

DEPARTEMEN KIMIA Gedung Kimia Wing 1 Lantai 3 Jl. Tanjung, Kampus Darmaga Bogor 16680 Telp/Fax (0251)8624567 Email: kimia@apps.ipb.ac.id; Website: http://chem.ipb.ac.id

SEMESTER LEARNING PLAN

KIM 1345 PHYSICAL CHEMISTRY PRACTICUM 2 (2-0)

INSTRUCTIONAL ANALYSIS

Learning Outcomes:

- 1. Can demonstrate the concepts of physical chemistry by doing lab work in the laboratory.
- 2. Skilled in using chemical instrumentation to support practicum and research activities
- 3. Can review and evaluate practicum results in accordance with the approach of chemistry, especially physical chemistry
- 4. Can complete chemical calculations contained in each practicum material correctly and precisely





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SEMESTER LEARNING PLAN

Course Name	: Physical Chemistry Practicum
Code/Credit	: KIM1345/2(2-0)
Semester	: Even (Semester 4)
Description	: This Physical Chemistry Practicum course is a compulsory course of the Chemistry Major Undergraduate Study Program related to Basic Chemistry courses that have been delivered in semester 2, as well as supporting other courses, such as Chemical Thermodynamics, Chemical Equilibrium, Quantum Chemistry and Spectroscopy, and Chemical Kinetics. This course is given to equip students to apply the basic concepts of Physical Chemistry by doing a practicum in the laboratory. The scope of the discussion and learning process is to use active learning through practicum and <i>cooperative learning</i> . The language of instruction used in this lecture is Indonesian.
Prerequisites course	: KIM1105 Basic Chemistry
Learning Outcomes	 Can demonstrate the concepts of physical chemistry by doing lab work in the laboratory. Skilled in using chemical instrumentation to support practicum and research activities in the field of Physical Chemistry Can review and evaluate practicum results in accordance with the approach of chemistry, especially physical chemistry Can complete chemical calculations contained in each practicum material correctly and precisely.
Scope and Curriculum map of RSC	:
Curriculum (RSC)2)	
Division/Field	: Physical Chemistry/Physical Chemistry
Lecturers	 1. Dr. Henny Purwaningsih, MSi (Coordinator) 2. Dr. Trivadila, MSi 3. Drs. Ahmad Sjahriza, MSi

¹¹⁾Tutorial/practicum activities are expressed in credits, not in the number of hours



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²⁾see Excel file: Chemistry Curriculum Map from RSC

	8	(== _) =====								
	Learning Outcomes	A1	A2	A3	B1	B2	B3	B4	C1	C2
А.	Knowledge	X	X	Х						
В.	Specific skills				X	X	X	X		
C.	General Attitudes and								×□	×□
	Skills									

Graduate Learning Outcomes (CPL) charged to Course Learning Outcomes (CPMK)



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I. LESSON PLAN

WEE	I FADNINC				STUDV	E	VALUATION		REFE
K OF	OUTCOMES	TOPIC	METHOD	TION	EXPERIENCE	CRITERION	INDICATOR	WEIG HT (%)	RENC ES
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
1	Can work in the laboratory by applying the principles of GOOD LABORATORY PRACTICES (GLP) and LABORATORY OCCUPATIONAL SAFETY AND HEALTH) for all experimental materials during the Midterm period	 a. Introduction to Physical Chemistry Laboratory b. GLP c. Laboratory Safety d. Explanation of I-V Materials 	Synchronous- /Offline Face-to- Face Lectures, including: a. Lecture b. Class Interactive Discussion c. Review of Discussion Results	3 × 60 minutes	 a. Gain insight and explanation of GLP, Lab Safety, and Material I to V through visual learning b. Interact with students and: ecturers Other students Teaching materials 	No assessment criteria	No assessment	None	
2-6	Can demonstrate THERMOCHEMI CAL CONCEPTS through practicum activities in the laboratory	MATERIALS IA and IB, IA, and IB a. Calorimeter Setting	Practicum (8-10 students per group)	2×60 min	Hard Skills Gain experience in practicing science empirically involving cognitive, effective, and especially psychomotor	MATERI IA 1.Knowing changes in the properties of calorimeters to heat. 2.Determine the calorimeter	 a. >90% of students can take the IA Material quiz b. >90% of students can properly demonstrate 	See Assessm ent Weights (Part III)	1-3



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b. Determination of Hydrogen Bond Strength		abilities by using facilities and infrastructure supporting learning in Chemical Thermodynamic Concepts available in the Physical Chemistry Laboratory Soft Skills: a. Activeness b. Cooperation c. Responsibility d. Discipline	setting as the basis for subsequent experiments.	 psychomotor work in the laboratory c. > 90% of students can prepare reports well using scientific writing rules d. >90 students can answer questions related to IA Material 		
		working according to procedures				
	2 × 60 min		MATERIAL IB 1. Shows that the strength of hydrogen bonds is less than the strength of covalent.	 a. >90% of students can take the IB Material quiz b. >90% of students can properly demonstrate psychomotor 	See Assessm ent Weights (Part III)	1-3



2-6	Can demonstrate	IC MATERIALS	Practicum (8-10	2 × 60	Hard Skills	 In the bonds that occur from a reaction can be measured in strength. IC MATERIAL 	laboratory c. >90% of students can prepare reports well using scientific writing rules d. >90 students can answer questions related to IB Material a. >90% of	See	1-3
	the STATE of GAS through practicum activities in the laboratory	Gaseous State: Determination of Vapor BJ and Gas Constant	students per group)	min	Gain experience in practicing science empirically involving cognitive, effective, and especially psychomotor abilities by using the facilities and infrastructure supporting learning in Gaseous State available in the	Determining the molar mass of a volatile liquid using the ideal gas equation and van der Waals gas	students can take the IC Material quiz b. >90% of students can properly demonstrate psychomotor work in the laboratory c. >90% of students can prepare reports well using	Assessm ent Weights (Part III)	



2-6	Can demonstrate	MATERIAL IIA	Practicum (8-10	3 × 60	Physical Chemistry Laboratory Soft Skills: a. Activeness b. Cooperation c. Responsibility d. Discipline e. Compliance in working according to procedures Hard Skills	MATERIAL	scientific writing rules d. >90 students can answer questions related to IC Material a. >90% of	See	1-3
	the ELECTROCHEMI CAL CONCEPT through practicum	and IIB Electrochemical	students per group)	min	Gain experience in practicing science empirically involving	IIA 1. Determining the number of Avogadro	students can take the Material IIA quiz	Assessm ent Weights (Part III)	
	activities in the laboratory	 a. Determination of Avogadro's number b. Transport Number Determination 			cognitive, effective, and especially psychomotor abilities by using facilities and infrastructure supporting learning Electrochemistry Concepts available in the Physical Chemistry Laboratory	 (N_o) 2. Practicing the concept of Avogadro's number (N_o) 	 b. >90% of students can properly demonstrate psychomotor work in the laboratory c. 90% of students can prepare reports well using 		



		Soft Skills: a. Activeness b. Cooperation c. Responsibility d. Discipline e. Compliance in working according to procedures		scientific writing rules d. >90 students can answer questions related to Material IIA		
	3 × mi	50 n	 MATERIAL IIB 1. Determine the number of Cu²⁺ and SO₄²⁻ transport 2. Get to know the visible light spectrophoto metry method 	 a. >90% of students can take the IIB Material quiz b. >90% of students can properly demonstrate psychomotor work in the laboratory c. 90% of students can prepare reports well using scientific writing rules d. >90% of students can 	See Assessm ent Weights (Part III)	1-3



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							answer questions related to IIB Material		
2-6	Can demonstrate the CONCEPT OF ELECTROLYTE SOLUTION through practicum activities in the laboratory	MATERIAL IIIA Buffer effects of ionic strength on pH buffers	Practicum (8-10 students per group)	3 × 60 min	Hard Skills Gain experience in practicing science empirically involving cognitive, effective, and especially psychomotor abilities by using facilities and infrastructure supporting learning the Concept of Electrolyte Solution available in the Physical Chemistry Laboratory Soft Skills: a. Activeness b. Cooperation c. Responsibility d. Discipline	 MATERIAL IIIA 1. Describes the effect of the ionic environment on pH buffers. 2. Demonstrate the use of pH meters and glass electrodes. 3. Measures the weak acid dissociation constant. 	 a. >90% of students can take the Material IIIA quiz b. >90% of students can properly demonstrate psychomotor work in the laboratory c. 90% of students can prepare reports well using scientific writing rules d. >90% of students can answer questions related to Material IIIA 	See Assessm ent Weights (Part III)	1-3



					e. Compliance in						
					working						
					according to						
2.6	0 1 4 4		D (* (0.10	0 (0	procedures	1	<u> </u>		. 000/ 6		1.2
2-6	the CONCEPT OF	MATERIAL IIIA	Practicum (8-10	3×60	Hard Skills	1.	Can explain	a.	>90% OI	See	1-3
		Globs equation	students per	min	Gain experience in		any of the		students can	Assessin	
	SURFACE AND		group)		practicing science		phenomena		lake the	ent Weighte	
	CULLUIDAL						that occur			(Dent III)	
	CHEMISTRY				involving		on the	հ	quiz	(Part III)	
	activities in the				cognitive, effective,	2	Con	U.	>90% 01		
	leboratory				neuchomotor	۷.	calculata		properly		
	laboratory				abilition by using		calculate		domonstrato		
					facilities and		avcass using		nevehomotor		
					infrastructure		the Gibbs		work in the		
					supporting		equation		laboratory		
					learning Surface		equation	C	90% of		
					and Colloidal			с.	students can		
					Chemistry				prepare		
					Concepts available				reports well		
					in the Physical				using		
					Chemistry				scientific		
					Laboratory				writing rules		
					5			d.	>90% students		
					Soft Skills:				can answer		
					a. Activeness				questions		
					b. Cooperation				related to		
					c. Responsibility				Material IIIB		
					d. Discipline						



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					e. Compliance in				
					working				
					according to				
					procedures				
2-6	Can demonstrate	MATERIAL IV	Practicum (8-10	3×60	Hard Skills	MATERIAL	a. >90% of	See	1-3
-	the CONCEPT OF	A and IVB	students per	min	Gain experience in	IVA	students can	Assessm	_
	CHEMICAL		group)		practicing science	a. Shows how	take the IVA	ent	
	KINETICS through	a. Speed of	8 1		empirically	the reaction	Material quiz	Weights	
	practicum activities	Reaction			involving	speed varies	b. >90% of	(Part III)	
	in the laboratory	between			cognitive, effective,	with the	students can	(
		Peroxydisulfate			and especially	concentratio	properly		
		and Iodide			psychomotor	n of the	demonstrate		
		b. Arrhenius			abilities by using	reagent.	psychomotor		
		Equation and			facilities and	b. Shows the	work in the		
		Activation			infrastructure	estimates	laboratory		
		Energy			supporting	used in the	c 90% of		
		2110185			learning of	differential	students can		
					Chemical Kinetics	method	prepare		
					Concents available	c Determine	reports well		
					in the Physical	the order of	using		
					Chemistry	the reaction	scientific		
					Laboratory	and calculate	writing rules		
					Lucoratory	its rate	d > 90% of		
					Soft Skills:	constant at a	students can		
					a Activeness	certain	answer		
					b. Cooperation	temperature	questions		
					c. Responsibility	temperature.	related to IVA		
					d. Discipline		Material		
					e. Compliance in				
					working				



					according to					
				3 × 60 min	procedures	MATERIAL IVB 1. Show how the reaction rate depends on temperature. 2. Calculate the activation energy (<i>E</i> _a) by using the Arrhenius equation.	a. b. c. d.	>90% of students can take the IVB Material quiz >90% of students can properly demonstrate psychomotor work in the laboratory 90% of students can prepare reports well using scientific writing rules >90% of students can answer questions related to IVB Material	See Assessm ent Weights (Part III)	
2-6	Can demonstrate the CONCEPT OF CHEMICAL	MATERIAL V Kinetics of ester hydrolysis	Practicum (8-10 students per group)	6 × 60 min	Hard Skills Gain experience in practicing science	a. Can determine the constant rate	a.	>90% of students can take the	See Assessm ent	1-3
	KINETICS through	· · ·			empirically	of methyl				



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	practicum activities				involving	acetate	Material V	Weights	
	in the laboratory				cognitive, effective,	hydrolysis	quiz	(Part III)	
					and especially	reaction	b. >90% of		
					psychomotor		students can		
					abilities by using	b. Can	properly		
					facilities and	estimate the	demonstrate		
					infrastructure	amount of	psychomotor		
					supporting	activation	work in the		
					learning of	energy of	laboratory		
					Chemical Kinetics	methyl acetate	c. 90% of		
					Concepts available	hydrolysis	students can		
					in the Physical	reaction	prepare		
					Chemistry		reports well		
					Laboratory		using		
							scientific		
					Soft Skills:		writing rules		
					a. Activeness		d. >90% of		
					b. Cooperation		students		
					c. Responsibility		answer		
					d. Discipline		questions		
					e. Compliance in		related to		
					working		Material V		
					according to				
					procedures				
7	Can:	MATERIALS I to	 Presentation 	6×60	Hard Skills	a. Can make	a. >90% of the	See	1-3
	a. review and	V	Group	min	Gain experience in:	presentation	group can	Assessm	
	evaluate the		discussion		(i) presenting a	S	present the	ent	
	experimental		Cooperative		result involving		results of the	Weights	
	results of		learning		empirical data, (ii)	b. Can conduct	experiment	(Part III)	
	Materials I to V				reviewing and	studies and	well		



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	using a chemical approach b. present the results of the study and evaluate it well				evaluating the resulting data to support learning in the field of Physical Chemistry Soft Skills: a. Activeness b. Cooperation c. Responsibility d. Discipline e. Leadership	evaluations of empirical data supported by knowledge that has been possessed	 b. >90% of groups make presentation materials well, systematically , and interestingly c. >90% of students have interactive discussions 		
8	Can work in the laboratory by applying the principles of GLP and LABORATORY OCCUPATIONAL SAFETY AND HEALTH for all Final Exam session experimental materials	a. b. c.	GLP Lab Safety Explanation of Materials VI to X	Synchronous- Off- Network/Offline Face-to-Face Lectures include: a. Lecture b. Class Interactive Discussion c. Review of Discussion Results	 a. Gain insight and explanation of GLP, Lab Safety, and Material I to V through visual learning b. Interact with students and: • Lecturers • Other students • Teaching materials 	No assessment criteria	No assessment	None	



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9-13	Can demonstrate	MATERIAL VI	Practicum (8-10	6×60	Hard Skills	1.	Study the	a. >90% of	See	1-3
	the CONCEPT OF		students per	min	Gain experience in		kinetics of	students can	Assessm	
	CHEMICAL	Kinetics of Ester	group)		practicing science		ester	take the	ent	
	KINETICS through	Saponification	0 17		empirically		saponificatio	Material VI	Weights	
	practicum activities	1			involving		n.	quiz	(Part III)	
	in the laboratory				cognitive, effective,			b. >90% of	× ,	
	5				and especially	2.	Determine	students can		
					psychomotor		the order of	properly		
					abilities by using		the ester	demonstrate		
					facilities and		saponificatio	psychomotor		
					infrastructure		n reaction.	work in the		
					supporting the			laboratory		
					learning of	3.	Determines	c. 90% of		
					Chemical Kinetics		the	students can		
					Concepts available		magnitude of	prepare		
					in the Physical		its ionic	reports well		
					Chemistry		conductivity.	using		
					Laboratory			scientific		
								writing rules		
					Soft Skills:			d. >90% of		
					a. Activeness			students can		
					b. Cooperation			answer		
					c. Responsibility			questions		
					d. Discipline			related to		
					e. Compliance in			Material VI		
					working					
					according to					
					procedures					



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9-13	Can demonstrate	MATERIALS	Practicum (8-10	3×60	Hard Skills	MATERIAI	a > 90% of	See	
7-15	the CONCEPT OF	VIIA and VIIR	students ner	3×00	Gain experience in	VIIA	students can	Assessm	
	CHEMICAL	a Change in	group)	111111	practicing science	Can determine	take the	ent	
	FOLIII IBRILIM	a. Change III Standard	group)		empirically	the change in	Material VIIA	Weights	
	through lab work in	Gibbs Free			involving	standard Gibbs		(Dart III)	
	the laboratory	Energy (ΛC^0)			involving	fraa anargy and	quiz	(1 at 111)	
	the faboratory	Ellergy (ΔG^{*})			cognitive, effective,	aquilibrium	0. >90% 01		
		anu Equilibrium			and especially	equilibrium			
		Equilibriuli Constant (K)			psycholitotor	following	property		
		Constant (K)			admittes by using	Tollowing	demonstrate		
					facilities and	reactions:	psychomotor		
		b. Effect of			infrastructure	$Zn + Cu^{2+} \rightleftharpoons$	work in the		
		Temperature			supporting learning	$Zn^{2+} + Cu$	laboratory		
		and			in the Concept of		c. 90% of		
		Concentration			Chemical		students can		
		on Galvanic			Equilibrium		prepare		
		Cells			available in the		reports well		
					Physical Chemistry		using		
					Laboratory		scientific		
							writing rules		
					Soft Skills:		d. >90% of		
					a. Activeness		students can		
					b. Cooperation		answer		
					c. Responsibility		questions		
					d. Discipline		related to		
					e. Compliance in		Material VIIA		
					working				
					according to				
					procedures				
				3×60		MATERIAL	a. >90% of	See	
				min		VIIB	students can	Assessm	



0.12				2 (2)		 Compiling the device of Galvanic cells from Zn + Cu²⁺ ≒ Zn²⁺ + Cu Observing the effect of concentratio n on galvanic cell potential Observing the effect of temperature on galvanic cell potential 	take the Material VIIB quiz b. >90% of students can properly demonstrate psychomotor work in the laboratory c. 90% of students can prepare reports well using scientific writing rules d. >90% of students can answer questions related to Material VIIB	ent Weights (Part III)	
9-13	the PASIC	MATERIAL VIII	Practicum (8-10	3×60	Hard Skills		a. >90% of	See	
	CONCEPTS OF	A Application of	students per	min	practicing science	VIIIA Determining the	the Material	Assessiii	
	OUNTERNUM	Application of Derticles in a 1D	group)		empirically	length of	VIIIA quiz	Weights	
		Particles III a TD			involving	neligui oi	v IIIA quiz b >0.0% of	(Dort III)	
	WECHANICS IN	DUX:			involving	poryene	U. >90% 01	(Part III)	
	in the laboratory	the Length of			cognitive, effective,	through a 1D	students can		
I	in the laboratory	the Length of			and especially	unougn a TD	property		



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		Polyene Compounds			psychomotor abilities by using facilities and infrastructure supporting learning Basic Concepts of Quantum Mechanics available in the Physical Chemistry Laboratory Soft Skills: a. Activeness b. Cooperation c. Responsibility d. Discipline e. Compliance in working according to	box system model	demonstrate psychomotor work in the laboratory C. 90% of students can prepare reports well using scientific writing rules d. >90% of students can answer questions related to Material VIIIA		
					working according to procedures				
9-13	Can demonstrate the CONCEPT OF IONIC SOLUTION through practicum activities in the laboratory	MATERIAL VIII B Determination of Salt Solubility by Conductometry	Practicum (8-10 students per group)	3 × 60 min	Hard Skills Gain experience in practicing science empirically involving cognitive, effective, and especially psychomotor abilities by using	MATERIAL VIIIB Apply the concept of conductivity of solutions to determine the solubility of salts that are	 a. >90% of students can take the Material VIIIB quiz b. >90% of students can properly demonstrate 	See Assessm ent Weights (Part III)	1-3



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					facilities and infrastructure supporting learning the Concept of Ionic Solution available in the Physical Chemistry Laboratory Soft Skills: a. Activeness b. Cooperation c. Responsibility d. Discipline e. Compliance in working according to procedures	difficult to dissolve at a certain temperature	psychomotor work in the laboratory c. 90% of students can prepare reports well using scientific writing rules d. >90% of students can answer questions related to Material VIIIB		
9-13	Can demonstrate the CONCEPT OF CHEMICAL THERMODYNAM ICS through practicum activities in the laboratory	MATERIAL IX Entropy and Enthalpy of Melting	Practicum (8-10 students per group)	6 × 60 min	Hard Skills Gain experience in practicing science empirically involving cognitive, effective, and especially psychomotor abilities by using facilities and infrastructure supporting learning	 a. Introduces the difference in the cooling curve of pure liquid and solution. b. Shows freezing point drop events caused by 	 a. >90% of students can take the Material IX quiz b. >90% of students can properly demonstrate psychomotor work in the laboratory 	See Assessm ent Weights (Part III)	1-3



					Chemical Thermodynamic Concepts available in the Physical Chemistry Laboratory Soft Skills: a. Activeness b. Cooperation c. Responsibility d. Discipline e. Compliance in working according to procedures	с.	the addition of solutes. Calculate the entropy and freezing entropy of a substance using the Van't Hoff equation.	 c. 90% of students can prepare reports well using scientific writing rules d. >90% of students can answer questions related to Material IX 		
9-13	Can demonstrate the CONCEPT OF PHASE DIAGRAM through lab work in the laboratory (Case study of Phase Diagram 2 and 3 components)	MATERIAL X Phase Diagram: 2-Component System Phase Diagram 3-Component System Phase Diagram	Practicum (8-10 students per group)	6 × 60 min	Hard Skills Gain experience in practicing science empirically involving cognitive abilities, effective, and especially psychomotor abilities by using learning support facilities and infrastructure of the concept of PHASE DIAGRAM	a. b.	Can create phase 2 diagrams of benzoic acid components: naphthalene Can determine the critical point (temperature and composition) of a	 a. >90% of students can take the Material X quiz b. >90% of students can properly demonstrate psychomotor work in the laboratory c. 90% of students can prepare reports well 	See Assessm ent Weights (Part III)	1-3



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					available in the Physical Chemistry Laboratory Soft Skills: a. Activeness b. Cooperation c. Responsibility d. Discipline e. Compliance in working according to procedures	 mixture using a 2- component phase diagram c. Can create 3- component phase diagrams d. Can determine the solubility of materials based on 3- component phase diagrams 	using scientific writing rules d. >90% of students can answer questions related to Material X		
14	Can: a. review and evaluate the experimental results of Materials VI to X using a chemical approach	MATERIALS VI to X	 Presentation Group discussion Cooperative learning 	6 × 60 min	Hard Skills Gain experience in: (i) presenting a result involving empirical data, (ii) reviewing and evaluating the resulting data to support learning in the field of	 a. Can make presentation s b. Can conduct studies and evaluations of empirical data supported by knowledge that here here 	 a. >90% of the group can present the results of the experiment well b. >90% of groups make presentation materials well, 	See Assessm ent Weights (Part III)	
	results of the				Chemistry	possessed	systematically		



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study and evaluate it well		Soft Skills: a. Activeness b. Cooperation c. Responsibility d. Discipline	, and interestingly c. >90% of students have interactive discussions					
		e. Leadership						
FINAL EXAM								

II. ASSESSMENT DESIGN

No	Course Learning Outcomes	Weekly	Performance	Report	Drecontation	Exam	
INU	Course Learning Outcomes	Tasks	Evaluation	Writing	r resentation	Midterm	Final
1.	Can demonstrate the concepts of physical	-	\checkmark	-	-	-	_
	chemistry by doing lab work in the laboratory.						
2.	Skilled in using chemical instrumentation to		1	-	-	-	-
	support practicum and research activities in the	-	N				
	field of Physical Chemistry						
3.	Can review and evaluate practicum results in	1					
	accordance with the approach of chemistry,	N	-	\checkmark	\checkmark	-	-
	especially physical chemistry						
4.	Can complete chemical calculations contained					1	
	in each practicum material correctly and	\checkmark	-	\checkmark	-	N	\checkmark
	precisely.						



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Assessment Criteria	Score Range	Score Weight (%)	Information
Weekly Task Assessment			
Work Plan	40-85	2.5	Individual score
Punctuality in completing tasks			
Compatibility of work materials and procedures with Practicum Guidelines			
Pre-Lab Tasks	0-100	2.5	
• Punctuality in completing tasks;			Individual score
• Completeness and clarity of answers;			
Practicum Assessment			
Quiz			
• Evaluation of students' readiness of knowledge and understanding of practicum			
material is carried out through quizzes (10-15 minutes) before practicum begins.	0-100	7.5	Individual score
Work			
• Performance evaluation in the form of skills in using chemical instrumentation			
related to practicum material is carried out through Work Assessment	40-85	35	Individual score
Report			
• Evaluation of the report is carried out on the knowledge, understanding, and			
application of basic concepts of physical chemistry as well as the ability to analyze	50-85	15	Individual score
the results obtained during practicum			
Presentation Assessment			
• Systematics and content of presentation;			
Accuracy of delivery;			
• Good use of language;	60-85	7.5	Group score
• Ability to respond to questions (whether or not appropriate);			
• Attitude in material delivery (eye contact, posture, neat appearance)			
Clarity of presentation (voice volume and intonation)			

III. RATING WEIGHTS



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Exam Assessment			
• The cognitive abilities of students in this practicum are also evaluated based on			
the level of knowledge/introduction (C1), understanding (C2), application			
(C3), and analysis (C4) to complete chemical calculations contained in the			
practicum material			
• The composition of questions in the student cognitive ability evaluation			
activity for each level is 25%, with the assessment weight for the $C4 > C3 >$			
C2 > C1 question models			
• The exam question model consists of:			
i. MODEL 1, establishes TRUE or FALSE from a series of statements			
related to the subject matter topic being tested.			
ii. MODEL 2, choose the right one from several answer options provided for			
statements/questions related to the subject matter.			
iii. MODEL 3, answering independently to a question/question related to the			
subject matter tested.			
• The composition of each question model to the weight of the overall score is:			
20% MODEL 1, 30% MODEL 2, and 50% MODEL 3.			
Midterm	0.100	1 -	.
Final	0-100	15	Individual score
	0-100	15	Individual score
Grade Criteria			
A > 85			
$75 < AB \le 85$			
$65 < B \le 75$			
$60 < BC \le 65$			
$50 < C \leq 60$			
$40 < D \le 50$			
E < 40			
Score of PHYSICAL CHEMISTRY PRACTICUM/KIM 1345 2 (0-2)		100	



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IV. ASSESSMENT RUBRIC

Score Range	Work Plan Assessment Criteria
75-85	If students can compile work plans systematically, easy to read , easy to understand and understand, made in accordance with
	work procedures in the practicum guide, include time management, prepare a place to record practicum data, prepare a
	place to do calculations, prepare a place to take notes Things to note
65-75	If students can prepare work plans in a NOT systematic, NOT easy to read, NOT easy to understand and understand, made in
	accordance with work procedures in the practicum guide, include time management, prepare a place to record practicum
	result data, prepare a place to do calculations, Set up a place to record things that need to be noted
55-65	if students can prepare work plans in a NOT systematic manner, NOT easy to read, NOT easy to understand and understand,
	made NOT in accordance with work procedures in the practicum guide, including time management, preparing a place to
	record practicum result data, preparing a place to do calculations, Set up a place to record things that need to be noted
40-55	If students can prepare work plans in a NOT systematic manner, NOT easy to read, NOT easy to understand and
	understand, made NOT in accordance with work procedures in the practicum guide, DO NOT include time management,
	prepare a place to record data on practicum results DO NOT prepare a place to perform calculations, prepare a place to
	record things that need to be recorded
	Work Assessment Criteria
75-85	If students can demonstrate work in accordance with work procedures (SOP), can operate/use simple chemical
	equipment/instrumentation, apply GLP and K3 Laboratory principles at work
65-75	If students can demonstrate work in accordance with work procedures (SOP), can operate/use simple chemical
	equipment/instrumentation, DO NOT apply GLP and K3 Laboratory principles at work
55-65	If students can demonstrate work in accordance with work procedures (SOP), LESS SKILLED in operating/using simple
	chemical equipment/instrumentation, NOT applying GLP and K3 Laboratory principles in working
40-55	If students CANNOT demonstrate work in accordance with work procedures (SOPs), are LESS SKILLED in
	operating/using simple chemical equipment/instrumentation, DO NOT apply GLP and K3 Laboratory principles at work
	Report Assessment Criteria
75-85	If students can compile reports well, easy to read, and easy to understand and understand, the data of practicum results
	reported are in accordance with the results obtained, chemical calculations are carried out correctly and precisely,
	discussions are prepared in accordance with the study and evaluation of the data obtained, using the principles of physical



	chemistry in conducting studies and evaluations, conclusions are made in accordance with objectives, results, and discussions;
	The library used is less than 10 years
65-75	If students are NOT can compile reports properly, NOT easy to read, NOT easy to understand and understand, the data of
	practicum results reported are in accordance with the results obtained, chemical calculations are carried out correctly and
	precisely, discussions are prepared in accordance with the study and evaluation of the data obtained, using physical
	chemistry principles in conducting studies and evaluations, conclusions are made in accordance with objectives, results,
	and discussions; The library used is less than 10 years.
50-65	If students are NOT can compile reports properly, NOT easy to read, NOT easy to understand and understand, the
	reported practicum data is NOT in accordance with the results obtained, chemical calculations are carried out correctly
	and precisely, discussions are prepared in accordance with the study and evaluation of the data obtained, DO NOT use
	physical chemistry principles in conducting studies and evaluations, conclusions are made in accordance with objectives,
	results, and discussion; The library used is less than 10 years.
	Presentation Assessment Criteria
75-85	If students can present material with good systematics, timeliness of delivery, good language use, ability to answer questions
	well / precisely, and good and clear material delivery attitude.
65-74	If students can present material with good systematics, the timeliness of delivery is NOT APPROPRIATE, the use of language
	is NOT good, the ability to answer questions well/precisely, and the attitude of delivering material is NOT good and NOT
	clear.
60-65	If students can present material with NOT good systematics, timeliness of delivery is NOT APPROPRIATE, use of NOT
	good language, ability to answer questions NOT well/precisely, attitude of material delivery is NOT good and NOT clear.

V. REFERENCES

- 1. Atkins P, de Paula J. 2006. *Physical Chemistry*. 8th Ed. New York: WH Freeman and Co.
- 2. Bird T. 1987. Penuntun Praktikum Kimia Fisik untuk Universitas. Jakarta: Penerbit PT Gramedia.
- 3. Daniels F, Mathews JH, Williams JW, Bender P, Alberty RA. 1956. *Experimental Physical Chemistry*. New York: McGraw-Hill Book Company, Inc.
- 4. Patel NH et al. 2010. College Practical Chemistry. Mumbay: Himalayan Publishing House