



Subject Benchmark Statement

Biomedical Science
and Biomedical Sciences

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About this Statement

This document is a QAA Subject Benchmark Statement for Biomedical Science and Biomedical Sciences. Biomedical Science degree programmes are designed to meet the requirements for accreditation by the professional body, the [Institute of Biomedical Science](#) (IBMS). Biomedical Sciences degree programmes cover a broader curriculum, including areas outside of the usual remit for diagnostic laboratory science. For further information on the distinguishing features between Biomedical Science and Biomedical Sciences courses, see the Context and purposes of Biomedical Science/Biomedical Sciences degrees section.

This Subject Benchmark Statement defines what can be expected of a graduate in the subject, in terms of what they might know, do and understand at the end of their studies. Subject Benchmark Statements are an established part of the quality assurance arrangements in UK higher education, but not a regulatory requirement. They are sector-owned reference points, developed and written by academics on behalf of their subject. Subject Benchmark Statements also describe the nature and characteristics of awards in a particular subject or area. Subject Benchmark Statements are published in QAA's capacity as an expert quality body on behalf of the higher education sector. A summary of the Statement is also available on the QAA website.

Key changes from the previous Subject Benchmark Statement include:

- a revised structure for the Statement, which includes the introduction of cross-cutting themes of:
 - equality, diversity, and inclusion
 - accessibility and the needs of disabled students
 - education for sustainable development
 - employability, entrepreneurship and enterprise education
- a comprehensive review updating the context and purposes, including course design and content in order to inform and underpin the revised benchmark standards.

How can I use this document?

Subject Benchmark Statements are not intended to prescribe any particular approaches to teaching, learning or assessment. Rather, they provide a framework, agreed by the subject community, that forms the basis on which those responsible for curriculum design, approval and update can reflect upon a course, and its component modules. This allows for flexibility and innovation in course design while providing a broadly accepted external reference point for that discipline.

They may also be used as a reference point by external examiners in considering whether the design of a course and the threshold standards of achievement are comparable with those of other higher education providers. They also support professional, statutory and regulatory bodies (PSRBs) with the academic standards expected of students.

You may want to read this document if you are:

- involved in the design, delivery, and review of courses in Biomedical Science and/or Biomedical Sciences
- a prospective student thinking about undertaking a course in Biomedical Science and/or Biomedical Sciences
- an employer, to find out about the knowledge and skills generally expected of Biomedical Science and/or Biomedical Sciences graduates.

Relationship to legislation

The responsibility for academic standards lies with the higher education provider which awards the degree. Higher education providers are responsible for meeting the requirements of legislation and any other regulatory requirements placed upon them by their relevant funding and regulatory bodies. This Statement does not interpret legislation, nor does it incorporate statutory or regulatory requirements.

The regulatory status of the Statement will differ depending on the educational jurisdictions of the UK. In England, Subject Benchmark Statements are not sector-recognised standards as set out under the Office for Students' [regulatory framework](#). However, they are specified as a key reference point, as appropriate, for academic standards in Wales under the [Quality Assessment Framework for Wales](#) and in Scotland as part of the [Quality Enhancement Framework](#). Subject Benchmark Statements are part of the current quality arrangements in Northern Ireland. Because the Statement describes outcomes and attributes expected at the threshold standard of achievement in a UK-wide context, many higher education providers will use them as an enhancement tool for course design and approval, and for subsequent monitoring and review, in addition to helping demonstrate the security of academic standards.

Additional sector reference points

Higher education providers are likely to consider other reference points in addition to this Statement in designing, delivering and reviewing courses. These may include requirements set out by PSRBs and industry or employer expectations. QAA has also published [Advice and Guidance](#) to support the [Quality Code](#), which will be helpful when using this Statement – for example, in [course design](#), [learning and teaching](#), [external expertise](#) and [monitoring and evaluation](#).

Explanations of unfamiliar terms used in this Subject Benchmark Statement can be found in [QAA's Glossary](#). Sources of information about other requirements and examples of guidance and good practice are signposted within the Statement where appropriate.

1 Context and purposes of Biomedical Science and Biomedical Sciences degrees

1.1 This Subject Benchmark Statement offers clarification between Biomedical Science (singular) and Biomedical Sciences (plural) courses.

1.2 A Biomedical Science degree will include all the key clinical laboratory specialities (Medical Microbiology (including virology), Clinical Biochemistry, Haematology and Transfusion Science, Clinical Immunology, Cellular Pathology/Histopathology and Clinical Genetics), enabling graduates to achieve the academic requirements needed to apply for registration with the [Health and Care Professions Council](#) (HCPC) as a Biomedical Scientist (protected title). Eligibility for HCPC registration can be achieved by award of an IBMS-accredited honours degree plus a placement/period of training in an IBMS-approved training laboratory where the IBMS Registration Training Portfolio is undertaken and successfully verified (either during the degree or post graduation).

1.3 A degree in Biomedical Sciences is generally broader and may encompass other human biology courses. Courses following this curriculum can be delivered with the title of Biomedical Sciences, or with various named awards or specialisms in the degree title such as pharmacology, molecular biology or cell biology. The potential absence of taught material in some or all of the key clinical laboratory specialities summarised in paragraph 1.2 results in these courses not meeting the HCPC academic requirements for registration as a Biomedical Scientist. However, there are opportunities for students to 'make up' this limitation by undertaking additional 'top-up' modules to meet the clinical skills requirement. The IBMS will advise on which additional modules are required to be completed and this will be in addition to a time in clinical practice to complete the IBMS certificate of competence portfolio. Upon successful completion, students may apply to HCPC to gain registration.

1.4 Honours degree courses in either Biomedical Science or Biomedical Sciences are designed to provide graduates with a broad understanding of the scientific basis of human health and disease. Graduates from these courses will develop the qualities needed for employment in situations which require the exercise of professionalism, critical independent thought, personal responsibility and decision-making in complex and unpredictable circumstances.

1.5 This Statement is intended to be valuable to potential students, their supporters and sponsors, employers, professional and regulatory bodies, universities, colleges and schools.

Purposes and characteristics of Biomedical Science/Biomedical Sciences degrees

1.6 Biomedical Science degrees are suitable for accreditation by the Institute of Biomedical Science (IBMS) and provide the academic foundation for application to register with HCPC as a Biomedical Scientist, if combined with a period of clinical laboratory training. Degree courses which incorporate integrated and appropriate placement experience may also be approved directly by HCPC, enabling graduates to become eligible to apply for HCPC registration as a Biomedical Scientist. The content of these degrees, and subsequent delivery, is developed in close cooperation with Biomedical Scientists in practice to ensure requirements for HCPC registration are met, particularly where professional practice placement opportunities are offered. Further information of the roles of the HCPC/IBMS and degree routes to registration are provided in Appendix 1 and paragraphs 1.13 to 1.15 below.

1.7 Graduates from degrees in either Biomedical Science or Biomedical Sciences enter a rapidly changing employment environment in which lifelong learning plays an essential

role. Graduates of both degree courses can attain additional qualifications before or after taking up employment, including master's degrees (MSc, MRes), doctoral degrees (PhD/DPhil and Professional Doctorates), postgraduate medical and teaching qualifications and other professional qualifications offered by IBMS.

1.8 An IBMS-accredited Biomedical Science degree is primarily focused on producing graduates who can enter NHS or private clinical diagnostic pathology laboratories, including Blood Transfusion Services and Public Health Wales, but can also lead to a variety of careers.

1.9 Both Biomedical Science and/or Biomedical Sciences degrees are considered as an excellent basis for a wide variety of graduate-entry career paths, including:

- life science and pharmaceutical industries
- research laboratories and institutes
- sales and marketing related to healthcare and diagnostic products
- education: school, further and higher education
- food industry and food safety
- forensic laboratories
- clinical trials and regulatory sector.

1.10 Hands-on practical laboratory work forms an essential part of Biomedical Science and/or Biomedical Sciences courses. It allows students to develop the necessary technical skills for a career in this area and ensures they are competent and capable of safe and accurate working in a clinical/industrial/laboratory environment.

1.11 Research skills developed within a Biomedical Science and/or Biomedical Sciences degree provide students with the ability to develop ideas, critically appraise literature, plan and carry out original investigations independently and assess and report the significance of outcomes. In addition, research skills prepare students effectively for professional employment or postgraduate research degrees in the subject areas.

1.12 Graduates from Biomedical Science courses will develop skills and knowledge to enable interpretation of clinical laboratory and near-patient test results through their taught modules, completing the IBMS Registration Training portfolio and being HCPC registered, which facilitates a contribution to multidisciplinary approaches to healthcare.

Registration and protected title

1.13 Biomedical Scientist is the protected title awarded by HCPC for those who carry out a range of laboratory investigations and scientific techniques on tissue samples and fluids to assist in the diagnosis and monitoring of disease, evaluate the effectiveness of treatments and provide expert advice for the treatment of patients and prevention of disease.

1.14 Those wishing to use the protected title of Biomedical Scientist are required by statute to register with HCPC which is the regulatory body, created under the 1999 Health Act. Eligibility to apply for registration is based on achieving the HCPC Standards of Proficiency for the safe and effective practice of registrant biomedical scientists.

1.15 The role of the [Institute of Biomedical Science](#) (IBMS) in this process is as the awarding body for the Certificate of Competence. This award provides evidence that individuals have met the competency requirement of the HCPC Standards of Proficiency for Biomedical Scientists. This verifies that they are 'fit to practice' as a Biomedical Scientist and are therefore eligible to apply for professional registration with HCPC. Since 2010, IBMS has been approved by HCPC to award the Certificate of Competence to graduates of IBMS-

accredited degree programmes who have also successfully completed the IBMS Registration Training Portfolio.

Equality, diversity and inclusion

1.16 This Subject Benchmark Statement expects the biomedical science and/or biomedical sciences learning communities to commit to equity, inclusive access and practices that anticipate the diverse needs of their community members.

1.17 This Statement asks the learning community to address issues of inclusion throughout, and advocates intentional support for diverse student cohorts, acknowledging that equality and diversity are inter-dependent. Promoting equity of opportunities for all, through considered course design and development, is underpinned by valuing and harnessing differences and treating everyone with dignity and respect. Course teams should create an environment that encourages openness and participation, where everyone feels respected, supported, valued and understands their personal responsibility for equality and inclusive practice. Inclusive environments for learning anticipate and accommodate the varied requirements of learners and ensures equitable access to educational opportunities. Biomedical Science and/or Biomedical Sciences courses should proactively raise awareness of equality, equity, diversity and inclusivity through integrated activities and discussions. They should be designed to address issues in global healthcare, including factors affecting access to good quality diagnosis and treatment. Course providers, staff and students all have a role in, and responsibility for, promoting equality and diversity and challenging biases and stereotypes, that is regularly reviewed and updated in line with institutional and government guidance.

1.18 Biomedical Science and/or Biomedical Sciences are subjects whose underpinnings rely upon objective observation. It is important, however, to recognise and proactively discuss and confront the historical factors that have influenced many aspects of these subject areas. Courses should critically engage with how the field has contributed to and benefited from social injustice by, for example, presenting a balanced and informed history of the field and acknowledging that influential scientists might have benefited from and perpetuated misogyny, racism, homophobia, ableism and other prejudices. Students will be encouraged to consider how individual biases, culture and society as a whole influence biomedical science and/or biomedical sciences, including what science is done, what is considered ethical, who does that science, how data is interpreted and how biological knowledge is used. This should include critical examination of current practices and incorporation of a diverse range of underrepresented sources, including work from scientists from marginalised communities, plus case studies and learning materials representing the full range of human diversity. Courses should be regularly reviewed to consider whether teaching materials and subject matter covered might inadvertently perpetuate biases and stereotypes.

1.19 Curricula should recognise the discoveries and contributions of Biologists and Biomedical Scientists with diverse backgrounds and identities and acknowledge that different cultural backgrounds provide different insights and lead to new discoveries. Furthermore, learners should have the opportunity to explore Biomedical Science and/or Biomedical Sciences topics that inspire them and allow them to situate their knowledge in the light of their lived experiences or cultural backgrounds. Students should be encouraged to evaluate both the positive and negative impacts of potential applications of biological discoveries and reflect on the ways in which knowledge of Biomedical Science and/or Biomedical Sciences might be exploited for political, commercial or capital ends, for example drug development and targeting, in ways that can further gender-based, ethnicity-based or other inequalities.

Accessibility

1.20 Equity involves enabling access to the programme of study for people who have differing individual requirements alongside eliminating arbitrary and unnecessary barriers to successful learning. Access should be equitable and based on an individual's potential to complete the Biomedical Science and/or Biomedical Sciences course.

1.21 Biomedical Science and/or Biomedical Sciences course teams must pay attention to ensuring that curricula, pedagogy, assessments and practical elements of courses are designed to be fully accessible and flexibly designed. All students should be offered learning and assessment opportunities that are equally accessible to them, using inclusive design wherever possible and by means of reasonable individual adjustments where necessary. Learning and assessment experiences should be diverse to reflect the variety of the subject, to test a range of academic and practical skills and to increase accessibility for all.

1.22 Equitable access to the course for all students should be proactively and flexibly considered in an anticipatory way, including fieldwork, laboratory work and placements. Different requirements should be addressed with flexibility in assessment and teaching methods built in. Social capital, culture, sexuality, disability, neurodiversity and other characteristics should not prevent students from having equitable access to the entire curriculum. The team should refine and improve the course to remove barriers in response to feedback. Course teams should work in close collaboration with student support to ensure both the staff member and student are fully supported to ensure the curriculum is accessible to all students.

Sustainability

1.23 Sustainability and sustainable development are key considerations in Biomedical Science and/or Biomedical Sciences, as they are vital to managing earth resources to promote the long-term well-being of the planet and all its inhabitants. It is important to note that sustainability is not solely about the environment. It is an ongoing process of addressing social, environmental and economic concerns to create a better world, and, as such, has particular relevance to Biomedical Science and/or Biomedical Sciences. Practical considerations might include reducing paper use, the [LEAF initiative](#) for improving the sustainability and efficiency of laboratories and discussion of ethics and environmental impact of laboratory work, replacing chemicals with sustainable alternatives if possible, and consider glassware in place of disposable plastic. An awareness of waste reduction, bioremediation, careful use of all non-renewable resources, alternative energy sources and pollution control can be explored in the curriculum. Where applicable, consideration could also be given to assessment design.

1.24 The application of sustainable development in the higher education sector takes place through Education for Sustainable Development (ESD) which is the process of creating curriculum structures and subject-relevant content to support and enact sustainable development. As stated in the UNESCO 2019 definition, 'ESD is holistic and transformational education which addresses learning content and outcomes, pedagogy, and the learning environment. It achieves its purpose by transforming society', a vision which is consistent with the aspirations of the Biomedical Science and/or Biomedical Sciences disciplines. An understanding of the United Nations Sustainable Development Goals (SDGs) is essential to this vision.

1.25 To support the inclusion of sustainable development within Biomedical Science and/or Biomedical Sciences, users should refer to the [QAA and Advance HE Education for Sustainable Development Guidance](#) to address teaching and learning for sustainable development, key competencies, learning outcomes and assessment within the curricula.

Enterprise and entrepreneurship education

1.26 Employability is a set of competencies, demonstrated by combined knowledge, skills and behaviours that make individuals more likely to gain employment and be successful in their chosen occupations, benefiting themselves, society and the economy. It includes problem identification and solving, innovation, creativity, expression, communication and practical action. Entrepreneurship enhances employability by promoting personal development. It fosters those attributes that enable students to transition into successful graduates, actively participating in society and identifying opportunities to develop a meaningful career combined with the creation of cultural, social and economic value. These attributes are integral in both Biomedical Science and/or Biomedical Sciences, although the emphasis within the learning outcomes may differ. Developing close links with employers and involving them in curriculum and assessment design will positively enhance graduate employability. Employability and entrepreneurship focus on competencies (knowledge, skills and behaviours) plus transferable themes such as business awareness, professional ethics, health and safety, the development of reflection and self-awareness, personal motivation, and accountability.

1.27 [Enterprise and entrepreneurship education](#) supports behaviours, attributes and competencies that are likely to have a significant impact on the individual student in terms of successful careers. It prepares students for changing environments and provides enhanced impact through placements and activities that build links between academic institutions and external organisations.

1.28 Beyond employment, entrepreneurship education provides competencies to help students lead a rewarding, self-determined professional life, well placed to add social, cultural and economic value to society through their careers.

1.29 Enterprise and entrepreneurship education can be co-created with multiple stakeholders (for example, employers, professional bodies, service users or patients) and may cover a range of topics, such as project planning and management, financial, environmental or personal sustainability, innovation, intellectual property, and commercialisation. Ideally, these topics may be explored through subject-specific applications based on real-world examples.

1.30 Alumni, entrepreneurs and other relevant specialists (for example, practitioners) may be invited as visiting lecturers and guest speakers, ensuring that tasks and assessments are authentic and support learning through self-reflection. Collaborative work in the course can promote teamworking and negotiation and leadership skills that can improve employability. The student will take responsibility for continuing personal and professional development, demonstrating a commitment to learning and self-improvement and supporting the development of others, as appropriate.

1.31 More information can be found in the QAA document [Enterprise and Entrepreneurship Education: Guidance for UK Higher Education Providers](#).

2 Distinctive features of Biomedical Science/ Biomedical Sciences degrees

Design

2.1 There is a variety of Biomedical Science and Biomedical Sciences courses across the UK. This diversity is a strength, as it allows students to choose a course that aligns with their interests and is suited to their individual needs and aspirations. Some courses contain the required curriculum of the Institute of Biomedical Science (IBMS), including specific clinical specialisms. As explained in section 1, these courses enable students to meet the education standards of the HCPC and are called Biomedical Science (singular). Students should confirm the accreditation status of the programme before they apply. Other courses that encompass broader areas of human biology related to health and disease can be called Biomedical Sciences (plural).

2.2 There are a range of possible paths to admission to degree courses. The majority of courses require A Level Biology and Chemistry or equivalent, but many courses provide alternatives for those choosing to study Biomedical Science or Biomedical Sciences, regardless of prior educational background. Science foundation years are delivered by both universities and colleges, that enable applicants without a relevant Biology and/or Chemistry qualification to develop foundational knowledge prior to progressing onto an honour's degree programme.

2.3 Undergraduates in Biomedical Science and/or Biomedical Sciences will study a standard bachelor's degree with honours (FHEQ Level 6; FQHEIS Level 10). For Biomedical Sciences only, students may have the opportunity to study an integrated master's degree with honours (FHEQ Level 7; FQHEIS Level 11). These degrees have distinct learning outcomes to reflect the level of the award. Bachelor's degrees provide students with subject-specific knowledge, understanding and skills, as well as the wider transferable skills and attributes that prepare graduates for a range of careers. Integrated master's degree courses (such as MBio or MSci) encompass both bachelor's degrees with honours and master's degree outcomes. An integrated master's degree is awarded after an extended course of study which allows students to study topics in Biomedical Sciences to a greater depth and to further develop specialist knowledge, advanced skills and undertake project work. Standalone master's (MSc and MRes) degree courses in Biomedical Science or Biomedical Sciences are self-contained courses, normally involving one or two years of postgraduate study.

2.4 Biomedical Science courses may contain optional or integrated periods of placement/assessed professional practice in an IBMS-accredited laboratory that offers the opportunity to complete the IBMS Registration Training portfolio. Successful completion and verification of the IBMS Registration Training portfolio together with a completed IBMS-accredited BSc Hons Biomedical Science degree programme allows graduates to apply to register with the Health and Care Professions Council (HCPC) as a Biomedical Scientist. Some Biomedical Sciences programmes may offer different placements at organisations in the biosciences industrial sector, or the opportunity to study at an international university. Such placements may last for a term, semester or an entire year. Credit awarded during such a placement may vary according to the learning and assessment workload during the experience. Credit-bearing placements should, however, be integrated within the programme of study, so that students can relate their experience to, and use the skills that they have developed in, their academic study. Many providers also offer or facilitate non-credit-bearing industrial and research placement experiences during vacations to enhance student experience and development.

2.5 Where an institution offers several similar courses, for example Biomedical Science, Biomedical Sciences, Human Nutrition, Pharmacology and Human Physiology, these will typically be based around a common core of shared compulsory modules, especially in the early years, with options in later years that allow students to specialise. This modularity enables both flexibility and efficiency of delivery and may even allow students to defer selection of award title until later years by retaining the option to transfer between cognate courses.

2.6 The academic component of degree apprenticeships in Biomedical Science or [Healthcare Science Practitioner](#) should follow the guidelines in this Subject Benchmark Statement. Degree apprenticeships in higher education are covered explicitly in the [Characteristics Statement for Higher Education in Apprenticeships](#) which describes the general characteristics and distinctive features of apprenticeships in the UK.

2.7 All degree courses covered in this Statement can ensure that all students are offered learning and assessment opportunities that are equally accessible to them, as described in the Equality, diversity and inclusion section. This should be incorporated by means of inclusive design wherever possible and by means of reasonable individual adjustments where necessary. Learning and assessment experiences should be diverse to both reflect the variety of the subject and to increase accessibility for all.

2.8 Biomedical Science and/or Biomedical Sciences course teams can also ensure that curricula, pedagogy, assessments and practical elements of courses are designed to be fully accessible. All learners should be supported in their development of the full range of verbal, spatial and numerical skills, alongside other approaches required to successfully complete their course.

Progression

2.9 Biomedical Science and/or Biomedical Sciences degree course should be designed to promote academic and personal development. Initially, students will apply their knowledge and understanding of simple concepts to solve well-defined problems. As the course advances, they will develop confidence in their subject-specific knowledge and understanding, making connections between more challenging and complex concepts that enable them to analyse and evaluate data and problem solve effectively. On graduation, students will be competent in a range of knowledge, understanding, experience and skills. Graduates from Biomedical Science degrees only (following an appropriate period of clinical training, and completion of the IBMS Certificate of Competence) are equipped to begin a career as an HCPC-registered Biomedical Scientist. Graduates from both Biomedical Science and Biomedical Sciences programmes may find employment in a variety of other sectors.

2.10 The learning, teaching and assessment methods used should encourage a progressive acquisition of subject knowledge and skills. Students will move gradually from highly structured tasks that 'scaffold' learning and support the transition into university to managing their own learning and undertaking independent tasks. This progression should be reinforced by strategies that:

- recognise the diversity of prior experience and the challenges of transition
- allow all students to achieve their potential and realise their ambitions, irrespective of their background or motivations for studying Biomedical Science and/or Biomedical Sciences
- support academic and personal development in addition to learning
- are matched to the course learning outcomes or competencies for each level of study.

2.11 Students on a Biomedical Science and/or Biomedical Sciences degree course will progress from one level or academic stage to the next by satisfying the regulations and processes for each institution. These require the students to demonstrate that they have met at least the threshold standard for the level of study. This will usually include successful completion and the award of credit for the full range of learning and assessment, including practical components. Students may also be required to meet additional criteria, such as passing all core clinical specialisms on an IBMS-approved Biomedical Science programme. The standard required to progress on a Biomedical Sciences integrated master's degree course may also be higher than that for a bachelor's course.

2.12 Subject to the regulations for the institution, students will usually be offered an opportunity to re-sit any failed assessments, particularly where that prevents either progression or qualification for an award. Students who are not eligible to progress, or who choose to leave a course of study early, may be eligible for a Certificate of Higher Education, a Diploma of Higher Education, or a Pass degree, depending on the amount and type of credit successfully completed. Integrated master's degrees typically also offer a bachelor's degree with honours as an exit award for those who have attained sufficient credit but are not able to complete the course. Bachelor's degrees with honours from institutions in Scotland are typically designed to include four years of study, which relates to the structure of primary and secondary education in Scotland. For students following part-time routes, their study time would be the equivalent of the three or four-year degree.

Flexibility

2.13 The diversity in the types of courses offered in Biomedical Science and/or Biomedical Sciences is also reflected in diverse modes of delivery. While many courses are delivered full-time, some offer part-time and/or distance learning study. Biomedical Sciences courses may also offer students the opportunity to study abroad or industrial placements. The range of delivery methods (both face-to-face and digital) utilised are also diverse and appropriate for the needs of the learner, the taught material and their assessments. The progressive acquisition of knowledge and skills within the subject area also enables flexibility between courses, both within and between institutions, with mechanisms available for the transfer of credit between institutions.

2.14 Given that Biomedical Science and/or Biomedical Sciences courses must contain practical skills acquisition, course teams need to consider how they will support the development of practical skills, employing both bench practical sessions supported by online tutorials and virtual practical skills that may be acquired in a range of environments.

2.15 Courses also need to be sufficiently flexible to be able to respond to and anticipate change, both in the advancement of the subject and its interface with other disciplines and in the needs of its graduates and their employers, as required. Courses should be sufficiently resilient to be able to adapt to unforeseen circumstances such as the Covid pandemic and other challenges that may arise in the future.

Partnership

2.16 Providers may operate in academic partnerships with further education and international colleges or with international degree providers to enable study-abroad programmes. Some providers also offer partnership programmes that give advanced standing to students with prior study abroad, for admission into year two or three of existing UK degree courses. Industrial and NHS collaborations may also be utilised for partnership delivery of degree apprenticeships. Providers are expected to develop processes for oversight to ensure that partners involved in degree delivery meet all relevant standards and

expectations. This should include effective communication and regular consultation to ensure that courses continue to meet employers' needs.

2.17 Courses should work with relevant stakeholders to incorporate work-based or work-like learning where possible. Enhancing student employability is a fundamental outcome for Biomedical Science and/or Biomedical Sciences courses. Therefore, engagement with the relevant employment sectors should be extensive. The courses should have a clear strategy for students to have the opportunity to develop employment-focused skills and engage with employers. Students may engage with employers through paid and/or unpaid placements of various durations during which students will be fully immersed in the workplace and experience the day-to-day routine of employment. Funding or payment should be considered to ensure that placement opportunities are inclusive and accessible to all.

2.18 Student societies provide excellent opportunities for students to collaborate with their peers both socially and professionally. Societies contribute to a vibrant learning community and range in their engagement activities from working within the university to local communities and professional bodies. Students can also engage with relevant national or international learned societies and professional bodies. Benefits of engagement include access to publications, training events, careers information, grants and networking opportunities.

2.19 Students should expect to be embraced as partners within their own courses. Student voice should play a significant role in course development, delivery, review and the overall student experience within Biomedical Science and/or Biomedical Sciences. Students are able to provide guidance, feedback and support for their own learning in several ways, this can be through departmental representatives, module, course and external student surveys such as the National Student Survey (NSS). Furthermore, students can feed into, and collaborate with, their students' union, and many universities offer public social media platforms to receive feedback from students and discuss current trends in the student experience. Students should be involved in quality review processes and can be invaluable during the curriculum review and development of new courses where student steering groups may be established.

Monitoring and review

2.20 Degree-awarding bodies and their collaborative partnerships routinely collect and analyse information and undertake periodic course review according to their own needs. They draw on a range of external reference points, including this Statement, to ensure that their provision aligns with sector norms. Monitoring and evaluation are a periodic assessment of a course, conducted internally or by external independent evaluators. Evaluation uses information from both current and historic monitoring to develop an understanding of student achievement or inform future course planning.

2.21 Monitoring and review should include feedback from current students, external stakeholders, such as employers and placement providers, and alumni, to influence curriculum design, content and delivery. There should also be feedback from employers and apprentices for degree apprenticeships.

2.22 A review ensures the embedding of Education for Sustainable Development (ESD) and equality, diversity and inclusion (EDI) throughout the entire curriculum.

2.23 Evaluation of student performance data and various measures of the student experience should be integrated with expert review, including that provided by external examiners.

2.24 Externality is an essential component of the quality assurance system in the UK. Higher education providers will use external reviewers as part of periodic review to gain an external perspective on any proposed changes and ensure threshold standards are achieved and content is appropriate for the subject.

2.25 The external examination system currently in use across the UK higher education sector also helps to ensure consistency in the way academic standards are secured by degree-awarding bodies. Typically, external examiners will be asked to comment on the types, principles and purposes of assessments being offered to students. They will consider the types of modules on offer to students, the outcomes of each cohort and how these compare to similar provision offered by other UK higher education providers. External examiners are asked to produce a report each year and make recommendations for changes to modules and assessments (where appropriate). Subject Benchmark Statements, such as this one, can play an important role in supporting external examiners in advising on whether threshold standards are being met in a specific subject area.

2.26 Undergraduate Biomedical Science and/or Biomedical Sciences degree courses sometimes require more than one external examiner to cover the breadth of material covered in the programme.

2.27 Programme and course teams should also conduct regular monitoring and evaluation, with the support of independent evaluators and student feedback, to ensure continuous quality enhancement. Evaluation of student performance data as well as student feedback and student voice alongside other measures of the student experience should be integrated with expert review, including that provided by external examiners, to ensure the curricula remain current, engaging and accessible. Historic data may also enable trend analysis to measure progress and identify emerging issues. Students and graduates, as well as employers, service users and relevant professional bodies, should be actively involved in designing and delivering enhancements to courses of study.

2.28 The degree courses covered in this Subject Benchmark Statement will hold accreditation from different professional statutory and regulatory bodies. These include, but are not limited to, the [Institute of Biomedical Science](#) (Biomedical Science programmes only) [The Royal Society of Biology](#) (Biomedical Science and Biomedical Sciences programmes, plus Human Physiology programmes), [Association for Nutrition](#) (AfN) for Nutrition, and [British Pharmacological Society](#) for Pharmacology programmes.

3 Content, structure and delivery

Content common to Biomedical Science and/or Biomedical Sciences courses

3.1 Scientific content covered in both Biomedical Science and/or Biomedical Sciences courses generally includes:

- human anatomy and physiology: the structure, function, neurological and hormonal control of the human body, its component parts and major systems (musculoskeletal, circulatory, respiratory, digestive, renal, urogenital, nervous, endocrine) and their relationship to each other
- cell biology: the structure and function of prokaryotic and eukaryotic cells; the cell as the fundamental unit of life; cell division, cell cycle, stem cells, cell specialisation and cooperation
- biochemistry: key chemical principles relevant to biological systems, the structure and function of biological molecules and the biochemistry of processes which support life, including cellular metabolism and its control
- microbiology: the structure, physiology, biochemistry, identification, classification, and control of microorganisms, including the roles of normal flora
- immunology: acute and chronic inflammation, structure, function and mechanisms of action of the components of the immune system; innate and acquired immunity
- developmental biology, which may include topics such as embryonic development, human life cycles, ageing, stem cells and regenerative medicine
- physics and chemistry sufficient to support understanding of biochemical and biophysical processes and instrumentation
- genetics, genomics and human variation: the structure and function of genes, the principles of their inheritance, genetic disorders with particular biomedical significance, evolution and population biology
- molecular biology: the structure and function of biologically important molecules, including DNA, RNA and proteins and the molecular events that govern cell function; molecular biology overlaps with biochemistry, genetics and cell biology
- the causes and pathology of common diseases and the impact of lifestyle upon human health
- bioinformatics and systems biology: the analysis of high volumes of biological data, including use of appropriate computational tools and algorithms; appreciation and modelling of the properties of a network of interacting components in a system, as well as the properties of the components themselves
- pharmacology: the importance of drug actions in the living organism for prevention and treatment of disease; the principles of drug-receptor interactions and the relationship between dose and response, routes of administration, types of drugs, how drugs are metabolised and eliminated from the body, toxic effects; approaches for drug discovery; personalised medicine/precision medical science.

Content specific to Biomedical Science courses - clinical pathology subjects

3.2 The clinical pathology specialisms form the cornerstone of Biomedical Science courses. While many Biomedical Sciences courses may contain some of these specialisms,

Biomedical Science courses are required to cover all the clinical laboratory specialisms as detailed in the IBMS accreditation criteria which form an important basis for registration as a Biomedical Scientist. These degrees may be called either 'Biomedical Science' or 'Healthcare Science' but must be accredited by IBMS in order for graduates to meet the academic requirements for registration with HCPC as Biomedical Scientists.

3.3 Biomedical Science students are encouraged to integrate their knowledge of various key subjects to further their understanding of the study, investigation, diagnosis and monitoring of human health and disease and the therapeutic strategies applicable to disease states. Through a systems-led approach, students will integrate the clinical laboratory specialities with underpinning knowledge of Biomedical Science processes, investigation and treatment used for specific diseases. Biomedical Science graduates are aware of the current laboratory methods available for the study, investigation, diagnosis and monitoring of human health and disease in clinical and research environments. This includes an appreciation of the development and evaluation of new and current methods and therapeutic intervention strategies.

3.4 In addition to those areas outlined in paragraph 3.1, IBMS-accredited Biomedical Science or Healthcare Science courses will contain the following clinical pathology subject areas. Graduates are required to have studied and passed all subject specialisms in order to meet the education standards required for registration with HCPC, following completion of both the degree programme and verification of the IBMS Registration Training Portfolio.

- Cellular pathology is the microscopic examination of normal and abnormal cells (cytopathology) and tissues (histopathology) for indicators of disease. A Biomedical Science graduate will have knowledge of:
 - the gross structure and ultrastructure of normal cells and tissues and the structural changes which may occur during disease
 - reproductive science, including infertility and embryology
 - the preparation of cells and tissues for microscopic examination
 - the principles and applications of visualisation and imaging techniques, including microscopy, to aid diagnosis and treatment selection.
- Clinical biochemistry is the investigation of the function and dysfunction of systems, organs and tissues by the measurement of biochemical markers. A Biomedical Science graduate will have knowledge of:
 - the range of common methods used for the collection and analysis of clinical samples
 - investigations of major body and organ systems - for example, renal function tests, liver function tests, tumour marker tests, bone profile tests
 - the principles and applications of biochemical investigations used for screening, diagnosis, treatment and monitoring of disease
 - therapeutic drug monitoring and investigation of substance abuse.
- Clinical immunology is the study of immunopathological conditions and abnormal immune function. A Biomedical Science graduate will have knowledge of:
 - the principles of the function and measurement of effectors of the immune response
 - the causes and consequences of abnormal immune function, neoplastic diseases and transplantation reactions together with their detection, diagnosis, treatment and monitoring
 - principles and practice of immunological techniques used for screening, diagnosis, treatment and monitoring of disease prophylaxis and immunotherapy.

- Haematology is the study and investigation of the different elements that constitute blood and blood-forming organs in normal and diseased states. A Biomedical Science graduate will have knowledge of:
 - the structure, function and production of blood cells
 - the regulation of normal haemostasis
 - blood cell morphology - identification of normal white blood cells and common red blood cell abnormalities
 - nature and diagnosis of anaemias, haematological malignancies, haemorrhagic and thrombotic disease
 - principles and practice of haematological techniques used for screening, diagnosis, treatment and monitoring of disease.

- Transfusion science is the identification of blood group antigens and antibodies which ensures a safe supply of blood and blood components. A Biomedical Science graduate will have knowledge of:
 - interpretation of blood groups, causes of blood group anomalies, antibody screening
 - the genetics, inheritance, structure and role of red cell antigens
 - immune-mediated destruction of blood cells
 - the preparation, storage and use of blood components
 - patient blood management
 - the selection of appropriate blood components for transfusion and possible adverse effects.

- Clinical genetics is the identification of genetic mutations and polymorphisms and their influence on disease processes. A Biomedical Science graduate will have knowledge of:
 - genomic, transcriptomic, proteomic methods used to analyse and study human chromosomes and DNA
 - the application of molecular biology and bioinformatics in medicine
 - pharmacogenetics and personalised medicine
 - principles and practice of techniques used for genetic testing for screening, diagnosis and monitoring of disease, and associated ethical issues.

- Medical microbiology (including virology) is the identification and investigation of pathogenic microorganisms, including viruses, bacteria, fungi protozoa, helminths and the diseases they cause. A Biomedical Science graduate will have knowledge of:
 - the pathogenic mechanisms of a range of microorganisms
 - public health microbiology (epidemiology and control of infectious diseases) and the concept of One Health
 - principles and practice of techniques used for screening, diagnosis, treatment and monitoring of a range of infectious diseases, involving a range of methods to detect and identify microorganisms, prevention and control of infection, including vaccination, environmental and vector control
 - antimicrobial chemotherapy, antimicrobial resistance (antibiotics, antivirals, antifungals, anti-parasitics).

- Near-patient testing (NPT)/point-of-care testing is the analytical testing performed for a patient by healthcare professionals outside the conventional laboratory setting. A Biomedical Science graduate will have knowledge of:
 - the principles and applications of investigations used in screening, diagnosis, treatment and monitoring of disease using NPT equipment
 - the application of NPT into patient pathways
 - relevant quality assurance considerations.

- Quality is central to the delivery of all laboratory services and is achieved through the incorporation of quality systems, quality control and quality assurance in all aspects of laboratory practice. A Biomedical Science graduate will have knowledge of:
 - interpretation of quality control standards (QC)
 - importance of quality assurance and pre-analytical variables
 - an understanding of the importance of external quality assessment (EQA)
 - quality management (to include basic knowledge of the purpose of quality policy, audits, standard operating procedures, training and competency documentation, error logging and incident reporting, validation and verification, and reagent inventories)
 - laboratory accreditation (to include basic awareness of UK Accreditation Service (UKAS) and International Organisation for Standardisation (ISO) standards).

Content specific to other courses in the Biomedical Sciences area

3.5 Other specialisms exist within the subject area of the Biomedical Sciences which have their own specific content requirements and may also be accredited by other professional, statutory or regulatory bodies. Specific content requirements for these courses are detailed below.

Content in Pharmacology courses

- Pharmacology is the science of drugs, their chemical and physical properties, their actions on living tissues and systems, and their effects on health and disease.
- Pharmacologists have played a crucial role in the discovery of hundreds of chemicals used in the treatment of disease and the relief of human and animal suffering.
- Pharmacologists have extended understanding of mechanisms of drug action, drug discovery, safety and efficacy. In designing degree courses, staff are encouraged to seek an integrated approach to pharmacology teaching and assessment that embeds practical and transferable skills into the investigation of pharmacological principles.

3.6 A Pharmacology graduate will have the following core knowledge, understanding and skills.

- Pharmacodynamics (what drugs do to the body) in health and disease, including:
 - molecular targets of drug action: receptors, enzymes, ion channels, transporters and others
 - drug-receptor relationships, including agonism, antagonism specificity, selectivity, potency, desensitisation and tolerance
 - the main molecular targets for drugs, knowledge of their structure and function, and the ways in which drugs alter this function at the molecular level
 - how drug action affects the major organ systems of the body as well as drug effects on cell function, cell proliferation and cell death.
- Pharmacokinetics (what the body does to drugs), including absorption, distribution, biotransformation and excretion.
- Individual variation in drug action and toxicity; for example, the effects of ethnicity, gender, age, pregnancy, genetic factors, disease and drug-drug interactions. Emerging technologies in personalised medicine (for example, small molecular inhibitors, antisense therapy, biopharmaceuticals, novel drug delivery systems).

- Pharmacological methods, including knowledge and/or practical experience of:
 - drug concentration/dose-response relationships
 - experimental methods and techniques applied to pharmacology (for example, bioassays, receptor binding, receptor cloning, recombinant proteins for therapy, animal models of disease, genetic manipulation of cells and animals and their uses)
 - ethical and legal issues pertaining to the use of animals in research, with knowledge of approaches to replace, refine and reduce their use
 - drug discovery and development, including toxicology, with knowledge of the regulatory processes that monitor drug quality, safety and effectiveness
 - principles of clinical trials; avoidance of bias, effect of sample size, placebo effect and the concept of therapeutic index. Ethical issues surrounding the use of human study participants and human tissues.

Content in Human Nutrition courses

3.7 Degree courses in Human Nutrition include a comprehensive education in nutritional science and its application to the maintenance of human health and the prevention of disease, echoing the 'science' competencies outlined in the Association for Nutrition (AfN) competency requirements for course accreditation.

3.8 Many graduates of Human Nutrition courses who progress to work as nutritionists undertake voluntary professional registration with AfN. Human Nutrition graduates are employed in a wide range of areas, such as: health promotion, the food industry, sports nutrition, teaching and nutritional research. Some Human Nutrition graduates progress to undertake postgraduate training in dietetics and work as dietitians. Similar to Biomedical Scientists, those working as dietitians in the health service in the UK must undertake statutory registration with HCPC.

3.9 A Human Nutrition graduate will have the following core knowledge, understanding and skills.

- An integrated knowledge of:
 - the chemistry of living processes; the role of nutrients in the major metabolic pathways and the cellular and molecular basis of disease, including the processes of gene expression
 - the clinical biochemistry of human disease and its management, with a focus on the nutritional factors involved
 - the assessment of nutritional status and the key nutritional issues associated with different stages of the human life cycle as well as the relationship between socio-demographic, economic and environmental factors on dietary behaviour and patterns
 - the concepts and processes associated with food science, food safety, food storage, food processing and food microbiology
 - clinical nutrition, diet therapy and health promotion/nutritional education
 - nutritional issues associated with sports and exercise to maximise performance
 - gene nutrient interactions and their potential role in the prevention of diet-related diseases.
- The impact of nutritional status on the nature of disease and core theoretical understanding of the multidisciplinary nature of human disease and its management.

Content in Human/Medical Physiology courses

3.10 Physiology is an integrative science focused on knowledge and understanding of how the body functions throughout the levels of organisation from chemical/molecular, through cellular to systems and organismal level. Clear understanding of normal anatomy

and physiology, including nervous, hormonal and other homeostatic control mechanisms, provides the basis on which to build knowledge and understanding of the impact of disease and inherent pathophysiological changes and processes on cells, tissues and body systems. Degree courses are encouraged to contextualise the teaching of human physiology with particular reference to dysregulation and the pathophysiological processes that underpin disease.

3.11 A Physiology graduate will have the following core knowledge, understanding and skills.

- Integrated human physiological systems and processes:
 - chemical, cellular, tissue, organ, organ-system and organism levels, and the internal and external factors that regulate physiological systems
 - structure-function relationships and fundamental functions of each body system and interrelationships with other systems
 - life processes, including metabolism, responsiveness, movement, growth, differentiation and reproduction
 - systems of cell-cell communication.
- Internal and external regulation:
 - homeostasis (autoregulation and extrinsic regulation)
 - neural tissue, spinal cord, spinal nerves and spinal reflexes, brain and cranial nerves and neural integration
 - fluid, electrolyte and acid-base balance, including control systems, and disturbances and impact on health
 - the endocrine system, including hormone secretion, distribution and mechanisms of hormone action
 - response to internal and external stressors
 - coordination, communication and integration of activity of body systems through neuronal, hormonal and chemical mechanisms
 - physiological response and regulation for adaptation and survival in a changing environment.
- Cellular physiology:
 - principal components of a human cell and the main transport processes and maintenance of cellular integrity
 - cellular differentiation, life cycle and diversity of cell types, and the complex intracellular chemical events that sustain life and underpin cellular response to the internal/external environment.
- Tissues, support and movement:
 - structural and functional attributes of epithelial tissues, connective tissues and membranes, and tissue injury and repair
 - fundamental appreciation of skin, bone structure, skeleton and articulations
 - skeletal muscle and other types of muscular tissue
 - exercise physiology and impact of exercise and related nutritional aspects.
- Fluids and transport:
 - cardiovascular system, including nature of blood and haemostasis, heartbeat and cardiodynamics, cardiovascular physiology and regulation
 - lymphatic system, including organisation, defences and immunity.
- Environmental exchange:
 - respiratory system and physiology
 - digestive and hepatobiliary systems, including components/organs and processes of digestion and absorption, detoxification and elimination
 - metabolism and energetics

- urinary system and the principles of renal physiology.
- Continuity of life:
 - reproductive systems and integration with other systems
 - development and inheritance, including fertilisation, pregnancy, prenatal development and foetal growth
 - aspects of human inheritance, development and ageing.
- Physiological experimentation, data management and subject articulation:
 - ethical and legal issues pertaining to the use of humans or animals (or tissues) in research and other contexts
 - core physiological techniques and practical skills, including experimental design, measurement, data handling and statistical analysis.

Approaches to study in all courses

3.12 Approaches to study and the subject knowledge likely to be common to all Biomedical Science, Biomedical Sciences, Pharmacology, Nutrition and Human Physiology degree courses include:

- whatever the degree course, there is a need for an interdisciplinary and, where appropriate, multidisciplinary approach in advancing knowledge and understanding of the processes and mechanisms of life, from the molecular and cellular levels through to the whole body and the environment in which a person lives
- engagement with the essential facts, major concepts, principles and theories associated with the chosen subject
- competence in the basic experimental and/or technical skills appropriate to the subject under study; relevant knowledge and understanding of a range of methodologies for data analysis, including the application of appropriate statistical methods and other analytical tools
- understanding of information from a variety of sources such as texts, published journal articles, reports and clinical data within the context of biomedical sciences; familiarity with methods of acquiring, interpreting and analysing information with a critical understanding of its use and limitations
- familiarity with relevant terminology and classification systems
- awareness of the contribution of the subject area to the development of knowledge about the complexity of human health and disease
- competence in the use of a range of appropriate communication platforms, both digital and physical, for the effective dissemination of information to scientific and lay audiences
- engagement with current developments in the subject area and awareness of their contribution to debate and controversies; their applications to the quality and sustainability of health and well-being; the philosophical and ethical issues involved and awareness of intellectual property (IP) and how scientific advances can be secured and progressed by the application of intellectual property rights (IPRs)
- appreciation and enactment of the applicability of the subject-specific and transferable skills and knowledge of graduates to a wide variety of career paths and further study opportunities both within and beyond the life sciences.

3.13 Graduate attributes integrated in all courses facilitate students to acquire graduate and professional attributes appropriate to Biomedical Science, Biomedical Sciences, Pharmacology, Nutrition and Human Physiology, and will recognise that much of what they

are taught is likely to change in the future, particularly in the light of continuing scientific advances.

3.14 These acquired attributes include, but are not limited to:

- an appreciation of the complexity and diversity of human processes in health and disease
- the ability to read and evaluate appropriate literature with a full and critical understanding, including the context, aims, objectives, experimental design, methodology, data interpretation and application of the study
- the capacity to give a clear, current and accurate account of their subject area, the ability to critically discuss and debate both with specialists and non-specialists, using appropriate scientific language
- critical and analytical skills, including a recognition that statements and hypotheses should be tested, and that evidence is subject to assessment and critical evaluation
- the ability to successfully apply a variety of methods of study in investigating, recording and analysing material
- the ability to think independently, work autonomously and solve problems
- an understanding of how to identify, protect and exploit intellectual property (IP) as part of the scientific innovation process
- an appreciation of the global reach of the subject area, the impact on human life and the environment and the ethical considerations implicit in their application.

Teaching and learning

3.15 Teaching and learning strategies are designed to scaffold the acquisition of subject knowledge and skills by moving from study methods that are structured and supported towards more independent and self-directed activities. As the course advances, students become increasingly responsible for their own learning in preparation for the rest of their professional careers. Progression is enabled and reinforced by a diversity of learning and teaching methods that are matched to the expressed learning outcomes. This Subject Benchmark Statement does not aim to be directive about the methods used for a particular course but, rather, provides the basis for reflection in relation to what might be appropriate for a course, and the modules contained within that course. Integrating topics across the programme is essential to ensure effective teaching and integrated learning. Teaching and learning strategies are designed to be enriching, stimulating, challenging, effective and enjoyable.

3.16 Learning and teaching strategies in Biomedical Science and/or Biomedical Sciences are not static but adapt to changes in philosophy and technology in innovative ways that are accessible and inclusive to all. In this context, there is an expectation that all staff who contribute to student learning – including demonstrators, and temporary and visiting lecturers, as well as permanent academic staff – should have access to a range of educational professional development opportunities. Current strategies are student-centred and utilise a range of delivery methods, as appropriate, to incorporate experiential, practical and formal academic practice. Teaching sessions may be synchronous, asynchronous or a blend of modes. Synchronous delivery may be face-to-face, remote or a hybrid of these, to increase accessibility. Asynchronous learning is typically delivered using a range of digital tools and techniques. Live sessions may be recorded for self-directed study and consolidation of learning. Independent learning can be encouraged using pre/post-session student activity. It is considered good practice to use a range of different activities and reflect

on how, for example, module choice by students might influence the range of activities available to them.

3.17 Synchronous learning activities may include, but are not limited to:

- seminars, tutorials, lectures
- laboratory classes
- case studies, problem-based learning, simulations and/or team-based learning
- workshops, including sessions led by employers and external stakeholders
- fieldwork and visits
- peer and collaborative learning, including the use of social media
- interactive sessions, including debates, quizzes and poster presentations.

3.18 Asynchronous learning activities may include, but are not limited to:

- self-directed study
- textbooks and digital multimedia
- recordings (taught sessions and laboratory demonstrations) and broadcasts
- virtual experiments
- pre/post-laboratory and pre/post-sessional exercises
- peer and collaborative learning, including the use of discussion fora and quizzes
- research projects
- reflective practice and portfolio building
- work-based placements or other appropriate professional experience.

Assessment

3.19 Assessment strategies are designed to recognise achievement of learning outcomes and competencies, and to discriminate between such achievement at threshold and higher levels. Strategies include a varied range of both formative and summative assessment and may include self and peer-assessment. They provide evidence to employers of graduate attributes. Assessment is progressive in terms of level and content and leads to effective feedback to enable development of students' knowledge and skills, including transferable skills. In this increasingly digital world, such skills include digital literacy; opportunities are present to exploit this and diversify how students are assessed, ensuring a range of methodologies which allow students from all backgrounds and characteristics to demonstrate their learning and development. Assessments should be authentic, with real-world application to enhance employability skills and professional development; they should allow for reasonable adjustments to ensure inclusivity.

3.20 The following principles should be considered when designing assessments:

- assessment should be of, and for, learning and associated with effective feedback
- assessments should be valid, reliable and consistent, and provide a means for students to demonstrate mastery of a topic
- assessment and feedback should explicitly consider accessibility and EDI considerations
- information provided about assessment and feedback should be explicit, accessible and transparent
- assessment and feedback should be planned to ensure students and staff can manage their workloads effectively
- assessments and feedback should be integral to the course of study and clearly relate to the learning outcomes

- assessment and feedback should give the student the opportunity to validate knowledge and understanding
- assessment and feedback should align with accreditation and approval requirements as necessary
- an appropriate balance of formative and summative assessments should be provided, with helpful interrelation between the two forms.

3.21 Themes for authentic assessment include, but are not limited to:

- practical applications and professional competencies (for example, laboratory and placement activity)
- collaborative working (for example, peer assessment and teamworking)
- integrative assessments (for example, capstone projects or dissertation)
- range of style of scientific communication, for a range of audiences (for example, posters, graphical, video or website)
- professional scientific communication (for example, journals and reports)
- professional skills (for example, reflective pieces).

3.22 Any of the above themes could be examined via unseen, seen or open-book invigilated examinations, facilitated in person or remotely, or via coursework.

3.23 At integrated master's level, there is a strong emphasis on requiring students to apply their subject-specific knowledge to the solution of unfamiliar problems. Assessment of the full range of research skills is also considered crucial in determining whether master's level learning outcomes have been achieved.

3.24 Feedback should be personal/individual, understandable, empowering, manageable and developmental. It should be timely, relevant to the assessment brief and accompanied by access to interpretative support/advice. Feedback should allow students the opportunity for supportive reflection on their academic and professional development. The nature, extent and timing of feedback for each assessment task should be made clear in advance.

4 Benchmark standards

4.1 This Subject Benchmark Statement sets out the minimum threshold standards that a student will have demonstrated when they are awarded an honours degree in Biomedical Science and/or Biomedical Sciences. Demonstrating these standards over the course of study will show that a student has achieved the requisite range of knowledge, skills and understanding expected of graduates in Biomedical Science and/or Biomedical Sciences. They also indicate excellent levels of achievement to assist course teams in setting their own internal standards.

4.2 The majority of students will perform significantly better than the minimum threshold standards articulated below. Each higher education provider has its own method of determining what appropriate evidence of this achievement will be and should refer to *Annex D: Outcome classification descriptions for FHEQ Level 6 and FQHEIS Level 10 degrees*. This Annex sets out common descriptions of the four main degree outcome classifications for bachelor's degrees with honours: 1st, 2.1, 2.2 and 3rd.

4.3 As indicated elsewhere in this Statement, the range of Biomedical Science and/or Biomedical Sciences degree courses offered by UK higher education providers is broad; therefore, one set of detailed and restrictive standards for all courses that may be covered by this Subject Benchmark Statement would not be helpful. The benchmark standards in this Statement are therefore broad and generic, and focus on core knowledge and skills development in order to cover both Biomedical Science and Biomedical Sciences taught content (Table 1).

4.4 The benchmark standards specific to Biomedical Science degree programmes that have IBMS accreditation are strongly linked to the HCPC Standards of Proficiency, and these are detailed in Appendix 1.

4.5 The benchmark standards for master's level courses are detailed in Table 2.

Table 1: On graduating with an honour's degree in Biomedical Science and/or Biomedical Sciences, graduates will have the following core knowledge, understanding, experience and skills:

Benchmark outcome	Threshold standard	Excellent standard
Describe and discuss the key concepts and phenomena relevant to the course (see section 3) confidently, accurately and in detail, using appropriate terminology, and be aware of the full breadth of Biomedical Science and/or Biomedical Sciences, from molecular to cellular, and from health to disease.	Recall basic knowledge of key concepts in Biomedical Science and/or Biomedical Sciences and phenomena relevant to the course and explain these using appropriate terminology.	Apply a comprehensive knowledge of concepts in Biomedical Science and/or Biomedical Sciences and phenomena to discuss and explain essential aspects of the course and show evidence of enquiry beyond this.
Apply knowledge and understanding of human biological systems and methodologies to design experiments and to solve theoretical and practical problems, with awareness of appropriate controls, possible bias, ethics and sustainability.	Demonstrate an understanding of basic experimental design and application of methods to solve routine problems relevant to the course, with some awareness of appropriate controls, possible bias, ethics and sustainability.	Devise and evaluate solutions to solve both routine and unfamiliar problems using a range of methods, including awareness of appropriate controls, possible bias, ethics and sustainability.
Describe, document and enact safe working practices in terms of managing biological, chemical, laboratory or sample-based risk, through knowledge-based risk assessments and practical activities.	Produce and follow risk assessments for completing practical work in a safe and reliable manner with support.	Independently produce and apply risk assessments for completing practical work in a safe and reliable manner.
Select and carry out appropriate quantitative and qualitative practical techniques to solve problems relevant to the course, including consideration of the theoretical basis and limitations of various techniques.	Suggest and demonstrate competence in a broad range of appropriate qualitative and quantitative practical techniques relevant to the course.	Design, optimise and demonstrate competence in a broad range of appropriate qualitative and quantitative practical techniques relevant to the course, with a high degree of autonomy and efficiency.
Use appropriate databases, computational techniques and tools to aid further understanding and insight of Biomedical Science and/or Biomedical Sciences processes.	Apply computational techniques and tools to investigate familiar Biomedical Science and/or Biomedical Sciences concepts covered in course content and report outcomes using appropriate terminology.	Select and apply appropriate computational techniques and tools to investigate complex Biomedical Science and/or Biomedical Sciences concepts and evaluate and report outcomes using appropriate terminology.

Engage with literature from the Biomedical Science and/or Biomedical Sciences to develop insight into the subject.	Assess the evidence base for scientific claims, by accessing primary literature and commenting on the adequacy of the methods, data and interpretation therein.	Identify and select appropriate sources of biological information, including primary literature, and appraise and evaluate the adequacy of methods, data and their interpretation with a high degree of independence.
Complete independent open-ended investigative work through a project/research-based assignment relevant to the course.	Demonstrate planning, execution and presentation of a piece of independently produced work which includes analysis or evaluation of data within a supported framework, demonstrating some evidence of time management, problem solving and independence.	Demonstrate highly independent and competent planning, execution and presentation of a piece of independently produced work which includes the analysis and critical evaluation of data, demonstrating high levels of time management, problem solving and independence.
Appreciate the contribution of Biomedical Science and/or Biomedical Sciences to the innovations that characterise the modern world, and the potential of Biomedical Science and/or Biomedical Sciences graduates to develop solutions to current and future challenges.	Identify and discuss application of Biomedical Science and/or Biomedical Sciences in solving current and future challenges in the world and demonstrate some understanding of the role of Biomedical Scientists and research scientists in this.	Explain, suggest and critique ways in which Biomedical Science and/or Biomedical Sciences and Biomedical Scientists can contribute to solving current and future world challenges.
Recognise the relationships and interfaces between Biomedical Science and/or Biomedical Sciences and other subjects, enabling efficient interactions in a multidisciplinary environment.	Identify and explain relationships between Biomedical Science and/or Biomedical Sciences and other subjects relevant to the course content.	Explain and evaluate the contribution of Biomedical Science and/or Biomedical Sciences to solving interdisciplinary challenges and the role of interdisciplinary thinking in solving scientific problems.
Deploy mathematical and statistical concepts, processes and tools, such as the manipulation of equations and graphical and statistical analysis, to solve problems or evaluate data.	Use mathematical and statistical concepts, processes and tools to solve familiar problems or evaluate data.	Select, use and evaluate appropriate mathematical and statistical concepts, processes and tools to solve problems or evaluate data.
Collect qualitative and quantitative data from investigations relevant to the course, and analyse and interpret this data to allow testing of hypotheses, contextualising of findings,	Demonstrate accurate data collection, including selection of appropriate methods for analysis, interpretation of findings to test hypotheses, consideration of further lines of	Demonstrate independent and accurate data collection, including selection of appropriate methods for analysis, interpretation of findings to test hypotheses, consideration of further

presentation of findings, and suggestions for further lines of investigation.	investigation and manipulation of data for effective presentation.	lines of investigation and manipulation of data for effective presentation, with a thorough understanding of the context of the investigation within the field.
Collaborate and work successfully in a group environment, contributing positively and flexibly to team outputs.	Effectively participate in group and teamwork, demonstrating clear contributions to the work.	Identify and apply effective strategies for working in a group environment and provide clear and valuable contributions to team outputs, demonstrating good teamwork and/or leadership skills.
Communicate effectively, selecting appropriate content, media and methods for the audience, purpose and subject.	Communicate information, ideas, problems and solutions verbally and/or non-verbally, with clear expression and style.	Communicate information, ideas, problems and solutions to an accomplished level verbally and non-verbally, in an accurate, fluent and sophisticated style, at a level consistently appropriate for the audience.
Apply ethical awareness to working in Biomedical Science and/or Biomedical Sciences, appreciate the historical context of the subject and the societal impacts of advances in the Biomedical Science and/or Biomedical Sciences.	Describe some of the ethical issues and societal impacts of advances in Biomedical Science and/or Biomedical Sciences, with some acknowledgement of the historical context of the subject.	Understand and evaluate ethical issues and the societal impact of advances in Biomedical Science and/or Biomedical Sciences, with some understanding of the historical context of the subject.
Stay up to date with advances in Biomedical Science and/or Biomedical Sciences and appreciate the fluid nature of knowledge that evolves as new findings emerge.	Awareness of how new findings may change current understandings of various topics in Biomedical Science and/or Biomedical Sciences, that many aspects of the subject are not fully understood and demonstrate some ability to stay up to date with new findings.	Clear appreciation of the fluid nature of knowledge in Biomedical Science and/or Biomedical Sciences, including an ability to incorporate new findings into previous understanding of various topics.
Act professionally, with due regard for legal, ethical and societal responsibilities, modelling good practice that promotes positive perceptions of Biomedical Science and/or Biomedical Sciences and Biomedical Scientists.		

Table 2: Benchmark standards - in addition to Table 1, on graduating with a master's degree in Biomedical Science and/or Biomedical Sciences, graduates should be able to:

Benchmark outcome	Threshold standard	Excellent standard
Develop, integrate, synthesise and apply the systematic and broad understanding of relevant and state-of-the-art biological/ biomedical concepts to solve complex problems.	With significant support and guidance.	With a high degree of independence and autonomy.
Interrogate and integrate diverse sources of scientific literature alongside other information sources, in order to design and develop methods for investigation and analysis, including in areas at the forefront of knowledge and outside their current specialist knowledge.		
Project planning, including, as appropriate, evaluation of ethics, hazards, environmental effects, sustainability and appreciation of costs.		
Development of advanced experimental and investigative skills as appropriate for the project.		
Discussion of the background, context, methods, results and potential impact of a significant research project.		

5 List of references and further resources

QAA (2019) The UK Quality Code for Higher Education

www.qaa.ac.uk/quality-code

QAA and Advance HE (2021) *Education for Sustainable Development Guidance*

www.qaa.ac.uk/quality-code/education-for-sustainable-development

HEA (2016) Framework for Embedding employability in higher education

www.advance-he.ac.uk/guidance/teaching-and-learning/embedding-employability

QAA (2018) *Enterprise and Entrepreneurship Education: Guidance for UK Higher Education Providers*

www.qaa.ac.uk/docs/qaas/enhancement-and-development/enterprise-and-entrepreneurshipeducation-2018.pdf

QAA (2019) *Characteristics Statement: Higher Education in Apprenticeships*

www.qaa.ac.uk/docs/qaa/quality-code/characteristics-statement-apprenticeships.pdf

QAA (2019) *Annex D: Outcome classification descriptions for FHEQ Level 6 and FQHEIS Level 10 degrees*

www.qaa.ac.uk/docs/qaa/quality-code/annex-d-outcome-classification-descriptions-for-fheqlevel-6-and-fqheis-level-10-degrees.pdf

United Nations, Department of Economic and Social Affairs, Sustainable Development Goals

<https://sdgs.un.org/goals>

Institute of Biomedical Science

www.ibms.org

Health and Care Professions Council (HCPC)

www.hcpc-uk.org

Royal Society of Biology

www.rsb.org.uk

Association for Nutrition (AfN)

www.associationfornutrition.org

British Pharmacological Society

www.bps.ac.uk

6 Membership of the Advisory Groups for the Subject Benchmark Statement for Biomedical Science and Biomedical Sciences

Membership of the Advisory Group for the Subject Benchmark Statement for Biomedical Science and Biomedical Sciences (2023)

Professor Mary Hannon-Fletcher (Chair)	Ulster University
Dr Sue Jones (Deputy Chair)	Institute of Biomedical Science
Professor Carol Ainley	Manchester Metropolitan University
Dr Avninder Singh Bhambra	De Montfort University
Victoria Bradley	Cardiff Metropolitan University
Daniel Kassahun	University College London
Dr Sobia Kauser	University of Bradford
Kevin Kendall	QAA Officer
Dr Ian Locke	University of Westminster
Professor Stephen McClean	Ulster University
Dr Liz O'Gara	University of Wolverhampton
Lee Peters	Swansea Bay University Health Board
Professor Claire V S Pike	Anglia Ruskin University
Dr Sarah Pitt	University of Brighton
Nicola Richards	Nottingham Trent University
Andrew Usher	Gloucestershire Hospitals NHS Foundation Trust
Alan Wainwright	Institute of Biomedical Science
Dr Linda Walsh	Glasgow Caledonian University
Aminul Schuster	University of Westminster

Membership of the review group for the Subject Benchmark Statement for Biomedical Sciences (2019)

The fourth edition, published in 2019, was revised by QAA to align the content with the revised UK Quality Code for Higher Education, published in 2018. Proposed revisions were checked and verified by the Chair of the Subject Benchmark Statement for Biomedical Sciences from 2015.

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Membership of the review group for the Subject Benchmark Statement for Biomedical Sciences (2015)

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Appendix 1

Draft suggestions for QAA Subject Benchmark Statement threshold levels of achievement for Biomedical Science degrees based on Health and Care Professions Council (HCPC) standards of proficiency (SoP) for Biomedical Scientists.

To note: The rationale for linking these draft proposals to the HCPC SoP for Biomedical Scientists is to strengthen the relationship of the QAA Subject Benchmark Statement with respect to Biomedical Science singular degree (and therefore IBMS degree accreditation) to statutory regulation with the HCPC.

These suggestions have been taken from the current IBMS Registration Training Portfolio as the source of HCPC SoP, preserving the general presentation format of this document for ease of reference, and to see what has not been included. It is recommended they are further informed by the HCPC SoP for Biomedical Scientists. It is also recognised there may be other (perhaps more specific) threshold standards that should be included and the obvious source for these could be the QAA Subject Benchmark Statement for Biomedical Science.

Section 1: Professional Conduct (covered across 5 module areas)

Module 1	Personal Responsibility and Development
Module 2	Equality and Diversity
Module 3	Communication
Module 4	Patient Records and Data Handling
Module 5	Professional Relationships

Section 2: Professional Practice (covered across 5 module areas)

Module 1	Application of Professional Knowledge
Module 2	Health and Safety
Module 3	Quality
Module 4	Performing Standard Investigations
Module 5	Research and Development

Section 1: Professional Conduct

Module 1: Personal Responsibility and Development

Registered biomedical scientists must:	
1	Understand what is required of them by the Health and Care Professions Council (HCPC SoP 2.2)
2	Understand the need to respect and uphold the rights, dignity, values and autonomy of service users including their role in the diagnostic and therapeutic process and in maintaining health and wellbeing (HCPC SoP 2.3)
3	Recognise that relationships with service users should be based on mutual respect and trust (HCPC SoP 2.4)
4	Know about the current legislation applicable to the work of their profession (HCPC SoP 2.5)
5	Be aware of the British, European and International Standards that govern and affect pathology laboratory practice (HCPC SoP 2.6)
6	Understand both the need to keep skills and knowledge up to date and the importance of career-long learning (HCPC SoP 3.3)
7	Understand the value of reflection on practice and the need to record the outcome of such reflection (HCPC SoP 11.1)

Module 2: Equality and Diversity

1	Be aware of the impact of culture, equality and diversity on practice (HCPC SoP 5)
2	Understand the requirements to adapt practice to meet the needs of different groups and individuals (HCPC SoP 5.1)

Module 3: Communication

1	Communicate in English to the standard equivalent to level 7 of the International English Language Testing System, with no element below 6.5 (HCPC SoP 8.1)
2	Demonstrate effective and appropriate verbal and non-verbal skills in communicating information, advice, instruction and professional opinion to service users, colleagues and others (HCPC SoP 8.2)
3	Communicate the outcomes of biomedical procedures (HCPC SoP 8.4)

Module 4: Patient Records and Data Handling

None as related directly to practice and evidence in Registration Training Portfolio but see section on Research and Development.

Module 5: Professional Relationships

1	Be aware of the impact of pathology services on the patient care pathway (HCPC SoP 9.5)
2	Recognise the role of other professions in health and social care (HCPC SoP 13.3)

Section 2: Professional Practice

Module 1: Application of Professional Knowledge

1	Understand the key concepts of the knowledge base relevant to their profession (HCPC SoP 13)
2	Understand the structure and function of the human body, together with knowledge of health, disease, disorder and dysfunction relevant to their profession (HCPC SoP 13.1)
3	Be aware of the principles and application of scientific enquiry, including the evaluation of treatment efficacy and research process (HCPC SoP 13.2)
4	Understand the theoretical basis of, and the variety of approaches to, assessment and intervention (HCPC SoP 13.6)
5	Demonstrate knowledge of underpinning scientific principles of investigations provided by clinical laboratory services (HCPC SoP 13.7)
6	Understand the role of the following specialisms in the diagnosis, treatment and management of disease: cellular science, blood science, infection science, molecular and genetic science and reproductive science (HCPC SoP 13.8)
7	Understand the principles of good laboratory practice (HCPC SoP 15.6)

Module 2: Health and Safety

1	Understand the need to establish and maintain a safe practice environment (HCPC SoP 15)
2	Be aware of applicable health and safety legislation, and any relevant safety policies and procedures in force at the workplace, such as incident reporting (HCPC SoP 15.2)
3	Understand the biological hazard groups and associated containment levels (HCPC SoP 13.11)
4	Work safely, including being able to select appropriate hazard control and risk management, reduction or elimination techniques in a safe manner and in accordance with health and safety legislation (HCPC SoP 15.3)
5	Select appropriate protective equipment and use it correctly (HCPC SoP 15.4)

Module 3: Quality

1	Recognise the value of case conferences and other methods of review (HCPC SoP 11.2)
2	Be aware of the role of audit and review in quality management, including quality control, quality assurance and the use of outcome measures (HCPC SoP 12.3)

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| 3 Understand the implications of non-analytical errors (HCPC SoP 14.15) |
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Module 4: Performing Standard Investigations

1 Understand the techniques and associated instrumentation used in the practice of biomedical science (HCPC SoP 13.10)
2 Demonstrate proficiency in liquid handling methodologies, including preparation of standard solutions and buffers (HCPC SoP 14.6)
3 Demonstrate proficiency in practical skills in cellular science, blood science, infection science, molecular and genetic science and reproductive science, where appropriate to the discipline (HCPC SoP 14.7)
4 Demonstrate practical skills in the investigation of disease processes (HCPC SoP 14.9)

Module 5: Research and Development

1 Recognise the value of research to the critical evaluation of practice (HCPC SoP 14.30)
2 Be aware of a range of research technologies (HCPC SoP 14.31)
3 Use statistical packages and present data in an appropriate format (HCPC SoP 14.27)
4 Demonstrate a logical and systematic approach to problem solving (HCPC SoP 14.28)
5 Design experiments, report, interpret and present data using scientific convention, including application of SI units and other units used in Biomedical Science (HCPC SoP 14.33)

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