spectrometry and tandem mass spectrometry ,Nanotechnology and microfabrication, Techniques to study in vivo metabolism-NMR,SPECT,PET scans, Radioisotope techniques like PCR, DNA Extraction technique and RFLP etc.

Enzymes

General properties, classification and nomenclature, kinetic model, Km value , factors influencing enzymes action, specificity, mechanism of enzymes action, enzymes kinetics, regulation of enzyme action, isolation, isoenzymes, diagnostic and therapeutic uses of enzymes

Vitamins:

Structure, sources, daily requirements, physiological role and deficiency manifestation of vitamins, hypo and hyper vitamins and vitamins Mechanism of action of coenzymes

Metabolism

- Chemistry and metabolism of carbohydrates, lipids, proteins, and amino acids in human system with clinical implications

- Inborn errors of metabolism: Inborn errors of carbohydrates, lipids amino acids, protein nuclein acids, mineral metabolism.

Human Nutrition:

- Principal food components, general nutritional requirements, energy requirements, biological value of proteins, specific dynamic action, balanced diet, diet formulation in health and disease, mixed diet, nutritional supplements, food toxins and additives, parental nutrition, disorders of nutrition, obesity, protein and protein energy, malnutrition dietary fibers, under-nutrition, laboratory diagnosis of nutrition disorders, national nutritional program

- Mineral metabolism and role of micro and macronutrients

Molecular Biology

- Chemistry and Metabolism of nucleotides/nucleic acids, replication, transcription and translation, regulation of gene expression, protein targeting, recombinant DNA and other molecular biology techniques, Human genome project, functional genomics, proteomics,

- Principles of human genetics- Transmission of genetic disease-mutations and their functional consequences, alleles, genotypes, haplotypes, phenotypes, genetic linkage, identification of disease causing gene, chromosomal disorders, monogenic Mandelian disorders, mitochondrial disorders, nucleotide repeat expansion disorders, polygenic disease and complex genetic traits, imprinting disorders, methods of mutation detection, gene therapy, gene library and uses of recombinant DNA technology, restriction enzymes, mechanism of antibiotics and anti cancer drugs, differences between Eukaryotic and Prokaryotic gene expression.

- Stem cells in clinical medicine.

Immunology

Overview-innate and acquired immunity, cells and organs of the immune system-T and B cells, macrophages, dendritic cells, NK cells, granulocytes, antigens,

epitopes and haptens, immunoglobulins classes, isotypes, allotypes, idiotypes, monoclonal antibodies, organization and expression of immunoglobulin genes, immunoglobulin gene rearrangement, class switching, antigen-antibody interaction- 5 immunochemical techniques, MHC, antigen processing and presentation, T cell and B cell receptor, toll like receptors, cell maturation/activation/differentiation, B cell generation /activation/ differentiation, cytokines, complement system, cell mediated immunity, T regulatory cells, Hypersensitivity, immune response to infections, vaccines and newer approaches, immunodeficiency, autoimmunity, transplantation immunology, cancer and immune system, immunodiagnostics and immunotherapy.

Hematopoietic disorders-

Iron deficiency and other hypoproliferative anaemias-iron metabolism, laboratory tests of iron status, iron therapy, anemia of chronic disease, anaemia of renal disease Hemoglobinopathies- sickle cell anaemia, methaemoglobinemias, thalassemia syndromes, Megaloblastic anaemias, RBC membrane and metabolism,. Hemolytic anaemias-inherited defects in RBC membrane and enzymes-G6PD deficiency, immunologic causes of hemolysis, ABO blood group system-biochemical basis, transfusion biology, Plasma cell disorders-multiple myeloma, MGUS.

Hemostasis and thrombosis:

Biochemical mechanisms of coagulation, related laboratory tests, antiplatelet /anticoagulant / fibrinolytic therapy.

Cardiovascular system-

Cardiac biomarker's diagnostic and prognostic implications and risk stratification Atherosclerosis- pathogenesis, risk factors, its prevention and treatment Heart failure, acute coronary syndrome, cardiac biomarkers, cardiomyopathies. Hypertension-essential and secondary, genetics, laboratory evaluation, approach to therapy.

Respiratory system

Gaseous exchange in lungs-physiological features and disturbances, arterial blood gases. Pathogenesis of asthma, cystic fibrosis, emphysema, α1AT deficiency etc.

Kidney

Kidney function tests, Pathophysiology, biochemistry ,laboratory findings and management in acute renal failure, chronic renal disease and failure/uremia,

Estimation of GFR, Glomerular diseases-pathogenesis and mechanisms of glomerular injury, Nephrotic syndrome, Diabetic nephropathy, Tubular disorders, Renal tubular acidosis, Proteinuria, Nephrolithasis, Kidney transplant etc.

Gastrointestinal system

Alimentary tract-gastric physiology, pathophysiology of peptic ulcer disease, role of H.pylori ,gastric function tests, Zollinger Ellison syndrome, nutrient digestion and absorption, evaluation of malabsorption, celiac sprue, inflammatory bowel disease, steatorrhea, lactose intolerance, protein losing enteropathy, investigation of maldigestion / malabsorption, GIT regulatory peptides , Neuroendocrine tumors. Liver- liver function tests , hyperbilirubinemias , viral hepatitis, serologic /virologic markers, alcoholic liver disease, fatty liver, chronic liver disease, cirrhosis and its complications, pathogenesis of ascites, hepatic encephalopathy, metabolic diseases affecting liver, Reye's syndrome, diseases of gall bladder/bile ducts-pathogenesis of gallstones. Pancreas-acute and chronic pancreatitis, cystic fibrosis, pancreatic function tests

Disorders of Immune system, connective tissue and joints

Immune tolerance ,mechanisms of immune mediated damage to host tissues, primary immune deficiency diseases-laboratory evaluation and management of autoimmune diseases, hypersentivities and immune deficiency disorder like SLE, AIDS, rheumatoid arthritis, Sjogren's syndrome, Asthma, gout

Bone and mineral metabolism

Bone structure and metabolism, calcium, phosphate and magnesium metabolism, regulation and abnormalities, vitamin D, calcitonin, PTH, osteoporosis-pathophysiology, markers of bone turnover.

Nervous system and Neurologic disorders

Neurotransmitters and their receptors, ion channels and channelopathies, memory and learning-signaling pathways, neurotrophic factors, apoptosis, protein aggregation and neurodegeneration, genetic disorders of CNS, pathophysiology of ischemic stroke, Alzheimer's disease, Parkinson'disease, Huntington'disease, Inherited ataxias, Amyotrophic lateral sclerosis and other motor neuron diseases, Multiple sclerosis. Prions and Prion diseases, Guillain-Barre syndrome-immunopathogenesis, Myasthenia gravis-pathophysiology, Hereditary myopathies-Duchenne muscular dystrophy, Inherited disorders of muscle energy metabolism, mitochondrial myopathies. Biochemistry of olfaction taste, vision and touch.

Psychiatric disorders

Anxiety, depression ,schizophrenia-pathophysiology. Neuropsychiatric drugs-biochemical basis of mode of action, biochemical basis of drug addiction and abuse, CSF analysis.

Cancer

Cancer genetics, clonal origin and multistep nature, oncogenes, tumour suppressor genes, familial cancer syndromes, chromosomal instabilityin solid tumours, viruses in human cancer, epigenetic regulation in cancer, gene expression profiling in cancer, cancer cell biology, cell cycle abnormalities, telomerase, apoptosis, metastasismolecular basis and therapeutic strategies, tumour angiogenesis-molecular events and antiangiogenic therapy, biological basis of cancer chemotherapy, multidrug resistance, molecularly targeted cancer therapy, cancer immunotherapy.

Environmental Biochemistry

Xenobiotic metabolism, pesticide organophosphorous poisoning, water and air pollution

Clinical Biochemistry

Investigative aspects-principles of laboratory analysis and safety, specimen collection and processing, automation, point of care testing, evidence based laboratory medicine, selection and analytical evaluation of methods, clinical evaluation of methods-sensitivity and specificity, ROC curves, establishment and use of reference values, preanalytical variables, clinical laboratory informatics, Total quality management, Biomedical waste disposal. Analytes-Amino acids/peptides/proteins, plasma proteins, enzymes, clinical enzymology ,tumour markers, carbohydrates, lipids / lipoproteins / apolipoproteins, cardiovascular,risk factors, electrolytes, blood, gases, hormones, catecholamines / serotonin, vitamins,and,trace elements, hemoglobin, iron and bilirubin, porphyrins and their disorders, Therapeutic drug monitoring. Pituitary, adrenal and thyroid function, Reproductive related disorders-infertility, Pregnancy-maternal and fetal health, Inborn errors of metabolism, Clinical toxicology, Molecular diagnostics. Accreditation of labs NABL, ISO etc.

Endocrinology

Diabetes mellitus etiopathogenesis, diagnostic and prognostic marker's, short and long term complications, risk factors and principle management.
Thyroid hormones, synthesis and mechanism of action, hyper and hypo thyroidism
Derangement of structure and functions of hypothalamus, pituitary, parathyroid glands, adrenal cortex, adrenal medulla and gonads.

Miscellaneous

Biological oxidation, bioenergetics, and High energy phosphate compounds, Digestion and absorption of food and other nutrients, Detoxification/ xenobiotics, Cytochrome P450 system, Free radicals formation, scavenging oxygen free radicals, Antioxidants. Role in diseases. Respiratory chain and oxidative phosphorylation, components of respiratory chain control, site specific inhibitors, uncouplers, Muscular contraction, nerve conduction, coagulation of food Metabolism in specialized tissues like erythrocytes, lens nervous tissues etc. Fluid and electrolyte balance and Acid-Base balance-regulation and disturbances.

PRACTICAL

Clinical Biochemistry

Estimation in blood of glucose, GTT, glycosylated Hb, urea creatinine, uric acid, ammonia, clearance tests, cholesterol, triglycerides, HDL, LDL, bilirubin, total proteins, albumin, AST, ALT, ALP, GGT, acidphosphatase, amylase, LDH, CK total,CKMB,calcium, Phosphorus,serum electrolytes-sodium and potassium, blood gas analysis, Apo A ,ApoB, copper, ceruloplasmin, iron,TIBC, ferritin, troponin, myoglobin. Urine analysis, microalbuminuria. Analysis of CSF and other body fluids. Chemiluminescence based immunoassays, Cell culture, HPLC, Mass spectrometry.

List of suggested practical

Protein fractionation- Ion exchange chromatography, gel filtration chromatography

TLC for lipids, amino acids

Kinetic analysis of enzymes (Alkaline phosphatase) from a suitable source

Separation and molecular weight determination of proteins by SDS-PAGE

Western blotting

Purification of IgG by protein A-Sepharose affinity column chromatography

Estimation of proteins by Lowry and Bradford methods

Separation of LDH isoenzymes by PAGE

Serum protein electrophoresis on agarose gel and densitometric scanning.

Immunodiffusion techniques-radial immunodiffusion,ouchterlony

Immunofixation

Lipoprotein electrophoresis

Paper chromatography for separation of amino acids

Separation of peripheral blood lymphocytes on Ficoll Hypaque

Subcellular fractionation by ultracentrifugation

Isolation of high molecular weight DNA from tissues/blood

Restriction enzyme digestion of DNA

Isolation of plasmid and agarose gel electrophoresis

PCR

ELISA for hormones/tumour markers radioactivity measurements, RIA

Biostatistics, Research Methodology and Clinical Epidemiology

Ethics

Medico legal aspects relevant to the discipline

Health Policy issues as may be applicable to the discipline

Competencies

- Based on the available facilities, department can prepare a list of postgraduate experiments pertaining to basic and applied biochemistry.
- Active learning should form the mainstay of postgraduate training there should be lectures for postgraduates (at least 20 per year).
- Along with seminars, symposia, group-discussions, journal clubs. The postgraduate students should regularly take the ward rounds of various clinical departments and learn cases of interest for discussion with the Biochemistry faculty.

- They should render special investigative services in their respective area of specialization .Each institute should have a medical education unit to generate teaching resource material for UG and evolving of problem solving modules.
- Micro teaching and problem based learning
- Horizontal and vertical integration

THESIS PROTOCOL & THESIS

The candidates are required to submit a thesis at the end of three years of training as per the rules and regulations of NBE.

Guidelines for Submission of Thesis Protocol & Thesis by candidates

Research shall form an integral part of the education programme of all candidates registered for DNB degrees of NBE. The Basic aim of requiring the candidates to write a thesi protocol & thesis/dissertation is to familiarize him/her with research methodology. The members of the faculty guiding the thesis/dissertation work for the candidate shall ensure that the subject matter selected for the thesis/dissertation is **feasible, economical** and **original**.

Guidelines for Thesis Protocol

The protocol for a research proposal (including thesis) is a study plan, designed to describe the background, research question, aim and objectives, and detailed methodology of the study. In other words, the protocol is the 'operating manual' to refer to while conducting a particular study.

The candidate should refer to the NBE Guidelines for preparation and submission of Thesis Protocol before the writing phase commences. The minimum writing requirements are that the language should be clear, concise, precise and consistent without excessive adjectives or adverbs and long sentences. There should not be any redundancy in the presentation.

The development or preparation of the Thesis Protocol by the candidate will help her/him in understanding the ongoing activities in the proposed area of research. Further it helps in creating practical exposure to research and hence it bridges the connectivity between clinical practice and biomedical research. Such research exposure will be helpful in improving problem solving capacity, getting updated with ongoing research and implementing these findings in clinical practice.

Research Ethics: Ethical conduct during the conduct and publication of research is an essential requirement for all candidates and guides, with the primary responsibility of ensuring such conduct being on the thesis guide. Issues like Plagiarism, not maintaining the confidentiality of data, or any other distortion of the research process will be viewed seriously. The readers may refer to standard documents for the purpose.

The NBE reserves the right to check the submitted protocol for plagiarism, and will reject those having substantial duplication with published literature.

PROTOCOL REQUIREMENTS

1. All of the following will have to be entered in the online template. The thesis protocol should be restricted to the following word limits.

- Title : 120 characters (with spacing) page
- Synopsis [structured] : 250-300
- Introduction : 300-500
- Review of literature : 800-1000
- Aim and Objectives : Up to 200
- Material and Methods : 1200-1600
- 10-25 References [ICMJE style]

2. It is mandatory to have ethics committee approval before initiation of the research work. The researcher should submit an appropriate application to the ethics committee in the prescribed format of the ethics committee concerned.

Guidelines for Thesis

1. The proposed study must be approved by the institutional ethics committee and the protocol of thesis should have been approved by NBE.

2. The thesis should be restricted to the size of 80 pages (maximum). This includes the text, figures, references, annexures, and certificates etc. It should be printed on both sides of the paper; and every page has to be numbered. Do not leave any page blank. To achieve this, following points may be kept in view:

    a. The thesis should be typed in 1.5 space using Times New Roman/Arial/ Garamond size 12 font, 1” margins should be left on all four sides. Major sections viz., Introduction, Review of Literature,

Aim & Objectives, Material and Methods, Results, Discussion, References, and Appendices should start from a new page. Study proforma (Case record form), informed consent form, and patient information sheet may be printed in single space.

b. Only contemporary and relevant literature may be reviewed. Restrict the introduction to 2 pages, Review of literature to 10-12 pages, and Discussion to 8-10 pages.
c. The techniques may not be described in detail unless any modification/innovations of the standard techniques are used and reference(s) may be given.
d. Illustrative material may be restricted. It should be printed on paper only. There is no need to paste photographs separately.

3. Since most of the difficulties faced by the residents relate to the work in clinical subject or clinically-oriented laboratory subjects, the following steps are suggested:
    a. The number of cases should be such that adequate material, judged from the hospital attendance/records, will be available and the candidate will be able to collect case material within the period of data collection, i.e., around 6-12 months so that he/she is in a position to complete the work within the stipulated time.
    b. The aim and objectives of the study should be well defined.
    c. As far as possible, only clinical/laboratory data of investigations of patients or such other material easily accessible in the existing facilities should be used for the study.
    d. Technical assistance, wherever necessary, may be provided by the department concerned. The resident of one specialty taking up some problem related to some other specialty should have some basic knowledge about the subject and he/she should be able to perform the investigations independently, wherever some specialized laboratory investigations are required a co-guide may be co-opted from the concerned investigative department, the quantum of laboratory work to be carried out by the candidate should be decided by the guide & co-guide by mutual consultation.

4. The clinical residents are not ordinarily expected to undertake experimental work or clinical work involving new techniques, not hitherto perfected OR the use of chemicals or radioisotopes not readily available. They should; however, be free to enlarge the scope of their studies or undertake experimental work on their own initiative but all such studies should be feasible within the existing facilities.

5. The DNB residents should be able to freely use the surgical pathology/autopsy data if it is restricted to diagnosis only, if however, detailed historic data are required the resident will have to study the cases

himself with the help of the guide/co-guide. The same will apply in case of clinical data.

6. Statistical methods used for analysis should be described specifically for each objective, and name of the statistical program used mentioned.

General Layout of a DNB Thesis:

- **Title-** A good title should be brief, clear, and focus on the central theme of the topic; it should avoid abbreviations. The Title should effectively summarize the proposed research and should contain the PICO elements.
- **Introduction-** It should be focused on the research question and should be directly relevant to the objectives of your study.

- **Review of Literature -** The Review should include a description of the most relevant and recent studies published on the subject.

- Aim and Objectives - The 'Aim' refers to what would be broadly achieved by this study or how this study would address a bigger question / issue. The 'Objectives' of the research stem from the research question formulated and should at least include participants, intervention, evaluation, design.

- **Material and Methods-** This section should include the following 10 elements: Study setting (area), Study duration; Study design (descriptive, case-control, cohort, diagnostic accuracy, experimental (randomized/non-randomized)); Study sample (inclusion/exclusion criteria, method of selection), Intervention, if any, Data collection, Outcome measures (primary and secondary), Sample size, Data management and Statistical analysis, and Ethical issues (Ethical clearance, Informed consent, trial registration).

- **Results-** Results should be organized in readily identifiable sections having correct analysis of data and presented in appropriate charts, tables, graphs and diagram etc.

- **Discussion–**It should start by summarizing the results for primary and secondary objectives in text form (without giving data). This should be followed by a comparison of your results on the outcome variables (both primary and secondary) with those of earlier research studies.

- **Summary and Conclusion-** This should be a précis of the findings of the thesis, arranged in four paragraphs: (a) background and objectives; (b) methods; (c) results; and (d) conclusions. The conclusions should strictly pertain to the findings of the thesis and not outside its domain.

- **References-** Relevant References should be cited in the text of the protocol (in superscripts).

- **Appendices -**The tools used for data collection such as questionnaire, interview schedules, observation checklists, informed consent form (ICF), and participant information sheet (PIS) should be attached as appendices. Do not attach the master chart.

Thesis Protocol Submission to NBE

1. DNB candidates are required to submit their thesis protocol within 90 days of their joining DNB training.

2. Enclosures to be submitted along with protocol submission form:
    a) Form for Thesis Protocol Submission properly filled.
    b) Thesis Protocol duly signed.
    c) Approval letter of institutional Ethical committee. *(Mandatory, non receivable of any one is liable for rejection)*

Thesis Submission to NBE

1. As per NBE norms, writing a thesis is essential for all DNB candidates towards partial fulfillment of eligibility for award of DNB degree.
2. DNB candidates are required to submit the thesis before the cut-off date which shall be 30th June of the same year for candidates appearing for their scheduled December final theory examination. Similarly, candidates who are appearing in their scheduled June DNB final examination shall be required to submit their thesis by 31st December of preceding year.
3. Candidates who fail to submit their thesis by the prescribed cutoff date shall NOT be allowed to appear in DNB final examination.
4. Fee to be submitted for assessment (In INR): 3500/-
5. Fee can be deposited ONLY through pay-in-slip/challan at any of the Indian bank branch across India. The challan can be downloaded from NBE website www.natboard.edu.in
6. Thesis should be bound and the front cover page should be printed in the standard format. A bound thesis should be accompanied with:
    a. A Synopsis of thesis.
    b. Form for submission of thesis, duly completed
    c. NBE copy of challan (in original) towards payment of fee as may be applicable.
    d. Soft copy of thesis in a CD duly labeled.
    e. Copy of letter of registration with NBE.

7. A declaration of thesis work being bonafide in nature and done by the candidate himself/herself at the institute of DNB training need to be submitted bound with thesis. It must be signed by the candidate himself/herself, the thesis guide and head of the institution, failing which thesis shall not be considered.

The detailed guidelines and forms for submission of Thesis Protocol & Thesis are available at www.natboard.edu.in.thesis.php.

LOG BOOK

A candidate shall maintain a log book of operations (assisted / performed) during the training period, certified by the concerned post graduate teacher / Head of the department / senior consultant.

This log book shall be made available to the board of examiners for their perusal at the time of the final examination.

The log book should show evidence that the before mentioned subjects were covered (with dates and the name of teacher(s) The candidate will maintain the record of all academic activities undertaken by him/her in log book .

1. Personal profile of the candidate
2. Educational qualification/Professional data
3. Record of case histories
4. Procedures learnt
5. Record of case Demonstration/Presentations
6. Every candidate, at the time of practical examination, will be required to produce performance record (log book) containing details of the work done by him/her during the entire period of training as per requirements of the log book. It should be duly certified by the supervisor as work done by the candidate and countersigned by the administrative Head of the Institution.
7. In the absence of production of log book, the result will not be declared.

Leave Rules

1. DNB Trainees are entitled to leave during the course of DNB training as per the Leave Rules prescribed by NBE.
2. A DNB candidate can avail a maximum of 20 days of leave in a year excluding regular duty off/ Gazetted holidays as per hospital/institute calendar/policy.
3. MATERNITYLEAVE:
    a. Afemale candidate is permitted a maternity leave of 90 days once during the entire duration of DNB course.
    b. The expected date of delivery (EDD) should fall within the duration of maternity leave.
    c. Extension of maternity leave is permissible only for genuine medical reasons and after prior approval of NBE. The supporting medical documents have to be certified by the Head of the Institute/hospital where the candidate is undergoing DNB training. NBE reserves its rights to take a final decision in such matters.
    d. The training of the candidate shall be extended accordingly in case of any extension of maternity leave being granted to the candidate.
    e. Candidate shall be paid stipend during the period of maternity leave. No stipend shall be paid for the period of extension of leave.
4. Male DNB candidates are entitled for paternity leave of maximum of one week during the entire period of DNB training.
5. No kind of study leave is permissible to DNB candidates. However, candidates may be allowed an academic leave as under across the entire duration of training program to attend the conferences/CMEs/Academic programs/Examination purposes.

DNB COURSE	NO. OF ACADEMIC LEAVE
DNB 3 years Course (Broad & Super Specialty)	14 Days
DNB 2 years Course (Post Diploma)	10 Days
DNB Direct 6 years Course	28 days

6. Under normal circumstances leave of one year should not be carried forward to the next year. However, in exceptional cases such as prolonged illness the leave across the DNB training program may be clubbed together with prior approval of NBE.
7. Any other leave which is beyond the above stated leave is not permissible and shall lead to extension/cancellation of DNB course.
8. Any extension of DNB training for more than 2 months beyond the scheduled completion date of training is permissible only under extra-ordinary circumstances with prior approval of NBE. Such extension is neither automatic nor shall be granted as a matter of routine. NBE shall consider such requests on merit provided the seat is not carried over and compromise with training of existing trainees in the Department.
9. Unauthorized absence from DNB training for more than 7 days may lead to cancellation of registration and discontinuation of the DNB training and rejoining shall not be permitted.
10. Medical Leave
    a. Leave on medical grounds is permissible only for genuine medical reasons and NBE should be informed by the concerned institute/hospital about the same immediately after the candidate proceeds on leave on medical grounds.
    b. The supporting medical documents have to be certified by the Head of the Institute/hospital where the candidate is undergoing DNB training and have to be sent to NBE.
    c. The medical treatment should be taken from the institute/ hospital where the candidate is undergoing DNB training. Any deviation from this shall be supported with valid grounds and documentation.
    d. In case of medical treatment being sought from some other institute/hospital, the medical documents have to be certified by the Head of the institute/hospital where the candidate is undergoing DNB training.

e. NBE reserves its rights to verify the authenticity of the documents furnished by the candidate and the institute/hospital regarding Medical illness of the candidate and to take a final decision in such matters.

11.

a. Total leave period which can be availed by DNB candidates is 120+28 = 148 days for 6 years course, 60+14=74 days for 3 years course and 40+10 = 50 days for 2 years course. This includes all kinds of eligible leave including academic leave. Maternity / Paternity leave can be availed separately by eligible candidates. Any kind of leave including medical leave exceeding the aforementioned limit shall lead to extension of DNB training. It is clarified that prior approval of NBE is necessary for availing any such leave.

b. The eligibility for DNB Final Examination shall be determined strictly in accordance with the criteria prescribed in the respective information bulletin.

EXAMINATION

FORMATIVE ASSESSMENT

Formative assessment includes various formal and informal assessment procedures by which evaluation of student's learning, comprehension, and academic progress is done by the teachers/ faculty to improve student attainment. Formative assessment test (FAT) is called as "Formative "as it informs the in process teaching and learning modifications. FAT is an integral part of the effective teaching .The goal of the FAT is to collect information which can be used to improve the student learning process.

Formative assessment is essentially positive in intent, directed towards promoting learning; it is therefore part of teaching. Validity and usefulness are paramount in formative assessment and should take precedence over concerns for reliability. The assessment scheme consists of Three Parts which has to be essentially completed by the candidates.

The scheme includes:-

Part I:- Conduction of theory examination
Part-II :- Feedback session on the theory performance
Part-III :- Work place based clinical assessment

Scheme of Formative assessment

PART – I	**CONDUCT OF THEORY EXAMINATION**	Candidate has to appear for Theory Exam and it will be held for One day.
PART – II	**FEEDBACK SESSION ON THE THEORY PERFORMANCE**	Candidate has to appear for his/her Theory Exam Assessment Workshop.
PART – III	**WORK PLACE BASED CLINICAL ASSESSMENT**	After Theory Examination, Candidate has to appear for Clinical Assessment.

The performance of the resident during the training period should be monitored throughout the course and duly recorded in the log books as evidence of the ability and daily work of the student

1. Personal attributes:

- **Behavior and Emotional Stability:** Dependable, disciplined, dedicated, stable in emergency situations, shows positive approach.
- **Motivation and Initiative:** Takes on responsibility, innovative, enterprising, does not shirk duties or leave any work pending.

- **Honesty and Integrity:** Truthful, admits mistakes, does not cook up information, has ethical conduct, exhibits good moral values, loyal to the institution.
- **Interpersonal Skills and Leadership Quality:** Has compassionate attitude towards patients and attendants, gets on well with colleagues and paramedical staff, is respectful to seniors, has good communication skills.

2. Clinical Work:

- **Availability:** Punctual, available continuously on duty, responds promptly on calls and takes proper permission for leave.
- **Diligence:** Dedicated, hardworking, does not shirk duties, leaves no work pending, does not sit idle, competent in clinical case work up and management.
- **Academic ability:** Intelligent, shows sound knowledge and skills, participates adequately in academic activities, and performs well in oral presentation and departmental tests.
- **Clinical Performance:** Proficient in clinical presentations and case discussion during rounds and OPD work up. Preparing Documents of the case history/examination and progress notes in the file (daily notes, round discussion, investigations and management) Skill of performing bed side procedures and handling emergencies.

3. Academic Activity: Performance during presentation at Journal club/ Seminar/ Case discussion/Stat meeting and other academic sessions. Proficiency in skills as mentioned in job responsibilities.

FINAL EXAMINATION

The summative assessment of competence will be done in the form of DNB Final Examination leading to the award of the degree of Diplomate of National Board in Biochemistry. The DNB final is a two-stage examination comprising the theory and practical part. An eligible candidate who has qualified the theory exam is permitted to appear in the practical examination.

Theory Examination

1. The theory examination comprises of ***Three/ Four*** papers, maximum marks 100 each.
2. There are 10 short notes of 10 marks each, in each of the papers. The number of short notes and their respective marks weightage may vary in some subjects/some papers.
3. Maximum time permitted is 3 hours.
4. Candidate must score at least 50% in the aggregate of ***Three/ Four*** papers to qualify the theory examination.

5. Candidates who have qualified the theory examination are permitted to take up the practical examination.
6. The paper wise distribution of the Theory Examination shall be as follows:

Paper I: General and Clinical Biochemistry including quality control and Enzymology**,** Research Methodology

Paper II: Metabolism, Bioenergetics, Nutrition, Vitamins and Hormones

Paper III: Molecular biology, immunology, cancer

Paper IV: Techniques in Experimental Biochemistry Recent Advances

a) Practical Examination:

1. Maximum Marks: 300.
2. Comprises of Clinical Examination and Viva.
3. Candidate must obtain a minimum of 50% marks in the Clinical Examination (including Viva) to qualify for the Practical Examination.
4. There are a maximum of three attempts that can be availed by a candidate for Practical Examination.
5. First attempt is the practical examination following immediately after the declaration of theory results.
6. Second and Third attempt in practical examination shall be permitted out of the next three sessions of practical examinations placed alongwith the next three successive theory examination sessions; after payment of full examination fees as may be prescribed by NBE.
7. Absentation from Practical Examination is counted as an attempt.
8. Appearance in first practical examination is compulsory;
9. Requests for Change in center of examination are not entertained, as the same is not permissible.
10. Candidates are required not to canvass with NBE for above.

Declaration of DNB Final Results

1. DNB final is a qualifying examination.
2. Results of DNB final examinations (theory & practical) are declared as PASS/FAIL.
3. DNB degree is awarded to a DNB trainee in the convocation of NBE.

RECOMMENDED TEXT BOOKS AND JOURNALS

1. Biochemistry Ed. Lubert Stryer. W.H. Free man and Company, New York

2. Principles of Biochemistry. Ed. Lehninger, Nelson and Cox. CBS Publishers and Distributors.

3. Harper's Biochemistry. Ed. R.K.Murray, D.K.Granner, P.A. Mayes and V.W.Rodwell. Appleton and Lange, Stamford, Connecticut.

4. Textbook of Biochemistry with Clinical Correlations. Ed. Thomas M. Devlin, Wiley-Liss Publishers.

5. Genes VIII Ed Benjamin Lewin. Oxford University Press.

6. Tietz Textbook of Clinical Chemistry and molecular diagnostics Ed Burtis and Ashwood. W.B Saunders Company.

7. Principles and techniques of Practical Biochemistry. Ed Keith Wilson and John Walker. Cambridge University Press.

8. Biochemistry. Ed. Donald Voet and Judith G. Voet. John Wiley & Sons, Inc.

9. Molecular Cell Biology, H. Lodish, A, Berk, S.L.Zipursky, P. Matsudaira, D. Baltimore, J. Darnell.

10. Medical Biochemistry by Bhagwan.

11. KU BY's

12. Roitt – Immunology

13. Campbell – Biochemistry

14. Harrison's – Principles of Internal Medicine

15. William's – Concepts of Genetics

16. Mosby's – Manual of diagnostics

17. Basic & Advances Biostatistics – Manju Pandey

18. Oxford Handbook of Medical Biostatistics

JOURNALS

- Annual Reviews of Biochemistry, Cell and Developmental Biology, Genetics, Genomics and Human Genetics
- Archives of biochemistry and biophysics (Arch BiochemBiophys)

- Biochemical and Biophysical Research communications (Biochem Biophys res Commun)
- Biochemical journal (biochem J)
- Biochemistry
- European Journal of Biochemistry
- Indian Journal of Biochemistry and Biophysics
- Journal of Biological chemistry
- Journal of Clinical Investigation
- Journal of Lipid Research
- Nature Genetics
- Proceedings of the National academy of Sciences USA
- Trends in Biochemical Sciences

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