

## Universitas Negeri Surabaya Faculty of Mathematics and Natural Sciences Undergraduate Chemistry Education Study Program

Document Code

## SEMESTER LEARNING PLAN

Courses			CODE				Co	urse F	amily			Cred	t Weig	ht	SEN	NEST	ER	Co Da	mpilat te	ion
Biomolecule	Structure & Fun	ction	842040233	14			Co Pro	mpuls gram	ory Stu Subjec	dy ts		T=2	P=0	ECTS=3.18	3	3	3	Jur 202	ne 20, 22	
AUTHORIZA	ΓΙΟΝ		SP Develo	oper						Co	ourse	Clust	er Coo	ordinator	Stu	dy Pr	ogram	Coord	inator	
			Prof. Dr. R	udiana	a Agus	stini, M	l.Pd.			Pro M.	of. Dr. Si.	. Nunie	ek Hero	dyastuti,	Ρ	Prof. Dr. Utiya Azizah, M.Pd.				
Learning model	Case Studies																			
Program	PLO study pro	ogram w	hich is ch	arged	to th	e cou	rse													
Outcomes (PLO)	PLO-7	Applyin techno solving	ng logical, c blogy and an g problems (	ritical, t that p CPL 5	syster ays at )	natic a ttentio	and in n to a	novati nd app	ve thinl blies hu	king in Imanit	i the c ies va	ontext alues a	of the ppropr	developm iate to the	ent or i field of	impler f chen	mentati nistry e	on of s ducatic	cience on in	
	PLO-11	Able to princip	o demonstra lles of separ	te knov ation, a	wledg analys	e relat sis, syı	ed to hthesi	theore s and	etical co charac	oncept terizat	ts abo tion of	ut stru f chem	icture, icals (	dynamics a CPL 1)	and en	ergy,	as well	as bas	sic	
	Program Obje	ectives (F	PO)																	
	PO - 1	Studen macror	nts have kno molecules a	owledg nd vita	e of th mins,	ne stru miner	icture als, ho	of ma ormon	icro mo es in oi	lecule ganis	es: ca ms	rbohyd	drates,	proteins, f	ats, nı	ıcleic	acids;	functio	n or ro	e of
	PO - 2	Studen as vita	nts master th mins, minera	ne conc als and	cept of I horm	f struc iones	ture a in the	nd fun organ	ction o ism	f macı	romol	ecules	of car	bohydrates	s, prote	eins, fa	ats, nuo	cleic ac	ids; as	wel
	PO - 3	Studen	nts have the	ability	to utili	ize lea	rning	resou	rces ar	Id ICT	to su	pport	master	y of Bioche	emical	conce	epts and	d theori	ies	
	PO - 4	Students have the ability to solve science and technology problems in biochemistry and in a simple scope application of knowledge of the structure and function of macromolecules, and relevant technology.								cope th	nrough	the								
	PO - 5	Studen	nts have res	ponsibi	ility an	ıd an i	ndepe	endent	attitud	e in th	eir fie	ld of e	xpertis	e						
	PLO-PO Matrix																			
			P.0 PO-1 PO-2 PO-3 PO-4 PO-5		PLO	- /		PLO	-11	-										
	PO Matrix at t	he end c	of each lea	rning	stage	e (Sub	o-PO)													
			PO									Wee	k							Ī
			1.0	1	2	3	Λ	5	6	7	8	- nee	10	11	12	13	14	15	16	ł
		PO	-1	-	-	•	•	-	Ū	•	0	Ū				10		10	10	
		PO	-2																	•
		PO	-3																	
		PO	4																	•
		PO-	-4 E			-														-
		P0-	-5																	]
Short Course Description	Study of the stru on the function	ucture and of vitamin	d function of is and miner	f protei als car	n mac ried o	cromol ut thro	ecule: ough le	s, enz ecture	ymes, ( , discus	carboł ssion a	nydrat and pi	tes, lip resent	ids, nu ation n	cleic acids nethods.	, and r	nemb	ranes;	as well	as stu	dies
References	Main :																			

Support lecturer	1. Lehninge     2. Color Atl     3. Mathews     4. Nelson D     5. Stryer, L.     Supporters:     Ing     Prof. Dr. Leny Yu     Prof. Dr. Hi, Rudi     Dr. Prima Retno V     Prof. Dr. Nuniek I     Mirwa Adiprahara     Muhammad Nurr     dr. Shod Abdurra	er. 1988. Dasar-dasar Bio as of Biochemistry, 2005, .C. K and Van Holde K. E J. L., and Cox M. M., 200 ., 1988, Biochemistry, th 	kimia ,jilid 1, Terjemahan Koolman, J and Roehm k E, 2000, Biochemistry ,se 03, LehningerPrinciple of hirded. , New York : W. H.	Maggi Thenawid (. H. , 2ndedition. cond ed. , The Be Biochemistry , 4tl Freeman and co	jaya. Penerbit Erlangga, Stutgard New York enjamin Cumming compa h edition, University ofWin mpany	Jakarta ny, Inc. nconsin-Madison	
Week-	Final abilities of each learning stage (Sub-PO)	Evalu	Jation	Studen [ Es	t Assignments, timated time]	Learning materials [ References ]	Assessment Weight (%)
-	(6451-6)	Indicator	Criteria & Form	offline (	Online ( <i>online</i> )		
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
1	Explain the molecules of living organisms (biomolecules) and their composition	<ul> <li>1.1. Explain the characteristics of living substances</li> <li>2.2. Explain the chemical processes in living substances</li> <li>3.3. Explain that cells are the smallest part of life.</li> <li>4.4. Explain the parts of a living cell.</li> <li>5.5. Explain the function of each organelle</li> <li>6.6. Explain the organization of molecules in cells</li> </ul>	<ul> <li>Criteria: <ol> <li>The assessment is carried out on the following aspects:</li> <li>Participation during lectures is carried out through observation (weight 2)</li> <li>S.2. Subsummative test, carried out twice assessing all relevant indicators through written exams, averaged and weighted (2)</li> <li>A.3. Structured assignment assessment from each teacher and the scores are averaged, then given a weight (3)</li> <li>A.4. Summative test as UAS score, given weight (3)</li> <li>The final NA is (participation value x2) (assignment value x3) (UTS value x 2) UAS value (3) divided by 10</li> </ol> </li> </ul>	Questions and answers, discussion, reflection 2 X 50		Material: Basics of Biochemistry Bibliography: Nelson DL and Cox MM, 2021, Lehninger Principle of Biochemistry, 8th ed., University of Wisconsin- Madison	5%

2	Show the structure and function of Carbohydrates	<ol> <li>1.1. Classify carbohydrates based on the number of constituent monomers, functional groups and constituents.</li> <li>2.2. Explain the center of asymmetry, ring structure, hawort, mutarotation, and anomer.</li> <li>3.3. Explain the functions of monosaccharides and polysaccharides in biological systems.</li> </ol>	Criteria: 1.The assessment is carried out on the following aspects: 2.1. Participation during lectures is carried out through observation (weight 2) 3.2. Subsummative test, carried out twice assessing all relevant indicators through written exams, averaged and weighted (2) 4.3. Structured assignment assessment from each teacher and the scores are averaged, then given a weight (3) 5.4. Summative test as UAS score, given weight (3) 6.The final NA is (participation value x 3) (UTS value x 2) UAS value (3) divided by 10 Form of Assessment : Participatory Activities	Questions and answers, discussion, reflection 2 X 50	Material: 1. Structure of carbohydrates 2. Function of carbohydrates in biological systems <b>References:</b> Nelson DL and Cox MM, 2021, Lehninger Principle of Biochemistry, 8th ed., University of Wisconsin- Madison	6%
3	Show the structure and function of Carbohydrates	<ul> <li>1.1. Classify carbohydrates based on the number of constituent monomers, functional groups and constituents.</li> <li>2.2. Explain the center of asymmetry, ring structure, hawort, mutarotation, and anomer.</li> <li>3.3. Explain the functions of monosaccharides and polysaccharides in biological systems.</li> </ul>	Criteria: 1. The assessment is carried out on the following aspects: 2.1. Participation during lectures is carried out through observation (weight 2) 3.2. Subsummative test, carried out twice assessing all relevant indicators through written exams, averaged and weighted (2) 4.3. Structured assignment assessment from each teacher and the scores are averaged, then given a weight (3) 5.4. Summative test as UAS score, given weight (3) 6. The final NA is (participation value x 2) UAS value x 3) (UTS value x 3) divided by 10 Form of Assessment : Participatory Activities	Questions and answers, discussion, reflection 2 X 50	Material: 1. Structure of carbohydrates 2. Function of carbohydrates in biological systems <b>References:</b> Mathews, C. K and Van Holde K. E, 2000, Biochemistry, second ed., The Benjamin Cumming company, Inc.	6%

4	Show the structure and function of Carbohydrates	1. Classify carbohydrates based on the number of constituent monomers, functional groups and constituents. 2. Explain asymmetry centers, ring structures, hawort, mutarotation and anomers. 3. Explain the functions of monosaccharides and polysaccharides in biological systems.	<ul> <li>Criteria: <ol> <li>The assessment is carried out on the following aspects:</li> <li>Participation during lectures is carried out through observation (weight 2)</li> <li>S.2. Subsummative test, carried out twice assessing all relevant indicators through written exams, averaged and weighted (2)</li> <li>S.3. Structured assignment assessment from each teacher and the scores are averaged, then given a weight (3)</li> <li>S.4. Summative test as UAS score, given weight (3)</li> <li>The final NA is (participation value x2) (assignment value x3) (UTS value x 3) (UTS value x 2) UAS value (3) divided by 10</li> </ol></li></ul>	Questions and answers, discussion, reflection 2 X 50		Material: 1. Structure of carbohydrates 2. Function of carbohydrates in biological systems <b>References:</b> Nelson DL, and Cox MM, 2003, LehningerPrinciple of Biochemistry, 4th edition, University ofWinconsin- Madison	5%
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F	Depariha tha	1 Evolain the	Cuitaula	Disaurria	Matari-I	<u> </u>
5	Describe the structure and	1. Explain the structure of amino	Criteria:	Discussion	Material:	6%
	function of Proteins	acids and the	L. i ne assessment	2 X 50	nronerties of	
		classification of	is carried out on	2 \ 50	amino acide	
		amino acids 2.	the following		peptide bonds and	
		acids and bases	aspects:		their function in	
		amphoteries,	2.1. Participation		living systems,	
		isoelectric points,	uuring lectures is		separation and	
		separation of amino	through		purification of	
		(electrophoresis and	observation		amino acids and	
		chromatography),	(weight 2)		understanding	
		special reactions of	3.2 Subsummative		nomologous	
		amino acids 3. Explain the reaction	test, carried out		structure and	
		of peptide bond	twice assessing		function of	
		formation 4. Explain	all relevant		proteins (primary.	
		the function of	indicators through		secondary, tertiary	
		systems 5. Explain	written exams,		proteins),	
		the separation	averaged and		characteristics of	
		process by dialysis,	weighted (2)		fiber and globular	
		electrophoresis 6.	4.3. Structured		proteins,	
		Explain the	assignment		nroteins and	
		determination of	assessment from		disorders protein	
		amino acid series by	each teacher and		genetics	
		acid reactions with	the scores are		Bibliography:	
		FDNB, dansyl	averaged, then		Nelson DL, and	
		chloride, Edman	given a weight (3)		Cox MM, 2003,	
		the definition of	5.4. Summative		LehningerPrinciple	
		homologous proteins	iesi as UAS		of Biochemistry,	
		8. Explain fixed	weight (3)		401 eullion, University	
		residues, non-lixed	6.The final NA is		ofWinconsin-	
		homology and	(participation		Madison	
		examples of the	value x2)			
		importance of series	(assignment			
		various species9.	value x 3) (UTS			
		Explain the	value x 2) UAS			
		classification of	value (3) divided			
		function. constituent	by 10			
		elements and				
		shape10. Explain	Form of Assessment			
		configuration and	: Dortioinotony Activition			
		Explain the structure	Participatory Activities			
		of -helices, the types				
		of amino acids that				
		properties and				
		structure as				
		constituents of				
		the structure of silk				
		fibroin, and the				
		differences in its				
		properties from - helices 13 Explain				
		the structure of the				
		helix that makes up				
		collagen, the				
		in tendons and bone				
		matrix 14. Explain the				
		helical structure that				
		the properties of				
		elastin in joints 15.				
		Types and functions				
		16. Characteristics of				
		the tertiary structure				
		of globular proteins in				
		myogiobin 17. Types of amino acids that				
		make up globular				
		proteins 18. tertiary				
		structures in				
		Differences in tertiary				
		structures in several				
		globular proteins 20.				
		rypes of bonds that				
		structures 21.				
		Definition of				
		oligomeric proteins				
		oligomeric proteins				
		22. Quaternary				
		structures make up				
		oligomeric proteins 23. Explain the				
		function of				
		hemoglobin and				
		myoglobin. 24.				
		anemia and other				
		disorders caused by				
		gene mutations				

r							
6	Describe the	1. Explain the	Criteria:	Discussion		Material:	6%
	function of Proteins	acids and the	1.The assessment	Presentation		Structure and	
	function of 1 fotcing	classification of	is carried out on	2 X 50		properties of	
		amino acids 2.	the following			amino acids,	
		Explain the nature of	aspects:			their function in	
		acius anu bases,	2.1. Participation			living systems	
		isoelectric points,	during lectures is			separation and	
		separation of amino	carried out			purification of	
		acids	through			amino acids and	
		chromatography).	observation			understanding	
		special reactions of	(weight 2)			homologous	
		amino acids 3.	3.2. Subsummative			proteins, covalent	
		of peptide bond	test, camed out			structure and	
		formation 4. Explain	all relevant			noteins (primary	
		the function of	indicators through			secondary tertiary	
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		the separation	averaged and			characteristics of	
		process by dialysis,	weighted (2)			fiber and globular	
		gel filtration, electrophoresis 6	4.3. Structured			proteins,	
		Explain the	assignment			quaternary	
		determination of	assessment from			disorders protein	
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		acid reactions with	the scores are			Bibliography:	
		FDNB, dansyl	averaged, then			Nelson DL, and	
		chloride, Edman	given a weight (3)			Cox MM, 2003,	
		the definition of	5.4. Summative			LehningerPrinciple	
		homologous proteins	IESI dS UAS			of Biochemistry,	
		8. Explain fixed	weight (3)			4111 EUITION, 1 Iniversity	
		residues, non-fixed	6. The final NA is			ofWinconsin-	
		homology and	(particination			Madison	
		examples of the	value x2)				
		homology from	(assignment				
		various species9.	value x 3) (UTS				
		Explain the	value x 2) UAS				
		classification of	value (3) divided				
		function, constituent	by 10				
		elements and					
		shape10. Explain	Form of Assessment				
		conformation 11.	Participatory Activities				
		Explain the structure	r arnoipaíory riolarniou				
		of -nelices, the types of amino acids that					
		make up them, their					
		properties and					
		structure as					
		keratin 12. Explain					
		the structure of silk					
		fibroin, and the					
		properties from -					
		helices 13. Explain					
		the structure of the					
		collagen, the					
		properties of collagen					
		matrix 14 Explain the					
		helical structure that					
		makes up elastin and					
		elastin in joints 15					
		Types and functions					
		of globular proteins					
		the tertiary structure					
		of globular proteins in					
		myoglobin 17. Types					
		make up globular					
		proteins 18. tertiary					
		structures in					
		Differences in tertiary					
		structures in several					
		globular proteins 20.					
		rypes of bonds that					
		structures 21.					
		Definition of					
		and examples of					
		oligomeric proteins					
		22. Quaternary					
		oligomeric proteins					
		23. Explain the					
		function of					
		nemoglobin and myoglobin 24					
		Explain sickle cell					
		anemia and other					
		dene mutations					
		gene mutations	1		1		

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ļ	7	Describe the	1. Explain the	Criteria:	Discussion		Material:	5%
ļ		structure and function of Protoine	structure of amino	1.The assessment	Presentation		Structure and	
ļ		TUTCION OF PROLEINS	classification of	is carried out on	2 X 50		properties of	
ļ			amino acids 2.	the following			amino acids,	
			Explain the nature of	aspects:			peptide bonds and	
			acids and bases,	2.1. Participation				
			isoelectric points	during lectures is			soparation and	
			separation of amino	carried out			nurification of	
			acids	through			amino acids and	
			(electrophoresis and	observation			understanding	
			chromatography),	(weight 2)			homologous	
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			Explain the reaction	test, carried out			structure and	
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			peptides in living	indicators through			secondary, tertiary	
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			the separation	averaged and			characteristics of	
			process by dialysis,	weighted (2)			fiber and globular	
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			Explain the	assignment			proteins and	
			determination of	assessment from			disorders protein	
			hydrolysis and amino	each teacher and			genetics	
			acid reactions with	the scores are			Bibliography:	
			FDNB, dansyl	averaged, then			Nelson DL, and	
ļ			chloride, Edman	given a weight (3)			Cox MM, 2003,	
ļ			the definition of	5.4. Summative			LehningerPrinciple	
ļ			homologous proteins	test as UAS			of Biochemistry,	
ļ			8. Explain fixed	score, given			4th edition,	
ļ			residues, non-fixed	6 The final MA is			ofWinconsin	
ļ			homology and	0. The linal NA IS			Madison	
ļ			examples of the	(participation			maaison	
I			importance of series	value XZ)				
			nomology from	(assignment				
			Explain the					
			classification of	value (2) divided				
			proteins based on	by 10				
			function, constituent	by 10				
			shape10. Explain	Form of Assessment				
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			of -helices the types					
			of amino acids that					
			make up them, their					
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			nelix that makes up					
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ļ			the tertiary structure					
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I			∠3. Explain the function of					
ļ			hemoglobin and					
ļ			myoglobin. 24.					
ļ			Explain sickle cell					
ļ			anemia and other					
ļ			gene mutations					
1				1	1	1		

1. The assessment is carried out on the following aspects:     Subsummative written test-1 2 × 50       2.1. Participation during lectures is	10%
is carried out on the following aspects: 2.1. Participation during lectures is	
aspects: 2.1. Participation during lectures is	
2.1. Participation during lectures is	
during lectures is	
corried out	
through	
observation	
(weight 2)	
3.2. Subsummative	
twice assessing	
all relevant	
indicators through	
Written exams,	
weighted (2)	
4.3. Structured	
assignment from	
each teacher and	
the scores are	
averaged, then	
given a weight (3)	
test as UAS	
score, given	
weight (3)	
0. The lina NA is	
value x2)	
(assignment	
value x 3) (UTS	
value x 2) OAS	
by 10	
Form of Accossment	
Test	
9         Describe the structure and function of common         1. Explain the structure of enzymes         Criteria: 1. The assessment is carried out on from         Study material from         Material: Structure, properties and	6%
enzymes 3. Explain the following mandatory function of	
the function of aspects: DOOKS, ask enzymes, Procedure for	
the difference during lectures is answer 2 X 50 naming enzymed answer 2 X 50	es,
between trivial and systematic naming of carried out gractice Algorithm and any systematic naming of carried out gractice any systematic naming out gractice any	
enzymes 5. Name through reactions, Kin	tics
enzymes along with (weight 2)	
the groups they attack 6 Explain the 3.2. Subsummative that influence	ors
mechanism of test, carried out enzyme activi	<i>y</i> ,
enzymatic reactions twice assessing Enzyme inhib	ion,
Mutt-enzyme systems	
equation 8. Indicators infolding Systems Systems References:	
of Vmax and KM. 9. averaged and Nelson DL, ar	1
Explain the weighted (2) Lineweaver-Burk A o structured	inle
equation10. Explain 4.3. Structured of Biochemist	/,
influence enzyme assessment from 4th edition,	
activity11. Explain each teacher and University of Wisconsin-	
enzyme inhibition by the scores are Madison	
inhibitors along with a diveraged, then binding model12. given a weight (3)	
Explain multi enzyme 5.4. Summative	
overtaine with	
test as UAS	
systems with test as UAS score, given	
test as UAS score, given weight (3) 6.The final NA is	
test as UAS score, given weight (3) 6.The final NA is (participation	
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test as UAS score, given weight (3) 6.The final NA is (participation value x2) (assignment value x3) (UTS value x2) UAS value (3) divided by 10	
systems with     test as UAS       score, given     weight (3)       6.The final NA is     (participation       value x2)     (assignment       value x3) (UTS     value x2) UAS       value (3) divided     by 10	

10	Describe the structure and function of enzymes	1. Explain the structure of enzymes 2. Explain the properties of enzymes 3. Explain the function of enzymes 4. Explain the difference between trivial and systematic naming of enzymes 5. Name the six groups of enzymes along with the groups they attack 6. Explain the mechanism of enzymatic reactions 7. Explain the Michaelis-Menten equation 8. Determine the values of Vmax and KM. 9. Explain the Lineweaver-Burk equation10. Explain the factors that influence enzyme activity11. Explain the process of enzyme inhibition by inhibitors along with binding model12. Explain multi enzyme systems with	Criteria: 1.The assessment is carried out on the following aspects: 2.1. Participation during lectures is carried out through observation (weight 2) 3.2. Subsummative test, carried out twice assessing all relevant indicators through written exams, averaged and weighted (2) 4.3. Structured assignment assessment from each teacher and the scores are averaged, then given a weight (3) 5.4. Summative test as UAS score, given weight (3) 6.The final NA is (participation value x 2) (assignment value x 3) (UTS value x 2) UAS value (3) divided by 10 Form of Assessment : Participatory Activities	Study material from mandatory books, ask questions, answer 2 X 50 practice questions	Material: Structure, properties and function of enzymes, Procedures for naming enzymes, Mechanisms of enzymatic reactions, Kinetics of enzymatic reactions, Factors that influence enzyme activity, Enzyme inhibition, Multi-enzyme systems. <b>Reference:</b> Color Atlas of Biochemistry, 2005, Koolman, J and Roehm KH, 2nd edition. Stutgard New York	6%
11	Describe the structure and function of vitamins and minerals	1. Name water- soluble vitamins 2. Name fat-soluble vitamins 3. Describe the structure of water-soluble vitamins. 5. Explain the role of fat- soluble vitamins in biological systems6. Mention the minerals needed in nutrition, both plants and animals. 7. Explain the role of minerals in enzyme function.	<ul> <li>Criteria: <ol> <li>The assessment is carried out on the following aspects:</li> <li>Participation during lectures is carried out through observation (weight 2)</li> <li>S.2. Subsummative test, carried out twice assessing all relevant indicators through written exams, averaged and weighted (2)</li> <li>S.3. Structured assignment assessment from each teacher and the scores are averaged, then given a weight (3)</li> <li>S.4. Summative test as UAS score, given weight (3)</li> <li>The final NA is (participation value x2) (UTS value x2) UAS value (3) divided by 10</li> </ol></li></ul>	Study material from mandatory books, ask questions, answer 2 X 50 practice questions	Material: 1. Types of vitamins, their structure and role in enzyme function. 2. Inorganic elements (minerals) required in nutrition and their role in enzyme function. <b>Reference:</b> <i>Stryer, L., 1988, Biochemistry,</i> <i>thirded. , New</i> <i>York : WH</i> <i>Freeman and</i> <i>company</i>	6%

12	Describe the structure and function of vitamins and minerals	1. Name water- soluble vitamins 2. Name fat-soluble vitamins 3. Describe the structure of water-soluble vitamins 4. Describe the structure of fat- soluble vitamins. 5. Explain the role of vitamins in biological systems6. Mention the minerals needed in nutrition, both plants and animals. 7. Explain the role of minerals in enzyme function.	Criteria: 1.The assessment is carried out on the following aspects: 2.1. Participation during lectures is carried out through observation (weight 2) 3.2. Subsummative test, carried out twice assessing all relevant indicators through written exams, averaged and weighted (2) 4.3. Structured assignment assessment from each teacher and the scores are averaged, then given a weight (3) 5.4. Summative test as UAS score, given weight (3) 6.The final NA is (participation value x 2) UAS value x 3) (UTS value x 2) UAS value (3) divided by 10 Form of Assessment : Participatory Activities	Study material from mandatory books, ask questions, answer 2 X 50 practice questions	Material: 1. Types of vitamins, their structure and role in enzyme function. 2. Inorganic elements (minerals) required in nutrition and their role in enzyme function. <b>Reference:</b> <i>Stryer, L., 1988, Biochemistry,</i> <i>thirded., New</i> <i>York: WH</i> <i>Freeman and</i> <i>company</i>	6%
13	Describe the structure and function of nucleic acids	1. Explain the components of nucleotides 2. Explain the main components of DNA and RNA nucleic acids; free nucleotides 3. Describe the structure of DNA and RNA nucleic acids; free nucleotides 4. Explain the nature of nucleic acids DNA, RNA 5. Explain the nature of tRNA, rRNA 6. Explain the relationship between transcription, translation, protein synthesis	<ul> <li>Criteria:         <ol> <li>The assessment is carried out on the following aspects:</li> <li>Participation during lectures is carried out through observation (weight 2)</li> <li>Subsummative test, carried out twice assessing all relevant indicators through written exams, averaged and weighted (2)</li> <li>Structured assignment assessment from each teacher and the scores are averaged, then given a weight (3)</li> <li>The final NA is (participation value x2) (assignment value x3) (UTS value x3) UTS value x3) UTS value x3) UTS</li> <li>Torm of Assessment : Participatory Activities</li> </ol> </li> </ul>	Questions and answers, discussion, reflection 2 X 50	Material: Nucleoside components, nucleicas, nucleic acids, structure of nucleic acids, free nucleotides, role of nucleic acids in protein synthesis. <b>References:</b> <i>Nelson DL, and Cox MM, 2003, LehningerPrinciple</i> <i>of Biochemistry,</i> <i>4th edition,</i> <i>University of</i> <i>Wisconsin-</i> <i>Madison</i>	5%

structure and function of lipids and bio- membranes	<ul> <li>L. Explain the structure of lipids. 2.</li> <li>Explain the function of lipids in biological systems 3. Explain the main components of membranes 4.</li> <li>Describe the fluid structure of the membrane mosaic 5.</li> <li>Explain the nature of the lipid bilayer in the membrane 6. Explain the function of the membrane</li> </ul>	Criteria: 1.The assessment is carried out on the following aspects: 2.1. Participation during lectures is carried out through observation (weight 2) 3.2. Subsummative test, carried out twice assessing all relevant indicators through written exams, averaged and weighted (2) 4.3. Structured assignment assessment from each teacher and the scores are averaged, then given a weight (3) 5.4. Summative test as UAS score, given weight (3) 6.The final NA is (participation value x2) (assignment value x3) (UTS value x2) UAS value (3) divided by 10 Form of Assessment	Questions and answers, answering 2 X 50 practice questions	Material: Structure and Function of Lipids Reference: Lehninger. 1988. Basics of Biochemistry, volume 1, Maggi Thenawidjaya Translation. Erlangga Publishers, Jakarta	6%
15 Explain the structure and function of Hormones	Describe the role of each hormone in primary and secondary target hormones	Criteria: 1. The assessment is carried out on the following aspects: 2.1. Participation during lectures is carried out through observation (weight 2) 3.2. Subsummative test, carried out twice assessing all relevant indicators through written exams, averaged and weighted (2) 4.3. Structured assignment assessment from each teacher and the scores are averaged, then given a weight (3) 5.4. Summative test as UAS score, given weight (3) 6. The final NA is (participation value x 2) UAS value (3) divided by 10 Form of Assessment Participatory Activities	Questions and answers, answering 2 X 50 practice questions	Material: Types of hormones, Mechanism of action of hormones, Function of hormones in metabolism. Reference: Stryer, L., 1988, Biochemistry, thirded., New York: WH Freeman and company	6%

16	UAS	Criteria:			10%
	0,10	1 The assessment	2 X 50		1070
		is carried out on			
		the following			
		asports:			
		2 1 Derticipation			
		2.1. Participation			
		during lectures is			
		carried out			
		through			
		observation			
		(weight 2)			
		3.2. Subsummative			
		test, carried out			
		twice assessing			
		all relevant			
		indicators through			
		written exams,			
		averaged and			
		weighted (2)			
		4.3. Structured			
		assignment			
		assessment from			
		each teacher and			
		the scores are			
		averaged, then			
		_ given a weight (3)			
		5.4. Summative			
		test as UAS			
		score, given			
		weight (3)			
		6.The final NA is			
		(participation			
		value x2)			
		(assignment			
		value x 3) (UTS			
		value x 2) UAS			
		value (3) divided			
		by 10			
		<b>F</b>			
		Form of Assessment			
		Tost			
		1001			

Evaluation Percentage Recap: Case Study

No	Evaluation	Percentage	
1.	Participatory Activities	80%	
2.	Test	20%	
		100%	

Notes

- Learning Outcomes of Study Program Graduates (PLO Study Program) are the abilities possessed by each Study Program graduate which are the internalization of attitudes, mastery of knowledge and skills according to the level of their study program obtained through the learning process
- obtained through the learning process.
  2. The PLO imposed on courses are several learning outcomes of study program graduates (CPL-Study Program) which are used for the formation/development of a course consisting of aspects of attitude, general skills, special skills and knowledge.
  3. Program Objectives (PO) are abilities that are specifically described from the PLO assigned to a course, and are specific to the study
- Program Objectives (PO) are abilities that are specifically described from the PLO assigned to a course, and are specific to the study
  material or learning materials for that course.
- 4. Subject Sub-PO (Sub-PO) is a capability that is specifically described from the PO that can be measured or observed and is the final ability that is planned at each learning stage, and is specific to the learning material of the course.
- 5. Indicators for assessing abilities in the process and student learning outcomes are specific and measurable statements that identify the abilities or performance of student learning outcomes accompanied by evidence.
- Assessment Criteria are benchmarks used as a measure or measure of learning achievement in assessments based on predetermined indicators. Assessment criteria are guidelines for assessors so that assessments are consistent and unbiased. Criteria can be quantitative or qualitative.
- 7. Forms of assessment: test and non-test.
- 8. Forms of learning: Lecture, Response, Tutorial, Seminar or equivalent, Practicum, Studio Practice, Workshop Practice, Field Practice, Research, Community Service and/or other equivalent forms of learning.
- 9. Learning Methods: Small Group Discussion, Role-Play & Simulation, Discovery Learning, Self-Directed Learning, Cooperative Learning, Collaborative Learning, Contextual Learning, Project Based Learning, and other equivalent methods.
- 10. Learning materials are details or descriptions of study materials which can be presented in the form of several main points and subtopics.
- 11. The assessment weight is the percentage of assessment of each sub-PO achievement whose size is proportional to the level of difficulty of achieving that sub-PO, and the total is 100%.
- 12. TM=Face to face, PT=Structured assignments, BM=Independent study.