Teaching and Examination Regulations 2017-2018 Master´s degree programmes Biomedical Sciences and Medical Pharmaceutical Sciences

Appendix I Learning outcomes of the degree programme (art. 1.3)

Graduates Biomedical Sciences (BMS) or Medical Pharmaceutical Sciences (MPS) can:

1. explain in detail, using appropriate terminology, how molecular and cellular biology or integrative physiology and behaviour, and/or medical or pharmaceutical sciences interrelate, and use this to acquire in depth knowledge on:
   - the etiology and pathophysiology of disease and maintenance of health (BMS);
   - drug discovery, drug disposition and drug usage (MPS);
2. design and conduct scientific research;
3. independently investigate, and critically evaluate, scientific literature;
4. identify new developments in the relevant disciplines, and can familiarize themselves with these developments;
5. systematically organize their work in scientific research and formulate realistic and original solutions to complex problems;
6. participate in, and contribute to, a multidisciplinary team;
7. effectively communicate acquired knowledge, insights and skills to others, both in writing and in oral presentation;
8. identify societal and ethical implications of scientific research, and are able to critically reflect on their actions in this context;
9. independently acquire new knowledge and skills that are relevant for their professional career, in science, in policy & management or society.

Appendix II Tracks/Specializations of the degree programme (art. 2.2)

1. Within the degree programmes, the student chooses one of the R-tracks written below ("Research-track", p-variant in Dutch) or one chooses the SBP-track ("**Science, Business and Policy** -track", m-variant in Dutch), which prepares for professions in a societal, political and/or commercial context.

2. Within the degree programme Biomedical Sciences, the **Biomedical Sciences Research** track (R-track), provides students training as a researcher in various fields of biomedical sciences.

3. Within the degree programme Biomedical Sciences, the **Biology of Ageing** track (R-track), provides students training as a researcher mainly in the field of ageing and age-related pathologies.

4. Within the degree programme Medical Pharmaceutical Sciences, the **Medical Pharmaceutical Research** track (R-track), provides students training as a researcher in various fields of medical pharmaceutical sciences.

5. Within the degree programme Medical Pharmaceutical Sciences, the **Toxicology and Drug Disposition** track (R-track), provides students training as a researcher mainly in the field of adverse drug reactions.

6. Within the degree programme Medical Pharmaceutical Sciences, the **Pharmacoepidemiology** track (R-track), provides students training as a researcher in the area of pharmacovigilance, database research, observational and trial intervention methodology and utilization studies with specific attention to the role of pharmaceuticals in healthy ageing.

Appendix III. Content of the degree programme (art. 2.3)

The degree programme Biomedical Sciences offers the following Research-tracks: Biomedical Sciences Research & Biology of Ageing.
The degree programme Medical Pharmaceutical Sciences offers the following Research-tracks: Medical Pharmaceutical Research, Toxicology and Drug Disposition & Pharmacoepidemiology.
R- track (Research track):

Course unit	ECTS	Assessment	Practical	Entry requirements
research project (RP)*	≥ 40	technical and/or laboratory skills, written report, oral presentation	x	Safe Microbiological Technique certificate[#]
research project (RP)*	≥ 30	technical and/or laboratory skills, written report, oral presentation	x	Safe Microbiological Technique certificate[#]
colloquium	5	oral presentation	x	RP
essay	5	written report	x	-
master courses	20	see appendix IV	see app. IV	see appendix IV
electives**	≤ 20	see appendix IV	see app. IV	see appendix IV

[#] Students who have not obtained a Safe Microbiological Technique certificate (VMT in Dutch) have to register to the MBS course to obtain one, before or at the start, of their first research project.

SBP-track (Science, Business and Policy track):

Course unit	ECTS	Assessment	Practical	Entry requirements
research project (RP)*	≥ 40	technical and/or laboratory skills, written report, oral presentation	x	Safe Microbiological Technique certificate[#]
colloquium	5	oral presentation	x	RP
master courses	5	see appendix IV	see app. IV	see appendix IV
internship SBP	40	performance, written report, reflection report	x	RP, course units S&B and S&P
course units: Science & Business and Science & Policy	2x10 = 20	assignment, exam	x	-
electives**	≤ 10	see appendix IV	see app. IV	see appendix IV

[#] Students who have not obtained a Safe Microbiological Technique certificate (VMT in Dutch) have to register to the MBS course to obtain one, before or at the start, of their first research project. The Microbiological Safety course is not compulsory for students following the SBP-track who will only do one research project that will not involve laboratory work for which a Microbiological Safety certificate is necessary.

The following rules apply to all programmes, in addition to the above scheme:

- * the first research project must be performed at the Faculty of Science and Engineering (FSE) or the University Medical Center Groningen under supervision of one of the appointed examiners for the respective master programme. The grade of the first research project must have been registered before the start of a second research project.

- the student chooses a study mentor from the list of each Master programme to advise and discuss the contents of the individual degree programme, before sending a signed programme proposal for approval to the Board of Examiners.

- the tracks Biology of Ageing, Toxicology and Drug Disposition and Pharmacoepidemiology have designated mentors, as mentioned on the student portal.

- all elements of the individual programme must be approved by the Board of Examiners before their start.

- research projects, colloquium and essay must deal with different research subjects, must be supervised by a different examiner, and be approved of by the Board of Examiners.

- the subject of the SBP-track internship must be clearly related to the scientific domain of the chosen master programme (see Appendix I, 1). Therefore two examiners must be involved in the assessment of the internship: one SBP-examiner and one appointed examiner.

- ** electives: the student may choose:

    - to use 5 – 20 ECTS to extend a research project. In case a student has obtained an odd number of ECTS (due to a non-5 ECTS course), a research project may also be extended with less than 5 ECTS.

    - to include extra master courses (see appendix IV) or non-scheduled electives from the pharmacy master programme,

    - to include master courses from other relevant Life Sciences programmes, to repair specific deficiencies up to a maximum of 10 ECTS,
    - to perform a research assignment of 5, 10, 15 or 20 ECTS.

  One may extend the research project with 5 -10 ECTS during the midterm review only.

Additional requirements for Biomedical Sciences

Additional requirements for the research track Biology of Ageing:

- topics of both research projects are chosen within the biology of ageing research area,
- 20 ECTS master courses are filled with the following courses:
  a. Courses (10 ECTS)

Course unit	ECTS
Current themes in healthy ageing	5
Molecular biology of ageing and age-related diseases	5

  b. 10 ECTS from the following list of courses:

Course unit	ECTS
Advanced metabolism & nutrition	5
Immunology: from bedside to bench and back	5
Neurodegenerative diseases	5
Stem cells & regenerative medicine	5
Editing, regulating and targeting genomes with CRISPR-Cas9	5

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› **Additional requirements for Medical Pharmaceutical Sciences:**

a. The course unit Drug Development is compulsory all MPS students. This course is part of the 20 ECTS master courses.
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b. Additional requirements for the research track Toxicology and Drug Disposition:
- topics of both research projects are chosen within the toxicology and drug disposition research area,
- 20 ECTS master courses are filled with the following courses:
  a. Courses (15 ECTS):

Course unit	ECTS
Drug development	5
Molecular toxicology	5
Advanced pharmacokinetics	5

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  b. A minimum of 5 ECTS from the following list:

Course unit	ECTS
Pharmacovigilance	5
Animal and human experimentation*	5
Reproductive Toxicology and Epidemiology	5
Innovative dosage forms	5
Clinical toxicology	5

* In consultation with the study mentor students can either follow this course or the 4 ECTS course handling laboratory animals (ex. Art.9 Experiments on Animals Act).

c. Additional requirements for the research track Pharmacoepidemiology:

- the subject of the first research project is in the field of Pharmacoepidemiology. The other research project is chosen in another discipline within the domain of the master programme,
- 26 ECTS master courses are filled with the following courses:
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› a. Courses (26 ECTS):

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Course unit	ECTS
Drug development	5
Medical statistics	3
Basics in medicine	8
Pharmacoepidemiology UK*	5
Pharmacoepidemiology in practice	5

* students who accomplished the equivalent course far-epi (= farmacoepidemiologie) in their bachelor programme will be exempted from this requirement. The remaining 5 ECTS should be considered as 5 ECTS extra electives in their master programme.

- b. Suggested courses for ≤ 14 ECTS electives:

Course unit	ECTS
Advanced pharmacoepidemiology	5
Advanced topics in pharmacoepidemiology	5
Pharmaco-economics	5
Pharmacovigilance	5
Reproductive Toxicology and Epidemiology	5

Appendix IV Electives (art. 2.4)

Table 1-3 below list study elements that can be chosen as 'master courses' or 'electives' in Biomedical Sciences (BMS), Medical Pharmaceutical Sciences (MPS) or both. For up to date information regarding the courses, such as assessment, entry requirements and learning objectives, Ocasys is leading.
Table 4 and 5 list courses that can only be chosen as 'electives' in BMS, MPS or both (see column right). After consultation with the study mentor and approval of the Board of Examiners students may also choose from options available from other departments, other universities in the Netherlands or even abroad.

Table 1: Master courses available for Biomedical Sciences

Course	ECTS	Programme
Advanced metabolism & nutrition	5	BMS
Current themes in healthy ageing	5	BMS
Current themes in Biomedicine	5	BMS
Immunology: from bedside to bench and back	5	BMS
Molecular biology of ageing and age-related diseases	5	BMS
Neurodegenerative diseases	5	BMS
Scientific writing	5	BMS, MPS
Stem cells & regenerative medicine	5	BMS
Cancer Research	5	BMS
Nutrition in Medicine	5	BMS
Neurobiology of Nutrition	5	BMS
Professionalism in Science^	5	BMS, MPS
Microbiome, Diet & Health and Disease	5	BMS
Nutrition, Brain Development and Cognition	5	BMS
Editing, regulating and targeting genomes with CRISPR-Cas9	5	BMS
Introduction to Biomedical Sciences	10	BMS
From Big Data to Personalised Medicine	5	BMS, MPS

^Students who follow the SBP-track may only choose this course unit as part of the 'electives' not as part of the 'master courses'.

Table 2: Master courses available for Medical Pharmaceutical Sciences

Course	ECTS	Programme
Advanced pharmacoepidemiology	5	MPS
Advanced pharmacokinetics	5	MPS
Drug development	5	MPS, BMS
Advanced Topics in Pharmacoepidemiology	5	MPS
Industrial bioanalysis	5	MPS
Innovative dosage forms	5	MPS
Medicinal natural products	10	MPS
Molecular toxicology	5	MPS
› Pharmaceutical biology practical	5	MPS
Pharmaceutical biotechnology	5	MPS
Pharmaco-economics	5	MPS
Pharmacoepidemiology in practice	5	MPS
Pharmacoepidemiology UK*	5	MPS
Pharmacovigilance	5	MPS
Reproductive Toxicology and Epidemiology	5	MPS
Selected topics in molecular pharmacology	3	MPS

Clinical toxicology	5	MPS
Nanomedicine and nanosafety	5	MPS
Microbiological safety	1	MPS, BMS

Table 3: General Life Sciences master courses

Course	ECTS	Programme
Advanced light microscopy	5	BMS
Advanced imaging techniques	5	BMS
Advanced statistics	5	BMS
Animal and human experiment.: design, practice and ethics^	5	BMS, MPS
Behavioural pharmacology	5	BMS, MPS
Current Themes in Biomedicine	5	BMS
Introduction to the behavioural and cognitive neurosciences	4	BMS
Science & Business[#]	10	BMS, MPS
Science & Policy[#]	10	BMS, MPS
Orientation on international scientific careers	5	BMS, MPS
Programming in C^{++} for biologists	5	BMS
Radioisotopes in experimental biology	5	BMS, MPS

^ In consultation with the study mentor students can either follow this course or the 4 ECTS course handling laboratory animals, (ex. Art.9 Experiments on Animals Act). However, only one of these courses may be chosen as 'master course'.

[#] Students who follow the R-track may only choose one of these courses as part of the 'electives' not as part of the 'master courses'.

Table 4: Elective master courses organized by other Master Programmes

Course	ECTS	Programme
DNA micro-array analysis	5	BMS, MPS
Biocatalysis and green chemistry	5	BMS
Topics in enzymology	5	BMS, MPS
Food and Pharma Products and Processes	5	BMS, MPS
Science Communication Skills	5	BMS, MPS
Introduction to Research in Science Education and Communication	5	BMS, MPS
Tools and approaches of systems biology	5	BMS
Science Communication and Journalism	5	BMS, MPS
Science Education and Communication Design	10	BMS, MPS
iGEM (International Genetically Engineered Machine competition)*	20	BMS, MPS
Science and the Public	5	BMS, MPS

* Selection for this competition takes place in winter time, an advertisement about application details will be announced via the student portal during the academic year.

Table 5: Elective master courses organised by The Donald Smits Center for Information Technology:

Course (max 2 ects per individual programme^)	Half day unit^	Programme
Access basic	5	BMS, MPS
Excel basic	5	BMS, MPS
Excel data bases en draaitabellen[a]	1	BMS, MPS

[a] These modules are instructed in Dutch

^ A minimum of 5 half day units is required for a study load of 1 ECTS, for 2 ECTS 11 units are needed. These courses have additional costs (low student tariff), which are at the student's own expenses. These courses are not available in Ocasys. Please consult the Donald Smits Center for further information, time schedules and enrolment details.

Appendix V Entry requirements and compulsory order of examinations (art. 3.4)

Course unit	Entry requirement
Research project	Safe Microbiological Technique certificate
Colloquium	Research project
Research project 2	Research project
Internship Science Business & Policy	Research project + courses Science & Business and Science & Policy

Appendix VI Admission to the degree programme and the different track/specializations (art. 5.1.1 + art. 5.2)

1. Requirements for admission to the master degree in <u>Biomedical Sciences</u>

Holders of the following Bachelor's degrees from the University of Groningen are considered to have sufficient knowledge and skills and can be admitted to the Master's degree programme in Biomedical Sciences on that basis:

- a Bachelor's degree in Biology with one of the following majors:
  - Biomedische wetenschappen.
  - Gedrag & neurowetenschappen including/plus the courses bio-organische chemie, immunologie I and Moleculaire biologie en medische biologie.
  - Moleculaire levenswetenschappen plus the minor Biomedische wetenschappen/Gedrag & neurowetenschappen (including the courses receptorfarmacologie, immunologie I and moleculaire biologie en medische biologie).
- a Bachelor's degree in Life Science & Technology with one of the following majors:
  - Biomedische wetenschappen.
  - Gedrag & neurowetenschappen including/plus the courses bio-organische chemie, immunologie I and Moleculaire biologie en medische biologie.
  - Moleculaire levenswetenschappen plus the minor Biomedische wetenschappen/Gedrag & neurowetenschappen (including the courses receptorfarmacologie, immunologie I and moleculaire biologie en medische biologie).
  - Medisch farmaceutische wetenschappen plus the courses (farmaceutische/medische) microbiologie and neurobiologie.
- .

› Students lacking one or two of the above mentioned courses, may sometimes be admitted on the condition of including these courses within the electives of the master programme.

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Students with a comparable Bachelor's degree from another Dutch or foreign university, focusing on knowledge and skills at the interface of molecular and cellular biology, organic chemistry and biochemistry, integrative physiology and behaviour, and medical sciences, may also qualify for admission. However, admission is then granted on an individual basis by the Admission Board.

2. Requirements for admission to the master degree in <u>Medical Pharmaceutical Sciences</u>

Holders of the following Bachelor's degrees from the University of Groningen are considered to have sufficient knowledge and skills and will be admitted to the Master's degree programme in Medical Pharmaceutical Sciences on that basis:

- a Bachelor's degree in Pharmacy or Pharmaceutical Sciences.
- a Bachelor's degree in Life Science & Technology with one of the following majors:
  - Medisch farmaceutische wetenschappen.
  - Biomedische wetenschappen including/plus the courses receptorfarmacologie and geneesmiddel van target tot gebruik, or the minor farmaceutische wetenschappen.
  - Moleculaire levenswetenschappen plus the minor Biomedische wetenschappen/Gedrag en neurowetenschappen (including courses receptorfarmacologie and immunologie I), or the minor farmaceutische wetenschappen.
- a Bachelor's degree in Biology with one of the following majors
  - Biomedische wetenschappen including/plus the courses receptorfarmacologie and geneesmiddel van target tot gebruik, or the minor farmaceutische wetenschappen.
  - Moleculaire levenswetenschappen plus the minor Biomedische wetenschappen/Gedrag en neurowetenschappen (including courses receptorfarmacologie and immunologie I), or the minor farmaceutische wetenschappen

Students lacking one or two of the above mentioned courses, may sometimes be admitted on the condition of including these courses within the electives of the master programme.

Students with a comparable Bachelor's degree from another Dutch or foreign university, focusing on knowledge and skills at the interface of molecular and cellular biology, organic chemistry and biochemistry, and pharmaceutical sciences, may also qualify for admission. However, admission is then granted on an individual basis by the Admission Board.

Appendix VIII

Application deadlines for admission (art. 5.6.1)

Deadline of Application	**Non-EU students**	**EU students**
Nanoscience	February 1st 2018	May 1st 2018
Behavioural and Cognitive Neurosciences	May 1st 2018	May 1st 2018
Biomolecular Sciences (top programme)	May 1st 2018	May 1st 2018
Evolutionary Biology (top programme)	May 1st 2018	May 1st 2018
Remaining FMNS Masters	May 1st 2018	May 1st 2018

Decision deadlines (art. 5.6.3)

Deadline of Decision	**Non-EU students**	**EU students**
Nanoscience	June 1st 2018	June 1st 2018
Behavioural and Cognitive Neurosciences	June 1st 2018	June 1st 2018
Biomolecular Sciences (top programme)	June 1st 2018	June 1st 2018
Evolutionary Biology (top programme)	June 1st 2018	June 1st 2018
Remaining FMNS Masters	November 1st 2018	November 1st 2018