

**Competences required for applicants to attain registration as Clinical Scientists**  
**Modality: Medical Physics & Clinical Engineering**

<b>1 - SCIENTIFIC</b>		
<b>Area of Competence</b>		<b>Specific Competencies</b>
Sci1	Understand the science that underpins the specialty (modality) and the broader aspects of medicine and clinical practice.	<p>Perform and interpret specialist procedures, measurements, and calibrations, demonstrating an awareness of how they might impact clinical decisions.</p> <p>Critically appraise current procedures, applications, and workflows within a particular specialty.</p> <p>Demonstrate a broad awareness and relevant specific understanding of new scientific developments in the specialty.</p> <p>Collaborate in commissioning of specialist equipment, systems or facilities and producing protocols for safe and effective introduction into service.</p> <p>Critically review literature to formulate hypotheses, plan a study to test these, carry out scientific tests, critically review results and present conclusions.</p> <p>Understand uncertainties in measurements and include this in the presentation and review of data.</p>
Sci2	Demonstrate a strong base of knowledge appropriate to the specialty and to the investigations and therapeutic options available.	
Sci3	Have experience of searching for knowledge, critical appraisal of information and integration into the knowledge base.	
Sci4	Apply knowledge to problems associated with the routine provision, and development, of the service.	
Sci5	Identify the clinical decision which the test/intervention will inform.	
Sci6	Make judgements on the effectiveness of procedures.	
Sci7	Apply the knowledge base to the specialty (modality) and to the range of procedures/investigations available	

## 1 - SCIENTIFIC

**Achievement of:** An understanding of the underlying science as relevant to the practice of Medical Physics and Clinical Engineering. Scientific expertise to be able to identify problems, search the literature effectively and critically, formulate hypotheses and develop experimental plans to resolve problems within the specialty.

**Achieved through:** Application of learning from an appropriate MSc/MEng, participation in IPEM training programmes, relevant work experience, or equivalent.

Work presented in this section should demonstrate an understanding of the underlying science as well as applied critical scientific thinking and methodology.

Good pieces of evidence for this section may include:

- Document which demonstrates specialist measurement techniques, showing the use of uncertainties and statistical analysis (i.e. calibration reports, data analysis)
- Document prepared for audit
- Draft new quality management document/ standard operating procedure
- Reflection on procedures – their merits and their limitations, proposing changes or highlighting weaknesses within the processes
- Higher degree project abstract
- Scientific research publication/ presentation
- Local scientific report

**Assessed by:** IPEM nominated ACS Assessor

## 2 - CLINICAL

Area of Competence		Specific Competencies
Clin1	Understand the requirements of accuracy and precision of a procedure in the context of diagnosis, prognosis, monitoring and treatment and to use that information appropriately.	<p>Understand the relevant patient clinical pathways, and the impact that the specialty has on patient management.</p> <p>Demonstrate an awareness of the consequences of actions taken on the individual patient or patient population.</p> <p>Understand the significance and validity of diagnostic results and other data.</p> <p>Formulate advice on the application of diagnostic or therapeutic techniques and/or validity of data in the clinical context.</p> <p>Maintain an up-to-date knowledge of clinical practice within a particular specialty and influence changes in practice as needed to take account of new developments, technologies and changing contexts.</p> <p>Design, introduce and evaluate new or improved methods used in diagnosis, treatment and rehabilitation.</p>
Clin2	Provide interpretation of data and a diagnostic (therapeutic) opinion, including any further action to be taken by the individual directly responsible for the care of the patient.	
Clin3	Understand the wider clinical situation relevant to the service users presenting to the specialty.	
Clin4	Develop/devise an investigation strategy taking into account the complete clinical picture.	
Clin5	Understand the clinical applications of the specialty and the consequences of decisions made upon your actions/advice.	
Clin6	Demonstrate awareness of the evidence that underpins the use of the procedures employed by the service.	

## 2 - CLINICAL

**Achievement of:**

An understanding of relevant clinical specialties and patient pathways, including physiology, anatomy, pathology and mechanisms of disease at the level required.

Scientific skills relating to the acquisition, application, validation and interpretation of clinical data within the specialty and an understanding of how this data affects patient management.

An understanding of your role in delivering a patient focused service.

**Achieved through:**

Application of learning from an appropriate MSc/MEng, participation in IPEM training programmes, relevant work experience, or equivalent.

The evidence should show a good understanding of the wider clinical context of work undertaken.

Ensure some clinical placement and observation, case studies and reflection. This could include reflections on the implications on individual patients of work undertaken, such as decisions made on medical devices (including software platforms), which form part of a clinical pathway.

According to the specialism, this does not necessarily need direct involvement in the care of an individual patient but may reflect a knowledge of the broader clinical pathway.

Good pieces of evidence for this section may include:

- Advice and/or presentation of data given to other colleagues.
- Evidence of attending development courses to keep up to date with changes in technology in line with clinical practice.
- Examples of self- learning prompted by new clinical challenges.
- Examples of supporting clinicians with interpreting or processing clinical data and understanding limitations of processes.
- Example of displaying and analysing in clinical data.
- Introduction or evaluation of clinical software to analyse, interpret or modify data and demonstrate understanding and impact on the clinical practice.
- Example of contribution to writing specifications for new equipment or techniques in the light of clinical requirements.
- Examples of contribution at relevant multi-disciplinary meetings and clinical audit meetings
- Draft new quality management document/ standard operating procedure

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### 3 - TECHNICAL

Area of Competence		Specific competencies
Tech1	Understand the principles associated with a range of techniques employed in the modality including the appropriate use of information, communication and digital technologies.	Demonstrate safe use of specialist equipment, calibration and quality control instrumentation and software.
Tech2	Have knowledge of the standards of practice expected from these techniques including positioning of patients for safe interventions.	Interpret and apply current standards, legislation, codes of practice, guidance notes and related documents appropriate to a particular specialty.
Tech3	Perform these techniques.	Organise and conduct appropriate audits and surveys and demonstrate awareness of the impact of such procedures.
Tech4	Solve problems that might arise during the routine application of these techniques (troubleshooting).	Review and analyse the results of quality control procedures and discuss with others the findings, implications and actions required.
Tech5	Understand the principles of quality control and quality assurance.	Contribute to the resolution of technical problems and issues, plan and review appropriate action in the case of incidents and near misses, and report according to policies and procedures.
Tech6	Use quality control and quality assurance techniques including restorative action when performance deteriorates.	Analyse and formulate advice on health and safety issues within a particular specialty.

### 3 - TECHNICAL

**Achievement of:** An understanding of compliance with relevant legislation, regulatory frameworks, and professional guidance and the relevance and application of these within their work, as these apply to protection of staff, patients and the public and the environment.

Practical skills in the use of relevant technical equipment including an understanding of, and ability to apply, the principles of quality assurance to their own work.

An ability to explain to others the outcome of quality control processes and to implement the findings.

**Achieved through:** Application of learning from an appropriate MSc/MEng, participation in IPEM training programmes, relevant work experience, or equivalent.

Direct involvement in technical activities including commissioning, quality control and troubleshooting of equipment and systems.

Evidence submitted should be a combination of records of undertaking technical tasks and scientific analysis of procedures and results.

Demonstration of participation in routine technical work should be supplemented by case studies which demonstrate scientific understanding, thinking and analysis.

Good pieces of evidence for this section may include:

- Technical intervention which demonstrates proactive involvement in resolving underlying technical issues.
- Reflections on technical work which hasn't gone to plan or where outcomes were not as expected.
- Risk management documentation highlighting technical issues.
- Quality assurance, technical or commissioning summary reports.

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## 4 - RESEARCH AND DEVELOPMENT

Area of Competence		Specific competencies
R&D1	Read and critically appraise scientific literature and other sources of information.	Demonstrate knowledge of the wider healthcare context of a specific research project.
R&D2	Develop the aims and objectives associated with a project.	Perform a literature review to build the knowledge base, then undertake critical assessment of the relevant literature, including assessment of limitations of research set-ups and methods.
R&D3	Develop an experimental protocol to meet the aims and objectives in a way that provides reliable and robust data (i.e. free of bias).	
R&D4	Perform the required experimental work to produce and present the results (including statistical analysis).	Design and undertake research and/or service development projects. Critically appraise own study methodology, results and outcomes.
R&D5	Recognise the value of research and critically appraise results in the light of existing knowledge and the hypothesis developed and to formulate further research questions.	Report study outcomes, including implications for local practice as a result of the study.
R&D6	Present data and provide a critical appraisal to an audience of peers – both spoken and written.	Present research and/or service development projects locally, regionally or nationally in meetings, conferences or scientific publications.

## 4 – RESEARCH & DEVELOPMENT

**Achievement of:**

Skills in study design and management to address a research or service development question, including critical review of literature, design of methodology, data gathering, processing and interpretation.

Skills in self-directed inquiry and critical appraisal of results to formulate a clear conclusion and recommendations from research and/or service development projects.

Effective communication of research work and findings, through reports, presentations and/or seminars.

**Achieved through:**

Application of learning from an appropriate MSc/MEng, participation in IPEM training programmes, relevant work experience, or equivalent.

Participation in research and/or service development projects and in scientific meetings.

Evidence should be a summary of activity rather than full project reports and should highlight your own contribution, drawing out critical scientific thinking.

Evidence should be accompanied by contextual information on work undertaken including an appreciation of governance, clinical practice, and ethics.

Good pieces of evidence for this section may include:

- An abstract or summary report of your relevant M.Sc. or Ph.D. project
- An abstract of a published paper or a conference poster or presentation slides
- A summary of a piece of work (with reference to current literature) which leads to a recommended change in practice or design of a research project.

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## 5 - COMMUNICATION

Area of Competence		Specific competencies
Com1	Assess a situation and act accordingly when representing the specialty.	<p>Actively listen and engage with the needs of service users, family/carers and the wider multidisciplinary team, and respond appropriately.</p> <p>Collaborate effectively with service users in communicating findings, resolving issues or developing services, within the remit of their own pre-registration role.</p> <p>Present material at an appropriate level and format for the audience in scientific publications and/or at meetings, or public engagement events.</p> <p>Contribute to the training, supervision and education of other staff/ students/ trainees.</p> <p>Apply the principles of equality, diversity and inclusion, respecting data protection, confidentiality and dignity.</p>
Com2	Respond to enquiries regarding the service provided when dealing with clinical colleagues.	
Com3	Communicate with service users, carers and relatives, the public and other healthcare professionals appropriately, modifying means of communication depending on circumstance and its audience.	
Com4	Communicate the outcome of problem solving and research and development activities.	
Com5	Present scientific material to peers, colleagues or other healthcare professionals.	

## 5 – COMMUNICATION

**Achievement of:** Skills in communication, demonstrating confidentiality and respecting the values of equality, diversity and inclusivity with a range of stakeholders and service users.

Effective written and oral presentation skills for scientific and technical communication.

Multi-disciplinary collaboration and team working.

**Achieved through:** Participation in IPEM training programmes, relevant work experience, or equivalent.

Participation in research and/or service development projects and in scientific meetings.

Evidence for this section should be accompanied by appropriate context and commentary, and may include:

- Service user requirement specification (following conversation with service user)
- Risk assessment or action plan (following pre-appointment patient questionnaire)
- Reflections following professional conversations, supervision sessions and/or training events
- Reflections on multi-source feedback or feedback requested from public engagement events
- Presentation slides
- Article in local or national magazine/ newsletter
- Written correspondence with service users and/or the wider professional community

Notes:

- Quality of portfolio presentation is an indicator of competence in written communication
- The term 'service users' may include staff and/or patients

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## 6 - PROBLEM SOLVING

Area of Competence		Specific competencies
PS1	Assess a situation.	Define and assess the problem, including consideration of risk.  Utilise specialist knowledge and works collaboratively to formulate an action plan with a view to achieving a solution.  Communicate and document intended actions.  Prioritise actions and executes the plan to resolve the problem.  Review the effectiveness of the action plan after implementation and suggest further actions as necessary.
PS2	Determine the nature and severity of the problem.	
PS3	Call upon the required knowledge and experience to deal with the problem.	
PS4	Initiate resolution of the problem.	
PS5	Demonstrate personal initiative.	

## 6 – PROBLEM SOLVING

**Achievement of:** Ability to resolve problems in a structured way and in the interest of the service user, taking account of associated safety issues.  
Effective communication of steps being undertaken to resolve problems and their outcomes.

**Achieved through:** Participation in IPEM training programmes, relevant work experience, or equivalent.  
Assessment of and response to problems associated with service delivery.  
Good evidence may include:

- Work demonstrating the use of organisation risk management tools
- Quality improvement project reports
- Incident or error investigation reports
- Out of specification result investigation and implementation of corrective actions
- Planning for non-standard patient investigation or treatment
- Response to revised expectations of external stakeholders such as national professional bodies, regulators, vendors/suppliers or senior organisational management e.g., safety alerts, revised guidance, regulatory changes or updated organisational objectives.

Notes:

- These competencies can be addressed by one large project or multiple smaller pieces of problem-solving work.
- In the case of a large project, present evidence of your own involvement, not the entire project.
- It will be beneficial to show how you collaborated with others and how you escalated suggestions for implementation.
- Refer to appropriate sources of information in solving the problem.

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## 7 - PROFESSIONAL ACCOUNTABILITY

Area of Competence		Specific Competencies
Prof1	Follow the Standards of Proficiency for Clinical Scientists as published by the Health & Care Professions Council. <i>(published September 2023)</i>	Demonstrate the ability to work within legal and ethical boundaries of the modality and recognise the limitations of their knowledge and skills.
Prof2	Take personal responsibility and justify your decisions.	Is able to explain their own role and understand the limitations of their Scope of Practice.
Prof3	Work within the legal and ethical requirements of the modality, recognise the importance of equality, diversity and inclusion, including these and other ethical aspects of practice and scientific research.	Justify and take appropriate actions within own Scope of Practice, and refers to other professionals as appropriate.
Prof4	Practice safely and effectively within your abilities and recognise the limits of personal practice and identify when to seek advice.	Apply the principles of clinical governance and audits, reflecting on and reviewing practice.
Prof5	Manage personal workload, prioritise tasks appropriately and look after your own health and wellbeing, seeking appropriate support where necessary.	Adhere to standard operating procedures and quality systems.
Prof6	Demonstrate competence in the principles of clinical governance including maintaining appropriate records, clinical audit and accreditation requirements relevant to the modality. This includes diversity and inclusion, confidentiality, informed consent and data security.	Operate within the requirements of professional accreditation schemes appropriate to the modality.
Prof7	Contribute effectively to work undertaken as part of a multi-disciplinary team, working in partnership with service users, carers, colleagues and others.	Understand the principles of appraisal and the need for supervision in their area of responsibility.
Prof8	Supervise others as appropriate to area of practice, demonstrating leadership qualities, behaviours and approaches, and engage with appraisals as part of staff management and development.	Support aspiring professionals during work placements or outreach events, and contribute to the induction of new staff.
Prof9	Understand the need and obligation for career-long self-directed learning, including appropriate use of technology, awareness of emerging technologies and new developments, and the importance of continuing professional development.	Understand and reflect on the importance of continuous development and the need to update practice in response to changes in clinical and/or service needs and new scientific and technical evidence.
Prof10	Establish and maintain a safe practice environment, adhering to Health and Safety requirements, including infection control, and recognise your role in health promotion and preventing ill health.	Demonstrate a basic knowledge of health and safety requirements including infection control as appropriate to the modality.
		Demonstrate a basic understanding of the structure and organisation of the department and its overarching governance structures, including relevant procedures and policies.
		Understand the importance of staff wellbeing, the role of employee support services and how to access these.
		Promote equality, diversity, and inclusion in all interactions, recognise bad practice and is able to suggest improvements.

Prof11	Work within the structure and organisation of the local service and demonstrate awareness of financial accountability, budgetary control and resource management and a general understanding of the way the modality is structured and practised in other locations within the UK.	Apply the principles of equality, diversity, and inclusion in all communications, respecting data protection, confidentiality and dignity.
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## 7 – PROFESSIONAL ACCOUNTABILITY

**Achievement of:** The ability to act as a professional, to work effectively as part of a team and to adhere to the HCPC Standards of Proficiency for Clinical Scientists.

**Achieved through:** Application of learning from an appropriate MSc/MEng, participation in IPEM training programmes, relevant work experience, or equivalent.

Mentoring by an experienced Clinical Scientist.

This area of competence could be covered throughout the portfolio and in the summary report, or in specific additional pieces of evidence.

Good evidence may include:

- Audit of compliance with professional standards
- Minutes showing participation in governance/ organisational meetings
- Evidence showing delivery of training
- Reflections following professional conversations, supervision sessions and/or training events
- Reflections on multi-source feedback or feedback requested from public engagement events
- Summary of completed mandatory training
- Communications or records showing handing over of issues outside own Scope of Practice, or referral to other health professionals
- Pieces of work showing contribution to procurement of a new piece of equipment or software including financial appraisal
- Reflection on your strategies to manage stress, workload, and health and wellbeing

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