CMS 01 MBS	**THE NATIONAL CURRICULUM: MEDICAL BIOLOGICAL SCIENCE** **MEDICAL AND DENTAL PROFESSIONS BOARD: MEDICAL SCIENCE**

This document describes the core National Curriculum for Medical Biological Scientists and serves *as a requirement of the minimum standard of a facility-based internship-training program.* Note the following when developing an internship program:

- *The National Curriculum serves as core curriculum and prescribes the minimum requirements to pass the Board-approved competency-based examination in the form of a Portfolio of Evidence.*
- *Every training department will develop a facility-based internship-training program by using the Template for the development of a facility-based intern training program – CMS 03 MBS*
- *The facility-based training program will contain the minimum requirements as prescribed in this core National Curriculum – CMS 01 MBS.*
- *The Guidelines for the submission and assessment of the Portfolio of Evidence (CMS 02 MBS) is the prescribed template to compile the evidence.*
- *The National Curriculum is the instruction on how to complete the Portfolio of evidence and has to be read as one holistic document.*
- *All tables formats for evidence will be used and completed as prescribed in this Guideline – no other template of evidence will be accepted.*

This document has to be read with the following documents:

- *Policy regarding training of intern medical scientists – CMS A*
- *Policy regarding the criteria for accreditation of facilities for internship training in medical science – CMS B*
- *Guideline for Submission and Assessment of the Portfolio of Evidence - CMS 02 MBS*
- *Template for the development of a facility-based intern training program – CMS 03 MBS*
- *Guidelines on Assessment and Moderation of Portfolio of Evidence: Intern Medical Scientists – CMS H*

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1. INTRODUCTION

The National Curriculum serves as the core curriculum of the discipline Medical Biological Science and the relevant categories and prescribes the minimum requirements of a medical scientist internship-training program. All the components prescribed in The National Curriculum will be reflected as the minimum requirement in your facility-based program. Each component will be assessed, whereby the method and frequency of the assessment will be clearly indicated. A template based on the National Curriculum will be used for the development of a facility-based internship-training program *(CMS 03 MBS).*

The evidence of the components of the internship-training program will be provided in a structured manner to compile a Portfolio of Evidence, which serves as the Medical and Dental Professions Board-approved competency-based examination. The Guideline for submission and assessment of the Portfolio of Evidence (CMS 02 MBS) serves as the *prescribed structured template* to be completed by the intern medical scientist for assessment. The Portfolio of Evidence has a *four-fold function*:

- to prescribe *clearly defined evidence* required for assessment of each component and sub-component of facility-based training program as directed by the National Curriculum;
- for the purpose of self-assessment of the intern candidate;
- for the final facility-based exit assessment; and
- for formal assessment by the Medical and Dental Board.

1.1 Definitions

- *"Assessment*" is the process to determine whether the prescribed component or sub-component of the learning outcome of the training program was reached to the specific standard based on the evidence provided.
- *"Competencies"* are the knowledge, skills, abilities and behaviours that contribute to individual performance.
- *"Competency levels"* are defined as level 1 = Observed, level 2 = performed under direct supervision, level 3 = independent performance, still under supervision, level 4 = independent performance, experienced, still under non-direct supervision.
- *"Competency-based training"* refers to a model where learners must demonstrate the required level of academic knowledge and practical skill (competency) on a task prior to advancing to the next task.
- *"Summative"* describes something that is produced through addition or as a process often involves an incremental increase in learning. It is used in the same way as cumulative and comprehensive.
- *"Summative assessment"* is the process to evaluate intern learning at the end of a learning outcome by comparing it against a standard benchmark. It is design to both assess the effectiveness of the program and the learning of the intern and may include any method of evaluation performed at the end of a learning outcome or component thereof, allowing the assessor to measure a candidates' understanding against standardized criteria.
- *Periods of summative assessment* may be annually, mid-term or end-of-term.

2. OVERALL COURSE OUTCOMES

At the end of this internship, you will be able to:

2.1 Recognise and apply professional conduct and ethical principles.

2.2 Participate in the administration and management of a laboratory in terms of maintaining the quality processes, good laboratory practice, laboratory safety, and the quality management system.

2.3 Apply and integrate basic scientific principles and academic knowledge relevant to the category in which the intern is registered.

2.4 Perform and troubleshoot laboratory test methods in accordance with standard operating procedures and the interpretation of results relevant to a laboratory diagnostic environment. This includes method validation or verification.

2.5 Define and apply research principles in a semi-independent research project, compile a scientific report and present the findings (use of database/s and apply bioinformatics if applicable).

3. DISCIPLINE-SPECIFIC LEARNING OUTCOMES

The internship determines the overall competency by assessing all the specific learning outcomes. These include:

3.1 Professional Conduct and Ethical Rules

At the end of this component, you will be able to:

3.1.1 Understand and apply the Professional Conduct and Ethical Rules, Booklets 1 to 12 and 16 to 17 (available from the HPCSA website, https://www.hpcsa.co.za/Core Operations/Professional Practice/Ethics)

Teaching and learning activities:	Lectures and interactive discussions.
Assignment:	Apply the knowledge from the sessions on Booklets 1 to 12 and 16 to 17 to the case examples given.
Assessment:	Summative assessment of case studies.
Evidence:	*(a)* Complete *Table 3.* *(b)* Case studies with assessment to cover all 14 booklets.

3.1.2 Understand and apply the General guidelines for health researchers and biotechnology research in South Africa dealing with patients and patient samples, Booklets 13, 14 and 15 (available from the HPCSA website, https://www.hpcsa.co.za/Core Operations/Professional Practice/Ethics).

Teaching and learning activities:	Lectures and interactive discussions.
Assignment:	Apply the knowledge from the sessions to the case examples given.
Assessment:	Summative assessment of case studies.
Evidence:	(a) Complete *Table 3.* *(b)* Case studies with assessment to cover booklets 13, 14 and 15.

3.1.3 Understand and apply the Occupational Health and Safety Act.

Teaching and learning activities:	Lectures and interactive discussions.

Assignment:	Apply the knowledge from the sessions to the case examples given.
Assessment:	Summative assessment of case studies.
Evidence:	(a) Complete *Table 4.* (b) Case studies with assessment on the entire content.

3.1.4 Understand and apply Acts and Guidelines relevant to professional category.

Teaching and learning activities:	Lectures and interactive discussions.
Assignment:	Apply the knowledge from the sessions to the case examples given.
Assessment:	Summative assessment of case studies.
Evidence:	(a) Complete *Table 5.* (b) Case studies with assessment on the entire content.

3.2 Good Laboratory Practice (GLP) and Laboratory Safety

At the end of this component, you will be able to:

3.2.1 Define and practice the correct use of personal protective equipment (PPE).

Teaching and learning activities:	Facility-based induction-training program.
Assignment:	Apply the knowledge from the session(s) to complete the questionnaire.
Assessment:	Summative assessment of questionnaire.
Evidence:	*(a)* Complete *Table* 6. *(b)* Assessed questionnaire.

3.2.2 Define and practice the safe handling, storage and disposal of biological specimens.

Teaching and learning activities:	Facility based induction-training program.
Assignment	Apply the knowledge from the session(s) to complete the questionnaire
Assessment:	Summative assessment of questionnaire.
Evidence:	*(a) Complete Table 6.* (b) Assessed questionnaire

3.2.3 Define and practice the safe handling, storage, and disposal of chemicals (including, but not limited to radioactive materials, where applicable)

Teaching and learning activities:	Facility based induction-training program.
Assignment:	Apply the knowledge from the session(s) to complete the questionnaire.
Assessment:	Summative assessment of questionnaire.
Evidence:	(a) Complete *Table 6.* *(b)* Assessed questionnaire.

3.2.4 Identify and practise the managing of chemical and biological spills (including radioactive materials where applicable).

Teaching and learning activities:	Facility based induction-training program.
Assignment:	Apply the knowledge from the session(s) to complete the questionnaire.
Assessment:	Summative assessment of questionnaire.
Evidence:	*(a)* Complete *Table 6.*

(b) Assessed questionnaire.

3.2.5 Identify fire hazards and partake in safety drills.

Teaching and learning activities:	Facility based induction-training program.
Assignment:	Apply the knowledge from the session(s) to complete the questionnaire
Assessment:	Summative assessment of questionnaire
Evidence:	*(a) Complete Table 6.* *(b)* Assessed questionnaire

3.2.6 Identify and locate the physical and ergonomic hazards.

Teaching and learning activities:	Facility based induction-training program
Assignment:	Apply the knowledge from the session(s) to complete the questionnaire
Assessment:	Summative assessment of questionnaire
Evidence:	*(a) Complete Table 6.* *(b)* Assessed questionnaire.

3.3 QUALITY MANAGEMENT

At the end of this component, you will be able to:

3.3.1 Partake in various components of laboratory management and administration in the diagnostic environment.

Teaching and learning activities:

(a) Procurement of reagents / consumables.
(b) Management of stock levels.
(c) Monitoring of internal quality indicators: sample volumes, turnaround time, sample rejection rates and success rate of each test method to produce a clinical relevant patient report.
(d) Document control and implementation of logbooks.
(e) Identification of non-conformances, resolution thereof, root cause analysis and trend analysis.
(f) Costing of a procedure / test method
(g) Acknowledge yourself with Disciplinary procedure in the diagnostic setting

Assignment:	Part take in the activities.
Assessment:	Summative assessment of documentation of the protocols / procedures performed.
Evidence:	(a) Complete *Table 7.* (b) Documentation with assessment on each activity.

3.3.2 Participate in laboratory accreditation and audits.

Teaching and learning activities:	Physical accreditation and audits.
Assignment:	Part take in an accreditation visit and audits
Assessment:	Summative assessment *of* Root cause analysis and resolution of non-conformances raised.
Evidence:	(a) Complete *Table 8.*

(b) Resolution of non-conformances completed root cause analysis and resolutions.

3.3.3 Participate in internal and external quality assurance (EQA) programs.

Teaching and learning activities:	Active participation in EQA programs.
Assignment:	Discussion of evaluation reports, resolution of non-conformances, performing root cause analysis and possible trend analysis.
Assessment:	Summative assessment.
Evidence:	(a) Complete *Table 9.* (b) Assessed assignment (resolution of non-conformances, root cause analysis and trend analysis).

3.3.4 Perform validation/verification of diagnostic test methods / platforms / kits *(lot-to-lot / shipment-to-shipment / batch-to-batch verification is included under Internal Quality Control).*

Teaching and learning activities:	Active participation in the verification / validation of a test method / platform / kit.
Assignment:	Write a validation / verification report.
Assessment:	Formal team discussion and summative assessment.
Evidence:	(a) Complete *Table 10.* (b) Assessed verification / validation report.

3.3.5 List and apply the Standard Operation Procedures (SOP's) and guidelines.

Teaching and learning activities:	Understand, apply and revisions of SOP's and guidelines.
Assignment:	List, reading, revision and implementation of SOP's and guidelines.
Assessment:	Acknowledgement of reading and summative assessment of revisions.
Evidence:	(a) Complete *Table 11.* *(b)* Assessed revisions.

3.3.6 Participate in the safe operation, maintenance, troubleshooting and service of laboratory equipment.

Teaching and learning activities:	Training in the safe operation, maintenance and servicing of laboratory equipment.
Assignment:	Adherence to maintenance schedule and management of book of life.
Assessment:	Summative assessment of maintenance and servicing.
Evidence:	(a) Complete *Table 12.* *(b)* Certificate of training and record of maintenance and servicing.

3.3.7 Successful completion of a Vertical Assessment *(SANAS F95-07*) of each test method.

Teaching and learning activities:	Completion of a Vertical Assessment.
Assignment:	Undergo a Vertical Assessment.
Assessment:	Determine root cause analysis and resolutions of non-conformances. *(a)* Complete *Table 13*.
Evidence:	(b) Completed Vertical Assessment forms (SANAS F95-07).

(c) Completed resolution of non-conformance(s) / root cause analyses.

3.4 Scientific and Discipline-Specific Knowledge

At the end of this component, you will obtain a certain level of clinical integrated academic knowledge:

3.4.1 List of appropriate textbooks, literature or accredited online resources.

Teaching and learning activities:	Interactive lectures.
Assignment:	Written tests.
Assessment:	Formal assessment to cover all academic training (at least once annually).
Evidence:	(a) List of Textbooks – complete *Table 14* *(b)* Assessed written tests and question paper.

3.4.2 List Journal clubs attended and presented.

Teaching and learning activities:	Attendance and participation.
Assignment:	Attend, prepare and present journals.
Assessment:	Attendance register / CPD certificate.
Evidence:	(a) Complete *Table 15* (b) Program of Journal Club (c) Attendance register / CPD certificate

3.4.3 List all lectures / seminars / workshops / conferences / courses attended and presented.

Teaching and learning activities:	Attendance and participation.
Assignment:	Attend, participation and present
Assessment:	Attendance register, certificate of attendance and/or approved abstract.
Evidence:	(a) Complete *Table 16* (b) Attendance register, certificate of attendance, approved abstract.

3.5 Practical Competency Training

At the end of this component, you will be able to integrate clinical information, academic, and practical skills to interpret a laboratory finding and provide a patient report.

3.5.1 List the entire scope of testing (repertoire) of the training department. It is required that the intern candidate will be proficient in the full scope of the listed test methods at the end of their internship – complete *Table 17.*

Overall teaching and learning activity:
Apply the most appropriate test method from your test repertoire to a completed Request Form and provide an integrated patient report.

- Tabulate the summary of the total number of repetitive testing with competency levels (levels 1, 2, 3 and 4) in *Table 18.*
- Tabulate a list of unique sample numbers of each sample used in a specific test method – *Table 19*.

- Present evidence based on each (a) test method and (b) disease in your test repertoire *(as per Table 17).*

3.5.2

Assignment 1	Describe the general principles, limitations, benefits (specificity, sensitivity / positive predictive value / negative predictive value / verification data / validation data / reproducibility) of every test method listed in your test repertoire
Assessment	Summative assessment
Evidence:	(a) Complete Table 20 (b) Written report of maximum one A4 page per disease

3.5.3

Assignment 2	Define the etiology/pathology of the diseases listed in your test repertoire
Assessment	Summative assessment
Evidence:	(a) Complete Table 21 (b) Written report of maximum one A4 page per disease

3.5.4

Assignment 3	Perform the test method based on Standard Operation Procedure
Assessment	Direct Witness Activity *(SANAS F15-11).*
Evidence	*Evidence of at least five (5) complete test reports, as described in Assignment 3 (b) to (g) have to be provided as evidence for each test method and disease*. (a) Complete *Table 22* (b) Completed Direct witness form (c) Request Form which accompanied the sample to the laboratory (d) Pre-analytic worksheet (if applicable) (e) Post-analytical - this activity will provide evidence on how you evaluate data: • Qualitative analysis – provide raw data printed in color and use colored pencils to indicate the various aspects used in the interpretation of data) *or* • Quantitative analysis – provide raw data obtained/interfaced from instrumentation. (f) Patient report / template by intern candidate - recommend reflex or other follow up-testing in the report (g) Final report by relevant health professional

3.5.5

Assignment 4	Troubleshoot any failed test / equipment / operator procedure
Assessment	Summative assessment
Evidence	(a) Complete *Table 23* (b) Completed trouble shooting form with resolution

3.6 Principles of Research

At the end of this component, you will be able to:

3.6.1 *Overall teaching and learning activity:*
Provide and present a peer-reviewed scientific report, with both ethical and funding approval, and evidence of no plagiarism after successful completion of a semi-independent research project.

Assignment 1	Develop a protocol for your research study.

Assessment	Summative assessment by supervisor.
Evidence	Assessed protocol.

3.6.2

Assignment 2	Apply for ethical approval to perform your research project by using Health Science Research Ethical Committee application documents.
Assessment	Summative assessment by Training Department.
Evidence	Approval letter of ethical clearance from Training Department.

3.6.3

Assignment 3	Avoid plagiarism in the development of your protocol and scientific report.
Assessment	Apply the tool used, for example Turnitin.
Evidence	Provide Turnitin report (or similar).

3.6.4

Assignment 4	Compile a budget and apply for funding of disposables, reagents and other to perform your project.
Assessment	Summative assessment by Supervisor.
Evidence	Approved budget and funding application.

3.6.5

Assignment 5	Select and apply biostatistics and / or databases (if applicable), in the interpretation of your results / research.
Assessment	Summative assessment by Supervisor.
Evidence	Use and interpretation in scientific report (if applicable).

3.6.6

Assignment 6	Compile a scientific report in the following format: Abstract (250-300 words), Introduction, Methods, Results, Discussion, Conclusion, References.
Assessment	Summative assessment by Supervisor.
Evidence	Assessed Scientific report.

3.6.7

Assignment 7	*P*resent your research findings as a scientific report by using a Power Point presentation.
Assessment	Formal assessment by Training Department - *Table 24*
Evidence	Power Point presentation

4. CONTINUOUS ASSESSMENT OF TRAINING

4.1 Formal evidence-based continuous assessments must be performed over the 24-month period.

4.2 All components of the internship-training program must be assessed.

4.3 The method and frequency of assessments must be clearly indicated.

4.4 This is an evidence-based document and will not be accepted without original signatures from the trainers or supervisor and dates of each assessment.

4.5 The type and manner to present evidence of each sub-component of this National Curriculum are prescribed and shall be provided as required. In the case of a lack of evidence or if the Guideline for submission and assessment of a Portfolio of Evidence (CMS 02 MBS) is not followed, the Portfolio of Evidence will be returned, and assessment will only be initiated once all requirements are met.

5. ROTATION ROSTER

5.1 A schedule or planning roster (over the 24-month period) has to be included in the internship-training program. This should include all the various components of the program. Whereby, each component should specify the period, location of procedures and qualified trainers/supervisors responsible according to the facility-based rotation roster - *Table 1.*

5.2 A completed Rotation Roster with all the relevant information as specified in Table 2 has to be completed after each successful rotation – *Table 2.*

6. OUTCOME ASSESSMENT BY A PRESCRIBED BOARD-APPROVED COMPETENCY-BASED ASSESSMENT

6.1 The competency-based Board-approved assessment is in the form of the Portfolio of Evidence. Refer to the policy regarding the training of Intern Medical Scientists (CMS A) and Guidelines on assessment and moderation of the Portfolio of Evidence (CMS H) on a detailed process on the assessment.

6.2 A formal outcome-based assessment will be conducted to ensure that the candidate has acquired the necessary skills, academic knowledge, and practical competencies outlined in the syllabus.

6.3 The Guideline for the submission and assessment of Portfolio of Evidence (CMS-02 MBS) must be completed by the intern candidate, supervisor, and head of training program.

6.4 Final facility-based exit assessment consists of three parts:

(a) Final approval by the supervisor of the intern candidate whereby they confirm that the candidate has acquired the necessary skills, academic knowledge and practical competencies outlined in the syllabus (discipline-specific learning outcomes as prescribed in The National Curriculum – *CMS 01 MBS*), and recommends approval of this Portfolio of Evidence by the Head of the Training Program for summative assessment

(b) Final approval by the Head of the Training Program of the intern candidate whereby they confirm that by *summative assessment,* the candidate performed satisfactory over the entire internship training. By scrutinizing the completed Portfolio of Evidence, the supervisor confirms that the candidate has successfully complied the Portfolio of Evidence with the course outcomes outlined in the syllabus (as prescribed in The National Curriculum – *CMS 01 MBS*) and provides consent for formal assessment of this Portfolio of Evidence by the Board.

(c) The Intern Duty certificate (*CMS 02-01* MBS), contained in the Portfolio of Evidence will be completed by the Head of the Training Program and formally endorsed by the Head of the Training Facility before the Portfolio of Evidence may be submitted to the HPCSA. Refer to Guideline for the assessors and moderators of the Portfolio of Evidence (CMS H) and Policy regarding the training of Intern Medical Scientists (CMS A).

6.5 The Portfolio of Evidence is an outcome-based assessment in the form of the completed Guideline for the submission and assessment of the Portfolio of Evidence (CMS 02 MBS) and *prescribe the format and type of evidence,* which is required to successfully pass the Board-approved evaluation.