MEDICAL MICROBIOLOGY DIGITAL SPECIALIST PORTFOLIO MODULES

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Medical Microbiology Digital Specialist Portfolio Modules

- Quality (please see separate booklet for learning outcomes)
- Health and Safety
- Microscopy
- Culture techniques
- Anaerobic Infections
- Mycology
- Serological diagnosis of infection
- Molecular techniques in infectious science
- Urinary Tract Infections
- Genital Tract Infections
- Sexually Transmitted Infections
- Infections of the gastrointestinal tract
- Blood culture and sepsis
- Skin, soft tissue and ophthalmological infections
- Bone, joint and orthopaedic infections
- Deep seated infections
- Infection of the central nervous system (meningitis/encephalitis)
- Upper respiratory tract infections
- Lower respiratory tract infections
- Mycobacteria
- Vaccination
- Antimicrobials in infection management
- Infection prevention and control
- Emerging infections and the role of national agencies

Please note
All learning outcomes (LOs) are met through two pieces of evidence, Q&A as agreed with a training officer and an additional piece of work as selected by the candidate.

A statement of work and reflective statement on each module will be required which will include sign off by the trainer stating that the candidate works in accordance with laboratory procedures, the competence for which should be evidenced in-house and is not part of the portfolio submission.

Indicative Content outlines background knowledge that may be required to meet the LOs and/or knowledge and competences expected to be demonstrated across multiple modules. Knowledge of areas highlighted in the indicative content may be examined during the viva.

Module Title	Health and Safety
Info	8955
Rationale/ Aims	The module explores the role of diagnostic and reference Microbiology services in the identification, monitoring and control of high consequence infectious diseases (HCID). Candidates will gain an understanding of regulation, control and the management of health and safety in clinical diagnostic or reference laboratories. Candidates will be able to practice in a safe manner.
Learning outcomes	1.Demonstrate the process of risk assessment for the containment of hazard group 3 (HG3) pathogens illustrated with an example from practice, include human factors, laboratory design and warning apparatus. 2.Discuss with examples from practice how clinical and epidemiological information provided with clinical samples must be used to inform the containment level required to process samples safely. 3.Describe with examples from practice how the samples of a patient suspected to have a HCID should be processed in pathology, discuss the variation in control measures required for a range of clinical samples. 4.Discuss the principles of containment and the relationship of containment with pathogen infectivity, including the hierarchy of control principles, PPE and design and function of containment. 5.Discuss the principles of engineering control sufficient to inform effective supervision of Planned Preventative Maintenance of HVAC and pressure control systems and discuss how this is effectively managed in practice. 6.Explain the steps required to maintain and manage containment laboratories (level 2, 3 and 4 as relevant to the candidate's role) to biosafety level standards and give an example of application from candidates practice. 7.Describe the steps required to maintain microbiological safety cabinets and discuss their application with examples from practice. 8.Describe the HCID network and discuss the national planned response to pandemics. 9.Describe the development of pre-analytical processes to make samples safe and post-analytical safe transport, storage and disposal. Discuss compliance with Schedule 5 to the Anti-terrorism, Crime and Security Act 2001 (pathogens and toxins) and NaCTSO. 10.Discuss with examples from practice the principles and process of sterilisation and methods of decontamination of equipment, waste, microbiological safety cabinets and laboratories.
Indicative Content	Candidates require knowledge and understanding of: ACDC approved list of biological agents. Safe operation and maintenance of containment level rooms and safety cabinets.

	Safe operation of autoclaves and other equipment used for making waste safe. Candidates must be able to: Practice in a safe manner

Module Title	Microscopy
Module code	8960
Rationale/ Aims	Candidates will gain knowledge of different microscopes and stains and how these are used in practice. Candidates will gain the ability to use microscopes for microscopic investigation and identification of micro-organisms.
Learning outcomes	1. Discuss the range of stains used to visualize bacteria, cells and fungi, with examples from practice. 2. Discuss the technical limitations of staining and the reasons for staining errors. 3. Discuss the range of microscopes and their utility in microbiological practice. 4. Demonstrate with examples from practice the use of microscopy for the visualisation of bacteria, crystals, parasites, spores or fungi in primary samples. 5. Demonstrate with examples from practice the use of microscopy for the identification or quantification of cells in primary samples. 6. Discuss with examples the use of microscopy for the identification of bacteria or fungi from culture samples with reference to the characteristic microscopic features that differentiate bacterial genera/groups. 7. Discuss with examples the use of microscopy for the demonstration of motility. 8. Explain the local retention guidelines for storing microscopic preparations. 9. Discuss the maintenance requirements of microscopes with reference to ISO 15189:2022.
Indicative Content	Candidates require knowledge and practical application of: Setting up and using different types of microscopes Using different functionalities of a microscope (e.g. bright field, dark field, polarized, UV, graticule.) Maintaining a microscope (e.g. clean, change bulbs, service requirements)

Module Title	Culture Techniques
Module code	8954
Rationale/ Aims	Candidates will gain knowledge and understanding of culture media principles, methods, selection, quality assurance, storage and disposal. Candidates will understand the manipulation, interpretation and examination of cultures and organisms.
Learning outcomes	1. Discuss processes involved in the application of different culture media considering specification, verification, quality control and storage requirements. 2. Describe with an example the use, mode of action and limitations of semi-solid culture. 3. Describe with examples from practice the use, selection and mode of action of a range of solid agars: Selective Differential Standard Supplementary 4. Describe with examples the use, selection and mode of action of a range of liquid culture media: Selective Standard Supplementary 5. Discuss with examples from practice the variation in incubation requirements required for the isolation of bacteria, fungi or parasites. 6. Describe with examples from practice the use of standard non-selective and selective chromogenic agars. 7. Describe with examples the processes used to manipulate, interpret and examine cultures and organisms. 8. Describe and explain the safe handling, storage and disposal of solid, semi-solid and liquid cultures.
Indicative Content	Candidates require knowledge and understanding of: Principles of microbial culture. Consideration of risk assessment and containment in the culture of group 3 pathogens and the use on containment level 3 facilities. Waste disposal QA of processes undertaken Candidates must be able to: Safely and consistently culture a range of microorganisms.

Module Title	Anaerobic Bacteriology
Module code	8951
Rationale/ Aims	This module explores the importance of anaerobic infections including *C. difficile.* Candidates will gain understanding of anaerobic bacteria, including their pathogenesis, cultivation methods, identification methods as well as the clinical management of the patient. Candidates will understand the risk factors that predispose certain patient groups to anaerobic infection.
Learning outcomes	1. Discuss the pathogenesis of anaerobic infections and describe how patient demographics / clinical conditions may influence the potential pathogens isolated. 2. Describe the methods available for cultivation of anaerobic bacteria including advantages and disadvantages. 3. Discuss the value of performing direct smears of purulent patient samples. 4. Discuss the methods used to identify anaerobic bacteria, highlighting those characteristics of anaerobic bacteria that may help aid diagnosis of disease. 5. Describe the diagnosis of *C. difficile* infection and discuss the value and importance of typing with reference to your own practice 6. Discuss the diagnosis of neurotoxic clostridial infections. 7. Discuss the diagnosis of histotoxic clostridial infections. 8. Describe how anaerobic infections are managed clinically, giving one example of a high impact disease (e.g. Lemierres syndrome)
Indicative Content	Candidates require knowledge and understanding of: Pathogenesis of anaerobic infections and risk factors leading to these infections. Diagnosis and clinical management of anaerobic infections. QA of processes undertaken Candidates must be able to: Examine appropriate samples for anaerobic organisms.

Module Title	Medical Mycology
Module Code	8949
Rationale / Aims	This module explores the laboratory diagnosis of superficial through to invasive fungal infections and includes endemic hazard group 3 species. Candidates will gain understanding of various types of fungal infection, along with their causative organisms, and identification. Candidates will gain knowledge of methods used in the investigation of moulds.
Learning Outcomes	1. Discuss the methods used to identify mold isolates, include their advantages and disadvantages. Highlight the importance of recognising microscopic sporing structures and colonial morphology in mould identification and how they relate to non-microscopic methods., e.g. MALDI, molecular. 2. Discuss methods for performing microscopy on mould isolates and directly on samples. 3. Discuss the significance of performing direct microscopy on superficial and more invasive patient samples. 4. Describe the major dermatophyte and non-dermatophyte moulds infecting hair, skin and nails include how they are identified and discuss the importance of direct microscopy on interpreting the significance of a mould in the above sample types. 5. Discuss the aetiology of dark grain and pale grain mycetoma. 6. Discuss the aetiology of chromoblastomycosis. 7. Discuss the diagnosis of invasive fungal infections due to hazard group 3 fungi. Include the importance of clinical and travel history. 8. Describe the risks and precautions required in handling and processing a sample for microscopy and culture, potentially containing a Hazard group 3 mould and explain why these precautions are taken. 9. Demonstrate with an example from candidates practice the identification of yeasts and describe the method used. 10. Explain why microscopy is important in yeast identification and describe a method to examine their microscopical structures.
Indicative content	Candidates require knowledge and understanding of: Consideration of risk assessment and containment in diagnosis of fungal disease and use of containment level 3 facilities QA of processes undertaken Pathogenesis and diagnosis of fungal infections Candidates must be able to: Examine samples and cultures microscopically

Module Title	Serological Diagnosis of Bacterial, Fungal and/or Parasitic Infection
Module code	8962
Rationale/ Aims	Candidates will gain knowledge of diagnostic methods involved in the investigation of bacterial, fungal and/or parasitic infections. Candidates will understand the significance of verification and validation to practice and understand the importance of serological markers in diagnosis and monitoring of invasive fungal infections.
Learning outcomes	1. Describe with examples how sample types, sample integrity and host factors can affect serological results. 2. Explain with reference to the stage of infection the importance of knowing when a sample has been taken in the interpretation of results. 3. Explain, with examples the principles of the following assay methods: - Enzyme Immunoassay - Chemiluminescence - Lateral flow immunoassays - Agglutination assays - Double diffusion - Countercurrent Immuno-electrophoresis 4. Define validation and verification and discuss the significance of assay performance (specificity, sensitivity, positive prediction values, negative prediction values) in this process. 5. Discuss with examples, situations when serological methods are selected to enhance diagnostic accuracy and patient care. 6. Discuss the importance of serological markers in the diagnosis and monitoring of invasive fungal infections. 7. Discuss appropriate serological methods required in the investigation of a diagnostic scenario from candidate's laboratory, consider diagnosis, treatment, and infection control.
Indicative content	Candidates require knowledge and understanding of: Function of immunoglobulins within the body Principles of antigen/antibody interaction QA of processes undertaken

Module Title	Molecular Techniques in Infection Science
Module code	8916
Rationale/ Aims	This module aims to equip candidates with a comprehensive understanding of the foundational principles governing the selection of molecular techniques in diagnosis of infectious disease. Candidates will gain an understanding of various molecular techniques used in pathogen diagnostics, they will develop proficiency in assessing the strengths, limitations, and specific applications of different molecular techniques. Candidates will gain a comprehensive understanding of the skills necessary to select appropriate molecular techniques based on pathogen characteristics, sample types, sample timing and diagnostic objectives. Candidates will be able to demonstrate the ability to critically analyse diagnostic scenarios and make informed decisions regarding technique selection and apply knowledge gained to enhance diagnostic accuracy and contribute to effective patient care.
Learning outcomes	1.Discuss, with examples, the importance of specimen requirements including sample timing and issues that could affect assay performance. 2.Discuss the principles of nucleic acid extraction including: Phenol chloroform Solid phase spin column Magnetic bead 3.Discuss the principles and clinical application of the following molecular techniques: Nucleic acid amplification tests including PCR and isothermal amplification techniques Sequencing techniques (Next Generation/Whole Genome/ Sanger) 4.Evaluate with examples the strengths, limitations and application of three molecular assays (different techniques where possible) to candidates practice. 5.Discuss with examples situations when molecular techniques are selected to enhance diagnostic accuracy and patient care. 6.Discuss appropriate molecular assays required in the investigation of a diagnostic scenario from candidates practice, such as fever of unknown origin, consider diagnosis, treatment, and infection control. 7. Discuss the possible root causes, corrective actions and preventative actions of the following common molecular errors: Positive result for the negative amplification control Positive result in the extraction control Negative result in the positive amplification control Failed internal amplification result Positive results for environmental controls

Indicative Content	Candidates require knowledge and understanding of: The theoretical measures of molecular assay performance and the influence of specimen quality on the ability of the assay to deliver meaningful results. Overview of molecular assays: PCR, NASBA, bDNA, Isothermal amplification, Next-Generation Sequencing, etc. Principles underlying molecular assay selection: Sensitivity, specificity, turnaround time, diagnostic platform, cost-effectiveness. Factors influencing molecular assay choice as relevant to practice, e.g. Viral load, sample type & timing in disease course, epidemiological considerations. Optimal molecular assay selection in different pathogenic diagnostic contexts. Practical considerations and challenges in pathogen molecular assay selection.

Module Title	Urinary Tract Infection
Module code	8964
Rationale/ Aims	This module explores the laboratories role in the diagnosis of urinary tract infections, this encompasses a broad range of urological conditions such as acute and chronic pyelonephritis (kidney and renal pelvis), cystitis (bladder), urethritis (urethra), epididymitis (epididymis) and prostatitis (prostate gland) as well as infection to surrounding tissues (eg perinephric abscess) and development of urosepsis. Candidates will gain understanding of the sample types and the techniques utilised in the investigation of urinary tract infection. Candidates will also develop an understanding of how urinary tract infections are managed clinically. Candidates will gain the ability to interpret and identify pathogens associated with urinary tract infections.
Learning outcomes	1. Describe the structure and function of the urinary tract and discuss how this relates to the urinary tract microbiota in health and disease states. 2. Discuss common pathogens that cause urinary tract infection and explain, with examples, how patient demographics, clinical conditions such as pregnancy, age, catheterisation relate to pathogens encountered. 3. Discuss common pathogens that cause renal abscesses and how patient demographic, clinical conditions relate to pathogens encountered (including an awareness of when HG3 organisms may be suspected). 4. Identify the media and growth conditions required in the isolation of pathogens mentioned in learning outcomes 2 and 3. 5. Demonstrate with an example from practice the interpretation and identification of a pathogen associated with complicated urinary tract infection and discuss the treatment options. 6. Explain why there are specific antimicrobial guidelines for the reporting of infectious agents associated with the lower urinary tract. 7. Explain why there are specific antimicrobial guidelines for the reporting of some agents when there is a systemic infection originating from the urinary tract, including the need for therapeutic drug monitoring.

	8. Discuss situations where further testing/referral testing may be required in the investigation of urinary tract infection e.g. sterile pyuria. 9. Discuss the role of automation and diagnostic stewardship initiatives, such as white blood cell (WBC) or bacterial quantification cut off values, to reduce the need to culture all samples.
Indicative Content	Candidates require knowledge and understanding of: Sample types available for diagnosis of urinary tract infections How samples are processed for urine microscopy and culture Pre-analytical guidance for rejection of samples When and how to process a urine for parasites How to perform antimicrobial sensitivity tests (including which panels to test against) for pathogens associated with urinary tract infections. Consideration of risk assessment and containment in the culture of group 3 pathogens and the use on containment level 3 facilities Waste disposal QA of processes undertaken Candidates must be able to: Safely and consistently culture a range of microorganisms.

Module Title	Genital Tract Infections
Module code	8948
Rationale/ Aims	This module explores the laboratories role in the diagnosis of genital tract infections. Candidates will gain understanding of the breadth of samples and techniques utilised in investigation of genital tract infection. Candidates will gain the ability to identify and interpret results pertaining to genital tract infections.
Learning outcomes	1. Discuss how gender, age, antimicrobial use and pregnancy influences the microbiota of the genital tract. 2. Discuss with 3 examples from practice the use of microscopy and culture to diagnose genital tract infections from a range of sample types and patient groups. 3. Describe the pathophysiology of genital infections caused by three of the following: *Neisseria gonorrhoeae* *Candida albicans and other yeast species* *Mycoplasma genitalium* *Trichomonas vaginalis* *Treponema pallidum* *Clostridia sp and other anaerobe species* *Toxin producing Staphylococcus aureus* 4. Discuss the Group B streptococcal screening guidelines in pregnancy and explain how this applies to candidates laboratory practice. 5. Discuss with examples from practice the impact of antimicrobial resistance on the treatment and management of genital tract infection. 6. Describe the surveillance role undertaken by national reference services. 7. Demonstrate application of the medico-legal requirements of the laboratory when investigating samples that require a chain of evidence.
Indicative Content	Candidates require knowledge and understanding of: British Association of Sexual Health and HIV (BASHH) Guidelines British HIV Association (BHIVA) UK Standards for Microbiology Investigations UK(SMI) NICE Guidance for Group B Streptococcus Screening Candidates should have an awareness of terminology and significance of assigned gender and gender identity.

Module Title	Sexually Transmitted Infections
Module code	8914
Rationale/ Aims	This module explores the laboratories role in the diagnosis of sexually transmitted infection. Candidates will gain knowledge and understanding of the sample types and the techniques utilised for diagnosis of infection. Candidates will understand the role of treatment and control.
Learning outcomes	1. Identify 3 sexually transmitted infections and discuss their pathogenesis 2. Discuss, with an example, the potential influence that one infection may have on another consider for example, risk factors where relevant. 3. Discuss the importance of sample selection, collection and the impact that the presence of interfering substances has on methodology / assays used. 4. Discuss different diagnostic assays and methodologies that can be used in the investigation of sexually transmitted infections and demonstrate with an example from practice situations where further testing is required. 5. Discuss, with examples, where and why specific tests are selected in different settings, such as, sexual health clinics, point of care and laboratories, consider time samples are taken and circumstances. 6. Discuss the impact sample types and timings has on methodology/assay selection and performance, and discuss the extent to which specificity and sensitivity is considered. 7. Discuss the infection control and public health strategies of STIs in populations through contact tracing, screening, vaccination and prophylaxis. 8. Describe, with examples, different types of therapeutic options that may be available in the treatment of STIs including antivirals, antimicrobials, immunoglobulin and vaccines. 9. Describe medico-legal requirements of laboratories investigating samples that require a chain of evidence and discuss when this is applicable.
Indicative Content	Candidates require knowledge and understanding of: Organisms which contribute to sexual infection. The use of different assays to identify and monitor sexually transmitted infections, in respect to treatment. Candidates should be aware of: Relevant guidelines pertinent to sexually transmitted infections: British Association for Sexual Health and HIV British HIV Association

Module Title	Infections of the Gastrointestinal Tract
Module code	8953
Rationale/ Aims	This module looks at gastrointestinal disease and how the laboratory investigations support detection and diagnosis. This module will ensure specialist knowledge and understanding in infective gastrointestinal disease, and application of that knowledge and understanding to Medical Microbiology practice. Candidates will gain understanding of the bacterial, viral, parasitic and toxigenic causes of gastro-intestinal disease, and the sample types and procedures required to facilitate this. Candidates will be able to demonstrate safe, efficient and effective examination of samples submitted for the investigation of infective gastro-intestinal disease and understand how this supports patient management.
Learning outcomes	1. Describe the structure and function of the gastrointestinal tract and explain the role of the microbiota. Discuss the impact of alterations to the microbiota and explain why certain patient groups are at risk of gastrointestinal disease. 2. Describe routine microbial pathogens associated with gastrointestinal disease and the sample types required to assist diagnosis. 3. Discuss, with reference to less common GI pathogens, how patient history/clinical conditions influences diagnosis. 4. Explain the pathogenic mechanisms for one of each of the following pathogen groups – bacterial, viral, parasitic, toxin-producer. 5. Demonstrate the safe and appropriate examination of samples, including selection of appropriate recovery/detection methods, with reference to local and national policies and legislation. 6. Discuss different identification methods used to identify target microbial pathogens associated with gastrointestinal diseases, including recovery, biochemical, molecular, mass spectroscopy, serological and microscopic techniques. Demonstrate identification of 2 microbial pathogens from candidates' practice. 7. Discuss situations that require specialised tests/reference testing referring to guidelines where appropriate. 8. Explain how the results obtained from examination of gastrointestinal samples are used in patient management and management of infection control, include reference to therapeutic management. 9. Describe the reporting of significant isolates and discuss their importance locally and nationally with reference to UKHSA notifiable organisms and diseases. 10. Discuss the role of UKHSA in surveillance and outbreak management for food, water and aerosol borne gastrointestinal pathogens.

Indicative Content	Candidates require knowledge and understanding of: Recovery and detection methods including culture, molecular, direct microscopic examination, sample concentration, staining techniques and rapid antigen tests; Identification methods including biochemical, serological and molecular; antimicrobial susceptibility testing; Toxin detection; Typing methods; Infection control and patient management. Safe transport of samples, and infectious organisms requiring referral to another laboratory. Consideration of risk assessment and containment in the culture of group 3 pathogens and the use on containment level 3 facilities. Waste disposal QA of processes undertaken Candidates must be able to: Safely and consistently culture a range of microorganisms.

Module Title	Blood Cultures and Sepsis
Module code	8956
Rationale/ Aims	Blood culture is the “gold standard” investigation for the detection of micro-organisms in blood. Candidates will gain knowledge of the principles and uses of blood cultures, analytical requirements of specimens and safety aspects when processing blood cultures. Candidates will gain the ability to identify, culture and report on micro-organism causes of blood stream infections. Candidates will understand susceptibility testing and the methods used in the investigation of blood stream infections, including endocarditis.
Learning outcomes	1. Describe with reference to one continuous monitoring system the principles and use of blood cultures. 2. Discuss the principles of how micro-organisms can cause bloodstream infections. 3. Discuss the pre-analytical requirements of blood cultures. 4. Discuss the reasons for the generation of: False positive signals False negative signals And the actions that should be taken. 5. Discuss with an example from practice the safety aspects that should be considered when processing positive blood cultures. 6. Demonstrate with a maximum of 5 examples from practice the identification, culture, susceptibility testing and reporting of a range of micro-organisms associated with blood stream infection, including endocarditis. 7. Discuss the importance of biomarkers in the recognition of sepsis. 8. Discuss with examples from practice the use of rapid methods to identify blood culture isolates including molecular, serological and non-culture based techniques. 9. Discuss with an example from practice compliance with health protection notifications and demonstrate referral of a micro-organism to a national reference service or health protection unit.
Indicative Content	Candidates require knowledge and understanding of: Diagnosis of septicaemia.

	Sepsis pathway guidelines. Consideration of risk assessment and containment in diagnosis of septicaemia and use on containment level 3 facilities QA of processes undertaken Candidates must be able to: Use and operate a blood culture system. Examine positive and negative blood cultures.

Module Title	Skin, Soft Tissue and Ophthalmological Infections
Module code	8963
Rationale/ Aims	This module explores the laboratory diagnosis of skin, soft tissue and ophthalmological infections. Candidates will develop an understanding of the breadth of sampling areas and techniques utilised in the investigation of skin, soft tissue and ophthalmological infections as well as the impact of patient demographics/clinical conditions on these investigations. Candidates will gain the ability to identify and interpret results pertaining to these infections.
Learning outcomes	1: Describe the common pathogens that cause skin and soft tissue infections and discuss the sample types required for their optimal recovery. 2. Explain with examples how patient demographics/clinical conditions relate to expected pathogens of skin and soft tissue infections. 3: Describe the common pathogens that cause ophthalmological infections and discuss the sample types required for their optimal recovery. 4. Explain with examples how patient demographics/clinical conditions relate to expected pathogens of ophthalmological infections. 5: Demonstrate with an example from practice the candidate's ability to interpret and identify a pathogenic cause of skin, soft tissue or ophthalmological infection. Discuss the choice of techniques selected (e.g. media choice, presumptive identification methods, microscopy, confirmatory methods and sensitivity testing). 6. Discuss, with examples of disease, the selection of appropriate antimicrobials/treatment. 7. Discuss situations where referral of isolates or samples for more specialised testing is required and consider when public health might be important and require a muti-disciplinary approach.
Indicative Content	Candidates require knowledge and understanding of: Anatomy of the skin and eye When and why a range of culture media (including enriched, selective and differential) are used in the diagnosis of skin, soft tissue and ophthalmic infections. How to use clinical details to select a range of culture media The range of sample types and the benefits/limitations of each. How to perform antimicrobial sensitivity tests (including which panels to test against) for pathogens associated with skin, soft tissue and ophthalmic infections Guidelines and legislation for referring isolates to reference centres. Consideration of risk assessment and containment in the culture of group 3 pathogens and the use on containment level 3 facilities Waste disposal QA of processes undertaken Candidates must be able to: Safely and consistently culture a range of microorganisms.

Module Title	Bone, Joint and Orthopaedic Infections
Module code	8952
Rationale/ Aims	This module explores the laboratories role in the diagnosis of bone, joint and orthopaedic infections through the analysis of bone, tissue and fluid samples. Candidates will gain an understanding of the breadth of samples and techniques utilised and demonstrate the ability to identify and interpret results pertaining to bone, joint and orthopaedic infections.
Learning outcomes	1.Compare and contrast the range of sample types utilised for the detection of organisms causing bone and joint infections. 2.Discuss processing of tissue, joint and orthopaedic samples and explain why these might be processed in a different way to each other. 3. Describe how patient demographics/clinical conditions may influence the potential pathogens isolated. 4. Discuss the pathogenesis of orthopaedic infections (how do these infections arise). 5. Discuss the pathogenesis of bone and joint infections (how do these infections arise). 6. Demonstrate the ability to interpret and identify a pathogenic cause of bone and/or joint infection. 7. Evaluate the selected technique (e.g. media choice, broth inclusion, presumptive identification methods, microscopy and/or molecular methodology). 8. Discuss techniques used in orthopaedic surgery to reduce incidence of post-surgical infections. 9. Discuss with examples from practice how infections of bone and joint are managed.
Indicative Content	Candidates require knowledge and understanding of: The anatomy of knee, hip and other joints. The pathogenesis and examination of bone, joint and tissue infections. Aseptic technique and protection of samples from contamination during processing. Consideration of risk assessment and containment in examination of bone, joint and tissue infections and the use on containment level 3 facilities QA of processes undertaken Candidates must be able to: Examine bone, joint and tissue samples.

Module Title	Deep Seated Infections (Pus and Tissues)
Module code	8957
Rationale/ Aims	This module explores the laboratories role in the diagnosis of deep seated infections through the analysis of tissue and fluid samples. Candidates will gain an understanding of the breadth of samples and techniques utilised and demonstrate the ability to identify and interpret results pertaining to deep seated infections.
Learning outcomes	1.Compare and contrast the range of sample types utilised for the detection of organisms causing deep seated infections (e.g. endocarditis, peritonitis, intra-abdominal/liver abscesses). 2. Discuss with examples from practice, the processing of sterile and non-sterile fluid, tissue and prosthetic material and explain why these might be processed in different ways. 3. Describe how patient demographics/clinical conditions may influence the potential pathogens isolated, including hazard group 3 microorganisms. 4. Discuss with examples from practice the pathogenesis of infection caused by different infectious agents in 2 of the following tissues or organ systems: Cardiac Peritoneal Kidney Liver Brain 5. Discuss with examples phenotypic and molecular methods of identification of pathogenic causes of deep-seated infection. 6. Discuss with examples from practice the clinical management of deep-seated infections. 7. Discuss the role of specialist reference services in the investigation of primary samples or isolates pertaining to deep seated infection.
Indicative Content	Candidates require knowledge and understanding of: Structure and function of key solid organs. Aseptic technique and protection of samples from contamination during processing. Consideration of risk assessment and containment in the culture of group 3 pathogens from deep-seated infections and the use on containment level 3 facilities QA of processes undertaken

Module Title	Infection of the Central Nervous System (meningitis/encephalitis)
Module code	8930
Rationale/ Aims	This module explores the laboratories role in the diagnosis of meningitis and/or encephalitis through the analysis of cerebral spinal fluid and other relevant sample types. Candidates will gain understanding of the importance of cell counts and how microscopy results can be used alongside biochemical markers in the diagnosis of meningitis. Candidates will gain knowledge of the causes of meningitis and encephalitis and be able to demonstrate the methodology used to determine the causative organism.
Learning outcomes	1. Explain the significance of microscopy including counting, stains and/or differentiating white and red cells in a CSF with reference to normal ranges, and discuss non-infective reasons why white cells may be raised in a CSF. 2. Discuss how biochemical markers can aid in the diagnosis of meningitis/encephalitis. 3. Discuss with 3-5 examples from practice the pathogenesis of meningitis/encephalitis and discuss how patient factors, such as underlying conditions (e.g. HIV, PMH, hydrocephalus) and age, influence potential infectious agents. 4. Demonstrate with an example from practice the ability to analyse a CSF (or other relevant sample), in order to identify infectious agents (Include an understanding of the limitations of the method/technique chosen in the diagnosis of central nervous system infection). 5. Discuss merits of different diagnostic approaches including multiplex molecular panels and give examples of when confirmatory tests or reference facilities are required or mandated. 6. Demonstrate safe handling of CSF samples with reference to potentially high-risk patients (e.g. Creutzfeldt-Jakob disease [CJD], tuberculosis [TB]). 7. Demonstrate reporting of CSF samples and discuss the importance of a rapid turnaround time. 8. Discuss with examples treatment strategies and management of patients with acute and chronic meningitis/ encephalitis.
Indicative Content	Candidates require knowledge and understanding of: Anatomy of the brain and spinal cord with reference to meningitis/encephalitis. Need for urgency in providing a quick and accurate result. Basic principles behind microscopes and how to use them correctly. CSF shunts, their uses and infectious agents associated with them

Module Title	Upper Respiratory Tract Infection
Info	8958
Rationale/ Aims	This module explores the laboratories role in the diagnosis of upper respiratory tract (ear and throat) infections through the analysis of swab samples. Candidates will gain understanding of the structure and function of the upper respiratory tract (URT) and common pathogens associated with URT infections. Candidates will gain knowledge of the techniques utilised in the investigation and diagnosis of these infections and will be able to identify and interpret results pertaining to URT infections.
Learning outcomes	1. Describe the structure and function of the upper respiratory tract and discuss how this relates to the microbiota and introduction of pathogenic organisms. 2. Discuss common pathogens that cause otitis externa and otitis media and explain, with examples, how patient demographics/clinical conditions relate to pathogens encountered. 3. Discuss common pathogens that cause pharyngitis/throat infections and explain, with examples, how patient demographics/clinical conditions relate to pathogens encountered (including an awareness of when CL3 organisms may be suspected). 4. Discuss common pathogens that cause sinus infections and explain, with examples, how patient demographics/clinical conditions relate to pathogens encountered. 5. Explain the composition and method of action of various media used in the isolation of pathogens mentioned in learning outcomes 2-4 and discuss, with examples, why different media and growth conditions are required. 7.Demonstrate with an example from practice candidates the ability to interpret and identify a pathogenic cause of ear or throat infection. 8. Explain and evaluate the choice of techniques selected (e.g. media choice, presumptive identification methods, microscopy, confirmatory methods and sensitivity testing). 9. Discuss situations where further testing/referral testing may be required in the investigation of upper respiratory tract infections. 10. Discuss, with an example from candidates practice, the clinical management of an upper respiratory tract infection.
Indicative Content	Candidates require knowledge and understanding of : Sample types received in the diagnosis of upper respiratory tract infections including advantages and limitations of each from deep-seated infections Consideration of risk assessment and containment in the culture of group 3 pathogens and the use on containment level 3 facilities Waste disposal QA of processes undertaken Candidates must be able to: Safely and consistently culture a range of microorganisms.

Module Title	Lower Respiratory Tract Infection
Module code	8959
Rationale/ Aims	This module explores the laboratories role in the diagnosis of lower respiratory tract infections, this encompasses a broad range of respiratory conditions such as pneumonia, bronchitis, bronchiolitis, exacerbations of chronic obstructive pulmonary disease and asthma. Candidates will gain understanding of the sample types (sputa and bronchoalveolar lavage) and the techniques utilised for culture and non-culture diagnosis of lower respiratory tract infection. Candidates will gain the ability to identify pathogens and understand appropriate treatment strategies.
Learning outcomes	1. Describe the structure and function of the lower respiratory tract and discuss how this relates to the microbiota and introduction of pathogenic viral, bacterial, parasitic or fungal microorganisms. 2. Discuss common pathogens that cause pneumonia and explain, with examples, how patient demographics/clinical conditions such as Cystic Fibrosis, Bronchiectasis and COPD relate to pathogens encountered. 3. Discuss common pathogens that cause lung abscesses and how patient demographics/clinical conditions relate to pathogens encountered (including an awareness of and actions to be taken when HG3 bacteria, fungi or viral pathogens are clinically suspected). 4. Explain the composition and method of action of various media used in the isolation of pathogens mentioned in learning outcomes 2 and 3 and discuss, with examples, why different media and growth conditions are required. 5.Demonstrate with an example from practice the ability to identify a pathogen associated with: - community onset Pneumonia - hospital onset Pneumonia - ventilator associated Pneumonia 6.Discuss the antimicrobial agents used for oral, IV or nebulised therapy and the susceptibility test methods that are appropriate. 7. Explain and evaluate the benefits of syndromic PCR panels in the diagnosis of lower respiratory tract infection. 8. Discuss situations where further testing/referral testing may be required in the investigation of lower respiratory tract infection.

Indicative Content	Candidates require knowledge and understanding of : CF Trust Microbiology Guidance British Thoracic Society Range of lower respiratory tract samples received in a microbiology laboratory and the advantages/limitations of each Why and how samples are pre-treated and/or concentrated. Consideration of risk assessment and containment in the culture of group 3 pathogens and the use on containment level 3 facilities Candidates must be able to: Process a range of lower respiratory samples

Module Title	Mycobacteria
Module code	8961
Rationale/ Aims	Candidates will gain knowledge of the pathogenesis and epidemiology of mycobacterial infections and, knowledge of the sample types required in the investigation of suspected mycobacterial disease. Candidates will understand methods used in screening, and diagnosis of mycobacterial infections and how patients with tuberculosis and non-tuberculosis mycobacterial infections are clinically managed.
Learning outcomes	1. Discuss the pathogenesis and epidemiology of mycobacterial infections. 2. Explain the sample types required for investigation of mycobacterial infection. 3. Discuss with an example from practice how samples other than sputum may prove useful in diagnosing infection caused by Mycobacteria tuberculosis complex. 4. Discuss with an example from practice how samples other than sputum may prove useful in diagnosing infection caused by Non-Tuberculosis Mycobacteria. 5. Discuss the sensitivity and specificity of different staining methodologies used in the detection of Mycobacteria spp. 6. Discuss the techniques available (including molecular) to detect, identify and cultivate Mycobacteria spp. 7. Discuss phenotypic and genotypic methods for determining antimicrobial susceptibility. 8. Discuss the clinical management of patients with suspected and/or confirmed Mycobacterium tuberculosis complex. 9. Discuss the clinical management of patients with suspected and/or confirmed non-tuberculosis mycobacteria.
Indicative Content	Candidates require knowledge and understanding of: Structure and function of respiratory tract Consideration of risk assessment and containment in the culture of group 3 pathogens and the use on containment level 3 facilities. Isolation and culture of mycobacterial species Current and developing technologies for identification, anti-microbial susceptibility testing and typing of mycobacteria The use of screening methods for detection of latent Tuberculosis Candidates must be able to: Apply QA to all processes

Module Title	Vaccination
Module code	8913
Rationale/ Aims	This module aims to equip candidates with a comprehensive understanding of the foundational principles governing the history of vaccination, and its evolution to the current range of vaccine strategies. Candidates will gain understanding in vaccine preventable illness and the challenges to provide individual and herd immunity and why these different approaches are important in infectious disease.
Learning outcomes	1. Compare passive and active immunity and demonstrate how these are applicable to your practice. 2. Explain the mechanism of the following: Inactivated vaccines Live-attenuated vaccines 3. Explain the mechanism of the following vaccine types with an example of each; subunit, recombinant, polysaccharide, mRNA, viral vector vaccines and conjugate vaccines. 4. Discuss the strategies of vaccination to protect individuals with consideration to age, travel and immune status. 5. Discuss the strategies of vaccination to protect populations. 6. Discuss the strategies of vaccination in the eradication of disease. 7. Evaluate reasons for vaccine hesitancy and the impact of low vaccine uptake in populations. 8. Describe, with an example, the pro's and cons of vaccination versus testing and isolation. 9. Discuss, with an example from candidates practice, the importance of referral to reference laboratories, and explain the role of the Health Protection Team in vaccine preventable diseases.
Indicative Content	Candidates require knowledge and understanding of: Principles of immunity Principles of vaccination Different types of vaccines Description of vaccination for herd immunity Description of vaccination for individual protection Vaccinations for different groups, e.g. healthcare workers

Module Title	The Use of Antimicrobials in Infection Management
Module code	8950
Rationale/ Aims	This module explores the laboratories' role in the development of susceptibility test results. Candidates will give an understanding of techniques utilised and demonstrate the ability to perform and interpret susceptibility test results for a range of infections.
Learning outcomes	1. Describe the class, action and use of antimicrobials commonly encountered in your clinical practice. 2. Explain with examples the principles and use of standardised methods for generating susceptibility test results. 3. Demonstrate the ability to perform and interpret susceptibility test results and discuss why different methods are required. 4. Discuss with an example from practice the role of quality control in the generation of susceptibility test results and the strategies involved in investigating and resolving errors. 5. Discuss, with examples, intrinsic resistance, detection of resistance enzymes, the use of indicators, expected phenotypes and the actions that should be taken when an unexpected phenotype is encountered. 6. Discuss the use of antimicrobials in the treatment of infection at different sites, with examples from clinical practice. 7. Discuss with an example from practice the use of anti-infective agents and the wider national reference services, therapeutic drug monitoring reference services and health protection in the management of antimicrobial resistant phenotypes. 8. Discuss with an example from practice the need for antimicrobial stewardship, infection prevention and control strategies to control antimicrobial resistance, and the role of the microbiology laboratory in supporting these activities.
Indicative Content	Candidates require knowledge and understanding of: The range of reference services involved in the generation of specialist susceptibilty tests The role of national administrations in the development of AMR and AMS strategy

Module Title	Infection Prevention and Control (IPC)
Module code	8915
Rationale/ Aims	This module explores the laboratories role in the prevention and control of infections within the hospital and within community settings. Candidates will gain an understanding of infection prevention and control techniques and the knowledge to support outbreak investigations.
Learning outcomes	1. Discuss the role of the laboratory in supporting the infection prevention and control team in performing patient screening and maintaining a safe environment for patients. 2. Summarise the common pathogens that cause healthcare associated infection of IPC concern. 3. Discuss, with an example from practice, the environmental monitoring that is recommended for augmented, theatre and intensive care areas or other areas as applicable to candidates practice. 4. Explain and evaluate with examples from practice the variety of techniques used to perform standard or enhanced surveillance (e.g. media choice, use of molecular technology, sequencing). 5. Discuss with examples from practice the role of national agencies in the monitoring and resolution of outbreaks caused by bacteria, viruses and fungi. 6. Demonstrate, with examples from practice, compliance with the statutory requirements of the laboratory to notify health protection agencies. 7. Explain the structure and function of the local and regional infection prevention and control teams including within hospital and community locations and discuss how the laboratory supports their national remit to monitor key pathogens.
Indicative Content	Candidates require knowledge and understanding of: The monitoring role of, and reports produced by, national agencies. The role of national agencies and local health protection in resolving outbreaks. The role of the laboratory in supporting local health protection and national agencies. Appropriate personal protective equipment (PPE) and behaviours within laboratory and healthcare settings. Recommended environmental monitoring for a variety of areas, e.g. high dependency, haematology-oncology, other specialist units.

Module Title	Emerging Infections and the Role of National Agencies
Module code	8921
Rationale/ Aims	This module explores the relationship between diagnostic laboratories, health protection teams, reference laboratory networks and national health security agencies. Candidates will gain an understanding of how monitoring for new and emergent diseases is managed with an understanding of surveillance at local, regional, national and global levels and multi-agency response.
Learning outcomes	1. Describe, with a recent example, the emergence of a new infectious human pathogen linked to a large outbreak. 2. Discuss with an example from practice, diseases that have been demonstrated to, or have the potential, to pass from animals to humans. 3. Describe a bioterrorism incident and agents with the potential to be used as deliberate release biological agents. 4. Demonstrate compliance with the Health Protection Notification Regulations (2010) with an example from practice of a causative agent notification. 5. Discuss the surveillance remit of diagnostic laboratories. 6. Discuss with an example from practice the role a relevant reference service in the confirmation and surveillance of a pathogen requiring a causative agent notification. 7. Describe how global health patterns and emerging infections influence diagnostic testing strategies. 8. Describe with an example a neglected tropical disease.
Indicative Content	Candidates require knowledge and understanding of: Impact of the following on disease: Climatic and geopolitical change Natural disasters Migration and movement of people

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