The Royal College of Pathologists of Australasia

FACULTY OF SCIENCE

TRAINEE HANDBOOK 2018

MICROBIOLOGY

It is essential to read this Handbook in conjunction with the ***Trainee Handbook – Administrative Requirements*** which is relevant to all trainees. This has information about the College's structure and policies, together with details of requirements for registration, training and examination applications.

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Glossary

AS ISO	Australian and International Standard
CbD	Case-based Discussion
CPDP	Continuing Professional Development Program
DOPS	Direct Observation of Practical Skills
EBLP	Evidence Based Laboratory Practice
FSc	Faculty of Science
MSc	Master of Science
NATA	National Association of Testing Authorities
NPAAC	National Pathology Accreditation Advisory Council
PhD	Doctorate of Philosophy
QA	Quality Assurance
QC	Quality Control
RCPA	Royal College of Pathologists of Australasia
WHO	World Health Organisation

SECTION I

Introduction

The Faculty of Science provides a structured Fellowship program to enable scientists to demonstrate competence in the following areas to a standard specified by the RCPA.

1. Use professional judgement in advising clinicians on the requirements for investigations and in carrying out these investigations for patients as a member of the team providing clinical care.
2. Maintenance of safe and effective service through the use of relevant quality assurance and audit tools, to appropriate national standards.
3. Undertake scientific research, including the evaluation of scientific literature, to introduce new scientific procedures or solve diagnostic or therapeutic problems within their field.
4. Apply the principles of evidence-based laboratory practice to inform health care decisions
5. Provide innovative and strategic direction to the operation of the laboratory.

The scientist will complete the training requirements specified in the curriculum, and will demonstrate competence and attainment of learning outcomes by satisfying all assessment requirements to the standards set by the Faculty of Science, as defined in the curriculum.

General Aims and Structure of the Training Program

The general aims of the training program are to provide a structured pathway for scientists working in a Pathology context to meet the standards defined by the RCPA of a leading Scientist in their field.

These general aims of the training program relate to three areas of professional activity of a leading scientist, ie,

Discipline specific clinical laboratory functions
Research
Innovation, Development and Leadership

The Faculty of Science curriculum in Microbiology comprises standards in these three areas as follows:

1. Research Standards

- Demonstrate highly developed skills in research, management of time and resources and communication of outcomes and data, whilst independently developing theoretical concepts, acquiring new knowledge and testing hypotheses in the field of Microbiology.

2. Clinical Laboratory Standards

- Demonstrate competence in applying the techniques, technology and reporting associated with a Microbiology laboratory with a broad case-mix of patients.
- Apply the theoretical and technical expertise in laboratory techniques required to lead the activities of a Microbiology laboratory.

3. Innovation, Development and Leadership Standards

- Apply, implement and evaluate strategies that guarantee quality assurance, compliance, safety and efficient use of resources fundamental to the operation of a Microbiology laboratory.
- Demonstrate a commitment to the continual improvement and advancement of Microbiology.
- Apply the principles of Evidence Based Laboratory Practice (EBLP) to inform health care decisions.

These standards are elaborated as content areas and specific training outcomes in Section 2 of this handbook. In the Clinical Laboratory Standards section there are specific content areas and training outcomes for Part I and II. Competence in outcomes achieved by Part I of training should be maintained throughout. It is expected that trainees should achieve the outcomes in the Research Standards and Innovation, Development and Leadership Standards gradually throughout their training.

Trainees, with the assistance of their supervisor, should ensure that they engage in appropriate learning activities to achieve each of the outcomes, and therefore the standard. The indicators are statements which guide the assessment process, and describe how the trainee will demonstrate they have met the standard. Specific assessment requirements are detailed in Section 3 of this handbook.

The total time to complete the training program is normally a minimum of 5 years, except when time credits have been granted by the Chief Examiner on the advice of the Principal Examiner for previous experience through a Training Determination. Part I assessment criteria can normally be met and assessed during the third year of training, Part II requirements following another 2 years training.

Administrative Requirements

This handbook should be read in conjunction with the ***RCPA Trainee Handbook Administrative Requirements*** document on the College website

Entry requirements

Trainees should be graduates of a university in Australia or New Zealand with a degree at Australian Qualifications Framework level 7 (minimum) with subjects relevant to the field of pathology. If such a degree is awarded by an overseas tertiary education institution the qualifications should be approved by the College. To enter the program, trainees are ordinarily required to have five (5) years post graduate experience working as scientists in a Pathology related field.

Training requirements

Training must take place in an RCPA accredited laboratory and is limited to the time period for which that laboratory is accredited in each discipline. Details of RCPA accredited laboratories are available through the College website.

Please note that ordinarily, a maximum of 4 years is to be spent in any one laboratory over the course of the 5-year training program. Individuals should contact the College Registrar if a deviation from this requirement is sought.

Trainees are responsible to ensure that all forms are submitted by the due dates indicated in the handbook and the College website.

Supervision

References (including hyperlinks)

- RCPA policy on supervision
- Supervisor resources

All training must be supervised. More than one supervisor can be nominated if trainees divide the year between two or more unrelated laboratories. The College recommends that any one supervisor be responsible for no more than two trainees.

Who can be a supervisor?

The supervisor will normally be a Fellow of the RCPA; however non–Fellows may be approved by the Board of Education and Assessment if no Fellow is available. If the trainee spends significant periods working in an area where the supervisor has no personal involvement, the supervisor must certify that suitable supervision is being provided. The supervisor must also ensure that adequate supervision is arranged in their absence.

In some circumstances shared supervision may be necessary, but there must be a nominated primary supervisor with overall responsibility. Trainees working towards higher academic degrees (e.g. PhD), who find that their research supervisor is not suitable to be the RCPA training supervisor, should nominate an RCPA Fellow as co-supervisor.

Day-to-day supervision should primarily be the responsibility of a Fellow of the Faculty of Science, however it is appropriate for senior pathology staff with relevant experience to sign off on some workplace based assessments.

The role of the supervisor

Supervisors should devise a prospective training (or research) program, on initial registration and annually. This should be devised in collaboration with the Trainee and submitted to the RCPA. Supervisors should also ensure that the trainee has sufficient time and opportunities to carry out the required training activities.

Supervisors, and others to whom aspects of training have been delegated, are expected to monitor and provide regular feedback on the development of the Trainee's competence. In addition to the formal meetings with the Trainee which should occur every three months, they should meet regularly with the Trainee; observe their laboratory performance and interaction with pathologists, peers and clinicians; and review result reporting. This may be delegated to other trainers where appropriate, eg, when the Trainee is on secondment to another laboratory for a segment of training.

The formal duties of supervisors, such as requirements to report the Trainee's progress to the Board of Education and Assessment, are described in the RCPA Induction Manual for Supervisors and the RCPA policy on the Role of the Supervisor.

Supervisors and Trainees should contact the RCPA **Education Advisor** for assistance with supervision and training issues.

Resources

These lists are not exhaustive and the publications are suggestions only. Trainees are not expected to refer to all.

Journals

• Antimicrobial Agents and Chemotherapy

• Emerging Infectious Diseases

• Clinical Infectious Diseases

• Clinical Microbiology and Infection

• Clinical Microbiology Newsletter

• Clinical Microbiology Reviews

• Communicable Diseases Intelligence

• Journal of Antimicrobial Chemotherapy

• Journal of Clinical Microbiology

• Journal of Hospital Infection

• Journal of Infectious Diseases

• Journal of Virology

• Parasites and Vectors

Suggested Microbiology Texts

Please refer to the current edition of these texts:

• Winn WC, Allen SD, Janda WM, Koneman EW, Schreckenberger PC, Procop GW and Woods GL (2006) Koneman's Color Atlas and Textbook of Diagnostic Microbiology, 6th Edition. AACC.

• Jorgensen JH, Pfaller MA (ed) (2015) Manual of Clinical Microbiology, 11th Edition. American Society of Microbiology.

• Mayhall, C G (2011) Hospital Epidemiology and Infection Control, 4th Edition. Culinary and Hospitality Industry Publications Services (CHIPS).

• • Davise H. Larone (2011) Medically Important Fungi: A Guide to Identification. 5th edition, ASM Press.

• Sheorey H, Walker J, Biggs B. (2013) Clinical Parasitology: A Practical Handbook for Medical Practitioners and Microbiologists. Erudite Medical Books.

Conferences/Workshops

• RCPA Pathology Update, Annual Scientific Meeting http://www.rcpa.edu.au/Events/Pathology-Update

• Australian Society for Microbiology. Annual Scientific Meeting http://www.asm.org/

• Viruses in May Annual workshop http://www.rcpa.edu.au/Events/Viruses-in-May

• Mycology Master Class: http://www.mycology.adelaide.edu.au/masterclass.html

• Parasitology and Tropical Medicine Masterclass: http://www.theasm.org.au/special-interest-groups/parasitology-and-tropical-medicine-master-class-2015

• Advertised events in Pathology Today http://www.rcpa.edu.au/Library/Publications

Microbiology Websites

• National Pathology Accreditation Advisory Council www.health.gov.au/npaac

• Australian Society for Antimicrobials http://www.asainc.net.au/

• Australian Group on Antimicrobial Resistance (AGAR) http://www.agargroup.org/

• Australian Society for Microbiology http://www.theasm.org.au/

• The Australian Society for Parasitology http://www.parasite.org.au/

Other resources

• Electronic version of Infection Control Guidelines http://www.nhmrc.gov.au/guidelines-publications/cd33

• Morbidity and Mortality Weekly Report (MMWR) from Centers for Disease Control and Prevention http://www.cdc.gov/mmwr/

• Ozbug discussion group, hosted by Australasian Society for Infectious Diseases (ASID) https://www.asid.net.au/resources/members-resources

• Security Sensitive Biological Agents (SSBA) Regulatory Scheme (Australian Government site) http://www.health.gov.au/SSBA

• The Australian Immunisation Handbook (current edition) http://www.immunise.health.gov.au/internet/immunise/publishing.nsf/Content/Handbook10-home

• European Committee on Antimicrobial Susceptibility Testing (EUCAST) http://www.eucast.org/

• The CDS manual on-line http://cdstest.net/

If you have ideas about additional resources, please inform RCPA (rcpa@rcpa.edu.au) so these can be added to future editions of this handbook

SECTION 2 - CURRICULUM

Research Standards

Standard
Fellows of the Faculty of Science will: **Demonstrate highly developed skills in research, management of time and resources and communication of outcomes and data, whilst independently developing theoretical concepts, acquiring new knowledge and testing hypotheses in the field of Microbiology.**

Content	Outcomes	Indicator
R 1 Research	**R 1 Demonstrated ability in carrying out effective research** 1.1 Comment on recent advances and relevant literature within their field of study 1.2 Develop research proposals and protocols towards testing current hypotheses, investigating contemporary problems, or acquiring new knowledge in the field 1.3 Apply statistical and epidemiological concepts and interpret epidemiological/ laboratory data 1.4 Critically evaluate your own findings and the findings of others 1.5 Employ analytical and critical thinking to independently critique and refine theoretical concepts 1.6 Demonstrate an understanding of the ethical and professionalism issues relating to research including but not limited to consent, ethical treatment of humans and animals, confidentiality and privacy, attribution of credit (including authorship), intellectual property and copyright, malpractice and misconduct 1.7 Participate in effective and ethical peer review processes as researchers and peer reviewers	R 1 will be evidenced through: • 6 original research articles published in journals of a standard approved by the principal examiner within the last ten years in addition to a discussion that explains the background, interrelatedness and significance of the research. These could be presented as a dissertation OR • A PhD related to the area of expertise in Pathology, conferred by a university recognised by the College OR • MSc (Research) conferred by a university recognised by the College plus at least 2 original research articles published within the last ten years in journals of standard approved by the principal examiner AND • Answering questions in a viva voce examination to the standard approved by the principal examiner
R 2 Management	**R 2 Demonstrated ability in the management of research and research administration** 2.1 Prioritise outcomes, meet goals and work productively with key stakeholders using effective project management skills 2.2 Participate in processes for obtaining funding including applying for grants and other external funding 2.3 Record and communicate information through appropriate resources, archives, technologies and equipment 2.4 Demonstrate flexibility, adaptability, and innovation in ones approach to management of research 2.5 Determine the most cost-effective methods to achieve a research goal	All R 2 outcomes could be assessed through: • A report, to be submitted in the candidate's portfolio as detailed in Part II assessment policy AND • Answering questions in a viva voce examination to the standard approved by the principal examiner

Content	Outcomes	Indicator
R 3 Communication	**R 3 Demonstrated ability in research communication** 3.1 Clearly articulate ideas, construct cohesive arguments, and translate and convey technical concepts and information to a variety of stakeholders in a style appropriate to the context 3.2 Prepare reports and papers for peer review/ publication that comply with the conventions and guidelines for reporting biomedical research 3.3 Defend research methods and findings in peer review and/or viva voce examination 3.4 Achieve a significant number of articles in peer-reviewed publications 3.5 Support the development of research capacity of others when involved in teaching, mentoring or demonstrating	R 3 will be evidenced through: • Documenting material presented at weekly laboratory meetings • Documenting the planning and progress of research towards a higher degree through Annual or 6 monthly report • Publications, presentations and poster abstracts • Developing end-of-year reports for own laboratory where appropriate • Documenting the contribution to training programs or assisting other scientists/registrars in conducting research AND Answering questions in a viva voce examination to the standard approved by the principal examiner

Clinical Laboratory Standards – Part I

Standard
Fellows of the Faculty of Science will: • **Demonstrate competence in applying the techniques, technology and reporting associated with a Microbiology laboratory with a broad case-mix of patients.**

Content	Outcomes	Indicator
MC1 – Microbiological science **Describe the pathogens which underpin infectious disease**	**MC 1.1 – Describe the characteristics of pathogens and their methods of transmission** • Describe the taxonomy and biology of recognized human pathogens by their ecology, evolution, metabolism and replication, and treatment • Outline the principles of identification (to species level) of pathogens causing clinical disease including bacteria, fungi, viruses and parasites • Evaluate the classic, phenotypic, manual, automated and developing techniques for identifying human pathogens • Describe the virulence and pathogenesis of human pathogens • Explain the effect of microbial biology and pathogenesis on the selection, sampling and testing of human tissue for diagnosis • Explain the effect of microbial biology and pathogenesis on the phenotype, serotype or genotype of infectious agents **MC 1.2 – Explain infection control measures within a laboratory** • Describe the mechanisms of transmission of microbiological agents, including epidemiology and public health studies • Discuss strategies to prevent the spread of infection in the Laboratory • Compare sterilisation and disinfection • Discuss the application of molecular biology techniques in outbreak investigations and public health surveillance	All of MC 1.1 will be evidenced through: • Answering written and oral examination questions that require description, explanation and evaluation of human pathogens and their behaviour, identification and effects on humans • Complete workplace based assessment that assesses the candidate's ability to suitably collect and test human tissue appropriate for diagnosing the pathogen, to the satisfaction of the supervisor • Answer written and oral examination questions and/or complete as part of a portfolio of work that gives examples of incidences where infection control has been used successfully or has been unsuccessful • Answer written and oral examination questions that require a comparison of sterilisation and disinfection
MC2 – Preparation of samples **Evaluate the processes of selecting, collecting and transporting samples, in addition to selecting the appropriate test to identify organisms.**	**MC 2.1 – Evaluate specimen preparation** • Evaluate methods for the selection, collection and transport of specimens with reference to recent advancements • Suggest new strategies for the selection, collection and transport of specimens to optimize diagnostic yield • Evaluate samples rejected as "not for testing" **MC 2.2 – Suggest appropriate tests for diagnosis** • Suggest the optimal diagnostic algorithm (ie, samples to be collected, tests to be performed, time and cost considerations) for a given case	• Answer written and oral examination questions and/or complete a portfolio of work that gives examples of incidences where specimen collection has been evaluated and improved • Document examples of instances when 'not for testing' samples have been evaluated, with reasons for rejection or reasons why the sample was suitable • Document a case that shows competence in choosing the optimal diagnostic algorithm

Content	Outcomes	Indicator
MC3 – Laboratory techniques **Apply and evaluate the techniques and technology routinely used in the laboratory**	**Explain the principles, performance and limitations of the following, including technical and clinical aspects to support the interpretation of results** **MC 3.1 – Staining and Microscopy** • Perform routine staining techniques, including but not limited to faecal parasite stains, Gram's, modified acid fast, toluidine blue, Giemsa, fluorescent antibody stains • Identify ova cysts and parasites • Blood films containing pathogens • Describe components and use of the microscope – including Kohler illumination	Answer written and oral examination questions or complete workplace based assessments that demonstrate competence in these routine techniques
	MC 3.2 – Cultures - Bacteria, Fungi and Viruses (according to AS/NZS 2243.3:2010 standards • Explain origin and supply of QAP microbes to laboratory • Identify appropriate media or cell cultures for specimen inoculation • Explain the selective and differential components of different microbiological media • Identify appropriate environmental and growth conditions for cultures • Process specimens appropriately	Answer written and oral examination questions and complete workplace based assessments to the satisfaction of the supervisor to show competence in growing cultures
	MC 3.3 – Identification of microorganisms • Identify significant organisms by culture, Gram stain and biochemical tests, both manual and automated • Evaluate the strengths, limitations and applications of existing and emerging techniques for identifying microbes • Explain and justify the role of molecular identification of specific microbes • Trouble shoot potential errors in identification **MC 3.4 - Other non-culture detection of microorganisms** • Perform serologic assays demonstrating familiarity with automated systems • Perform molecular biologic assays demonstrating familiarity with automated systems	Answer written and oral examination questions on identifying and techniques for identifying microbes including molecular identification Complete workplace based assessments to the satisfaction of the supervisor in serologic and biologic assays
	MC 3.5 – Susceptibility testing • Apply the principles and theory of susceptibility testing to perform manual, molecular and automated methods in relation to antibiotic, antifungal and antiviral testing, including detection of resistance mechanisms and their role in antimicrobial therapy • Appropriately report antimicrobial susceptibility results for bacterial and fungal pathogens	Answer written and oral examination questions and complete workplace based assessment to the satisfaction of the supervisor in susceptibility testing
	MC 3.6 – Reporting • Outline the current and potential uses of Laboratory Information Management System (LIMS) systems • Describe NPAAC and NATA requirements for reporting **MC 3.7 – Safety** • Describe and demonstrate safety in the laboratory and biosafety practices in PC2 and PC3 laboratories	Answer written and oral examination questions on, and document involvement in LMIS and NPAAC & NATA procedures in the laboratory

Clinical Laboratory Standards – Part II

Standard
Fellows of the Faculty of Science will: **Apply the theoretical and technical expertise in laboratory techniques required to lead the activities of a Microbiology laboratory, including one specialised area of Microbiology.**

Content	Outcomes	Indicator
MC 4 – Advanced laboratory techniques in Bacteriology	**MC 4.1** – Detail your experience and contribution with an advanced laboratory technique used in Bacteriology **MC 4.2** – Describe the development of an advanced technique used in your field of expertise and its application to the analysis of a pathological disorder. Evaluate the science or technology underpinning the technique and list some key authors who contributed to the development of this technique	All **Part II** outcomes will be evidenced by Faculty of Science reports and answering viva voce questions to the satisfaction of the principal examiner appointed by the college.
AND/ OR **MC 5 – Advanced laboratory techniques in Virology**	**MC 5.1** – Detail your experience and contribution with an advanced laboratory technique used in Virology **MC 5.2** – Describe the development of an advanced technique used in your field of expertise and its application to the analysis of a pathological disorder. Evaluate the science or technology underpinning the technique and list some key authors who contributed to the development of this technique	
AND/ OR **MC 6 – Advanced laboratory techniques in Molecular Microbiology**	**MC 6.1** – Detail your experience and contribution with an advanced laboratory technique used in Molecular Microbiology **MC 6.2** – Describe the development of an advanced technique used in your field of expertise and its application to the analysis of a pathological disorder. Evaluate the science or technology underpinning the technique and list some key authors who contributed to the development of this technique	
AND/ OR **MC 7 – Advanced laboratory techniques in Mycology**	**MC 7.1** – Detail your experience and contribution with an advanced laboratory technique used in Mycology **MC 7.2** – Describe the development of an advanced technique used in your field of expertise and its application to the analysis of a pathological disorder. Evaluate the science or technology underpinning the technique and list some key authors who contributed to the development of this technique	

Content	Outcomes	Indicator
AND/ OR **MC 8 – Advanced laboratory techniques in Parasitology**	**MC 8.1** – Detail your experience and contribution with an advanced laboratory technique used in Parasitology **MC 8.2** – Describe the development of an advanced technique used in your field of expertise and its application to the analysis of a pathological disorder. Evaluate the science or technology underpinning the technique and list some key authors who contributed to the development of this technique	All **Part II** outcomes will be evidenced by Faculty of Science reports and answering viva voce questions to the satisfaction of the principal examiner appointed by the college.
AND/ OR **MC 9 – Advanced laboratory techniques in Serology**	**MC 9.1** – Detail your experience and contribution with an advanced laboratory technique used in Serology **MC 9.2** – Describe the development of an advanced technique used in your field of expertise and its application to the analysis of a pathological disorder. Evaluate the science or technology underpinning the technique and list some key authors who contributed to the development of this technique	
PLUS **MC 10 – Instrumentation**	**MC 10.1** – Describe the principles of operation of an advanced system or apparatus in your field of expertise **MC 10.2** – Explain the significance of this instrument to a specialised area of Microbiology	Answer viva voce questions to the satisfaction of the principal examiner appointed by the college, describing scientific principles supported by appropriate formulae and statistics, limitations, error detection and troubleshooting, along with how the apparatus or system has advanced Microbiology
AND **MC 11 – Advanced pathology science**	**MC 11.1** – Describe the laboratory diagnosis of a new or rare microbiological agent	Answer viva voce questions to the satisfaction of the principal examiner appointed by the college

Innovation, Development and Leadership Standards

Standard
Fellows of the Faculty of Science will: • **Apply, implement and evaluate strategies that guarantee quality assurance, compliance, safety and efficient use of resources fundamental to the operation of a Microbiology laboratory** • **Demonstrate a commitment to the continual improvement and advancement of Microbiology.** • **Apply the principles of Evidence Based Laboratory Practice (EBLP) to inform health care decisions.**

Content	Outcomes	Indicator
I 1 – Evaluate laboratory policies and practices to meet quality management, compliance and safety standards	I 1.1 Maintain and evaluate a quality assurance system under ISO 15189 I 1.2 Evaluate current practices to ensure compliance with NPAAC standards or international equivalent I 1.3 Adopt a combination of quality assurance, quality control and safety, and Total Quality Management policies to meet NATA accreditation or international equivalent I 1.4 Act with responsibility and accountability and an understanding of workflow, teams, decision making, and communication in management and planning of services and/or departments I 1.5 Evaluate and improve workplace safety through proactive management practices, employing laboratory information systems and reporting mechanisms where appropriate I 1.6 Develop or review the processes of validation and verification of methodology used in the laboratory	Answer written examination and viva voce questions that demonstrate competence in these aspects of management required to lead a laboratory PLUS Complete the RCPA Laboratory Management modules (online), found on the RCPA Education website
I 2 – Demonstrate leadership and innovation in developing the practice of Microbiology	I 2.1 Maintain an evidence base to support advice provided to clinicians I 2.2 Analyse the process of implementing analytically valid and traceable routine tests, underpinned by reference materials and documented methods I 2.3 Evaluate new methods as fit for use I 2.4 Assess business opportunities for validity where appropriate I 2.5 Provide strategic direction for the laboratory including management of change I 2.6 Support the education of colleagues, co-workers, students and the public through a variety of strategies including formal/ informal teaching sessions, educational material development, and mentoring I 2.7 Reflect on your engagement in Continuing Professional Development (CPD), and personal benefits I 2.8 Define and model ethical practices in handling/ reporting patient information, interacting with others and seeking opinion, conflict of interest, financial probity, and managing errors I 2.9 Identify your role in professional societies/ colleges and contribute to its activities	Answer viva voce questions and document activities in the portfolio that demonstrate leadership and innovation in these aspects of laboratory practice, supported by specific personal contributions review or develop educational materials for non-scientists e.g. Lab Tests Online Australasia Complete the RCPA Ethics and Confidentiality modules (online), found on the RCPA Education website

Content	Outcomes	Indicator
I 3 – Demonstrate the ability to make informed decisions by accessing and integrating the most current, relevant, valid and reliable evidence available	I 3.1 Identify knowledge gaps during practice and construct focussed, answerable questions to address these gaps I 3.2 Design and implement an appropriate search strategy to answer identified questions through existing evidence I 3.3 Critically evaluate the relevance, currency, authority and validity of all retrieved evidence including scientific information and innovations I 3.4 Apply the appraised evidence appropriately to practice by informing decisions in the given context I 3.5 Use reflective and consultative strategies to evaluate the EBLP process	Faculty of Science Reports submitted by the candidate should demonstrate principles of EBLP AND Answer written examination and viva voce questions

SECTION 3 – MICROBIOLOGY ASSESSMENT POLICY

This section explains the specific requirements and assessment policy for the Faculty of Science Microbiology program. It should be read in conjunction with the ***RCPA Trainee Handbook Administrative requirements***, found on the College website.

Part I – Requirements

Assessment in **Part I** is by:

1. Formal examinations
2. Portfolio of evidence indicating completion of a sufficient number and type of work-based activities
3. Satisfactory progress (Supervisor reports)

See Assessment Matrix in **Appendix 8**

The aim of the **Part I** assessments is to ensure that trainees have spent time in the laboratory and acquired requisite knowledge and skills and participated in a community of practice, such that they can appropriately mix the laboratory/scientific and clinical elements of Microbiology.

1. Formal examinations

There will be a written examination and a practically oriented structured oral examination, held in designated examination centres on dates specified by the College.

The written examination will require short answer and extended responses to questions from the Clinical Laboratory (Part I) and Innovation, Development and Leadership components of the curriculum. The research component is assessed separately at Part II level.

The practically oriented structured oral examination will consist of multiple stations of 10-15 minutes duration. This exam will focus on demonstrating practical aspects of Laboratory Standards (Part I) and Laboratory Innovation, Development and Leadership Standards such as the interpretation of test results from specimens, measurements and calculations, problem solving and reporting, quality control and laboratory management, although the discussion will often be much broader.

Where possible all candidates will be given reading material to evaluate before entering the exam room.

2. Portfolio requirements

In addition to various formal examinations, assessments carried out in the workplace (i.e. Directly Observed Practical Skills, short case reports, Case-based Discussions) and evidence of other learning activities should be recorded in a Logbook and portfolio. Together, these provide evidence that the Trainee is developing technical skills and professional values, attitudes and behaviours that are not readily assessed by formal examinations. Trainees should start accumulating evidence for the portfolio as early as possible in training. It is the Trainee's responsibility to keep the logbook up to date and meet the additional portfolio requirements.

Appendix 1 details the Microbiology Portfolio Requirements for both Part I and Part II.

Logbook

Appendix 2 is a sample page of what will become a logbook for recording workplace activities. **Every formal** learning activity should be recorded here. Only those outlined below should be documented in more detail.

The supervisor should review and sign off completed portfolio forms and logbook on the annual, rotation and pre-exam Supervisor Report.

Short case reports

Trainees must complete a total of three or more short case reports (~1000 words). The trainee should discuss with their supervisor before selecting a case/topic for the report. The focus of the case report could be on a specific technical aspect covering any of the content areas specified in the Part I Laboratory Standards, including laboratory issues of diagnosis and testing. The discussion should include a focussed review of the relevant literature.

The Trainee should select a suitable assessor, who should be an RCPA Fellow but does not need to be the listed supervisor. The assessor could note this as a quality activity in their annual Continuing Professional Development Program (CPDP) submission. Short case reports will be evidenced by the assessor completing the assessment form, included as **Appendix 3.** Please include the completed assessment form and the report in the portfolio. Trainees are encouraged to present their completed case reports at scientific meetings of relevant colleges or societies.

Case-based discussions (CbD)

Trainees must complete a total of five or more Case-based discussions (CbD). CbDs will be evidenced by the supervisor completing the relevant CbD form, included as **Appendix 4.**

Doing CbD assessments is excellent preparation for the oral examinations for trainees. CbD assessments provide feedback about the trainee's ability to interpret and relate laboratory results to opinions and conclusions, including about case circumstances; to plan appropriate investigations, and to provide advice on decisions related to investigations, including decisions with ethical and legal dimensions. The purpose of the CbD assessment is also to provide feedback to Trainees about their progress by highlighting strengths and areas for improvement, thereby encouraging their professional development.

The Trainee should initiate each CbD assessment. The Trainee should select a suitable assessor. The assessor need not always be the listed supervisor. The trainee can discuss and request the supervisor to delegate another assessor, preferably but not necessarily an RCPA Fellow. The assessor could note this as a quality activity in their annual Continuing Professional Development Program (CPDP) submission.

For the assessments, the Trainee should select and prepare two (2) recent cases with which s/he has been involved. The assessor should select one (1) of these for the Trainee to present and discuss. The Trainee should request a mutually convenient time to meet for about 30 minutes. The presentation/discussion should take about 15-20 minutes. A further 5-10 minutes should be allowed for the assessor to give immediate feedback and complete the CbD form. In addition to the formal CbD assessment, supervisors are encouraged to have an informal discussion of the second case prepared by the Trainee. Each CbD case discussion should cover one or more of the different aspects of practice indicated on the CbD form.

Directly Observed Practical Skills (DOPS)

In Microbiology, trainees are to complete the ***minimum number of procedures*** for each of the areas of competence as detailed below. **Further details of the specific specimen types are found in Appendix 5.** Once proficiency is achieved in each area (to be assessed by satisfactory completion of the minimum number of procedures AND at least one instance of observing the trainee in each procedure per sample type and giving feedback) supervisors will complete the relevant **Microbiology Investigations DOPS Assessment Form (Appendix 6)**, including details such as the workload in that area and the nature of the instruments used.

The table below shows the minimum number of procedures in the area of competence of **Part I** training in Microbiology.

Area of Competence	Minimum number of procedures
Macroscopic description of sample and evaluating specimen preparation, including appropriate media and culture conditions	As many as possible, no maximum, competence to be signed off by supervisor on competency form
Microscopy	Reporting on 20 urine samples, 5 sterile fluid samples
Staining	50xGram stains, 5xfungal stains, 5x Mycobacterial/Nocardia stains, 5xfluorescent stains
Cultures	As many as possible, no maximum, competence to be signed off by supervisor
Molecular/ non-culture detection methods	10 Nucleic Amplification (NAA) methods including Polymerase Chain Reaction (PCR), 10 Matrix assisted laser desorption ionization, time of flight (MALDI-TOF) mass spectroscopies
Antimicrobial susceptibility	50 assays to determine antimicrobial susceptibility of a variety of microbes, including 10 e-tests
Serology	5 times for each assay used in home laboratory

Supervisors should complete the DOPS competency form found as **Appendix 6**.

Other Evidence

Trainees should ensure that they are engaged in a variety of learning activities throughout training. These can include presentations (oral and posters), writing abstracts, staff presentations, conferences, teaching, and developing educational material. A suggestion for educational material development is the Lab Tests Online Australasia editing process, please email your details and discipline to ltoau@aacb.asn.au to participate.

These activities develop written and oral communication skills. Whilst each activity should be recorded in the logbook, documented evidence of a minimum of 5 per year from a variety of activity types should be made available upon request over the training period.

3. Supervisor Reports

The supervisor must review and sign off the *completed portfolio forms* and the *logbook* on the **Supervisor reports**. The supervisor must also rate the trainee according to their professional judgement in a range of competencies including laboratory skills, research, innovation and leadership, and professional attitudes and behaviours. The behaviours to be rated and the rating scale with anchors are provided in the supervisor report.

Trainees must submit a Supervisor Report for each year of training (and period of rotation if applicable) to the RCPA Registrar. Trainees who are sitting the **Part I** oral examination must

submit an additional pre-examination Supervisor Report. A cumulatively updated **Portfolio Summary Sheet**, documenting the portfolio of workplace based activities and assessment, must be appended to the pre-examination Supervisor Report and sent to the RCPA Registrar prior to the **Part I** oral examinations at a time determined by the RCPA. Trainees are responsible for submitting the pre-examination Supervisor Report by the due date. Failure to do so may jeopardise the accreditation of training time or finalisation of examination results. The Supervisor Report form can be found at: ***http://www.rcpa.edu.au/Trainees/Training-with-the-RCPA/Supervisor-Reports***

The portfolio summary sheet will be reviewed by the Registrar, Board of Education and Assessment or delegate and the Principal Examiner. The signatories and Trainee may be contacted to confirm evidence of satisfactory completion.

Note: The actual portfolio should not be sent unless requested for audit.

Summary of assessment requirements for Part I

Item	***Completion***	***Assessed by***	***Comments***
Written examination: short answer and/or more extended responses	At the end of three years of training	Marked by two (2) examiners with appropriate experience	Questions set by a panel of examiners
Practically-oriented structured 'oral' examination: Multi-stationed set of structured assessment tasks/ interviews, with practically-oriented questions.	At the end of three years of training After submission of pre-exam supervisor report and portfolio summary sheet	Marked by two (2) examiners with appropriate experience Two (2) examiners with appropriate experience per manned station	Questions set by a panel of examiners
Portfolio items (see Appendix I) to be signed off by supervisor or delegate e.g. DOPS, CbDs, Short Case Reports	To be completed before Part I oral examination	Portfolio summary spreadsheet is checked for completeness by RCPA. If incomplete, the candidate may be required to undertake further activities.	Portfolio items are to be reviewed by the supervisor when preparing the supervisor report. (The portfolio should not be sent to the College unless requested for audit)
Supervisors' Reports with portfolio summary spreadsheet.	Annual (end of rotation if applicable) and Part I pre-exam reports	Reviewed by College registrar or delegate	Referral to Principal Examiner if necessary.

Part II – Requirements

Assessment in **Part II** is by:

1. Formal examinations
2. Faculty of Science Reports on Clinical Laboratory Practice
3. Portfolio of evidence indicating completion of a sufficient number and type of workplace-based activities and assessments
4. Research work and reports
5. Satisfactory progress (Supervisor Reports)

See Assessment Matrix in **Appendix 8**.

The aim of the **Part II** assessments is to ensure that Trainees have spent time in the clinical laboratory, acquired requisite knowledge and skills and participated in a community of practice, such that they can appropriately lead the activities of a Microbiology laboratory in their area of expertise.

1. Formal examinations

There will be a structured 'oral' examination, consisting of approximately 3 stations of 20-30 minutes duration. The oral examination will normally pose similar questions for all Faculty of Science candidates (other than in the Laboratory Standards). There will be two examiners per station and responses will be marked against pre-determined criteria. The focus of this examination will be evaluation of specific aspects of Microbiology Laboratory Standards (Part II), Research Standards, and Laboratory Innovation, Development and Leadership.

2. Faculty of Science reports on Clinical Laboratory Practice

The **Part II** assessment requires four (4) Reports of 3000-5000 words. These should be of a standard publishable in a journal such as *Pathology*.

In Microbiology, the **Part II** curriculum content is divided into six (6) specialised areas:

- MC 4 – Advanced Laboratory techniques in Bacteriology
- MC 5 – Advanced Laboratory techniques in Virology
- MC 6 – Advanced Laboratory techniques in Molecular Microbiology
- MC 7 – Advanced Laboratory techniques in Mycology
- MC 8 – Advanced Laboratory techniques in Parasitology
- MC 9 – Advanced Laboratory techniques in Serology

For the purpose of the Part II assessments candidates should **choose one major and two minor** areas (i.e. three (3) of the six (6)). The **four (4) Reports** should comprise of **two (2) from the major area and one (1) each from the minor areas**. Instrumentation (MC 10) and advanced pathology science (MC 11) by themselves are not considered as specialised areas, but the Reports should demonstrate candidate's competence in these where relevant.

The focus of the Report could range from a single patient case or case series to a large population depending on the discipline involved and the complexity of the situation under investigation. The Reports should demonstrate the candidate's approach to analysing the clinical/ pathological problem or issue in the case(s) or the population (including a relevant review of the literature) and follow up action/discussion based on principles of Evidence-based clinical Laboratory Practice.

It is also expected that some Reports will demonstrate the candidate's ability to be innovative, assure quality and consider management issues such as staff, instrument and reagent costs. Where applicable a Report should comment on issues such as, but not limited to, method selection, method validation, method development and trouble-shooting.

Based on the approach described earlier, following are some suggestions appropriate as Report aims:

- The introduction or development of a new test and comparisons with current best practice
- Transference of an existing test to a new context, sample type or processing protocol and comparing it to current practice
- A study that examines the sensitivity and specificity of a test, including positive and negative predictive values in a particular population
- A detailed analysis of cumulative laboratory data (including case series)
- A study comparing specialised populations

Please note that the above list is not exhaustive. Trainees may discuss with their supervisor and determine any other aim, and inform the College administration well before planning the work involved. The Principal Examiner will confirm the appropriateness of the aim.

The Reports will be independently marked by two examiners in the relevant discipline and candidates will be provided with feedback. While these reports are considered to be Part II assessments, trainees should commence working on them as soon as possible. Candidates are encouraged to submit their Reports early in Part II, and at least 2 Reports should be submitted by the end of the fourth year of training. **It is recommended that *all* Clinical Laboratory Practice Reports be completed and submitted by the month following the Part II Oral Examination.**

Any publications arising from the Reports may be used to meet the requirements of the Research Standards component of the curriculum. Candidates are encouraged to publish their Reports subsequent to examination.

Please refer to **Appendix 7** – Guidelines for Faculty of Science Reports (Part II)

3. Portfolio requirements

Other Evidence

Trainees should ensure that they are engaged in a variety of learning activities related to teaching, scholarship and leadership throughout training as described earlier. Whilst each instance of these activities should be recorded in the logbook, documented evidence of a minimum of 5 from a variety of activity types per year should be made available upon request over the training period.

4. Research work and reports

A PhD or a Masters by research as specified in the indicators for Research Standards is accepted as demonstrated ability to carry out effective research. Otherwise, the candidate needs to submit, in dissertation format, a collection of 6 original research articles published in journals of a standard approved by the principal examiners within the last ten years in addition to a discussion that explains the background, interrelatedness and significance of the research as well as their own contribution to the research.

The candidate should be the first or lead author in at least two of the six articles. A minimum of three of the six articles should be full research papers (not case studies and reviews). In each case the candidate must demonstrate a significant role in the published research. In the case of a Masters by research, two original research articles as per the above specifications are required. Any Faculty of Science Reports completed and published during Part II training can be included as articles. Relevant documentation should be submitted at least one month prior to the Part II oral examination.

Research management would be assessed through a report to be submitted in the portfolio, which would detail the candidate's ability in managing a research project. The report should contain evidence and discussion (~1000 words) addressing the R2 and relevant R1 outcomes. Suggestions for evidence include research proposals and ethics submissions, grant

applications made and/or periodic progress/ evaluation reports of successful grants, and end-of-year reports.

5. Supervisor Reports

Similar to Part I, Trainees who are sitting the **Part II** examination must submit a pre-examination Supervisor Report with the appended copy of the Portfolio Summary Sheet to the RCPA Registrar prior to the **Part II** examinations at a time determined by the RCPA. Failure to submit by the due date may jeopardise the accreditation of training time or finalisation of examination results.

Summary of assessment requirements for Part II

Item	***Completion***	***Assessed by***	***Comments***
Oral examination: multi-station sets of 20-30 min structured interviews	In the fifth year of training (or equivalent)	Two (2) examiners with appropriate experience per station	Questions set by a panel of examiners
Faculty of Science Reports: four (4) of a publishable standard to be certified as candidate's own work and signed by supervisor or delegate	By the month following the Part II oral examination	Assessed by a panel of examiners	Candidates may be required to revise & resubmit if not satisfactory.
Other portfolio items to be signed off by supervisor or delegate	To be completed before Part II oral examination	Portfolio summary spreadsheet is checked for completeness by RCPA. If incomplete, the candidate may be required to undertake further activities.	Portfolio items are to be reviewed by the supervisor when preparing the supervisor report. (The portfolio should not be sent to the College unless requested for audit)
Supervisors' Reports with portfolio summary spreadsheet.	Annual (end of rotation if applicable) and Part II pre-exam	Reviewed by College registrar or delegate	Referral to Principal Examiner if necessary.
Research work and reports	To be completed one month before Part II oral examination	Assessed by a panel of examiners	Referral to Principal Examiner if necessary.

APPENDICES

Appendix 1 - Portfolio Requirements for Microbiology

The table below sets out guidelines to assist Faculty of Science trainees to compile the portfolio, the logbook and the portfolio summary spreadsheet.

Portfolio activities are carried out in the workplace and provide evidence that the trainee is developing technical skills and professional values, attitudes and behaviours that are not readily assessed by formal examinations. Trainees should start accumulating evidence for the portfolio as early as possible in training.

Appendices contain the forms and logbook pages for recording these workplace activities. Please file the (hard copy) forms in a **portfolio folder** with separate sections, numbered as in the table below.

A soft copy **portfolio summary** (Excel spreadsheet) should also be compiled so that trainees can keep track of what they have completed. It is the trainee's responsibility to keep both hard and soft copy records **up-to-date**.

The supervisor should review and sign off *completed portfolio forms* and *logbook* on the annual, rotation and pre-exam supervisor report.

The portfolio summary spreadsheet should be appended to the pre-exam supervisor report and submitted to the RCPA prior to the oral examination at a time determined by the RCPA. The summary will be reviewed by the Registrar, Board of Education and Assessment or delegate and the Principal Examiner. The signatories and trainees may be contacted to confirm evidence of satisfactory completion.

Note: The actual portfolio should not be sent unless requested for audit.

Table: Portfolio Requirements for Microbiology.

	Item	**Part I**	**Part II**	**Evidence**
1	**Supervisor report/s** with brief reflection (maximum 1 page) on the supervisor's comments for each report.	End-of-rotation and annual reports. An additional pre-exam report is required in the year of the Part I and Part II assessments		See Supervisor Report guidelines and forms Appendix
2	**DOPS** in the seven (7) areas of: 1. Macroscopic description and specimen preparation 2. Microscopy and reporting 3. Staining 4. Cultures 5. Non-culture/molecular detection methods 6. Antimicrobial susceptibility 7. Serology	Seven (7) with one each on the specified areas before the Part I examinations		DOPS forms for each curriculum area All forms signed as satisfactory by supervisor or other appropriately qualified person.
3	**CbDs**	A total of five (5) or more Case-based Discussions.		All forms/ reports signed as satisfactory by supervisor or other

	Item	Part I	Part II	Evidence
4	**Short Case Reports** of 1000 words	A total of three (3) or more short case reports,		appropriately qualified person. Reports to be included in portfolio.
5	**Clinical meetings** (laboratory, multidisciplinary) Plus a list of entities presented at each meeting	A combined total of at least five (5) learning activities with a minimum of one (1) in each type per year		Each meeting logged should be signed by the supervisor or another person as agreed/delegated by the Supervisor to verify the trainee's involvement in the meeting.
6	**Teaching sessions** Sessions conducted for students, colleagues, medical colleagues or other audiences. Educational material development			
7	**Scientific forums** Plus the abstracts presented at each meeting			
8	**RCPA Laboratory Management modules**	To be completed satisfactorily before Part I examinations		Signed as satisfactorily completed by supervisor
9	**RCPA Ethics and Confidentiality modules**			
10	**Research Management Report** of 1000 words		to be completed satisfactorily before Part II examinations	Signed as satisfactorily completed by supervisor, report to be included in portfolio.

Appendix 2 – Logbook

RCPA The Royal College of Pathologists of Australasia	**Logbook**
Trainee name:	
Supervisor's name:	

Record the details of each learning activity in the table below. This will form part of your portfolio. This form should be copied as required throughout training.

Description of learning activity	Date	Comments	Initial
Supervisor's signature:			

Appendix 3 – Short Case Report Assessment Form (Part I)

RCPA The Royal College of Pathologists of Australasia	**Microbiology Short Case Report Assessment Form**	
Trainee name	**Trainee ID (RCPA)**	**Stage of training** Y1 Y2 Y3 Y4 Y5 if > Y5 please specify
Assessor's name	**Assessor's position** ☐ Pathologist ☐ Scientist ☐ Other (pls specify)	

Please indicate (✓) if each of the following was deemed Satisfactory (S) or Unsatisfactory (U)

Aspect of Report	S	U
Clear layout of text with appropriate headings and paragraphs. Figures and tables are well planned and easy to understand		
Correct, concise English without spelling or grammatical errors		
Clear introduction, that covers the background of the topic & introduces the rest of the report		
The main body of the report is well organised, easy to read and answers the question that has been set		
A full range of appropriate sources has been used to research the case/topic, including textbooks, journals, websites, personal communications, surveys and/or experiments		
The conclusion accurately summarises the arguments that have been presented		
References are relevant and are cited accurately in the *Pathology* journal format		
No large amounts of irrelevant material & text		

Please comment on other relevant aspects, especially on aspects for improvement

Please indicate the overall standard of the report: ☐ SATISFACTORY ☐ UNSATISFACTORY

Signature of assessor	**Signature of Trainee**
Date completed	

Appendix 4 – Case-based Discussion Assessment Form (Part I)

RCPA The Royal College of Pathologists of Australasia	**Microbiology Case-based Discussion (CbD) Assessment Form**	
Trainee name	**Trainee ID (RCPA)**	**Stage of training** Y1 Y2 Y3 Y4 Y5 if > Y5 please specify
Assessor name and position:		

Technique (select one or few)

- ☐ Macroscopic description of sample and sample selection
- ☐ Evaluating sample preparation
- ☐ Microscopy and staining
- ☐ Molecular/non-culture detection methods
- ☐ Cultures
- ☐ Antimicrobial susceptibility
- ☐ Serology
- ☐ Infection control

Focus of discussion (tick as many as apply)

- ☐ Principles of pathophysiology and disease pathogenesis
- ☐ Common diseases and their diagnostic features
- ☐ Research relevance
- ☐ Significance to clinical management
- ☐ Instrumentation
- ☐ Quality control
- ☐ Advanced laboratory techniques
- ☐ Application of evidence based practice

Complexity of case: ☐ Low ☐ Medium ☐ High

Brief description of case presented, discussed and assessed

Why was this case selected for discussion?

Does this case broaden the trainee's experience by being different from previous cases that have been discussed? ☐ Yes ☐ No ☐ N/A

Please comment on whether these aspects of the trainee's performance are as expected for the stage of training	Yes	No	N/A
Ability to present case clearly and concisely			
Good understanding of clinical issues relating to the case			
Good understanding of laboratory issues relating to the case			
Depth of understanding and awareness of current literature relevant to this case			
Ability of interpret results in a balanced and rational way			
Ability to provide and clearly communicate well reasoned professional advice			
Ability to clinically correlate the laboratory tests results in the setting of clinical presentation of the patient.			
Ability to suggest further relevant or more useful tests towards the management of the patient in relation to diagnosis and monitoring including prognostication.			
Ability to communicate findings to a non-medical person (e.g. patient, lawyer)			
Understanding of management and financial aspects of the case			
Overall laboratory findings			

Please comment on other relevant aspects, especially on aspects for improvement

Final outcome (please tick)	**Date of CbD**	**Time taken for CbD**	**Time taken for feedback**
☐ As expected for the stage of training ☐ Below expected for the stage of training			

Signature of Assessor		**Signature of Trainee**
_____	_____	_____
Name (please print)	Signature	Signature

Laboratory

Appendix 5 – Specimen Types and Assays for Competence

RCPA The Royal College of Pathologists of Australasia	**Microbiology** **Specimen types and assays for competency**

Macroscopic description of sample and evaluating specimen preparation	• Blood/plasma/serum
	• Sterile site fluids
	  - Cerebro-spinal fluid (CSF)
	  - Joint fluid
	  - Ascites fluid
	  - Pericardial fluid
	  - Pleural fluid
	• Urine
	  - Midstream
	  - First void
	  - Catheter
	  o In-out
	  o Indwelling urethral
	  o suprapubic
	• Respiratory specimens
	  - Sputum
	  - Broncho-alveolar lavage
	  - Bronchoscopy fluid
	  - Naso-pharyngeal swab/aspirate
	  - Pharyngeal swab/exudate
	  - Nasal swab/exudate
	• Gastrointestinal specimens
	  - Faeces
	  - Gastric/duodenal aspirate
	• Genital specimens
	  - Urethral swab
	  - Endocervical swab
	  - Vaginal swab (high/low)
	  - Placental tissue
	  - Foetal tissue
	• Surgical specimens
	  - Tissue (biopsy/operative)
	  - Pus
	  - Aspirate
	• Skin & screening swabs
	  - Ulcer (skin/mucous membrane)
	  - Intravascular line tips
	  o Venous (peripheral/longline)
	  o Arterial
	  - Perineal screening swabs
	  - Perianal screening swabs
	  - Nasal screening swabs
	  - Throat screening swabs
	  - Hair (head/body/pubic)
	• Skin scraping

Microscopy	• Urine for detection and semi-quantification of: - Epithelial cells - Leucocytes - Erythrocytes (differentiating normal and abnormal morphology) - Bacteria - Fungi - Crystals (polarisation microscopy) - Casts • Cerebrospinal fluid/pleural fluid/joint fluid/ascites fluid: - Leucocytes - Erythrocytes - Cryptococcus - Crystals
Staining	• Examining Gram stain This should include a wide variety of bacteria, including both Gram-positive (e.g. Staphylococcus, Streptococcus, Corynebacterium, Propionibacterium) and Gram-negative (e.g. Enterobacteriaceae, Pseudomonas, Haemophilus, Neisseria and Fungi (Candida) • Examining Fungal stains (e.g. calcafluor white, trypan blue) • Examining Mycobacterial and Nocardia stains (e.g. Ziehl-Neelsen, modified acid-fast) • Examining Fluorescent stains (e.g. rhodamine-auramine for Mycobacteria, fluorescent antibody stain for Pneumocystis) • Examining faeces by light or phase contrast microscopy (for leukocytes, erythrocytes, eggs, protozoa, helminths). Trichrome or iron haematoxylin stain • A faecal parasite concentration method and stain
Cultures	i. Plating of samples onto agar to yield isolated and identifiable colonies ii. Understanding the growth condition variables of: • Medium type (agars/liquids) • Incubation temperatures • Oxygen concentrations, including microaerophilic and anaerobic conditions • Duration of incubation and how these conditions must be varied according to the specimen type and the microbes being sought. iii. Knowing the components of the various media used in the diagnostic microbiology laboratory and their importance in the culture of specified pathogens e.g. bile salts in MacConkey agar selects for enteric bacteria. iv. Recognising the colony type of common microbes (e.g. Staphylococcus, Streptococcus, Pseudomonas, Nocardia, Salmonella, Campylobacter, Enterobacteriaceae, Candida etc.) v. Recognising haemolytic reactions on horse blood agar (HBA), e.g. α and β haemolysis, and their significance in identifying certain bacteria (e.g. Streptococcus spp.) vi. Interpreting the significance of growth inhibition around bacitracin and optochin discs. vii. Interpreting the significance of colony colour of microbes growing on indicator media (e.g. Chrom Agar). viii. Examination of blood cultures and other sterile fluid samples by commercial automated culture (e.g. Bactec) ix. Culture of fastidious and difficult-to-grow microbes, including but not limited to Haemophilus, Granulicatella Identification of microbes in or from clinical culture samples by the following methods: "bench-top" biochemical tests to identify microbes obtained as isolated colonies on agar e.g. catalase, oxidase, serological groupings, germ-tube, indole.

Identification of microbes through non-culture methods	Identification of microbes in or from clinical samples by the following methods: i. Microbial antigen detection and identification by antigen – antibody reactions e.g. Legionella urinary antigen. ii. Microbial identification by Matrix assisted laser desorption ionization, time of flight (MALDI-TOF) mass spectroscopy. If the candidate's home laboratory does not have this methodology in house, experience with it must be obtained in another laboratory, by a short-term visit or staff exchange. iii. Nucleic acid amplification (NAA) methods for the detection and identification of microbes in clinical samples. The most common methodology, polymerase chain reaction (PCR), must be well understood and the candidate must have "hands-on" experience. If the candidates home laboratory does not perform this methodology in-house, experience with it must be obtained in another laboratory by a short-term visit or staff exchange. Candidates must understand the extraction and purification of DNA/RNA from patient specimens and describe • Gel-based PCR • Real-time PCR • Reverse transcriptase PCR • Multiplex PCR and how they differ from each other and in their sensitivities. iv. Sequencing of DNA, including microbial whole gene sequencing, must be understood as a microbial identifying and classifying tool, but hands-on experience is not required. Use of molecular data to type microbes within the same species (e.g. genotyping) for classification, phylogenetic and epidemiological purposes.
Antimicrobial susceptibility	The applicant must be fully familiar with the antimicrobial susceptibility (AMS) method used in their home laboratory and have used this method to determine the AMS of (as a minimum) the following microbes: • *Staphylococcus aureus*, including the differentiation of methicillin-sensitive *S.aureus* (MSSA) and methicillin-resistant S. aureus (MRSA). • *Streptococcus spp*. • *Enterococcus spp*, including VRE. • Entrobacteriaceae, including β-lactamase-positive, ESCAPPM, ESBL-positive and carbapenamase-positive strains. • Other multi-resistant Gram-negative rods, including *Pseudomonas spp* and *Acinetobacter spp.* The applicant must explain the theoretical basis of all the routine AMS systems in use currently e.g. • disc diffusion - CLSI - EUCAST - CDS • Agar dilution • E-tests • Microdilution (manual) • Microdilution (by commercial assay, e.g. Vitek)

	• Molecular detection of antibiotic resistance genes e.g. ESBL, VRE, KPC, MBL etc. Theoretical basis of molecular testing for antimicrobial resistance
Serology	The applicant must be familiar with assays for the detection of antibodies to microbial antigens in patient sera (infectious diseases serology). The assays that are currently used in the applicant's home laboratory should be fully understood at both a theoretical and practical level and used routinely by the applicant. The following serological assays must be understood at a theoretical level: • Enzyme immune assay (EIA/ELISA) • Chemiluminescent EIA • Immunofluorescence • Agglutination/haemagglutination/latex agglutination • Haemagglutination inhibition • Flocculation (e.g. VDRL) • Complement fixation • Immunodiffusion Evaluate point of care testing (POCT) Explain sensitivity, specificity, positive predictive value, and negative predictive value of serological (and other) assays

Appendix 6 – Directly Observed Practical Skills (DOPS) Assessment Form

<table>
<tr><td colspan="2">RCPA
The Royal College of Pathologists of Australasia</td><td>Microbiology Investigations
DOPS
Assessment Form</td></tr>
<tr><td>Trainee name</td><td>Trainee RCPA ID</td><td>Stage of training
Y1 Y2 Y3 Y4 Y5 if > Y5 please specify</td></tr>
<tr><td>Assessor name</td><td colspan="2">Assessor’s position
☐ Pathologist ☐ Scientist ☐ Other (please specify)</td></tr>
<tr><td colspan="3">Area of competence:
☐ Macroscopic description of sample and specimen preparation
☐ Microscopy and reporting
☐ Staining
☐ Cultures
☐ Molecular/ non-culture detection methods
☐ Antimicrobial susceptibility
☐ Serology</td></tr>
<tr><td colspan="3">Details of instruments used/ techniques practiced:</td></tr>
<tr><td colspan="3">Details of workload (Average number of tests per day or week)</td></tr>
<tr><td colspan="3">This form certifies that the trainee named has completed the minimum number of procedures for the selected area and is competent in all aspects of this area as defined in the curriculum.</td></tr>
<tr><td colspan="3">Comments:</td></tr>
<tr><td colspan="2">Signature of Supervisor</td><td>Signature of Trainee</td></tr>
<tr><td colspan="3">Date completed</td></tr>
</table>

Appendix 7–Guidelines for Faculty of Science Reports (Part II)

The Part II assessment requires four (4) Reports of 3000-5000 words. These should be of a standard publishable in a journal such as *Pathology*.

The focus of the Report could range from a single patient case or case series to a large population depending on the discipline involved and the complexity of the situation under investigation. The Reports should demonstrate the candidate's approach to analysing the clinical/ pathological problem or issue in the case(s) or the population (including a relevant review of the literature) and follow up action/discussion based on principles of Evidence-based clinical Laboratory Practice.

It is also expected that some Reports will demonstrate the candidate's ability to be innovative, assure quality and consider management issues such as staff, instrument and reagent costs. Where applicable a Report should comment on issues such as, but not limited to, method selection, method validation, method development and trouble-shooting.

Based on the above approach, following are some suggestions appropriate as Report aims:

- The introduction or development of a new test and comparisons with current best practice
- Transference of an existing test to a new context, sample type or processing protocol and comparing it to current practice
- A study that examines the sensitivity and specificity of a test, including positive and negative predictive values in a particular population
- A detailed analysis of cumulative laboratory data (including case series)
- A study comparing specific populations

Please note that the above list is not exhaustive. Trainees may discuss with their supervisor and determine any other aim, and inform the College administration well before planning the work involved. The Principal Examiner will confirm the appropriateness of the aim.

In Microbiology the four Reports should comprise of two (2) from the major specialised area and one (1) each from the minor specialised areas selected by the candidate for Part II. Instrumentation (MC 10) and advanced pathology science (MC 11) by themselves are not considered as specialised areas, but the Reports should demonstrate candidate's competence in these where relevant.

The Reports will be independently marked by two examiners in the relevant discipline and candidates will be given feedback. Candidates are encouraged to submit their Reports early in Part II, and at least two Reports should be submitted by the end of the fourth year of training.

Format

1. An electronic copy in an editable format (e.g. Microsoft Word) should be submitted.
2. The first page should have the Trainee's RCPA number and the word count (excluding references). For examination and feedback purposes page numbers should be provided for the whole document and line numbers should be provided for all text.
3. The Trainee's name should NOT be displayed anywhere in the document.
5. Any information and contributions provided by others should be clearly identified. Do NOT give personal or institutional details of the individuals concerned. The Report submitted should be primarily the candidate's own work and any attribution of authorship should take place only at the time of possible publication.
6. The manuscript and reference format should comply with the requirements for the journal *Pathology*. http://edmgr.ovid.com/pat/accounts/ifauth.htm

Marking criteria

1. The Report demonstrates one or more of the Report aims.
2. The methods are appropriate to the Report aims, and reflect an adequate amount of effort.
3. The Report demonstrates the appropriate principles of Evidence Based Laboratory Practice.
4. Where applicable the Report comments on issues such as method selection, method validation, method development and trouble-shooting.
5. Introduction covers the background of the topic and introduces the rest of the Report. The main body of the Report is well organised, easy to read and answers the question that has been set. Large amounts of irrelevant material have not been included.
6. The lessons derived from the Report are discussed adequately, and the implications are related to the candidate's own situation and in the broader context of the field. The conclusion accurately summarises the arguments that have been presented.
7. A full range of appropriate sources have been used to research the related work. This may include textbooks, journals, websites, personal communications, surveys or experiments. The appraisal of the cited literature is critical and selective.
8. References are relevant and are cited accurately and in accordance with the prescribed format. The reference list includes at least 10 and up to 30 references, including recent peer-reviewed literature.
9. Correct, concise English without spelling or grammatical errors.
10. Clear layout of text with appropriate headings and paragraphs. Figures and tables are well planned and easy to understand. Photographs and illustrations are of high quality.

Each criterion will be graded as satisfactory or unsatisfactory. If any of the criteria are unsatisfactory, the Report must be revised and re-submitted.

Any publications arising from the Reports may be used to meet the requirements of the Research Standards component of the curriculum. Candidates are encouraged to publish their Reports subsequent to examination.

Declaration of originality

Each Report must be accompanied by a signed declaration of originality. Please use the form on the next page and do NOT incorporate the form into the Report, to preserve anonymity. The College's policy is that Trainees who submit work that is not their own will fail and the matter will be referred to the Board of Education and Assessment.

Submitting the report and originality declaration

Please *email* the report and the signed declaration of originality to the RCPA at exams@rcpa.edu.au. The declaration and the report will be kept on file at the College. E-copies will be sent to examiners. Please refer to RCPA website for due dates.

Declaration for Faculty of Science reports

Trainee declaration:
I certify that this Report is my own original work and that the work documented was completed as part of my personal supervised practice during my accredited training. It has not been previously submitted for assessment and has not been used by any other trainee in this laboratory. I have read and understand RCPA Policy 10/2002 - Plagiarism and Cheating in Examinations.

Supervisor declaration: As the supervisor for ……, I certify that the work documented was completed personally by him/her during training. The Report is original and has not been used by any other trainee in this laboratory. I have reviewed this item and read the relevant RCPA requirements and believe it is suitable for submission to the RCPA examiners.

Trainee signature……...date……..

Supervisor name (print)……

Supervisor signature……..date……

Appendix 8 - Faculty of Science Microbiology Assessment Matrix

	Outcomes to be assessed *(From the Faculty of Science curriculum)*	Part I		Part II	Research projects		Portfolio					
		Written exam (SAQ)	Structured oral exam	Structured oral exam	Research thesis	Published articles	Faculty of Science reports	CbDs	DOPS	Short case reports	Other reports	Suggestions for portfolio evidence of activity
Clinical Laboratory – I	MC1.1 pathogens and methods of transmission	Y	Y					Y		Y		1, 2
	MC1.2 Infection control measures	Y	Y					Y		Y		1, 2
	MC2.1 Specimen preparation	Y	Y					Y	Y	Y		
	MC2.2 Diagnostic test selection	Y	Y					Y		Y		
	MC3.1 Laboratory techniques – staining and microscopy	Y	Y					Y	Y	P		
	MC3.2-3 Laboratory techniques – cultures and identification of microorganisms	Y	Y					Y	Y	P		
	MC3.4 Laboratory techniques – non-culture detection of microorganisms	Y	Y					Y	Y	P		
	MC3.5 Laboratory techniques – Susceptibility testing	Y	Y					Y	Y	P		
	MC3.6-7 Laboratory techniques – Reporting and safety practices	Y	Y							Y		5, 9
Clinical Laboratory – II	MC4-9 Advanced laboratory techniques in Bacteriology Virology Molecular microbiology Mycology Parasitology Serology			Y			Y					
	MC10 Instrumentation			Y			P					
	MC11 Advanced pathology science			Y			P					
Innovation/ Leadership	I1 Quality and safety of laboratory practices	Y		Y			Y					4, 5, 6, 7
	I2 Leadership and innovation in developing the discipline	P		Y	P	P	Y				P	8, 10
	I3 Evidence Based Laboratory Practice (EBLP) in decision making	Y		Y			Y					1, 3
Research	R1 Conducting Research			Y	Y	Y	P					
	R2 Research Management & administration			Y	P						Y	
	R3 Research Communication			Y		Y						1, 2

Y = Yes P = Possibly * Portfolio categories

1. Attendance/ presentations at laboratory/ multidisciplinary meetings
2. Attendance/ presentations at scientific forums e.g. conferences
3. Teaching sessions
4. Attendance at management meetings
5. Quality activities
6. Incident reports
7. RCPA Management module
8. RCPA Ethics module
9. Involvement in LMIS and NPAAC & NATA procedures in the laboratory
10. Educational material development