SEMESTER LEARNING PLAN

The Chemistry Masters Study Program (Magister (S2) Kimia)

FACULTY OF MATHEMATICS AND NATURAL SCIENCE

BENGKULU UNIVERSITY

Identity of Subject			**Identity of Lecturer**		
Subject Code	:	MIK-252	Lecturer Name	:	Prof. Dr. Morina Adfa, S.Si., M.Si and Dr. Eni Widiyati, MS
Subject	:	**BIOACTIVITY OF NATURAL PRODUCT AND SYNTHETIC MATERIAL**	Group	:	Organic Chemistry
Semester Credit Unit	:	2			
Semester	:	1 or 2			
Required subjects	:	-			

Graduate Learning Outcome (*Capaian Pembelajaran Lulusan/CPL*)

CPL Code		**Components CPL**
S-9	:	Demonstrate a responsible attitude towards work in their area of expertise independently
KU-1		Able to apply logical, critical, systematic and innovative thinking in the context of developing or implementing science and technology that pays attention to and applies humanities values in accordance with their field of expertise
KU-2	:	Able to demonstrate independent, quality and measurable performance
Scientific Study Material	:	Organic Chemistry
Capaian Pembelajaran Mata Kuliah/CPMK (*Course Learning Outcome*)	:	Students having an ability to mention concept of bioactivity, bioactivity of natural ingredients and synthetic compounds as sunscreen, anti-microbial (bacteria and fungi), antioxidant, cytotoxic (Brine shrimp lethality test), anti-malarial, anti-diabetic (hypoglycemic agents), anti-cancer, and botanical insecticides (anti-termite, antifeedant, attractant, repellent) in vivo, in vitro, and in silico. Students having an ability to explain the requirements of chemical compounds that can function as sunscreens, or antioxidants and their mechanism of action. Can give examples of chemical compounds that function as sunscreens or antioxidants. Can explain how to determine the presence of activity as a sunscreen or antioxidant from a preparation/chemical. Can give examples of some natural ingredients that function as sunscreens or antioxidants. Can present the results of international journal studies on sunscreens and/or antioxidants. Students having an ability to explain the meaning of antimicrobials (antibacterial and antifungal), antimicrobial test methods, the mechanism of action of a material as an anti-microbial. Can explain examples of natural and synthetic compounds that function as anti-bacterial and antifungal. Can

		present and explain international journals about anti-bacterial, and antifungal. Can explain the meaning of LC_{50}, LD_{50}, and IC_{50}. Can explain the cytotoxic activity with *Arthemia salina* Leach (BSLT) and Zebra fish, Probit analysis and Abbort formula. Can explain some activity tests as natural insecticides, including test of killing power against termites, test of anti-feeding activity against termites. Students having an ability to explain examples of some natural materials and synthetic materials that function as insecticides including termiticides, antifeedants, attractants, and repellents. Having an ability to explain several methods of testing insecticidal activity. Can explain about natural ingredients that have anti-malarial, anti-diabetic (hypoglycemic agents) and anti-cancer activities. Having an ability to explain how to investigate pre-clinical trials and clinical trials of drugs. Can explain the treatment of test animals, and can design Material Transfer Agreement documents.
Learning Experience	:	Students are taught about: Definition of bioactivity, bioactivity of natural ingredients and synthetic compounds as sunscreen, anti-microbial (bacteria and fungi), antioxidant, cytotoxic (*Brine shrimp lethality test*), anti-malarial, anti-diabetic (hypoglycemic agents), anti-cancer, and insecticide botanical (anti-termite, antifeedant, attractant, repellent) in vivo, in vitro, and in silico activities. Requirements for chemical compounds that can function as sunscreens, or antioxidants and their mechanism of action. Examples of chemical compounds that function as sunscreens or antioxidants. How to determine the presence of activity as a sunscreen or antioxidant from a preparation/chemical. Examples of some natural ingredients that function as sunscreen or antioxidants. Presentation of the results of an international journal review on sunscreens and/or antioxidants. Definition antimicrobials (antibacterial and antifungal), antimicrobial test methods, the mechanism of action of a material as an anti-microbial. Can explain examples of natural and synthetic compounds that function as anti-bacterial and antifungal. Can present and explain international journals about anti-bacterial, and antifungal. Can explain the meaning of LC_{50}, LD_{50}, and IC_{50}. Cytotoxic activity with *Arthemia salina* Leach (BSLT) and Zebra fish, Probit analysis and Abbort formula. He was taught about several tests of activity as a natural insecticide, including the test of killing power against termites, testing of antifungal activity against termites. Examples of some natural and synthetic materials that function as insecticides include termiticides, antifeedants, attractants, and repellents. Several methods of testing insecticidal activity Methods of pre-clinical trials and clinical trials of drugs. Can explain the treatment of test animals, and can design Material Transfer Agreement documents.
Reference list	:	1. Widiyati, E., 2015, Manufacture and characterization of cosmetic creams based on coconut oil and coconut shell charcoal, Dissertation, UGM. 2. Widiyati, E., Setiaji, B., Suharto, T., and Triyono, 2016, Effect of TiO 2 on the activity of sunscreen cream made from coconut oil, Seminar Proceedings, Lombok. 3. Hostettmann, K., 1991, Methods in plant biochemistry: Volume 6. Assays for bioactivity. Academic Press, London, UK. 4. Malone, M.H., 1983, The pharmacological evaluation of natural products—general and specific approaches to screening ethnopharmaceuticals, *Journal of ethnopharmacology*, *8*(2), pp.127-147. 5. Malone, M.H., 1977, Pharmacological approaches to natural product screening and evaluation. In *New natural products and plant drugs with pharmacological, biological or therapeutical activity*. Springer, Berlin, Heidelberg. 6. Article in reputable journal about sunscreen, antioxidant, antidiabetic, anticancer, antitermite, antimalarial, cytotoxic, antibacterial and antifungal activities. 7. Shaath, *et al*., 2005, Sunscreen

Step	Final ability	Subject	Reference	Learning methods	Time (minutes)	Assesment *	
						Indicator/ CPL code	Assessment technique /Percent
1	2	3	4	5		6	7
1	Applying learning rules and assessment components of subject	Introduction to the bioactivity of natural products and synthesis compounds, definition, scope of discussion, assessment and references	All references	Group discussion	2x50	Students Know: study rules, scope of discussion, assessment and references	Student activity
2	Students having an ability to explain the meaning of bioactivity, sunscreen, requirements for chemical compounds as sunscreen and mechanism of action	Definition of bioactivity, sunscreen, requirements for chemical compounds as sunscreens and their mechanism of action	Ref no. 1, 2, 6, 7	Group discussion	2x50	Students Know: - Definition of bioactivity - Definition of sunscreen, organic and inorganic sunscreen - requirements for chemical compounds as sunscreen - mechanism of sunscreen. Example of organic and inorganic sunscreen	Paper 5%
3	Students having an ability to determine preparations as sunscreens, some biological natural ingredients as sunscreens	How to determine extract as sunscreens, and some natural products ingredients as sunscreens	Ref no 1, 2, 6, 7	Group discussion	2x50	Students Know: Determining the sunscreen activity of preparations such as cosmetic creams by determining the UV absorption and determining the SPF value	Paper 8%
4	Students having an ability to explain the activity as a sunscreen from preparations containing inorganic and organic chemicals (journal review)	Sunscreen activity of inorganic and organic compounds (Journal review project)	Ref no 1, 2, 6, 7	Group discussion	2x50	Students Know: Sunscreen activity of cosmetic preparations containing inorganic/synthetic/organic sunscreen chemicals	Paper 8%

5	Students having an ability to explain the meaning of antioxidants, can give examples of some compounds that function as anti-oxidants and explain how antioxidants work	What are antioxidants, examples of some compounds that have antioxidants activity and mechanism action of antioxidant compounds	Ref no 1, 2, 6, 7	Group discussion	2x50	Students Know: Definition of antioxidants, examples of compounds that function as antioxidants, mechanism of action of antioxidants	Presentation and discussion 5%
6	Students having an ability to mention an examples of natural biological materials that contain anti-oxidants	Natural ingredients that contain antioxidants	Ref no 1, 2, 6, 7	Group discussion	2x50	Knowing: Antioxidant activity of natural ingredients containing secondary metabolites	Presentation and discussion 5%
7	Students having an ability to explain how to determine the presence of antioxidant activity in a preparation/ material	Methods for determining the antioxidant activity	Ref no 1, 2, 6, 7	Group discussion	2x50	Knowing: Determination of the antioxidant activity of a preparation/ingredient	Paper 8%
8	Mid-term	Mid-term		E-learning	2x50		Mid-term test 15%
9	Students having an ability to explain how to test cytotoxic activity with *Arthemia salina* and zebra fish, and can explain and analyze data using probit analysis and using the Abbort formula	Cytotoxic activity test with Arthemia salina and Zebra fish, analyze data with probit analysis and use the Abbort formula	Ref no 3, 4, 5, 6	Project base learning	2x50	Knowing: - Cytotoxic activity test with Arthemia salina Leach (BSLT), and Zebra fish - Probit analysis and Abbort equality. - LC_{50}	Paper 8%

10	Students having an ability to explain about natural ingredients that have anti-malarial, anti-diabetic (hypoglycemic agents) and anti-cancer activities. Can also explain some of these activity test methods	Natural ingredients that have antimalarial, antidiabetic (hypoglycemic agents) and anticancer activities, as well as several methods of testing these activities	Ref no 3, 4, 5, 6	Group discussion	2x50	Knowing: -Example of natural ingredients that have antimalarial, anti-diabetic (hypoglycemic agents) and anti-cancer activities -The methods of Antimalarial, antidiabetic, and anti-cancer activity - Example of organic compounds and inorganic synthetic that have anticancer activity - LD_{50}, LC_{50}	Presentation and discussion 5%
11	Students having an ability to explain several antibacterial and antifungal activity test methods, and can also explain some natural and synthetic materials (organic and inorganic) that have these activities	Test methods for antibacterial and antifungal activities, as well as several natural and synthetic materials (organic and inorganic) that have these activities (Review-Journal project's)	Ref no 3, 4, 5, 6	Group discussion	2x50	Knowing: - The methods of antibacterial and antifungal activity - Example of organic compounds and inorganic synthetic that have antibacterial and antifungal activity IC_{50}	Presentation and discussion 5%
12	Students having an ability to explain the classification of pesticides and how pesticides work, the history of pesticide use, the negative effects of synthetic pesticides	Classification of pesticides and how pesticides work, history of pesticide use, negative effects of synthetic pesticides	Ref no 3, 4, 5, 6	Group discussion	2x50	Knowing: - Classification of pesticides (such as insecticides, rhodenticides, fungicides, herbicides, molluscicides, nematicides, etc.) - History of pesticide uses - Negative effect of the use pesticide unwise - resistance and resurgence of pest	Presentation and discussion 5%

13	Students having an ability to explain some activity tests as natural pesticides, and some examples of natural materials and synthetic materials that have these activities	Some methods of biopesticides activity, and some examples of natural and synthetic materials that have this activity	Ref no 3, 4, 5, 6	Group discussion	2x50	Knowing: - Test of killing power activity (choice and no choice test), anti-eating, and repellence against termites - Test of larvicidal activity against mosquitoes that cause dengue fever and malaria - Examples of natural materials and synthetic materials that function as pesticides	Presentation and discussion 5%
14	Students having an ability to explain pre-clinical tests and clinical trials of a drug compound	Pre-clinical and clinical trials of a drug and ethical clearance	Ref no 3, 4, 5, 6	Group discussion	2x50	Knowing: - Pre-clinical drug test (pharmacodynamic test, pharmacokinetic test, toxicity, pharmaceutical test Method of drug clinical (phase I to phase IV)	Presentation and discussion 5%
15	Students having an ability to explain which test animals are suitable for each pre-clinical drug test, treatment of test animals, and can design and create a Material Transfer Agreement document	Animals for a pre-clinical drug test, treatment of test animals, and document Material Transfer Agreement	Ref no 3, 4, 5, 6	Group discussion	2x50	Knowing: - Ethical uses of animals test - Handling of animals test - Document *material transfer agreemen*t for research collaboration with foreign researchers	Test/7%
16	Final exam	Final exam		E-learning	2x50		Final exam 10%