

COURSE PORTFOLIO

Chemical Thermodynamics Academic Year – 2020/2021

- PLO 1 Able to apply religious attitudes, demonstrate an internalizing academic and human values
- PLO 2 Able to demonstrate excellence, honesty, competitiveness, leadership, and possessing social sensitivity to society and the environment
- PLO 3 Able to demonstrate performance independently or as part of a team professionally and measurably by applying interdisciplinary knowledge and skill, critical, and creative thinking in the context of being a lifelong learner
- PLO 4 Able to communicate ideas, scientific research results clearly in oral or written format to scientists and the wider community
- PLO 5 Able to Integrating mathematical and basic concepts of science to solve problems in chemistry
- PLO 6 Able to master the knowledge of chemistry (organic chemistry, inorganic, analytical, physical, and biochemical)
- PLO 7 Able to understand concepts and applications in the field of biosciences and materials chemistry to solve problems in the field of chemistry and its applications
- PLO 8 Able to understand operational knowledge about functions, how to operate chemical instruments, and analysis of data and information from these instruments
- PLO 9 Able to understand work safety, ethics, environmental issues, and policies related to the chemical field
- PLO 10 Able to carry out laboratory and research work by paying attention to the safety and security of laboratory work and applying responsible scientific behavior.
- PLO 11 Able to obtain, process, interpret, and evaluate scientific data and produce conclusions by considering scientific and technological aspects and scientific ethics.
- PLO 12 Able to solve science and technology problems in chemistry independently based on relevant scientific methodologies and present it as a scientific work.

Course Outcome (CO):

CO 1.	Analyzing the properties of an ideal gas based on the concept of the equation of state
CO 2.	Distinguish the properties of an ideal gas and a real gas based on the concept of the equation of state
CO 3.	Analyzing the First Law of Thermodynamics through the concept of system, environment, work, heat, internal energy, and enthalpy

CO 4.	Applying exact and inexact state and differential functions in the study of changes in energy with respect to pressure, temperature, and volume
CO 5.	Analyzing the direction of spontaneous change in the Second Law of Thermodynamics through the concept of entropy, heat engine efficiency
CO 6.	Analyzing the direction of spontaneous change in the Second and Third Laws of Thermodynamics through the concept of entropy, heat engine efficiency, Gibbs and Helmholtz free energy functions
CO 7.	Apply the concept of spontaneous chemical reactions in the study of equilibrium and its relation to chemical potential and the factors that affect the equilibrium
CO 8.	Analyze phase diagrams and phase boundaries based on the phase-component rules of a system
CO 9.	Analyze the application of thermodynamics properties in the electrochemical cells

Lecturers:

Dr. Yusmaniar, M.Si.

Mapping Course Learning Outcome (CO) and Program Learning Outcome (PLO)

Program Learning Outcome Course Outcome	PLO 3. Able to demonstrate performance independently or as part of a team professionally and measurably by applying interdisciplinary knowledge and skill, critical, and creative thinking in the context of being a lifelong learner	PLO 6. Able to master the knowledge of chemistry (organic chemistry, inorganic, analytical, physical, and biochemical)
CO 1. Analyzing the properties of an ideal gas based on the concept of the equation of state	• (Assignment)	
CO 2. Distinguish the properties of an ideal gas and a real gas based on the concept of the equation of state	• (Assignment)	
CO 3. Analyzing the First Law of Thermodynamics through the concept of system, environment, work, heat, internal energy, and enthalpy		• (Assignment, Midterm Exam)
CO 4. Applying exact and inexact state and differential functions in the study of changes	• (Assignment)	

in energy with respect to pressure, temperature, and volume		
CO 5. Analyzing the direction of spontaneous change in the Second Law of Thermodynamics through the concept of entropy, heat engine efficiency		• (Assignment, Midterm Exam)
CO 6. Analyzing the direction of spontaneous change in the Second and Third Laws of Thermodynamics through the concept of entropy, heat engine efficiency, Gibbs and Helmholtz free energy functions		• (Assignment, Midterm Exam)
CO 7. Apply the concept of spontaneous chemical reactions in the study of equilibrium and its relation to chemical potential and the factors that affect the equilibrium		• (Assignment, Final Exam)
CO 8. Analyze phase diagrams and phase boundaries based on the phase-component rules of a system		• (Assignment, Final Exam)
CO 9. Analyze the application of thermodynamics properties in the electrochemical cells	• (Assignment)	

Forms of Assessment

Group/Individuals Assignment	= 20%
Midterm examination	= 40%
Final examination	= 40%
Total	= 100%

	PLO 3 Critical Thinking	PLO 6 Problem Solving
Assignment	50%	50%
Midterm examination	30%	70%
Final examination	30%	70%

Outcomes Assessment

No	Nama	Assignment	Midterm Exam	Final Exam	Final Grade and Score	
1	A	83	80	75	86	A
2	B	70	85	80	70	B-
3	C	70	85	80	70	B-
4	D	70	75	70	60	B-
5	E	78	85	80	60	B-
6	F	70	85	80	80	B+
7	G	70	80	75	80	B+
8	H	70	85	80	80	B+
9	I	70	70	65	66	B-
10	J	65	75	70	66	B-
11	K	85	75	70	70	B-
12	L	70	70	65	70	B-
13	M	70	85	80	80	B+
14	N	70	85	80	80	B+
15	O	70	85	80	70	B-
16	P	70	85	80	70	B-
17	Q	73	85	80	60	B-
18	R	70	85	80	70	B-
19	S	75	85	80	70	B-
20	T	70	85	80	80	B+
21	U	65	85	80	60	B-
22	V	70	85	80	70	B-
23	W	70	80	75	70	B-

24	X	70	70	65	40	B-
25	Y	70	85	80	50	B-
26	Z	70	80	75	70	B-
27	AA	70	85	80	80	B+
28	AB	85	80	75	60	B-
29	AC	70	80	75	70	B-
30	AD	65	65	60	80	B+
31	AF	80	70	65	70	B-
32	AG	70	85	80	70	B-
33	AH	75	50	45	80	B+
34	AI	75	85	80	73	B
35	AJ	75	85	80	73	B
36	AK	75	85	80	73	B
37	AL	75	70	65	73	B
38	AM	65	75	70	80	B+
39	AN	70	60	75	60	B-
40	AO	70	70	65	70	B-
41	AP	70	70	65	63	B-

Calculation of Weight per PLO

Form of Assessment	Weight	Weight per PLO		Total	Total Weight	
		PLO 3	PLO 6		PLO 3	PLO 6
Assignment	0.20	0.50	0.50	1.00	0.10	0.10
Midterm Exam	0.40	0.30	0.70	1.00	0.12	0.28
Final Exam	0.40	0.30	0.70	1.00	0.12	0.28
Total	1.00	1.10	1.90	1.00	0.34	0.66

Example of PLO Calculation

No	Name	Assignment	Midterm Exam	Final Exam	Final Score and Grade	
1	A	83	80	75	86	A

No	Name	PLO 3	PLO 6
1	A	$(83 \times 0.10) + (80 \times 0.28) + (75 \times 0.12) / 0.34 = 79.12$	$(83 \times 0.10) + (80 \times 0.28) + (75 \times 0.28) / 0.66 = 78.33$

PLO Assessment Rubric

PLO	Performance Criteria	Excellent (E)	Good (G)	Satisfy (S)	Fail (F)
3	Demonstrate performance independently or as part of a team professionally and measurably by applying interdisciplinary knowledge and skill, critical, and creative thinking in the context of being a lifelong learner	Students are able to demonstrate performance independently or as part of a team professionally and measurably by applying interdisciplinary knowledge and skill, critical, and creative thinking in the context of being a lifelong learner with a score of at least 80.	Students are able to demonstrate performance independently or as part of a team professionally and measurably by applying interdisciplinary knowledge and skill, critical, and creative thinking in the context of being a lifelong learner with a score of at least 70 and less than 80.	Students are able to demonstrate performance independently or as part of a team professionally and measurably by applying interdisciplinary knowledge and skill, critical, and creative thinking in the context of being a lifelong learner with a score of at least 60 and less than 70.	Students are able to demonstrate performance independently or as part of a team professionally and measurably by applying interdisciplinary knowledge and skill, critical, and creative thinking in the context of being a lifelong learner with a score of less than 60.
6	Able to master the knowledge of chemistry (organic chemistry, inorganic, analytical, physical, and biochemical)	Students are able to master the knowledge of chemistry (organic chemistry, inorganic, analytical, physical, and biochemical) with a score of at least 80.	Students are able to master the knowledge of chemistry (organic chemistry, inorganic, analytical, physical, and biochemical) with a score of at least 70 and less than 80.	Students are able to master the knowledge of chemistry (organic chemistry, inorganic, analytical, physical, and biochemical) with a score of at least 60 and less than 70.	Students are able to master the knowledge of chemistry (organic chemistry, inorganic, analytical, physical, and biochemical) with a score of less than 60.

Example of PLO Predicates for Each Student

No	Name	PLO 3	PLO 6
1	A	79.12 Good	78.33 Good

PLO Predicates for All Students

No	Name	Assignment	Midterm Exam	Final Exam	Final Grade and Score		PLO 3	PLO 6	PLO 3	PLO 6
1	A	83	80	75	86	A	79.12	78.33	G	G
2	B	70	85	80	70	B-	78.82	80.61	G	E
3	C	70	85	80	70	B-	78.82	80.61	G	E
4	D	70	75	70	60	B-	71.76	72.12	G	G
5	E	78	85	80	60	B-	81.18	81.82	E	E
6	F	70	85	80	80	B+	78.82	80.61	G	E
7	G	70	80	75	80	B+	75.29	76.36	G	G
8	H	70	85	80	80	B+	78.82	80.61	G	E
9	I	70	70	65	66	B-	68.24	67.88	S	S
10	J	65	75	70	66	B-	70.29	71.36	G	G
11	K	85	75	70	70	B-	76.18	74.39	G	G
12	L	70	70	65	70	B-	68.24	67.88	S	S
13	M	70	85	80	80	B+	78.82	80.61	G	E
14	N	70	85	80	80	B+	78.82	80.61	G	E
15	O	70	85	80	70	B-	78.82	80.61	G	E
16	P	70	85	80	70	B-	78.82	80.61	G	E

17	Q	73	85	80	60	B-	79.71	81.06	G	E
18	R	70	85	80	70	B-	78.82	80.61	G	E
19	S	75	85	80	70	B-	80.29	81.36	E	E
20	T	70	85	80	80	B+	78.82	80.61	G	E
21	U	65	85	80	60	B-	77.35	79.85	G	G
22	V	70	85	80	70	B-	78.82	80.61	G	E
23	W	70	80	75	70	B-	75.29	76.36	G	G
24	X	70	70	65	40	B-	68.24	67.88	S	S
25	Y	70	85	80	50	B-	78.82	80.61	G	E
26	Z	70	80	75	70	B-	75.29	76.36	G	G
27	AA	70	85	80	80	B+	78.82	80.61	G	E
28	AB	85	80	75	60	B-	79.71	78.64	G	G
29	AC	70	80	75	70	B-	75.29	76.36	G	G
30	AD	65	65	60	80	B+	63.24	62.88	S	S
31	AF	80	70	65	70	B-	71.18	69.39	G	S
32	AG	70	85	80	70	B-	78.82	80.61	G	E
33	AH	75	50	45	80	B+	55.59	51.67	F	F
34	AI	75	85	80	73	B	80.29	81.36	E	E
35	AJ	75	85	80	73	B	80.29	81.36	E	E
36	AK	75	85	80	73	B	80.29	81.36	E	E
37	AL	75	70	65	73	B	69.71	68.64	S	S
38	AM	65	75	70	80	B+	70.29	71.36	G	G
39	AN	70	60	75	60	B-	68.24	67.88	S	S
40	AO	70	70	65	70	B-	68.24	67.88	S	S
41	AP	70	70	65	63	B-	68.24	67.88	S	S

Distribution of PLO Achievements

Bachelor's degree of Chemistry, Universitas Negeri Jakarta

Grade	PLO 3	PLO 6
E	12.195122	48.7804878
G	65.8536585	26.82926829
S	19.5121951	21.95121951
F	2.43902439	2.43902439

Achievement Percentage of PLO



