

Junior Sophister Genetics and Human Genetics – Course weights and exam structure (from 2007/08 onwards).

Note: Module numbers begin with GE31... and course numbers begin with GE30...

Annual examination papers (total: 30 ECTS units)	ECTS for module	Questions on exam paper†	
		single	either/or
Paper 1		Paper 1	
<i>Module GE3130 Human and medical genetics</i> , comprising these courses:	5		
GE3050 Medical genetics (PH, 16 lectures)		Q1, Q2	
GE3031 Extranuclear inheritance (TK, 8 lectures)			Q3a/b
GE3030 Quantitative trait analysis (DB, 8 lectures)			Q4a/b
<i>Module GE3140 Basic molecular mechanisms</i> , comprising these courses:	5		
GE3010 Transcription, translation and replication (KD, 16 lectures)		Q5	Q6a/b
GE3012 Recombination, repair and mutation (KD/RMcM, 16 lect.)		Q7	Q8a/b
Paper 2		Paper 2	
<i>Module GE3150 Evolution and systems biology</i> , comprising these courses:	5		
GE3026 Evolutionary genetics (KW/AMcL/DB, 24 lectures)		Q1, Q2	Q3a/b
GE3005 Genomics and systems biology (FW, 8 lectures)			Q4a/b
<i>Module GE3160 Molecular genetics</i> , comprising these courses:	5		
GE3013 Gene expression (KD/MR, 16 lectures)		Q5	Q6a/b
GE3036 Plant molecular genetics I (TK, 16 lectures)		Q7	Q8a/b
Paper 3		Paper 3	
<i>Module GE3170 Cellular and organismal genetics</i> , comprising these courses:	5		
GE3006 Neurogenetics (KM/MR, 16 lectures)		Q1, Q2	
GE3042 Molecular genetics of Drosophila (PL, 8 lectures)			Q3a/b
GE3096 Cell cycle (SM, 8 lectures)			Q4a/b
<i>*Module GE3180 Biochemistry, Immunology, Devel. Biol</i> comprising courses:	5		
BI3001 Proteins and enzymes (Amir Khan, 2 ECTS)		Q5	Q6a **
BI3005 Core Concepts of Immunology (Clair Gardiner, 2 ECTS)		Q7	Q6b **
BI3006 Signal transduction (Tim Mantle, 1 ECTS)			Q8a/b

Continuous Assessment modules (total: 30 ECTS units)	ECTS for module	ECTS for course
<i>Module GE3120 Practicals, data handling and bioinformatics</i>	20	
This module consists of these courses, which are all continuously assessed:		
GE3028 Bioinformatics (KW, 16 hours)		2
GE3025 Statistics in Genetics (MF, 16 hours)		2
GE3027 Computer programming for biologists (KH, 16 hours)		2
GE3070 Drosophila genetics practical (PL/MdeA, 32 hours)		4
GE3095 Medical genetics practical (MdeA, 24 hours,)		3
GE3020 Microbial and molecular genetics practical (MdeA, 32 hours,)		4
GE3094 Problems in genetics (AMcL/DMcC, 8 hours,)		1
GE3035 Molecular genetics techniques (FW, 8 lectures)		2
<i>Module GE3190 (Genetics) or GE3195 (Human Genetics): Reviews and oral presentation</i>	5	
<i>Modules GE3110 (Genetics) or GE3115 (Human Genetics)</i>	5	
Module GE3110 for Genetics students only:		
BI3025 Biochemical techniques practical (Mike McKillen, 24 hours)		3
GE3060 Tutorials and essays (FW/PL, 16 hours)		2
Module GE3115 for Human Genetics students only:		
GE3004 Science, philosophy and ethics (DMcC, 8 hours)		1
GE3051 Human pedigree analysis (MdeA, 16 hours)		2
GE3065 Tutorials and essays (DMcC 16 hours)		2

* Students taking the Broad Curriculum do not take the Biochemistry Module GE3180, but take 5 ECTS from Broad Curriculum instead.

† Exam questions are described as **single** or **either/or**. Single means that there is no choice within the question. Either/or means that the question will have two parts and you must answer either part A or part B. Both parts of an "either/or" question will come from the same course (except for the Biochemistry module; see Note ** below).

** Paper 3 Q6 will be an "either/or" question where the two parts of the question come from different courses (BI3001 and BI3005).

Junior Sophister Genetics and Human Genetics, exam paper formats.

The exam paper format changed from 2007/08 onwards, compared to previous years. The format in 2009/10 will be the same as in 2007/08 and 2008/09.

Sample exam papers in the new format are shown below. The questions in these samples are taken from previous exam papers, mostly 2006/07 (Old exam papers are available on the Web at <http://www.tcd.ie/local/>).

Paper 1 (3 hours)

Answer four questions in total: two from Q1-Q4 (*Module GE3130*) and two from Q5-Q8 (*Module GE3140*).

	Sample Questions (from previous exam papers)
Q1 GE3050 Medical genetics (PH)	Write on the development of genetic linkage and physical mapping techniques in human genetics.
Q2 GE3050 Medical genetics (PH)	Provide an outline of what you feel to have been some of the major developments in the field of human genetics since the beginning of the twentieth century.
Q3 Answer <u>either</u> Q3a GE3031 Extranuclear inheritance (TK) <u>or</u> Q3b GE3031 Extranuclear inheritance (TK)	Discuss the maternal inheritance of chloroplasts in the unicellular alga <i>Chlamydomonas</i> . Discuss the molecular basis of cytoplasmic male sterility (CMS) in plants.
Q4 Answer <u>either</u> Q4a GE3030 Quantitative trait analysis (DB) <u>or</u> Q4b GE3030 Quantitative trait analysis (DB)	Write an essay on the development of our knowledge of the cause of multifactorial diseases. Write on any two methods used to map the genetic loci which influence quantitative traits.
Q5 GE3010 Transcription, translation and replication (KD)	Discuss the role played by the DnaA protein in controlling the initiation of chromosomal replication in <i>Escherichia coli</i> .
Q6 Answer <u>either</u> Q6a GE3010 Transcription, translation and replication (KD) <u>or</u> Q6b GE3010 Transcription, translation and replication (KD)	Discuss with evidence the role of the alpha subunit in the functioning of bacterial RNA polymerase. How do upstream control elements and core promoter elements interact to control transcription? Illustrate your answer with examples when possible.
Q7 GE3012 Recombination, repair and mutation (KD's part of the course)	Discuss error prone DNA polymerases.
Q8 Answer <u>either</u> Q8a GE3012 Recombination, repair and mutation (KD's part of the course) <u>or</u> Q8b GE3012 Recombination, repair and mutation (RMcM's part of the course)	Compare and contrast the Holliday and Meselson-Radding models of homologous recombination in <i>Escherichia coli</i> . Discuss two of the following: (i) The role of oxidative mechanisms in DNA damage and mutation. (ii) The rate of mutation. (iii) Giving examples, describe how mutagens cause DNA damage.

Staff name initials:			
DB	Prof. Dan Bradley	DMcC	Prof. David McConnell
MdeA	Dr. Miguel deArce	AMcL	Dr. Aoife McLysaght
KD	Prof. Kevin Devine	RMcM	Dr. Ross McManus
JF	Dr. Jane Farrar	SM	Prof. Seamus Martin
PH	Prof. Pete Humphries	KM	Dr. Kevin Mitchell
TK	Prof. Tony Kavanagh	MR	Prof. Mani Ramaswami
ML	Prof. Mark Lawler	FW	Dr. Frank Wellmer
PL	Dr. Pablo Labrador	KW	Prof. Ken Wolfe

Paper 2 (3 hours)

Answer four questions in total: two from Q1-Q4 (*Module GE3150*) and two from Q5-Q8 (*Module GE3160*).

	<u>Sample Questions (from previous exam papers)</u>
Q1 GE3026 Evolutionary genetics (KW's part of the course)	Discuss the factors than can cause an allele's frequency to change in a population.
Q2 GE3026 Evolutionary genetics (AMcL's part of the course)	Discuss, with examples, the role of gene duplication in molecular evolution.
Q3 Answer <u>either</u> Q3a GE3026 Evolutionary genetics (AMcL's part of the course) <u>or</u> Q3b GE3026 Evolutionary genetics (DB's part of the course)	What is concerted evolution? How does it occur and what impact does it have on the evolution of gene families? Write on the concept of heritability and how it may be estimated.
Q4 Answer <u>either</u> Q4a GE3005 Genomics and systems biology (FW) <u>or</u> Q4b GE3005 Genomics and systems biology (FW)	(New course - No questions from previous years.) (New course - No questions from previous years.)
Q5 GE3013 Gene expression (KD/MR)	Discuss how gene expression can be regulated by controlling sigma factor expression and activity.
Q6 Answer <u>either</u> Q6a GE3013 Gene expression (KD's part of the course) <u>or</u> Q6b GE3013 Gene expression (MR's part of the course)	Compare and contrast the regulation of tryptophan biosynthesis in <i>Escherichia coli</i> and <i>Bacillus subtilis</i> . List three mechanisms by which transcription factor activity is regulated in a cell. Provide a specific example of one transcription factor and its regulatory mechanism.
Q7 GE3036 Plant molecular genetics I (TK)	Discuss the role of phytochromes in light perception in plants.
Q8 Answer <u>either</u> Q8a GE3036 Plant molecular genetics I (TK) <u>or</u> Q8b GE3036 Plant molecular genetics I (TK)	Discuss the molecular basis of pathogen recognition and race-specific resistance in plants. Discuss the interaction between <i>Agrobacterium tumefaciens</i> and plant cells that leads to transfer of T-DNA.

Paper 3 (3 hours)

Answer four questions in total: two from Q1-Q4 (*Module GE3170*) and two from Q5-Q8 (*Module GE3180*).

(Students taking the Broad Curriculum are not registered for Module GE3180. They should only sit Paper 3 for 1.5 hours and only answer two questions from Q1-Q4. They sit separate exam(s) in their registered Broad Curriculum subjects for their remaining 5 ECTS units).

	<u>Sample Questions (from previous exam papers)</u>
Q1 GE3006 Neurogenetics (KM's part of the course)	(New course - No questions from previous years.)
Q2 GE3006 Neurogenetics (MR's part of the course)	(New course - No questions from previous years.)
Q3 Answer <u>either</u> Q3a GE3042 Molecular genetics of Drosophila (PL)	Describe how you would design a screen to identify lethal genes required for eye development in Drosophila.
<u>or</u> Q3b GE3042 Molecular genetics of Drosophila (PL)	What are modifiers of Position Effect Variegation? Discuss their role in heterochromatin formation.
Q4 Answer <u>either</u> Q4a GE3096 Cell cycle (SM)	Write an essay on growth factors with particular emphasis on how they regulate entry of a cell into the division cycle. Illustrate your answer with an example of a growth factor-initiated signal transduction cascade.
<u>or</u> Q4b GE3096 Cell cycle (SM)	Discuss the various controls that regulate entry of cells into the cell division cycle.
Q5 BI3001 Proteins and enzymes (Dr. Amir Khan)	Discuss the importance of the 'hydrophobic effect' in protein folding and stability, and the amino acids that contribute significantly to these interactions.
Q6 Answer <u>either</u> Q6a BI3001 Proteins and enzymes (Dr. Amir Khan)	Describe the different approaches that may be used for the assay of enzyme activities and their relative advantages and disadvantages.
<u>or</u> Q6b BI3005 Core Concepts of Immunology (course coordinator is Dr. Clair Gardiner)	Describe the role of cytotoxic effectors and their functions within the immune system.
Q7 BI3005 Core Concept of Immunology (course coordinator is Dr. Clair Gardiner)	Discuss the generation of different classes of antibodies.
Q8 Answer <u>either</u> Q8a BI3006 Signal transduction (Dr. Tim Mantle)	Receptor-tyrosine kinases can be classified into three groups: the PDGF receptor paradigm, a second group that have "divorced" the SH2 domain and a third group that have additionally divorced the tyrosine kinase moiety. Discuss.
<u>or</u> Q8b BI3006 Signal transduction (Dr. Tim Mantle)	G-protein coupled receptors (GPCRs), or RGE systems as they are sometimes described, link a wide variety of receptors (R) to a range of effector enzymes (E). Describe the activation of two effector enzymes and the associated downstream events.