

PORTOFOLIO ENVIRONMENTAL CHEMISTRY

ACADEMIC YEAR 2019/2020 EVEN SEMESTER



**Course Coordinator:
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**CHEMISTRY DEPARTMENT
FACULTY OF MATHEMATICS AND SCIENCE
UNIVERSITAS NEGERI SURABAYA**

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A. SEMESTER LEARNING ACTIYITY PLAN

A.1. COURSE IDENTITY

Module Name	Environmental Chemistry
Module level	Bachelor
Abbreviation, if applicable	
Sub-heading, if applicable	-
Course included in the module, if applicable	-
Semester/term	7 th semester
Module coordinator(s)	Prof. Dr. Suyono, M.Pd
Lecturer(s)	Prof. Dr. Suyono, M.Pd Dr. Amaria, M.Si Dina Kartika Maharani, M.Sc Rusmini S.Pd, M.Si
Language	Indonesian
Classification within the curriculum	compulsory course
Teaching format/class hours per week during the semester:	3 hours lecturers (50 min per hours)
Workload:	1 CU for bachelor degree equals to 3 workhours per week or 170 minutes (50' face to face learning, 60' structured learning, and 60' independent learning). In one semester, courses are conducted in 14 weeks (excluding mid and end-term exam). Thus, 1 CU equals to 39.67 workhours per semester. One CU equals to 1.587 ECTS.
Credit points:	3 x 1.587 = 4,761 ECTS
Prerequisites course(s):	Instrumental Analysis, Organic Chemistry 3, Inorganic Chemistry 3
Targeted learning outcomes:	<ol style="list-style-type: none"> 1. Students have knowledge about the sources, reactions, displacement, effects, and changes of chemical species in the air, water and soil, the reciprocal effect of human activities on all of these, and Environmental Impact Analysis (AMDAL) 2. Students are skilled at using tools in conducting experiments on water quality parameters from the environment 3. Students have the ability to cooperate and are responsible for discussing knowledge about 1) sources, reactions, displacement, effects, and changes in chemical species in air, water and soil, 2) The reciprocal influence of human activities on all the so-called in no.1 and 3) Environmental impact analysis (AMDAL) 4. Students have the ability to communicate knowledge about 1) sources, reactions, displacement, effects, and changes in chemical species in the air, water and soil, 2) The reciprocal influence of human activities on all those


	mentioned in no. 1 and 3) Environmental impact analysis (AMDAL)
Content:	water pollutant soil pollutant air pollutant amdal (Environmental Impact Analysis)
Study / exam achievements:	Students are considered to be competent and pass if at least get 55 Final score is calculated as follows: 20% participation + 30% assignment + 20% middle exam (UTS) & 30% final exam (UAS) Table index of graduation <ul style="list-style-type: none"> ● A = 4 (85 ≤- >= 100) ● A- = 3,75 (80 ≤- < 85) ● B+ = 3,5 (75 ≤- < 80) ● B = 3 (70 ≤- < 75) ● B- = 2,75 (65 ≤- < 75) ● C+ = 2,5 (60 ≤- < 65) ● C = 2 (55 ≤- < 60) ● D = 1 (40 ≤- < 55) ● E = 0 (0 ≤- < 40)
Media:	Computer, LCD, White board, laboratory, book, practicum guide book, wastewater treatment plant
Learning Methods	Individuals assignment, group assignment, discussion, presentation, practicum, observation, project based learning
Literature:	<ol style="list-style-type: none"> 1. De, anil Kumar. 1987. <i>Environmental Chemistry</i>. India: Willey Eastern Limited. 2. Faust, S.D and Aly, O.M.1981. <i>Chemistry of Natural Water</i>. London: Ann Arbor Science. 3. Manahan, S.E. 1994. <i>Environmental Chemistry</i>. London: Lewis Publishers CRC Pres.Inc 4. More,J.W. and More,E.A.,1976. <i>Environmental Chemistry</i>. New York: Academic Press. 5. Radojevic, Miroslav and Bashkin, Vladimir N, 1999, <i>Practical Environmental Analysis</i>, Cambridge : Royal Society of Chemistry 6. Appropriate scientific articles
Note	Environmental chemistry covers the activities of theory, practicum, presentation, project, and observation

A.2. COURSE TOPIC

Study of 1) sources, reactions, displacement, effects, and changes of chemical species in the air, water, and soil, 2) Reciprocal influence of human activities on all those mentioned in no.1 and 3) Environmental Impact Assessment (AMDAL) accompanied by supporting laboratory activities so that

students are able to master related concepts, are skilled at using tools, are able to work together and can communicate their knowledge and skills scientifically.

A.3. COURSE PROGRAM

 UNESA	UNIVERSITAS NEGERI SURABAYA FACULTY OF MATHEMATICS AND NATURAL SCIENCE UNDERGRADUATE PROGRAMME OF CHEMISTRY					Document Code
SEMESTER LEARNING ACTIIVITY PLAN						
COURSE	CODE	Course Group	Credit Unit		Semester	Date
Environmental Chemistry			T=3	P=1	7	January 6 2020
AUTHORIZATION CHEMISTRY		Compiler	Coordinator		Head of Study Program	
		Prof. Dr. Suyono, M.Pd	Prof. Dr. Suyono, M.Pd		Dr. Amaria, M.Si.	
Learning Outcomes	Program Learning Outcomes (PLO)					
	PLO 1 (KNO-1)	Able to master the concepts of structure, dynamics and energy, as well as the basic principles of separation, analysis, synthesis, and characterization of micromolecular compounds and their applications				
	PLO 2 (KNO-2)	Able to master the basic principles and knowledge of how to operationalize instruments for the analysis and characterization of compounds, as well as utilizing ICT for modeling more specific molecules				
	PLO 5 (COM-1)	Able to apply logical, critical, systematic and innovative thinking in the context of the development or implementation of science and technology by observe and applying the value of humanities in accordance with the field of chemistry in solving problems				
	PLO 6 (COM-2)	Able to master the basics of the scientific method, designing and conducting research, compiling scientific reports and communicating them both verbally and in writing by utilizing information and communication technology				
	PLO 7 (SOC-1)	Able to build teamwork and have entrepreneurial skills that are environmental perspective, and make the right, honest and responsible decisions in solving problems of chemistry and have social sensitivity as a obligation of citizens and religious communities				
Course Learning Outcomes (CLO)						

	CLO1	Students have knowledge about the sources, reactions, displacement, effects, and changes of chemical species in the air, water and soil, the reciprocal effect of human activities on all of these, and Environmental Impact Analysis (AMDAL)
	CLO2	Students are skilled at using tools in conducting experiments on water quality parameters from the environment
	CLO3	Students have the ability to cooperate and are responsible for discussing knowledge about 1) sources, reactions, displacement, effects, and changes in chemical species in air, water and soil, 2) The reciprocal influence of human activities on all the so-called in no.1 and 3) Environmental impact analysis (AMDAL)
	CLO4	Students have the ability to communicate knowledge about 1) sources, reactions, displacement, effects, and changes in chemical species in the air, water and soil, 2) The reciprocal influence of human activities on all those mentioned in no. 1 and 3) Environmental impact analysis (AMDAL)
	Sub CLO	
	Sub-CLO1	Understanding the sources, reactions, transfer effects and changes of chemical species in water, preventive and curative measures, and the reciprocal effects of human activities on the air, water and soil environment
	Sub-CLO2	Understanding the sources, reactions, transfer effects and changes of chemical species in air, preventive and curative measures, and the reciprocal effects of human activities on the air, water and soil environment
	Sub-CLO3	Understanding the sources, reactions, transfer effects and changes of chemical species in soil, preventive and curative measures, and the reciprocal effects of human activities on the air, water and soil environment
	Sub-CLO4	Understanding ways to conduct environmental impact analysis/ EIA (AMDAL)
Brief Description of the Course	Study of 1) sources, reactions, displacement, effects, and changes of chemical species in the air, water, and soil, 2) Reciprocal influence of human activities on all those mentioned in no.1 and 3) Environmental Impact Assessment (AMDAL) accompanied by supporting laboratory activities so that students are able to master related concepts, are skilled at using tools, are able to work together and can communicate their knowledge and skills scientifically	
Study Materials: Learning Materials	<ol style="list-style-type: none"> 1. Water structure and physical properties, water microorganisms, chemical reactions in water, wastewater treatment systems and water quality parameters (chemical parameters: Pb, Hg, pH, chloride, Cd, organic, other metals, total solid, hardness, dye, pesticide, BOD, COD, detergent content; physical parameters: Water color, odor, turbidity, temperature; biological parameters: e-coli bacteria) 2. The structure of the atmosphere, the chemical composition of air, particulates in the air, chemical reactions in the air and research related to air (Pollutants carbon monoxide (CO), particulate matter (PM 10), Smog, Sulfur dioxide (SO₂), Volatile organics (VOC) and hydrogen sulfide (H₂S)) 	

	<ol style="list-style-type: none"> 3. Lithosphere structure, soil chemical composition, soil particulates, chemical reactions in soil and soil related research penelitian (Plastic pollutants, glass cans, metals, fertilizers, Styrofoam, and residual waste on the ground) 4. preparation of EIA and related legislation from within the country and from abroad 						
Reference	Main :						
	<ol style="list-style-type: none"> 1. Manahan, S.E. 1994. <i>Environmental Chemistry</i>. London: Lewis Publishers CRC Pres.Inc 2. Radojevic, Miroslav and Bashkin, Vladimir N, 1999, <i>Practical Environmental Analysis</i>, Cambridge : Royal Society of Chemistry 						
	Additional :						
	<ol style="list-style-type: none"> 1. De, Anil Kumar. 1987. <i>Environmental Chemistry</i>. India: Willey Eastern Limited. 2. Faust, S.D and Aly, O.M.1981. <i>Chemistry of Natural Water</i>. London: Ann Arbor Science 3. More, J.W. and More, E.A., 1976. <i>Environmental Chemistry</i>. New York: Academic Press. 4. Appropriate scientific articles 						
Lecturer	Prof. Dr. Suyono, M.Pd Dr. Amaria, M.Si Dina Kartika Maharani, M.Sc Rusmini S.Pd, M.Si						
Prerequisite courses	Instrumental Analysis, Organic Chemistry 3, Inorganic Chemistry 3						
Meetin g	The final ability of each activity	Assessment		Learning Forms, Learning Methods, Student Assignment		Reference	Rating Weight (%)
		Indicator	Criteria & Form	Offline	online		
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
1	<ul style="list-style-type: none"> - Understanding environmental chemistry in general - Understand the sources, reactions, transfer effects and changes of chemical species in water and the 	<ul style="list-style-type: none"> - Understanding environmental chemistry in general - Explaining the hydrosphere and research related to the aquatic environment 	<ul style="list-style-type: none"> Non test/ student activity observation sheet Essay writing test 		lecture, discussion, question and answer		

	mutual influence of human activities on the air, water and soil environment	- Explaining water quality parameters					
2	Understanding the sources, reactions, transfer effects and changes of chemical species in water and the mutual influence of human activities on the air, water and soil environment	<ul style="list-style-type: none"> - Understanding the sources, reactions, transfer effects and changes in chemical species of lead (Pb), and Mercury (Hg) in water as well as the reciprocal influence of human activities on the air, water and soil environment along with preventive and curative efforts - Practicing water quality parameters (Color, odor, pH, chloride) 	<ul style="list-style-type: none"> - Non test/ student activity observation sheet, presentation grading sheet - Non test/ assignment and report practicum 		<ul style="list-style-type: none"> - lecture, discussion, presentation, question and answer - practicum 		
3	Understanding the sources, reactions, transfer effects and changes of chemical species in water and the mutual influence of human activities on the air, water and soil environment	<ul style="list-style-type: none"> - Understanding the sources, reactions, transfer effects and changes in chemical species of polyan Cd, bacteria, in water and the reciprocal influence of human activities on the air, water 	<ul style="list-style-type: none"> - Non test/ student activity observation sheet, presentation grading sheet - Non test/ assignment and report practicum 		<ul style="list-style-type: none"> - lecture, discussion, presentation, question and answer - practicum 		

		<p>and soil environment along with preventive and curative measures</p> <ul style="list-style-type: none"> - Practicing water quality parameters (organic, metallic, total solid, hardness) 					
4	<p>Understanding the sources, reactions, transfer effects and changes of chemical species in water and the mutual influence of human activities on the air, water and soil environment</p>	<ul style="list-style-type: none"> - Understanding the sources, reactions, transfer effects and changes in chemical species of dyes, and pesticides in water as well as the reciprocal effects of human activities on the air, water and soil environment along with preventive and curative measures - Practicing water quality parameters (BOD, COD, detergent) 	<ul style="list-style-type: none"> - Non test/ student activity observation sheet, presentation grading sheet - Non test/ assignment and report practicum 		<ul style="list-style-type: none"> - lecture, discussion, presentation, question and answer - practicum 		
5	<p>Understanding the sources, reactions, transfer effects and changes of chemical species in air, preventive and curative measures, and the reciprocal effects of</p>	<p>Explaining about the atmosphere and research related to the air environment</p>	<p>Essay writing Test Non test/ student activity observation sheet,</p>		<p>lecture, discussion, , question and answer</p>		

	human activities on the air, water and soil environment						
6	Understanding the sources, reactions, transfer effects and changes of chemical species in air, preventive and curative measures, and the reciprocal effects of human activities on the air, water and soil environment	Understanding the sources, reactions, transfer effects and changes in chemical species of carbon monoxide (CO), particulate matter (PM 10) and Smog in the air and the reciprocal effects of human activities on the air, water and soil environment along with preventive and curative measures	Non test/ student activity observation sheet, presentation grading sheet		lecture, discussion, presentation, question and answer		
7	Understanding the sources, reactions, transfer effects and changes of chemical species in air, preventive and curative measures, and the reciprocal effects of human activities on the air, water and soil environment	Understanding the sources, reactions, transfer effects and changes in chemical species of Sulfur dioxide (SO ₂), Volatile organics (VOC) and hydrogen sulfide (H ₂ S) in the air and the mutual influence of human activities on the air, water and soil environment accompanied by preventive and curative measures	Non test/ student activity observation sheet, presentation grading sheet		lecture, discussion, presentation, question and answer		

8	Mid-Term Exam						
9	Understanding the sources, reactions, transfer effects and changes of chemical species in soil, preventive and curative measures, and the reciprocal effects of human activities on the air, water and soil environment	Explaining the lithosphere and research related to the soil environment	Essay writing Test Non test/ student activity observation sheet,		lecture, discussion, question and answer		
10	Understanding the sources, reactions, transfer effects and changes of chemical species in soil, preventive and curative measures, and the reciprocal effects of human activities on the air, water and soil environment	Understanding the sources, reactions, transfer effects and changes in chemical species from plastics, glass and metal cans, as well as fertilizers in the soil and the reciprocal effects of human activities on the air, water and soil environment along with preventive and curative measures	Non test/ student activity observation sheet, presentation grading sheet		lecture, discussion, presentation, question and answer		
11	Understanding the sources, reactions, transfer effects and changes of chemical species in soil, preventive and curative measures, and the reciprocal effects of human activities on the air, water and soil environment	Understanding the sources, reactions, transfer effects and changes in chemical species from styrofoam, detergents and residual waste in the soil and the reciprocal influence of human activities on the air, water and soil	Non test/ student activity observation sheet, presentation grading sheet		lecture, discussion, presentation, question and answer		

		environment along with preventive and curative measures					
12	Understanding ways to conduct environmental impact analysis/ EIA (AMDAL)	Explaining ways to conduct an environmental impact analysis (AMDAL) and applicable laws	Essay writing test		lecture, discussion, question and answer		
13	Understanding ways to conduct environmental impact analysis/ EIA (AMDAL)	preparation of EIA and related legislation from within the country and from abroad	assignment		Discussion, and survey		
14	Understanding ways to conduct environmental impact analysis/ EIA (AMDAL)	presentation of the results of the preparation of the AMDAL and the results of the survey	Non test/ student activity observation sheet, presentation grading sheet		lecture, discussion, presentation, question and answer		
15	Understanding ways to conduct environmental impact analysis/ EIA (AMDAL)	presentation of the results of the preparation of the AMDAL and the results of the survey	Non test/ student activity observation sheet, presentation grading sheet		lecture, discussion, presentation, question and answer		
16	Final Exams						100

A.4. MAPPING OF LEARNING OUTCOMES – COURSE OUTCOMES

A.4.1. The Expected Program Learning Outcomes (PLO) of Undergraduate Program of Chemistry (UPC)

ASPECTS	PLO	CODE
KNOWLEDGE	1. Able to master the concepts of structure, dynamics and energy, as well as the basic principles of separation, analysis, synthesis, and characterization of micromolecular compounds and their applications	KNO-1
	2. Able to master the basic principles and knowledge of how to operationalize instruments for the analysis and characterization of compounds, as well as utilizing ICT for modeling more specific molecules	KNO-2
SKIL	3. Able to master the principles of Occupational Health and Safety, manage laboratories and use their equipment, and operate instrumental of chemistry	SKI-1
	4. Able to design an activity to solve problems by implementing capabilities in the field of chemistry that refers to ecopreunership	SKI-2
COMPETENCIES	5. Able to apply logical, critical, systematic and innovative thinking in the context of the development or implementation of science and technology by observe and applying the value of humanities in accordance with the field of chemistry in solving problems	COM-1
	6. Able to master the basics of the scientific method, designing and conducting research, compiling scientific reports and communicating them both verbally and in writing by utilizing information and communication technology	COM-2
ATTITUDE AND SOCIAL	7. Able to build teamwork and have entrepreneurial skills that are environmental perspective, and make the right, honest and responsible decisions in solving problems of chemistry and have social sensitivity as a obligation of citizens and religious communities	SOC-1
	8. Able to adapt to various developments in chemistry, continue to develop and learn throughout long-life education, both formal and nonformal	SOC-2

A.4.2. The Education Program Objectives (PEOs) of Environmental Chemistry

PEO 1. Able to master the fundamental knowledge of chemistry, the basic principles of chemical instruments, laboratory organizations, Occupational Health and Safety, scientific methods, digital literacy to solve a problem in their profession/workplace (professional).

PEO 2. Able to improve higher-order thinking skills by analyzing, evaluating data, and being creative; communicating ideas, able to take the right initiatives, be good decision-makers, and have the ability to lead in relevant field workgroups

A4.3. Mapping of Program Learning Outcomes (PLO) – Education Program Objectives (PEOs)

	PLO 1 (KNO-1)	PLO 2 (SKI-1)	PLO 5 (COM -1)	PLO 6 (COM-2)	PLO 7 (SOC-1)
PEO 1	√	√	-		√
PEO 2	√	√	√	√	√

B. COURSE ASSESSMENT

B.1. Assessment Rubric

Cognitive Criteria

1. The ability to give answers correctly
2. The ability to provide argumentation according to theory
3. The ability to provide systematic explanations
4. The ability to solve problems comprehensively

B.2. Assessment System

Final Assessment Course with practicum

Practicum : 20%

Group/Individuals Assignment : 20%

Midterm examination : 30%

Final examination : 30%

Distribution of the weight of the ability of the test item

	PLO 1 (KNO-1)	PLO 2 (SKI-1)	PLO 5 (COM -1)	PLO 6 (COM-2)	PLO 7 (SOC-1)	Total
Practicum	10%	10%	20%	40%	20%	100%
Group/Individuals Assignment	30%	0%	0%	40%	30%	100%
Midterm examination	50%	10%	40%	0%	0%	100%
Final examination	50%	10%	40%	0%	0%	100%

Success Criteria of Program Learning Outcomes (PLO)

Excellent	$x \geq 80$
Good	$70 \leq x < 80$
Satisfy	$55 \leq x < 70$
Failed	$X < 55$

Final index for undergraduate program defined as follow:

Final Index	Range
A	4 (85 ≤ - ≥ 100)
A ⁻	3,75 (80 ≤ - < 85)
B ⁺	3,5 (75 ≤ - < 80)
B	3 (70 ≤ - < 75)
B ⁻	2,75 (65 ≤ - < 70)
C ⁺	2,5 (60 ≤ - < 65)
C	2 (55 ≤ - < 60)
D	1 (40 ≤ - < 55)
E	0 (0 ≤ - < 40)

C. COURSE DEVELOPMENT

C.1. Academic Year 2019/2020 Even semester

Parameter	∑ of person	Percentage
Number or students taking this subject	60	100%
Number of students who pass at first attempt (>B ⁻)	58	96.67%
Number of students who pass at first attempt (C ≥ - ≤ B ⁻)	0	0
Number of failed students after remedial (D & E)	2	3,33%

C.2. Problems Analysis

In 2019/2020 even semester academic year in the environmental chemistry course, there were 96,67 % of students who had passed the examination at the first attempt, and 3,33% failed student (D & E). One student got E. He did not submit assignments from the beginning to the end of the semester. He did not take midterms, and final semester exams too. One student got a D. He did not take the final exam because after UTS he was not present at the lecture so he was not allowed to take the final exam (attendance < 75%). So, it was thought that the learning strategy/methods still need to be improved to achieve higher results in the future. The average final score in 2019/2020 even semester is lower than before, due students have different characteristics, they difficult to cooperate with their group because in early pandemic situation all activities in online system so it not habit yet of them, therefore the have lack of average score.

C.3. Solutive Strategy

New teaching and learning methods should be developed for the next academic years, consisting of:

1. Redesigning the course material (PPT slides, course contents, etc.) to become more interesting and interactive to stimulate student's interest in this course.
2. Giving "lecture by online" to stimulate our students to learn about the next lecture topics.
3. Enhance the cooperative skills of students with exchange the methods and models of learning
4. Improve project assignment

D. APPENDICES

D.1. DOCUMENT OF COURSE ACTIVITY

D.1.1. Lecture's journal and student's attendance form siakadu.uneca.ac.id



KEMENTERIAN RISET, TEKNOLOGI, DAN PENDIDIKAN TINGGI
UNIVERSITAS NEGERI SURABAYA

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email : bakpk@unesa.ac.id

Aktivitas Perkuliahan

Nama Matakuliah : Kimia Lingkungan

Dosen :

RUSMINI (197906122005012001)

Kelas : 2017B

AMARIA (196406291991012001)

Jadwal & Ruang : C06.04.01-B (09.30 - 12.00) R.

SUYONO (196006201985031003)

RUDIANA AGUSTINI (196008101990022001)

No.	Tanggal	Pertemuan	Topik	Peserta	Status	Dosen
1	06-02-2020	Pertemuan ke 1	1. Kontrak belajar 2. Pendahuluan	29	Terjadwal	Rusmini
2	13-02-2020	Pertemuan ke 2	- Konsep Dan Ruang lingkup Kimia Lingkungan- Pencemaran air- Identifikasi pencemaran air	30	Terjadwal	Amaria
3	20-02-2020	Pertemuan ke 3	- Polutan polutan Cd, Pb, bakteri e-coli, dan polutan organik, fenol	30	Terjadwal	Amaria
4	27-02-2020	Pertemuan ke 4	- pewarna dan pestisida di air - BOD COD kadar detergen	30	Terjadwal	Rusmini
5	05-03-2020	Pertemuan ke 5	Polutan Zn, Hg, Pewarna dan minyak Struktur atmosfer komposisi kimia udara	29	Terjadwal	Amaria
6	12-03-2020	Pertemuan ke 6	1. Pencemaran udara	30	Terjadwal	Amaria
7	19-03-2020	Pertemuan ke 7	Polutan Sulfur dioksida (SO ₂) Volatil organik (VOC) dan hidrogen sulfida (H ₂ S) di udara	30	Terjadwal	Amaria
8	26-03-2020	Pertemuan ke 8	UTS bahan kajian pertemuan 1-7	30	Terjadwal	Amaria
9	02-04-2020	Pertemuan ke 9	Struktur litosfer komposisi kimia tanah partikulat di tanah reaksi-reaksi kimia di tanah dan penelitian terkait tanah	30	Terjadwal	Amaria
10	09-04-2020	Pertemuan ke 10	Polutan plastik kaleng kaca dan logam serta pupuk di tanah	30	Terjadwal	Rusmini
11	16-04-2020	Pertemuan ke 11	Polutan styrofoam detergen dan sampah residu di tanah	30	Terjadwal	Rusmini
12	23-04-2020	Pertemuan ke 12	Penyusunan Amdal dan	30	Terjadwal	Suyono

D.1.2. Sample of statement of examination official report (Scan Berita Acara Ujian MK)

D.2. SAMPLE OF STUDENT WORK

D.2.1. Sample of Test Paper



KEMENTERIAN PENDIDIKAN DAN KEBUDAYAAN
UNIVERSITAS NEGERI SURABAYA
FAKULTAS MATEMATIKA DAN ILMU PENGETAHUAN ALAM
JURUSAN KIMIA

Kampus Ketintang, Jalan Ketintang, Surabaya 60231
Telepon : +6231- 8298761, email: kimia@unesa.ac.id, Laman : <http://kimia.fmipa.unesa.ac.id>

FINAL EXAM 2019/2020 EVEN SEMESTER

Exam subject	: Environmental Chemistry
Department/ Faculty	: Chemistry/ FMNS
Program/Force	: Chemistry/ 2017
Day/Date	: Tuesday/ May 12, 2020
Time	: 100 minutes (07.00 – 08.40)
Lecturer	: Tim
Type of exam	: open books

INSTRUCTIONS!

1. **OPEN BOOK**
2. **ANSWERS HAND WRITTEN, PHOTOGRAPHED OR SCAN CLEARLY**
3. **FILE NAME: CLASS_NIM_NAME**
4. **ANSWER SHEET SENT TO THE LECTURER'S EMAIL: rusmini@unesa.ac.id**
5. **WORK CAREFULLY AND CORRECTLY**

QUESTION

1. The use of stereoform is still not overcome. There are still many uses of stereoform in everyday life for practical reasons and easy to obtain. Meanwhile, as a chemist, you understand that the current stereoform is not safe to use for food and is difficult to decompose by nature. As a chemist, what solutions can you give to overcome this stereoform problem?
2. Chemical fertilizers are very helpful for farmers in fertilizing plants. However, recently the use of chemical fertilizers has been criticized by many environmental activists. Explain why this can happen and explain how to solve the problem!
3. Explain in general preventive and curative measures against soil pollution!
4. Make a simple experimental design to test soil pollution (title, objectives, problem formulation, material tools, work procedures, data analysis techniques)!
5. In the COD test, KMnO_4 and $\text{K}_2\text{Cr}_2\text{O}_7$ were used. Both substances are oxidizing agents. Explain the role of each of these substances in the analysis of COD levels! Include appropriate reactions for each process!
6. A. In the wastewater treatment system at the WWTP, bioremediation techniques are used. Explain the advantages and disadvantages of this technique!

D.2.2. Sample of Student's Work

Nama : Meutia Asry

NIM: 17030234017

Kelas: KA 2017

UAS KIMIA LINGKUNGAN

10

1. Untuk mengatasi masalah penggunaan styrofoam, dapat menggunakan kemasan biofoam yang berbahan baku serat dari limbah pertanian dan pati, ini aman bagi kesehatan manusia, dan ramah lingkungan karena bisa terdegradasi atau terurai secara alami dalam tempo 15 hari, sehingga lebih aman bagi lingkungan.

15

2. Pupuk kimia banyak dikecam oleh ahli lingkungan karena banyaknya dampak negatif yang ditimbulkan dari penggunaan pupuk kimia.

Fosfat yang berada pada pupuk akan mengalami daur fosfor, dipindahkan dari tanaman ke hewan herbivora atau manusia yang selanjutnya akan dikonsumsi hewan karnivora atau manusia. Kandungan fosfor yang berlebih dapat mengganggu kesehatan manusia seperti kerusakan ginjal dan osteoporosis. Bahkan jenis fosfor putih juga dapat menyebabkan kulit terbakar dengan uapnya bisa menyebabkan kerusakan hati, jantung atau ginjal.

Pupuk yang mengandung nitrogen sebagai nitrat atau amonia menyebabkan cukup banyak nitrat yang diserap oleh tanaman. Apabila kandungan nitrat yang dikonsumsi oleh manusia cukup tinggi, maka nitrat tersebut direduksi menjadi ion nitrit. Ion nitrit diabsorpsi ke dalam darah dan masuk ke dalam eritrosit, kemudian mengoksidasi ion Fe^{2+} dalam hemoglobin (Hb) dan mengubahnya menjadi ion Fe^{3+} sehingga terjadi pembentukan MetHb. MetHb ini tidak sanggup lagi sebagai pembawa oksigen ke jaringan-jaringan sehingga terjadi kekosongan oksigen dalam darah (hipoksida) dan kemungkinan terjadi defisiensi oksigen dalam jaringan tersebut. apabila keadaan ini terus berlanjut, maka akan berakibat fatal bagi ternak dan menyebabkan kematian.

Zat-zat berbahaya yang terkandung dalam pupuk dapat diserap oleh akar tumbuhan dan akan disalurkan ke seluruh tubuh tumbuhan, sehingga bagian-bagian tumbuhan dapat mengandung zat-zat berbahaya tersebut, apabila dikonsumsi oleh manusia maka zat-zat tersebut akan masuk dalam tubuh manusia dan akan menimbulkan dampak berbahaya bagi tubuh.

3. Upaya preventif dan kuratif terhadap pencemaran tanah!

Preventif

- Memisahkan sampah

Pemisahan tempat sampah ini bertujuan agar sampah dapat lebih mudah diolah karena jenisnya yang sudah dibedakan. Tong sampah warna hijau adalah tempat sampah organik sampah inilah yang dijadikan bahan pupuk kompos seperti daun-daunan, bekas sayuran, dll.

Tong sampah warna kuning adalah tempat sampah non organik, seperti plastik bekas, gelas bekas air mineral kemasan jenis plastik dll. Dengan adanya tempat sampah ini dapat mempermudah pemanfaatannya sebagai kerajinan daur ulang atau didaur ulang di pabrik.

Tong sampah warna merah adalah tempat limbah B3 (Bahan Berbahaya dan Beracun), seperti sampah beling, kaca gelas beling, bekas detergen, obat nyamuk dll. Dengan adanya tempat sampah ini agar tidak membahayakan bagi orang lain.

Tong sampah warna biru khusus kertas. Salah satu manfaatnya adalah untuk mempermudah proses daur ulang kertas.

- Mengolah limbah sebelum dibuang ke lingkungan
- Reduce, Reuse, Recycle, Repair

Melakukan pengurangan/penghematan bahan yang berpotensi sebagai sampah (reduce), memanfaatkan ulang bahan (penanggulangan = reuse), pendaurulangan (recycle), dan melakukan pemeliharaan (repair).

Kuratif

- Guna memperbaiki tanah yang tercemar logam berat, untuk menurunkan kandungan logam berat dapat dilakukan melalui pemberian bahan organik, bakteri dan penggunaan tanaman pengikat logam berat.
- Bioremediasi in-situ dan ex-situ

Pada umumnya, teknik bioremediasi in-situ diaplikasikan pada lokasi tercemar ringan, lokasi yang tidak dapat dipindahkan, atau karakteristik kontaminan yang volatil.

Bioremediasi ex-situ merupakan teknik bioremediasi di mana lahan atau air yang terkontaminasi diangkat, kemudian diolah dan diproses pada lahan khusus yang disiapkan untuk proses bioremediasi.

4. Rancangan percobaan sederhana untuk menguji pencemaran tanah (judul, tujuan, rumusan masalah, alat bahan, prosedur kerja, tehnik analisis data).

Judul

Identifikasi tanah yang tercemar logam berat menggunakan instrumen *Atomic Absorption Spectroscopy* (AAS).

Tujuan

Untuk mengetahui cemaran logam berat dalam tanah dengan instrumen *Atomic Absorption Spectroscopy* (AAS)

Rumusan Masalah

Bagaimana cara mengidentifikasi tanah yang tercemar logam berat?

Alat Bahan

Alat : neraca analitik, meteran, tabung vixal, gelas ukur, kertas saring

Bahan : sampel tanah, asam nitrat, air bebas logam, aquades

Prosedur Kerja

Titik pengambilan sampel tanah sekitar 1 sampai 10 meter dari tempat pembuangan limbah industri. Sampel tanah yang diambil sebanyak 100 gram dari masing-masing titik pengambilan sampel.

Pengolahan sampel dilakukan dengan detruksi basah asam nitrat dengan mencampur sampel tanah hingga homogen dengan uritan detruksi sebagai berikut:

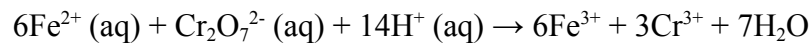
- Menimbang sampel tanah dengan teliti seberat 0,5 gram dengan menggunakan neraca analitik
- Memasukkan sampel ke dalam tabung vixal dan melakukan penambahan HNO_3 pekat sebanyak 15 ml
- Sampel yang telah ditambahkan HNO_3 pekat dimicrowave selama 1 jam.
- Pengujian kadar logam berat dilakukan dengan memindahkan larutan hasil detruksi basah ke dalam gelas ukur 50 ml. Selanjutnya mencuci tabung detruksi dengan air bebas logam dan masukkan ke dalam gelas ukur. Dinginkan, lalu tambahkan aquadest sampai tanda batas, dan menghomogenkan sampel hingga mendapatkan volume akhir sampel sebanyak 25 ml. Menyaring larutan dengan menggunakan kertas saring dan larutan siap dianalisa dengan menggunakan Spektrofotometri Serapan Atom (SSA).

Teknik Analisis Data

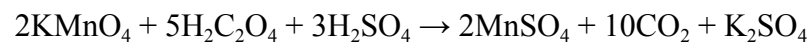
Dari hasil analisis menggunakan Spektrofotometri Serapan Atom (SSA) akan didapatkan nilai absorbansi dengan 3 kali pengulangan, nilai absorbansi yang didapat menunjukkan keberadaan logam berat pada sampel tersebut.

5. Peran KMnO_4 dan $\text{K}_2\text{Cr}_2\text{O}_7$ pada percobaan analisis kadar COD

- Agen pengoksidasi kalium dikromat ($K_2Cr_2O_7$) dalam percobaan kadar COD, digunakan untuk mengoksidasi zat-zat organik yang ada di perairan tersebut (Fe). $K_2Cr_2O_7$ bersama dengan asam sulfat dan indikator ferroin dititrasi oleh larutan FAS 0,0483 N (Ferro Ammonium Sulfat) $Fe(NH_4)_2(SO_4)_2$. Mula-mula larutan FAS akan bereaksi dengan jumlah total larutan $K_2Cr_2O_7$ dihasilkan warna larutan berubah menjadi hijau yang menandakan terbentuknya ion Cr^{3+} yang berwarna hijau. Titrasi dilakukan dengan cara mentitrasi sisa zat pengoksidasi (dikromat) sehingga akan diketahui jumlah COD dalam perairan dengan menggunakan indikator ferroin.



- $KMnO_4$ berperan sebagai oksidator sekaligus indikator
Larutan $KMnO_4$ adalah oksidator yang kuat sebagai titran dan berperan sebagai indikator. Kalium permanganate ini digunakan untuk menetapkan konsentrasi asam oksalat yang berlebih dengan perhitungan reaksi reduksi oksidasi.



6. Pengolahan limbah IPAL

a. Kelebihan dan kekurangan teknik bioremediasi

Kelebihan

- Bioremediasi sangat aman digunakan karena menggunakan mikroba
- Bioremediasi tidak menggunakan atau menambahkan bahan kimia berbahaya (ramah lingkungan)
- Tidak melakukan proses pengangkatan
- Teknik pengolahannya mudah diterapkan dan murah
- Dapat dilaksanakan di lokasi atau di luar
- Menghapus resiko jangka panjang

Kekurangan

- Tidak semua bahan kimia dapat diolah secara bioremediasi
- Membutuhkan pemantauan yang intensif
- Berpotensi menghasilkan produk yang tidak dikenal
- Membutuhkan lokasi tertentu

b. Di kolam effluent IPAL diberi ikan dan pada tanah di sekitar kolam effluent ditanami pohon mangga. Menurut anda apakah ikan dan mangga tersebut aman dikonsumsi?

Kolam effluent adalah kolam yang menampung air limbah olahan.

Menurut saya, ikan yang hidup dalam kolam effluent IPAL dan mangga yang tumbuh di sekitar kolam effluent tidak aman untuk dikonsumsi.

Ikan yang hidup di kolam effluent IPAL akan mengonsumsi zat-zat yang terkandung dalam kolam tersebut sebagai makanannya. Zat-zat yang dikonsumsi dapat merupakan bahan kimia berbahaya yang mungkin masih terkandung dalam effluent tersebut dan akan tertinggal dalam tubuh ikan. Apabila ikan tersebut dikonsumsi oleh manusia, maka kemungkinan besar zat-zat berbahaya yang ada dalam tubuh ikan juga akan masuk ke dalam tubuh manusia sehingga dapat menimbulkan dampak berbahaya bagi tubuh.

Begitu pula dengan pohon mangga yang hidup di sekitar kolam effluent tersebut, air dalam kolam effluent dapat masuk ke tanah dan diserap oleh akar tumbuhan, apabila air limbah tersebut masih mengandung sebagian kecil bahan kimia berbahaya, maka buah mangga yang dihasilkan juga dapat mengandung zat-zat berbahaya tersebut, apabila dikonsumsi oleh manusia maka zat-zat tersebut akan masuk dalam tubuh manusia dan akan menimbulkan dampak berbahaya bagi tubuh.

D.3. RECAPITULATION OF ASSESSMENT

D.3.1. Validate Test Item

The end-of-semester evaluation questions consist of six items in the form of essay questions analyzed content through experts in the appropriate field of Chemistry analyzed. Essay questions are validated with expert judgment in the course team members. The analysis was conducted by taking into account several aspects, namely the suitability of the questions with the course outcome, language, content and construct.

D.3.2 Evaluation Results of (Nama MK) □ Daftar Nilai (Excel dari SIAKADU)

No	NIM	Nama Mahasiswa	Angkatan	Kehadiran	Part	Tugas	UTS	UAS	NA	Huruf
1	15030234008	DHIEMAS FEBRYAN DWI CANDRA	2015	66.67 %	0	0	0	0	0	E
2	16030234005	SOFIA MADANI	2016	86.67 %	76	85,75	70	84	80,125	A-
3	16030234026	EDLYN AINAYYAH AN NABILAH	2016	66.67 %	78	84,5	70	0	54,95	D
4	17030234001	RIZKI AMALIA	2017	100%	87,5	85,75	72,5	83,5	82,775	A-

5	1703023400 3	DEWINTA INTAN LAILY	2017	100%	84	85,25	72,5	89	83,57 5	A-
6	1703023400 5	LISTYOWATI	2017	100%	81	84,5	71,5	84	81,05	A-
7	1703023400 7	ELMA ALFIANTI INDRI LESTARI	2017	100%	81	84,25	77	79	80,57 5	A-
8	1703023400 9	LAILATUL WAKHIDAH	2017	100%	81	85,5	86,5	87,5	85,4	A
9	1703023401 1	SHELA INSANUL HIKMAH	2017	100%	82,5	85,25	77,5	91,5	85,02 5	A
10	1703023401 3	PERINTIS GITA SUSANTI	2017	100%	81	85,25	71,5	86,5	82,02 5	A-
11	1703023401 5	SAVIRA AYU NINGTIAS	2017	100%	81	85,75	79	91	85,02 5	A
12	1703023401 7	MEUTIA ASRY	2017	100%	81	85,75	70	90	82,92 5	A-
13	1703023401 9	FIANTI DAMAYANTI	2017	100%	81	86	72,5	90,5	83,65	A-
14	1703023402 1	NUR WANDA AINI NATASYA	2017	100%	83	84	71	81,5	80,45	A-
15	1703023402 3	IKA NOVIANTI SAFITRI	2017	100%	81	85,25	70	84	80,97 5	A-
16	1703023402 5	LAILA ROIKHATUL JANNAH	2017	100%	84	86	78,5	90	85,3	A
17	1703023402 7	NAILIL HIDAYAH	2017	100%	81	86	70	86,5	81,95	A-
18	1703023402 9	RIZA RIFIYA NURUL MAWADDAH	2017	100%	81	84	70	91	82,7	A-
19	1703023403 3	IRENE CORNELIA CONSTANTY	2017	100%	81	84,75	72	89	82,72 5	A-
20	1703023403 7	JIHAN SHOFWATUL ISLAM DALILAH AZIZ	2017	100%	81	85	72	89,5	82,95	A-
21	1703023403 9	KELVIN RIO K.	2017	100%	83,5	85,25	76,5	82,5	82,32 5	A-
22	1703023404 1	MOCHAMMAD LUTHFI HAMDANI	2017	100%	83,5	85,25	72,5	90,5	83,92 5	A-
23	1703023404 2	JONATHAN ANGELO RANAMANGGALA	2017	100%	83,5	84,75	70	84	81,32 5	A-
24	1703023404 4	ALFIATUS SOLICHAH	2017	100%	81	85	72,5	82,5	80,95	A-
25	1703023404 6	NAFISA CAHYANI	2017	100%	80	85,25	73,5	84	81,47 5	A-
26	1703023405 0	AULIA HANAUL IZZAH	2017	100%	81	84,5	70	90,5	82,7	A-
27	1703023405 2	RIZKA DWI SAFITRI	2017	100%	80	84,75	71,5	85,5	81,37 5	A-
28	1703023405 6	WEKA FIRDA RIZKI NURZULLA	2017	100%	85	84,5	76,5	83	82,55	A-
29	1703023406 0	MAGDALENA BUTAR BUTAR	2017	100%	81	85,5	72,5	80	80,35	A-

30	1703023406 2	TRIFENA MEYSIA YUSUF	2017	100%	83,5	84	80	90,5	85,05	A
31	1703023400 2	AMALINA NUR FIDIYAH	2017	100%	81	83,25	72,5	90,5	82,82 5	A-
32	1703023400 4	DEVY PUSPITA SARI	2017	93.33 %	83,5	84,75	78	91,5	85,17 5	A
33	1703023400 6	NUR AIDA AMYLIANA	2017	100%	83,5	85,25	72,5	84,5	82,12 5	A-
34	1703023400 8	KUALA WIRIDA WENING	2017	100%	81	85,25	72,5	81,5	80,72 5	A-
35	1703023401 0	DICKY DHARMAWAN	2017	100%	85	84	75	80,5	81,35	A-
36	1703023401 2	DIMAS AYU YULIANTI	2017	100%	85	84,75	76	86,5	83,57 5	A-
37	1703023401 4	MUKHAMAD ROJIB AMINUDIN	2017	100%	85	84,5	71	91,5	84	A-
38	1703023401 6	BELA NUR WIDODO	2017	100%	81	84,5	70	89	82,25	A-
39	1703023401 8	RIZKA TAZKY AMALIA	2017	100%	83,5	82,25	70	77,5	78,62 5	B+
40	1703023402 0	JULIAN SAGUS BRAMASTA	2017	100%	81	84	77,5	81,5	81,35	A-
41	1703023402 6	FATIMATUZZAHRO	2017	100%	81	85	72,5	87,5	82,45	A-
42	1703023402 8	ESSA FEBRIANA	2017	100%	82,5	82,75	79	89	83,82 5	A-
43	1703023403 0	AINUN RACHMATINA ATQA	2017	100%	83,5	84,25	72,5	87	82,57 5	A-
44	1703023403 1	EUCHARISTIA OKTAVIA FIRDA LISTIADI	2017	100%	81	83,25	75	80	80,17 5	A-
45	1703023403 2	DHINI TRI WILUJENG	2017	100%	82,5	86	78,5	86,5	83,95	A-
46	1703023403 4	FIRLIA NUR FADILA	2017	100%	82,5	86	70	82,5	81,05	A-
47	1703023403 5	NORVIRIA TSALASATIN APRILIANI	2017	100%	82,5	84	71	88	82,3	A-
48	1703023403 6	EKA YULIA MAULIDAH	2017	100%	85	84	72	82,5	81,35	A-
49	1703023403 8	IANATUL KHAFIDLAH	2017	100%	81	83,25	71,5	84	80,67 5	A-
50	1703023404 0	QURROTA AYUN	2017	100%	82,5	84	79,5	86	83,4	A-
51	1703023404 3	ALIF WILDAN MOHAMMAD	2017	100%	81	82,75	76,5	81,5	80,77 5	A-
52	1703023404 5	ZEINUR ROCHMA FANDIS ROMADHON	2017	100%	83	85	79	90,5	85,05	A
53	1703023404 7	RIMBI RODIYANA SOVA	2017	100%	85	84,5	70	85,5	82	A-
54	1703023404 9	FIDELIA YUSTISIA ADRIANE	2017	100%	82,5	82,5	77,5	81,5	81,2	A-

55	1703023405 1	EMILISIA FATIMAH	2017	100%	83,5	85	72,5	85,5	82,35	A-
56	1703023405 3	TIA AYU NOVITASARI	2017	100%	85	83,75	70	87	82,22 5	A-
57	1703023405 5	AMELIA PUTRI DIVINDHA	2017	100%	81	83,5	76,5	89	83,25	A-
58	1703023405 7	EXCEL AIDA FRANSISKA	2017	100%	87,5	83,75	78,5	83	83,22 5	A-
59	1703023405 9	MARINDA MAYLIANSARISYAH PUTRI	2017	100%	82,5	84,75	70	86,5	81,87 5	A-
60	1703023406 1	FATIMATUZ ZAHROH	2017	100%	81	83,75	72,5	88	82,22 5	A-

D.3.3 Percentage of PLO achievements of environmental chemistry at Academic Year 2019/2020 even semester

PLO ASSESSMENT

Lecture : Environmental Chemistry
Code : 4720103107
Department : Chemistry Department
Total of Student : 59

	PLO-1	PLO-2	PLO-3	PLO-4	PLO-5	PLO-6	PLO-7	PLO-8
EXELENCE	58%	56%			47%	100%	100%	
GOOD	41%	42%			51%	0%	0%	
SATISFY	0%	0%			0%	0%	0%	
FALSE	2%	2%			2%	0%	0%	
	100%	100%	0%	0%	100%	100%	100%	0%

