Medical Sciences Divisional Board

Approved by Ros Whiteley on 25.08.20

Title of Programme/ Name of Regulation
Preliminary Examination in Molecular and Cellular Biochemistry

Brief note about nature of change: Changes following major course revision.

Location of change
In Examination Regulations 2019
https://examregs.admin.ox.ac.uk/Regulation?code=peimandcellbioc&srchYear=2019&Term=1

Effective date
For students starting from MT 2020
And
For first examination from 2020-21

Detail of change
A

1.1. The subjects of the Preliminary Examination in Molecular and Cellular Biochemistry shall be consist of five written papers:
   o 1.2(1) Molecular Cell Biology  Cellular Biochemistry
   o 1.3(2) Biological Chemistry  Mechanistic Biochemistry
   o 1.4(3) Biophysical Chemistry  Molecular Biochemistry
   o 1.5(4) Organic Chemistry  Physical Biochemistry
   o 1.6(5) Mathematics and Statistics for Biochemists  Quantitative Biochemistry
1.2. Candidates shall be deemed to have passed the examination if they satisfy the Moderators in all five subjects papers.

1.3. Candidates must offer all five subjects papers at their first examination attempt.

1.4. A candidate who fails one or two subjects papers will be permitted one further attempt at the failed subjects paper or papers, at the first available opportunity.

1.5. A candidate who fails three or more subjects papers shall be deemed to have failed the examination. He or she The candidate will be permitted one further attempt at the whole examination, at the first available opportunity.

1.6. The Moderators may award a Distinction to candidates of special merit who satisfy them in all five subjects papers at their first examination attempt.

B

1.12. One written paper will be set in each subject. The duration of the written papers will be three hours for subjects 1, 2, and 3, and two and a half hours for subjects 4 and 5. The syllabus for each subject will be that set out in the schedule below.

Papers 1 and 3 will be of three hours duration and shall be a computer-based assessment. Papers 2 and 4 will be of three hours duration and shall be a hand-written assessment. Paper 5 will be of two hours and thirty minutes duration and shall be a hand-written assessment.

1.13. The Moderators will permit the use of hand-held pocket calculators subject to the conditions set out under the heading ‘Use of Calculators in examinations’ in the Regulations for the Conduct of University Examinations. A list of recommended calculators will be provided by the Chair of the Moderators not later than the Wednesday of the fourth week of the Michaelmas Full Term preceding the examination. The use of calculators may not be permitted in certain papers.

1.14. All candidates shall be assessed as to their practical ability in coursework under the following provisions:

1.15.(a) The Chair of the Teaching Committee, or a deputy, shall make available to the Moderators, at the end of the fifth week of the term in which the examinations are first held, evidence showing the extent to which each candidate has completed the prescribed coursework.

1.16.(b) The Moderators may request coursework from any candidate. Such candidates will be named in a list posted by the day of the first written paper.

1.17.(c) Coursework cannot normally be retaken. Failure to complete the coursework to the satisfaction of the Moderators, in the absence of appropriate
documentary evidence (e.g. a signed medical certificate), will normally constitute failure of the examination.

Schedule

(1) Molecular Cell Biology Cellular Biochemistry

1.18 Classification, evolution and structure of bacterial, archeal, and eukaryotic cells; structure of subcellular organelles and the cytoskeleton of eukaryotes. Multicellularity and cell specialization. Differences between plant and animal cells. Nuclear and cell division in plants, animals, and bacteria. Intra- and intercellular signalling. Cells as the basic unit of life; multicellularity; cell signalling; cell metabolism.


1.21 Structure and properties of biological membranes. Membrane potentials and ion channels. Membrane transport; biological pumps. Bioenergetics; electron transfer, oxidative and photophosphorylation.

(2) Biological Chemistry Mechanistic Biochemistry


1.23 Structure and properties of proteins: amino acids, peptide bonds, conformational preferences, α-helices, β-sheets, stabilisation by non-covalent interactions; protein sequences and amino acid modification; glycoproteins.


1.26 Organic chemistry of enzyme reactions, particularly those in glycolysis.

1.27 Biological aspects of sulphur, iron, and phosphorus chemistry.

1.28 Organic chemistry of sugars and other heterocyclic compounds.
1.29 Structure and properties of nucleic acids; ribose and deoxyribose, keto-enol tautomerism and H-bonding in purines and pyrimidines, phosphate as linking group; nucleotides; polymeric chains of nucleotides; differences in stability between RNA and DNA; the double helix; DNA damage and mutation.

1.30 Techniques in molecular biology: purification of DNA and proteins. Electrophoresis, DNA sequencing, cloning, blotting.

(3) Biophysical Chemistry Molecular Biochemistry

1.31 Principles of Newtonian mechanics and electrostatics. Quantum theory: concepts of quantum mechanics in terms of energy levels. Boltzmann distribution. Atomic and molecular structure, atomic orbitals: crystal field theory; LCAO approach to molecular orbitals. DNA and RNA; genotype and phenotype; proteins; membrane structure and function.


(4) Organic Chemistry Physical Biochemistry

1.36 Structure: Elementary atomic and molecular orbital theory. Bonding and molecular geometry. Methods for structure determination (e.g. spectroscopy, mass spectrometry, nmr). Stereochemistry. Absolute configuration. Cis-trans and other isomerisations. Thermodynamics; chemical and enzyme kinetics; atomic, molecular and macromolecular structure and bonding; electromagnetic radiation and its interaction with matter.

Mechanism: Classification of reactions proceeding via intermediates and transition states. Substitution, elimination and addition processes. Rate determining steps; kinetic and thermodynamic control. Carbocation, carbanion, carbene and radical intermediates.

Functional group chemistry: Characteristic chemistry of carbonyl groups. Structure, properties and reactions of carbonyls.

(5) Mathematics and Statistics for Biochemists Quantitative Biochemistry

An elementary treatment of the following topics will be expected:

Mathematics


Statistics


Explanatory Notes