APPROVED

AGRI S7009: Biology and Chemistry in Agriculture

Module Details

Module Code:	AGRI S7009
Full Title:	Biology and Chemistry in Agriculture APPROVED
Valid From::	Semester 1 - 2021/22 (September 2021)
Language of Instruction:	English
Duration:	1 Semester
Credits::	5
Module Owner::	• Lyubov Bragina • Joe McKeever
Departments:	Agriculture, Food and Animal Health
Module Description:	The main aims of this module are to deliver the basic concepts, theory and practical techniques of biological and chemical sciences, which are relevant to an agricultural scince based programme. Students will receive training in basic laboratory skills used in Biology,Chemistry and Biochemistry.

Module Learning Outcome	
On successful completion of this module the learner will be able to:	
#	**Module Learning Outcome Description**
MLO1	Appraise the basic concepts of biology and chemistry, atoms and elements formation, their physical characteristics, and molecular basis of life.
MLO2	Explain the fundamental principles of biological systems from the molecular and cellular aspect of an organisms
MLO3	Interpret the structure of organic molecules and biomolecules and practice nomenclature and drawing of these structures
MLO4	Critique the differences between prokaryotic and eukaryotic cells, and the main principles of genetics and inheritance pattern
MLO5	Explain the interaction between cells and their environments and the structures within the cells which are involved in these interactions
MLO6	Operate Good Laboratory Practice (GLP) for biological and chemical analyses of laboratory samples.

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
Biology: Cell structure and functions of macromolecules; kinetic and potential energy; chemistry of life and molecules of life, structure of large biological molecules; prokaryotic and eukaryotic cells; basic plant and animal cell structures, cellular organelles; principles of genetics, mitosis and meiosis, transcription and translation, inheritance pattern; proteins synthesis, enzymes, molecules of energy; photosynthesis and cellular respiration (aerobic, anaerobic and fermentation); plant physiology (function and reproduction); interaction between cells and their environment and structures within the cells which are involved in these interactions; diversity of life and evolution, introduction to ecology.
Chemistry: Periodic table of elements (groups, periods, family), atomic structure, atoms and elements, atomic and ionic sizes; chemical bonding of elements (ionic and covalent); elements and their physical characteristics; physical mixture versus chemical compounds; expression of chemical reactions; balancing chemical equations (atoms, moles, density, chemical prefixes, international system of units (SI Units), molarity, PPM and % solutions); scientific measurements (precision, accuracy, uncertainly in measurements, significant figures and rounding); acids and base reactions, strong and weak acids, pH of strong and weak acids/bases; pH (pH definition, scale and calculation, buffering capacity, soil/natural waters pH, soil pH requirements); titration (acid-based titration, precipitation titration, redox titration); redox reactions; indicators and buffer solutions; chemistry in aqueous solutions; factors affecting chemical reaction (physical state, concentration, temperature, catalytic influences, and pressure) classification of organic compounds based on functional groups, structure, bonding and physical properties (boiling points and solubility); different types of biomolecules (amino acids, proteins, carbohydrates, fats, enzymes and vitamins).
Practicals: During the practical sessions students will learn fundamental Good Laboratory Practices used in Biology, Chemistry, and Biochemistry, including microscopy, pipetting techniques and making up solution testing accuracy and repeatability, making up solutions, concentration calculation, titration, DNA extraction and analysis, enzyme activity, protein extraction and analysis, determination of glucose concentrations. These practicals will be applied to agri-environmental science and food science.

Module Assessment

Assessment Breakdown	%
Course Work	30.00%
Practical	20.00%
Final Examination	50.00%

Module Special Regulation

Assessments

Part Time On Campus

Course Work

Assessment Type	Class Test	**% of Total Mark**	30
Marks Out Of	0	**Pass Mark**	0
Timing	S1 Week 10	**Learning Outcome**	1,2,3,4,5
Duration in minutes	0		

Assessment Description
Examination to test learning outcomes for topics covered to date.

No Project

Practical

Assessment Type	Practical/Skills Evaluation	**% of Total Mark**	20
Marks Out Of	0	**Pass Mark**	0
Timing	S1 Week 4	**Learning Outcome**	6
Duration in minutes	0		

Assessment Description
Application of biology and/or chemistry techniques. A shared assessment with Mathematics and Physics, Soil Science & Sustainable Farming, and Biology & Chemistry in Agriculture will include a statistical analysis of laboratory data (standard deviation, % error, mean etc.)

Final Examination

Assessment Type	Formal Exam	**% of Total Mark**	50
Marks Out Of	0	**Pass Mark**	0
Timing	End-of-Semester	**Learning Outcome**	1,2,3,4,5
Duration in minutes	0		

Assessment Description
End of semester 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.

Reassessment Description
Resubmit assignments/ reattend practical if necessary/ repeat exam as decided by the Exam Board.

Module Workload

This module has no Full Time On Campus workload.

Workload: Part Time On Campus

Workload Type	*Contact Type*	*Workload Description*	*Frequency*	*Average Weekly Learner Workload*	*Hours*
Lecture	Contact	Interactive lectures on indicative contect.	Every Week	2.00	2
Practical	Contact	Practical lab sessions on basic biology and chemistry principles.	Every Week	0.50	0.5
Online Contact	Contact	1 hour online activity every 2 weeks.	Every Week	0.50	0.5
Directed Reading	Non Contact	No Description	Every Week	2.00	2
Independent Study	Non Contact	No Description	Every Week	2.00	2
				Total Weekly Learner Workload	7.00
				Total Weekly Contact Hours	3.00

Module Resources

Recommended Book Resources

Campbell N. A and Reece J.B. (2008), Biology, 8. San Francisco, Cal. USA, [ISBN: 9780321536167].

Stoffels, S.. (2002), Essentials of General, Organic and Biological Chemistry, 1. Brooks/Cole Pub Co, p.534, [ISBN: 97806181928].

Raymond Chang,Jason Overby. Chemistry, [ISBN: 9781260085310].

Hames, D.. (2011), Biochemistry (BIOS instant notes in biochemistry), 4. Taylor & Francis, New York, USA, p.473, [ISBN: 9780415608459].

Supplementary Book Resources

Carter, M. R. and Gregorich, E. G.. (2007), Soil sampling and methods of analysis, 2. Canadian Society of Soil Science, Canada, [ISBN: 9780849335860].

Weathers, K.C., Strayer, D.L. and Likens, G.E.. (2012), Fundamentals of ecosystem science, 1. Academic Press, Amsterdam: Elsevier Ltd, p.326, [ISBN: 9780120887743].

Recommended Article/Paper Resources

Muro, E., Ekin Atilla-Gokcumen, G., and Eggert, U.S.. (2014), Lipids in Cell Biology: How Can We Understand Them Better?, Molecular Biology of the Cell, vol. 25, p.1819, https://www.molbiolcell.org/doi/10.1091/ mbc.e13-09-0516

Travers, A. and Muskhelishvili, G.. (2015), DNA Structure and Function, The FEBS Journal, vol. 282, p.2279, https://febs.onlinelibrary.wiley.com/doi /full/10.1111/febs.13307

Teruya, N., Zhao, Y., Yamagata, Y., Hua, Y.-J., and Yang, W.. (2012), Watching DNA Polymerase η Make a Phosphodiester Bond., Nature, vol. 487, no 7406, p.196, https://www.nature.com/articles/nature11 181

Dill, K. A., Ozkan, S. B., Shell, M. S., and Weikl, T. R.. (2008), The Protein Folding Problem, Annual Review of Biophysics, 37, p.289, https://www.annualreviews.org/doi/10.114 6/annurev.biophys.37.092707.153558

Other Resources

https://www.khanacademy.org, Khan Academy online learning platform. Khan Academy online learning platform.

https://www.sciencedirect.com, Journal Search Database: Science Direct. Journal Search Database: Science Direct.

https://www.elsevier.com, Journal Search Database: Elsevier. Journal Search Database: Elsevier.

https://www.jove.com, Online learning platform. Online learning platform.