APPROVED

PHAR S8013: Biomolecular Therapeutics and Bioinformatics

Module Details

Module Code:	PHAR S8013
Full Title:	Biomolecular Therapeutics and Bioinformatics APPROVED
Valid From::	Semester 1 - 2013/14 (September 2013)
Language of Instruction:	
Duration:	1 Semester
Credits::	7.5
Module Owner::	Arjan van Rossum
Departments:	Unknown
Module Description:	The aims of this module are: To provide students with a detailed understanding of current biopharmaceuticals (in development and in therapeutic use). To provide students with an in-depth understanding of genomics and genome sequencing projects, their significance and potential applications within the biopharmaceutical and related industries. To provide students with a comprehensive knowledge of the principles, background, benefits and applications of bioinformatics.

Module Learning Outcome	
On successful completion of this module the learner will be able to:	
#	**Module Learning Outcome Description**
MLO1	Describe and assess modern biotechnology and recombinant DNA/RNA technologies and their applications (theoretical and practical) in the production and development of a wide range of modern biopharmaceuticals
MLO2	Appraise the science and technology of therapeutic agents and gene therapy protocols and their application in the treatment of both inherited and acquired disorders.
MLO3	Critically analyse a relevant scientific article and present findings to peers.
MLO4	Evaluate and describe the applications, relevance, benefits and increasing importance of bioinformatics.
MLO5	Access relevant bioinformatics databases and search, analyse and evaluate the available information.

Pre-requisite learning
Module Recommendations *This is prior learning (or a practical skill) that is strongly recommended before enrolment in this module. You may enrol in this module if you have not acquired the recommended learning but you will have considerable difficulty in passing (i.e. achieving the learning outcomes of) the module. While the prior learning is expressed as named DkIT module(s) it also allows for learning (in another module or modules) which is equivalent to the learning specified in the named module(s).*
No recommendations listed

Module Indicative Content
Theory of modern (therapeutic) biopharmaceuticals: Incl. Cytokines, growth factors, antibodies etc. as biotherapeutics
Blood clotting: Blood clotting agents and clot lysis. Blood factor manufacture / purification and therapeutic use.
Therapeutic applications of molecular biology: Incl. siRNA / miRNA / RNAi, oligonucleotide therapy etc.
Delivery of biopharmaceuticals: Delivery methods for protein and nucleotide based therapeutics (incl. vectors).
Scientific data storage, analysis, integrity and dissemination: Genomics, gene targeting and genome sequencing projects. Laboratory Information Management System (LIMS): Importance of data storage and data integrity (in accordance with regulatory requirements for electronic records and signatures). Overview of scientific databases.
Sequence analysis methods: DNA & protein sequence analysis, incl. clustering techniques, pattern recognition protocols, similarity measures and their expression using software, predicting structures and functions of proteins.
Laboratory practicals: Many of the techniques are applicable to a range of biopharmaceutical products and so have a broad spectrum of merit. The following list is designed to serve as a resource of ideas for suitable practicals to illustrate key concepts and techniques. • Laboratory scale fermentation of recombinant E. coli producing a selected biopharmaceutical product. • Isolation and analysis of DNA (genomic/plasmid) from E. coli. • Cloning (and expression) of a gene. • Immunoaffinity purification of a blood product from plasma using immobilised anti-factor monoclonal antibody preparations. • Characterisation of a protein based biopharmaceutical by SDS-PAGE. • Biomolecular detection methods (e.g. ELISA).
Computer based practical work: Weekly practical sessions (computer based) will be used to deliver the practical aspect of the bioinformatics section, using appropriate DNA and protein analysis software and key databases.

Module Assessment

Assessment Breakdown	%
Course Work	50.00%
Final Examination	50.00%

Module Special Regulation

Assessments

Full Time On Campus

Course Work

Assessment Type	Practical/Skills Evaluation	**% of Total Mark**	25
Marks Out Of	0	**Pass Mark**	0
Timing	Every Week	**Learning Outcome**	1,2
Duration in minutes	0		

Assessment Description
The requirement to submit regular laboratory reports is intended to act as encouragement for students to focus on the laboratory work. Marks for these reports will be based on report writing skills as well as practical ability.

Assessment Type	Practical/Skills Evaluation	**% of Total Mark**	15
Marks Out Of	0	**Pass Mark**	0
Timing	Sem 1 End	**Learning Outcome**	5
Duration in minutes	0		

Assessment Description
Computer-based practical sessions will be used for bioinformatics (incl. clustering, similarity and alignment algorithms, predicting protein structure from sequence information). A computer-based 'bioinformatics project' type assessment will be used at the end of the semester.

Assessment Type	Presentation	**% of Total Mark**	10
Marks Out Of	0	**Pass Mark**	0
Timing	Every Week	**Learning Outcome**	3
Duration in minutes	0		

Assessment Description
Each student will be responsible for selecting a recent peer-reviewed article, from an internationally recognised journal, pertaining to their lecture course. This assignment will involve the critical analysis and presentation of the tutor-approved (relevant) scientific article (2-3 students each week). Each student will prepare a 10-minute presentation for the class. The chosen article will be reviewed, followed by a 5-10 minute group discussion about the article, led by the student.

No Project

No Practical

Final Examination

Assessment Type	Formal Exam	**% of Total Mark**	50
Marks Out Of	0	**Pass Mark**	0
Timing	End-of-Semester	**Learning Outcome**	1,2,4
Duration in minutes	0		

Assessment Description
End-of-Semester Final Examination

Reassessment Requirement

A repeat examination
Reassessment of this module will consist of a repeat examination. It is possible that there will also be a requirement to be reassessed in a coursework element.

Module Workload

Workload: Full Time On Campus

Workload Type	*Contact Type*	*Workload Description*	*Frequency*	*Average Weekly Learner Workload*	*Hours*
Lecture	Contact	No Description	Every Week	3.00	3
Practical	Contact	Laboratory-based (experiments)	Every Week	3.00	3
Tutorial	Contact	No Description	Every Week	1.00	1
Practical	Contact	Computer-based (bioinformatics)	Every Week	1.00	1
Directed Reading	Non Contact	No Description	Every Week	1.00	1
Independent Study	Non Contact	No Description	Every Week	3.00	3
				Total Weekly Learner Workload	12.00
				Total Weekly Contact Hours	8.00

This module has no Part Time On Campus workload.

Module Resources

Recommended Book Resources

Rho, J.P. and Louie, S.G.. (2007), Handbook of pharmaceutical biotechnology, Wiley-Interscience.

Hartwell, L.H., Hood, L., Goldberg, M., Reynolds, A., Silver, L. and Veres, R.. (2006), Genetics: From genes to genomes, 3rd. McGraw-Hill.

Walsh, G.. (2003), Biopharmaceuticals: Biochemistry and biotechnology, 2nd. Wiley.

Walsh, G.. (2007), Pharmaceutical biotechnology: Concepts and applications, Wiley.

Zvelebil, M.J. and Baum, J.O.. (2008), Understanding Bioinformatics, Garland Science.

Baxevanis, A.D. and Ouellette, B.F.F.. (2005), Bioinformatics: a practical guide to the analysis of genes and proteins, Wiley.

Rathore, A.S. and Sofer, G.K.. (2012), Process validation in manufacturing of biopharmaceuticals, 3rd ed.. CRC Press.

This module does not have any article/paper resources

Other Resources

Website, National Human Research Institute,
http://www.genome.gov/

Website, U.S. National Institutes of Health, Office of Biotechnology Activities,
http://www4.od.nih.gov/oba/

Website, Thrombosis advisor,
http://www.thrombosisadvisor.com

Website, National Centre for Biotechnology information,
http://www.ncbi.nlm.nih.gov/

Website, Ensembl Genome Database,
http://www.ensembl.org/index.html

Website, Swiss-Model protein structure homology-modeling server,
http://swissmodel.expasy.org/

Website, Wellcome Trust Sanger Institute,
http://www.sanger.ac.uk/

Link, Library Catalogue,
http://tinyurl.com/pxytw4h