## AL-FARABI KAZAKH NATIONAL UNIVERSITY

Faculty of Chemistry and Chemical Technology Department of Chemical Physics and Material Sciences

**APPROVED** by Vice Dean for teaching methods and educational work Kudreeva L.K. protocol No. 11, "\_30\_"\_06\_ 2022

## EDUCATIONAL-METHODICAL COMPLEX OF DISCIPLINE

HF 3302« Chemical Physics»

«6B05301-Chemistry»

Course –3 Semester –5 Number of credits –6

Almaty 2022

Educational-methodical complex of the discipline is made by Dr. of Sc., Prof. Yerdos Ongarbayev

Based on the curriculum for the educational program «6B05301- Chemistry»

Reviewed and recommended at the meeting of the department of chemical physics and materials science

«\_22\_ » \_\_\_\_06\_\_\_\_ 2022, protocol № \_27\_

Head of department \_\_\_\_\_ M. Tulepov

Recommended by methodical council of the faculty (24) = 06 = 2022, protocol  $N_{2} = 12$ 

Chairman of the methodical council of the faculty Bektemisova A.U.

## SYLLABUS Fall semester 2022-2023 academic year on the educational program "6B05301 - Chemistry"

Discipline's code	Discipline's title	Indepen	No. of	hours p	ber wee	ek			Numbe	Independen
-	•	dent	Lectu	Pra	ctical t	training La		ra	r of	t work of
		work of students	res		(PT	)	tory	y	credits	student
		(IWS)	(L)				(Lat	)		teacher
										(IWST)
HF 3302	Chemical Physics	82	15	6-	15		60		6	8
Form of education	Type of course	Academic course information					tical		Form of f	inal control
Form of education	Type of course	Types	of fectur	<b>C</b> 3	լ ոչի	training			mai control	
Full-time	Theoretical /	Informa	tion Lect	ure		practical oral			ral	
	practical									
Lecturer	Prof. Yerdos Ongarba	ayev								
e-mail	Erdos.Ongarbaev@ka	aznu.edu.kz								
Telephone number	+77014575789			6.41						
A :	A Error e e te d L e	cademic pr	esentatio	$\frac{1}{2}$ on of the second se	e cours	se		0	1.1	
Aim of course	As a result of studying	arning Out	comes (L	<b>.U)</b> derara	luata	Indicato	r each I		t least 2 in	it (ID)
	w	ill be able to	nie uie ui ):	lueigia	iualç	(10		LU a	it least 2 m	iuicators)
The goal of the	1. demonstrate the know	wledge gain	ed in the	field of	,	1.1. exp	lain the	e ba	sic laws	of elementary
discipline is to form	chemical physics	0 0				processes in chemistry				
the ability to						1.2. describe the composition and parameters			and parameters	
understand the		<u> </u>		1.1.		of elementary particles				
principles of	2. determine the param	leters of hon	nolytic ar	nd heter	olytic	2.1. calculate of flame temperature.			temperature,	
chemical physics	reactions					2.2 de	ig allu a	nhc	sis of exp	al radiation
						plasma chemical processes by using the				
						principles of thermodynamics			.,	
	3. calculate the mair	parameter	s of the	comb	ustion	<ul> <li>3.1. determine the composition of fuels</li> <li>3.2. calculate the characteristics of fuels</li> <li>4.1. formulate requirements for the properties of free radicals for the specific case of their use</li> </ul>			n of fuels	
	process	1.1.1.							cs of fuels	
	4. analyze the relation	isnip betwee	en the co	mposit	ion of				r the properties	
	crementary particles an	d then's end	acteristic	/3					e case of them	
						4.2. explain the mechanism of the eler			the elementary	
						processes				
	5. to evaluate the the	oretical fou	ndations,	capab	ilities,	5.1. choose the optimal conditions for the			ditions for the	
	limits and applications of elementary processes in				experiment using thermodynamic and kinetic			nic and kinetic		
	radiation chemistry p	ry partici	es, ph	otochen	nistry,	laws	uida th	0 m	atorial in	the form of a
	explosion processes	lasilla cilcili	istry, coi	noustio	n anu	5.2. provide the material in the form of a			the form of a	
Prerequisites	Fiz1403 Physics, ZK24	415 Structure	e of matte	er, KH2	413 Qu	antum che	emistry			
Post requisites	KDH3504 Chemistry of	of solids. KN	4H3505 (	Chemist	ry of c	arbon-cont	aining	mate	rials, ZhF	h4510 Physics
	and chemistry of comb	ustion and e	xplosion				0		,	
Information	Literature:									
resources	1. Mansurov Z.A. Soc	t formation:	textbook	Alm	aty: Ka	zakh Univ	ersity, 2	2015	5. – 166 p.	
	2. Nazhipkyzy M. Mo	dern Probler	ms of Pro	cesses	Burning	g, Detonati	ion, Exp	plosi	on Alma	aty: Qazaq
	3 Mansurov 7 A Mi	issip. Ikasvan Δ S	Rogach	ev A S	Self_P	ronagating	r Hiah.'	Temr	nerature S	vnthesis
	textbook, - Almaty: Oazag University. 2018 163 p.									
	4. Kabdulkarimova K.K., Orazbayeva G.D., Aubakirov Y.A. Electrochemical Production									
	Technology. Plasma Chemistry: educational man Almaty: Qazaq university, 2017 317 p.									
	5. Мансуров З.А., Онгарбаев Е.К., Кудайбергенов К.К. Химическая физика: учеб. пособие									
	Алматы: Қазақ ун-ті, 2015. – 417 с. 6. Мансиров 3. А. Онгарбаер F. К. Килайбергенер К.К. Унинетик Анались они интерн. Алистик									
	Казак ун-ті 2018	нароаев Е.1 - 389 б	қ., <b>қ</b> ұдан	ioepref	IOB K.K	лимиялық физика: оқу құралы Алматы:				
	Internet-resources:	567 0.								

6	<ol> <li>https://books.google.kz/books/about/Introduction_to_Chemical_Physics.html?id=40k0AAAAIAAJ&amp;red ir_esc=y</li> <li>https://books.google.kz/books/about/Pathways_to_Modern_Chemical_Physics.html?id=s- sCt4RT0bMC&amp;redir_esc=y</li> </ol>
Academic policy of the course in the context of university moral and ethical values	Academic Behavior Rules: All students have to register at the MOOC. The deadlines for completing the modules of the online course must be strictly observed in accordance with the discipline study schedule. ATTENTION! Non-compliance with deadlines leads to loss of points! The deadline of each task is indicated in the calendar (schedule) of implementation of the content of the curriculum, as well as in the MOOC. Academic values: - Practical trainings/laboratories, IWS should be independent, creative. - Plagiarism, forgery, cheating at all stages of control are unacceptable. Students with disabilities can receive courseling at wordes oncerbayed (compil nom)
Evaluation and attestation policy	Criteria-based evaluation: assessment of learning outcomes in relation to descriptors (verification of the formation of competencies in midterm control and exams). Summative evaluation: assessment of work activity in an audience (at a webinar); assessment of the completed task.

## CALENDAR (SCHEDULE) THE IMPLEMENTATION OF THE COURSE CONTENT:

Week	Topic name	Number of hours	Maximum score
	Module I Elementary processes in chemistry		
1	Lec 1. Tasks, sections and fields of application of chemical physics. Elementary processes in chemistry. Collision theory.	1	
1	Sem 1. Basic concepts of chemical kinetics. Experimental methods for studying the kinetics of chemical reactions	1	2
1	<b>Lab 1.</b> Laboratory safety instructions. Kinetics of the photochemical decomposition of hydrogen peroxide. Submission of theory and methodology	4	5
2	Lec 2. Free radicals and atoms, their formation. Carbenes.	1	
2	Sem 2. Kinetics of unilateral reactions in closed systems. Part 1	1	2
2	Lab 2. Kinetics of the photochemical decomposition of hydrogen peroxide. Processing laboratory results.	4	5
2	<b>IWST 1.</b> Consultation on the implementation of IWS 1. Solution of tasks in photochemistry		
3	Lec 3. Homolytic and heterolytic reactions	1	
3	Sem 3. Kinetics of unilateral reactions in closed systems. Part 2	1	2
3	Lab 3. Kinetics of the photochemical decomposition of hydrogen peroxide. Charting and lab report	4	5
3	IWS 1. Solution of tasks in photochemistry		25
4	Lec 4. Photochemistry. Kinetics of photochemical reactions	1	
4	<b>Sem 4.</b> Methods for determining the order of the reaction. Integral methods for determining the order of a chemical reaction	1	2
4	Lab 4. Thermocouple temperature measurement, manufacturing and calibration of thermocouples. Submission of theory and methodology	4	5
4	IWST 2. Colloquium (situational task). Solution of tasks in radiation chemistry		26
5	Lec 5. Radiation chemistry. Radiation chemical yield.	1	
5	Sem 5. Methods for determining the order of the reaction. Differential methods for determining the order of a chemical reaction	1	2
5	Lab 5. Thermocouple temperature measurement, manufacturing and calibration of thermocouples. Processing laboratory results	4	5
	Module II Chemistry of high energy		
6	Lec 6. Reactions in an electric discharge. Plasma chemistry. Types of Electric Discharges. Plasma-chemical reactions	1	
6	Sem 6. Kinetics of complex chemical reactions. Part 1	1	2

6       Lab 6. Thermocouple Interpretative measurement, manufacturing and calibration       4       5         7       Lee 7. Chain reactions, Chain Concepts, Chain origin, Chain continuation       1       2         7       Sem 7. Kinetics of complex, chemical reactions, Part 2       1       2         7       Lab 7. Determination of the decomposition rate of a manganese oxalate ion from       4       5         7       IVST 3. Consultation on the implementation of IWS 2. Solution of tasks in       7       1         8       Textoring and balance of the decomposition rate of a manganese oxalate ion from       4       5         8       Rub 8. Determination of the decomposition rate of a manganese oxalate ion from       4       5         9       Lab 8. Determination of the decomposition rate of a manganese oxalate ion from       4       5         9       Lee 9. Features of explosive reactions. N.N.Semenov theory of thermal       11       2         9       Sem 9. Influence of temperature on the rate of chemical reactions. Part 2       1       2       2         9       Sem 9. Calculation of the decomposition rate of a manganese oxalate ion from       4       5         9       Sem 10. Calculation of the composition rate of a manganese oxalate ion from       4       5         9       Lee 9. Calculation of the calculation of the cay of antive collisi				
1       Lee 7. Chain reactions. Chain Concepts. Chain origin. Chain continuation       1         7       Lee 7. Chain reactions. Chain Concepts. Chain origin. Chain continuation       1         7       Leb 7. Determination of the decomposition rate of a manganese exalate ion from       4         8       Sem 7. Kinetics of complex chemical reactions. Part 2       1         7       IVWST 3. Consultation on the implementation of IWS 2. Solution of tasks in       1         8       Sem 8. Influence of temperature on the rate of chemical reactions. Part 1       1         8       Bee 8. Chain termination. Kinetic laws of chain reaction. Chain length.       1         9       Leb 9. Determination of the decomposition rate of a manganese exalate ion from 4       5         9       Lee 9. Features of explosive reactions. N.N. Semenov theory of thermal 1       2         9       Lee 9. Features of explosive reactions. N.N. Semenov theory of active collisions 1       2         10       Lee 10. Types of flames. Normal burning rate. Detonation       1       1         10       Sem 10. Calculation of rate constants according to the theory of active collisions 1       2       1         110       Sem 10. Calculation of rate constants according to the theory of active collisions 1       2       1         10       Lee 10. Types of flames. Normal burning rate. Detonation       1       1 <td>6</td> <td>Lab 6. Thermocouple temperature measurement, manufacturing and calibration</td> <td>4</td> <td>5</td>	6	Lab 6. Thermocouple temperature measurement, manufacturing and calibration	4	5
Let         1. Chain reactions. Chain Concepts. Chain origin. Chain continuation         1           2         Sem 7. Khetics of complex chemical reactions. Part 2         is a baryon of the decomposition rate of a manganese oxalate ion from         4           7         Sem 7. Khetics of complex chemical reactions. Part 2         is of the symmetry of t		or mermocouples. Charming and lab report.	1	
7       Lab 7. Determination of the decomposition rate of a manganese oxalate ion from       4         7       Lub 7. Determination of the decomposition rate of a manganese oxalate ion from       5         9       IVST 3. Consultation on the implementation of IWS 2. Solution of tasks in reactions in an electric discharge       100         8       Sem 8. Influence of temperature on the rate of chemical reactions. Part 1       1       2         8       Sem 8. Influence of temperature on the rate of chemical reactions. Part 1       1       2         8       INS 2. Solution of tasks in reactions in an electric discharge       111       2         9       Lee 9. Features of explosive reactions. N.N.Semenov theory of thermal 1       2       2         9       Lee 0. Figues of tames. Normal burning rate. Detonation       1       2       2         9       Sem 9. Influence of temperature on the rate of chemical reactions. Part 2       1       2       2       2       1       2       2       2       1       2       2       2       1       2       2       2       1       2       2       2       1       2       2       2       1       2       2       2       1       2       2       2       1       2       2       2       1       1       2	/	Lec 7. Chain reactions. Chain Concepts. Chain origin. Chain continuation	<u> </u>	
7       Lab 7. Determination of the decomposition rate of a manganese oxalate ion from 4       5         9       IWST 3. Consultation on the implementation of IWS 2. Solution of tasks in reactions in an electric discharge       100         8       LEVEL CONTROL 1       100         8       Sem 8. Influence of temperature on the rate of chemical reactions. Part 1       1         9       Lev 8. Chain temperature on the rate of chemical reactions. Part 1       1         9       Lev 9. Features of explosive reactions in an electric discharge       111         9       Lev 9. Features of explosive reactions. N.N.Semenov theory of thermal explosion.       2         9       Lab 9. Determination of the decomposition rate of a manganese oxalate ion from explosion.       2         9       Lab 9. Determination of the decomposition rate of a manganese oxalate ion from explosion.       2         9       Lab 9. Determination of the decomposition rate of a manganese oxalate ion from explosion.       2         10       Lev 10. Types of flames. Normal burning rate. Decontion       1       2         10       Lab 10. Thermodynamic calculation of the equilibrium characteristics of 4       5       5         10       IWST 4. Colloquium (situational task). Solution of tasks in the kinetics of chain reactions.       11       11         11       Lev 11. Vibrational chemical reactions       1	7	Sem 7. Kinetics of complex chemical reactions. Part 2	1	2
electronic absorption spectra. Submission of theory and methodology         interactions in an electric discharge           1         IVST 5. Consultation on the implementation of IWS 2. Solution of tasks in reactions in an electric discharge         100           8         LEVEL CONTROL 1         1           8         Sem 8. Influence of temperature on the rate of chemical reactions. Part 1         1           9         Leb 8. Determination of the decomposition rate of a manganese oxalate ion from electronic absorption spectra. Processing laboratory results         11           9         Lee 9. Features of explosive reactions. N.N. Semenov theory of thermal explosion.         1           9         Lee 0. Influence of temperature on the rate of chemical reactions. Part 2         1         2           9         Lee 0. Influence of temperature on the rate of chemical reactions. Part 2         1         2           9         Lee 0. Types of flames. Normal burning rate. Detonation         1         2           10         Lee 10. Types of flames. Normal burning rate. Detonation         1         2           10         Lea 10. Thermodynamic calculation of the equilibrium characteristics of 4         5         2           10         Lub 10. Thermodynamic calculation of theory and methodology         1         2           11         Lea 11. Thermodynamic calculation of the equilibrium characteristics of 4         5 </td <td>7</td> <td>Lab 7. Determination of the decomposition rate of a manganese oxalate ion from</td> <td>4</td> <td>5</td>	7	Lab 7. Determination of the decomposition rate of a manganese oxalate ion from	4	5
7       IWST 3. Consultation on the implementation of IWS 2. Solution of tasks in reactions in an electric discharge       100         8       LEVEL CONTROL 1       100         8       Sem 8. Influence of temperature on the rate of chemical reactions. Part 1       1         9       Lev 8. Determination of the decomposition rate of a manganese oxalate ion from 4       5         9       Iso Determination of the decomposition rate of a manganese oxalate ion from 4       5         9       Sem 9. Influence of temperature on the rate of chemical reactions. Part 2       1       2         9       Lev 9. Features of explosive reactions. N.N.Semenov theory of thermal explosion.       2       1         9       Sem 9. Influence of temperature on the rate of chemical reactions. Part 2       1       2         10       Lev 10. Types of flames. Normal burning rate. Detonation 1       1       1         10       Sem 10. Calculation of rate constants according to the theory of cative collisions 1       2       1         11       reactions       1       11       1       1         10       Lab 10. Thermodynamic calculation of these yand methodology       1       1       1         10       Isom 11. Thermodynamic aspect of the activated complex theory       1       2       2         11       Sem 11. Thermodynamic aspect of the		electronic absorption spectra. Submission of theory and methodology		
IEVEL CONTROL 1       100         8       Leve 8. Chain termination. Kinetic laws of chain reaction. Chain length.       1         8       Sem 8. Influence of temperature on the rate of chemical reactions. Part 1       1         9       Lab 8. Determination of the decomposition rate of a manganese oxalate ion from electronic absorption spectra. Processing laboratory results       11         9       Lee 9. Features of explosive reactions. NN.Semenov theory of thermal explosion.       11         9       Lee 9. Features of explosive reactions. NN.Semenov theory of thermal electronic absorption spectra. Charting and lab report       1         9       Sem 9. Influence of temperature on the rate of chemical reactions. Part 2       1       2         9       Lee 0. Types of flames. Normal burning rate. Detonation       1       1         10       Lee 10. Thermodynamic calculation of the equilibrium characteristics of combustion processes. Submission of theory and methodology       1       1         11       Lee 11. Vibrational chemical reactions       1       2       1         11       Lee 11. Vibrational chemical reactions       1       2       2         11       Lee 11. Vibrational chemical reactions       1       2       2         11       Lee 11. Vibrational chemical reactions       1       2       2         12       Lee 11. Vi	7	<b>IWST 3.</b> Consultation on the implementation of IWS 2. Solution of tasks in		
LEVEL CONTROL 1         100           8         Lee 8. Chain termination. Kinetic laws of chain reaction. Chain length.         1           8         Sem 8. Influence of temperature on the rate of chemical reactions. Part 1         1           9         Lab 8. Determination of the decomposition rate of a manganese oxalate ion from 4         5           8         IWS 2. Solution of tasks in reactions. NN.Semenov theory of thermal 1         2           9         Sem 9. Influence of temperature on the rate of chemical reactions. Part 2         1         2           9         Lab 9. Determination of the decomposition rate of a manganese oxalate ion from 4         5           9         Leb 0. Determination of the decomposition rate of a manganese oxalate ion from 4         5           9         Lab 0. Determination of the decomposition rate of a manganese oxalate ion from 4         5           10         Calculation of rate constants according to the theory of active collisions 1         2           10         I. Calculation of rate constants according to the theory of active collisions 1         2           11         reactions         1         11           11         reactions         1         2           10         Lev 10. Types of flames. Normal burning rate. Detonation         1         11           11         Instreactions         1		reactions in an electric discharge		
8       Lee 8. Chain termination. Kinetic laws of chain reaction. Chain length.       1         8       Sem 8. Influence of temperature on the rate of chemical reactions. Part 1       1         9       Leb 8. Determination of the decomposition rate of a manganese oxalate ion from       4         9       Lee 9. Features of explosive reactions. N.N.Semenov theory of thermal       1         9       Lee 9. Features of explosive reactions. N.N.Semenov theory of thermal       1         9       Lee 0. Features of explosive reactions. N.N.Semenov theory of thermal       1         9       Lee 0. Types of flames. Normal burning rate. Detonation       4       5         9       Lee 10. Types of flames. Normal burning rate. Detonation       1       2         10       Lee 10. Types of flames. Normal burning rate. Detonation       1       2         10       Lee 10. Types of flames. Normal burning rate. Detonation       1       11         11       Lee 10. Types of flames. Normal burning rate. Detonation       1       2         10       Lab 10. Thermodynamic calculation of the equilibrium characteristics of 4       5       2         11       Lee 11. Vibrational chemical reactions       1       11       2         11       Lee 11. Vibrational chemical preactions       1       2       11       1       2 <td></td> <td>LEVEL CONTROL 1</td> <td></td> <td>100</td>		LEVEL CONTROL 1		100
Born 8. Influence of temperature on the rate of chemical reactions. Part 1         1         2           8         Sem 8. Influence of temperature on the rate of chemical reactions. Part 1         1         2           8         Lab 8. Determination of the decomposition rate of a manganese oxalate ion from 4         5           9         Lee 9. Features of explosive reactions. N.N.Semenov theory of thermal explosion.         11           9         Lee 9. Features of explosive reactions. N.N.Semenov theory of thermal explosion.         2           9         Lab 9. Determination of the decomposition rate of a manganese oxalate ion from 4         5           9         Lab 9. Determination of rate constants according to the theory of active collisions 1         2           10         Lee 10. Types of flames. Normal burning rate. Detonation 1         11           10         Sem 10. Calculation of rate constants according to the theory of active collisions 1         2           10         Lee 10. Types of flames. Normal burning rate. Detonation 1         11           10         Issem 11. Thermodynamic calculation of the equilibrium characteristics of 4         5           11         macdia task). Solution of tasks in the kinetics of chain reactions         1           11         Lee 11. Vibrational chemical reactions         1         2           11         Lee 11. Vibrational chemical reactions	8	Lec 8. Chain termination. Kinetic laws of chain reaction. Chain length	1	
a       both 5. Intervention of the decomposition rate of a manganese oxalate ion from the electronic absorption spectra. Processing laboratory results       1       1       2         g       Lab 8. Determination of the decomposition rate of a manganese oxalate ion from the explosion.       1       1         g       Lee 9. Features of explosive reactions. In an electric discharge       1       1         g       Lee 9. Features of explosive reactions. N.N.Semenov theory of thermal 1       1       2         g       Lab 9. Determination of the decomposition rate of a manganese oxalate ion from 4       5       1         g       Lab 9. Determination of the decomposition rate of a manganese oxalate ion from 4       5       1         g       Lab 10. Thermodynamic calculation of the expulsion rate of a manganese oxalate ion from 4       5       1         g       Lab 10. Thermodynamic calculation of the expulsion rate of a manganese oxalate ion from 4       5       1         g       Lab 10. Thermodynamic calculation of the expulsion rate of a manganese oxalate ion from 4       5       1         10       Lab 10. Thermodynamic aspect of the activated complex theory 6 faxin       1       11         reactions       1       1       1       1         11       Sem 11. Thermodynamic aspect of the activated complex theory       1       2         11	8	Sem 8 Influence of temperature on the rate of chemical reactions. Dart 1	1	2
8         Lab 8. Determination of the decomposition rate of a manganese oxalate ion from the electronic absorption spectra. Processing laboratory results         11           9         Lee 9. Features of explosive reactions. N.N.Semenov theory of thermal explosion.         11           9         Leb 0. Petermination of the decomposition rate of a manganese oxalate ion from electronic absorption spectra. Charting and lab report         1           10         Let 0. Determination of the decomposition rate of a manganese oxalate ion from electronic absorption spectra. Charting and lab report         1           10         Lev 10. Calculation of rate constants according to the theory of active collisions         1           210         Lab 10. Calculation of rate constants according to the theory of active collisions         1           211         Lev 11. Vibrational chemical reactions         1           211         Lev 11. Vibrational chemical reactions         1           211         Lev 11. Thermodynamic calculation of the equilibrium characteristics of 4         5           211         Lab 11. Thermodynamic calculation of the equilibrium characteristics of 4         5           211         Lab 11. Thermodynamic calculation of the equilibrium characteristics of 4         5           212         Lev 12. Self-propagating high temperature synthesis (SHS). SHS         1           212         Lev 12. Self-propagating high temperatuse synthesis (SHS). SHS	0	Sent 6. Initiacities of temperature on the fate of elicitical feactions. Fait 1		2
electronic absorption spectra. Processing laboratory results         iiii           9         IWS 2. Solution of tasks in reactions in an electric discharge         11           9         Lec 9. Features of explosive reactions. N.N.Semenov theory of thermal explosion.         1           9         Lec 9. Features of explosive reactions. N.N.Semenov theory of thermal explosion.         1           9         Lec 9. Features of explosive reactions rate of amaganese oxalate ion from electronic absorption spectra. Charting and lab report         2           10         Lee 10. Types of flames. Normal burning rate. Detonation         1         2           10         Lee 10. Types of flames. Normal burning rate. Detonation in characteristics of 4         5         5           10         Lab 10. Thermodynamic calculation of the equilibrium characteristics of 4         5         5           10         IWST 4. Colloquium (situational task). Solution of tasks in the kinetics of chain reactions         11         1           11         Lee 11. Vibrational chemical reactions         1         2         1         2           11         Lee 11. Vibrational chemical reactions of the equilibrium characteristics of 4         5         5         5           11         Lee 11. Vibrational chemical reactions and lab report         1         2         1           12         Lee 12. Self-propagati	8	Lab 8. Determination of the decomposition rate of a manganese oxalate ion from	4	5
8         IWS 2. Solution of tasks in reactions in an electric discharge         11           9         Lee 9. Features of explosive reactions. N.N.Semenov theory of thermal explosion.         1           9         Lab 0. Determination of the decomposition rate of a manganese oxalate ion from electronic absorption spectra. Charting and lab report         1           10         Lee 10. Types of flames. Normal burning rate. Detonation         1         1           10         Calubation of the decomposition rate of a manganese oxalate ion from electronic absorption spectra. Charting and lab report         1         2           10         Lab 10. Calculation of rate constants according to the theory of active collisions         1         2           11         Read Normal burning rate. Detonation         1         1         1           11         Lee 10. Calculation of rate constants according to the theory of active collisions         1         2           11         Lee 11. Vibrational chemical reactions         1         11         1         2           11         Lee 11. Vibrational chemical reactions         1         2         1         2           11         Lab 11. Thermodynamic calculation of the equilibrium characteristics of combustion processes. Processing laboratory results. Charting and lab report         2         1         2           11         Lab 12. Calculation of t		electronic absorption spectra. Processing laboratory results		
9         Lee 9. Features of explosive reactions. N.N.Semenov theory of thermal explosion.         1           9         Sem 9. Influence of temperature on the rate of chemical reactions. Part 2         1         2           9         Lab 9. Determination of the decomposition rate of a maganese oxalate ion from electronic absorption spectra. Charting and lab report         1         2           10         Lee 10. Types of flames. Normal burning rate. Detonation         1         2           10         Lab 10. Thermodynamic calculation of the equilibrium characteristics of combustion processes. Submission of theory and methodology         4         5           10         IWST 4. Colloquium (situational task). Solution of tasks in the kinetics of chain reactions         1         1           11         Lee 11. Vibrational chemical reactions         1         2         2           11         Lee 11. Vibrational chemical reactions         1         2           12         Lee 11. Vibrational chemical reactions         1         2           13         Sem 11. Thermodynamic calculation of the equilibrium characteristics of combustion processes. Processing laboratory results. Charting and lab report         2           14         Lee 11. Vibrational chemical sciencial kinetics. Bodenstein's stationary principle. Part 1         2           12         Lee 12. Self-propagating high temperature synthesis (SHS). SHS         1 <td>8</td> <td><b>IWS 2.</b> Solution of tasks in reactions in an electric discharge</td> <td></td> <td>11</td>	8	<b>IWS 2.</b> Solution of tasks in reactions in an electric discharge		11
explosion.         explosion.           9         Sem 9. Influence of temperature on the rate of chemical reactions. Part 2         1         2           9         Lab 9. Determination of the decomposition rate of a manganese oxalate ion from electronic absorption spectra. Charting and lab report         1         2           10         Lee 10. Types of flames. Normal burning rate. Detonation         1         2           10         Lab 10. Thermodynamic calculation of the equilibrium characteristics of combustion processes. Submission of theory and methodology         2           10         IWST 4. Colloquium (situational task). Solution of tasks in the kinetics of chain reactions         1           11         Lee 11. Vibrational chemical reactions         1         2           11         Lee 11. Vibrational chemical reactions         1         2           11         Lee 11. Vibrational chemical reactions         1         2           11         Lab 10. Thermodynamic calculation of the equilibrium characteristics of combustion processes. Processing laboratory results. Charting and lab report         2           12         Lee 12. Self-propagating high temperature synthesis (SHS). SHS 1         1           12         Leb 12. Calculation of the volume rate of heat release according to the temperature profile. Submission of theory and methodology.         1           12         Lab 12. Calculation of the volume rate of	a	Lec 9. Features of explosive reactions. N.N.Semenov theory of thermal	1	
9       Sem 9, Influence of temperature on the rate of chemical reactions. Part 2       1       2         9       Lab 9. Determination of the decomposition rate of a manganese oxalate ion from electronic absorption spectra. Charting and lab report       4       5         10       Lee 10. Types of flames. Normal burning rate. Detonation       1       5         10       Lab 10. Thermodynamic calculation of the equilibrium characteristics of combustion processes. Submission of theory and methodology       4       5         10       IWST 4. Colloquium (situational task). Solution of tasks in the kinetics of chain reactions       11       11         Module III Macrokinetic         11       Lee 11. Vibrational chemical reactions       1       2         Module III Macrokinetic         11       Lee 11. Vibrational chemical reactions       1       2         Lab 11. Thermodynamic calculation of the equilibrium characteristics of combustion processes. Processing laboratory results. Charting and lab report       2         12       Lee 12. Self-propagating high temperature synthesis (SHS). SHS 1       1       2         13       Lab 12. Calculation of the volume rate of heat release according to the temperature profile. Submission of theory and methodology.       1       2         13       Lee 13. SHS-technologies for obtaining materials       1       3       3		explosion.		
9       Lab 9. Determination of the decomposition rate of a manganese oxalate ion from electronic absorption spectra. Charting and lab report       4       5         10       Lec 10. Types of flames. Normal burning rate. Detonation       1       7         10       Lew 10. Types of flames. Normal burning rate. Detonation       1       7         10       Lab 10. Thermodynamic calculation of the equilibrium characteristics of 4       5         10       Iwit 10. Thermodynamic calculation of the equilibrium characteristics of 4       5         11       reactions       1       11         12       Let 11. Vibrational chemical reactions       1       1         11       Sem 11. Thermodynamic calculation of the equilibrium characteristics of 4       5       5         12       Lee 11. Vibrational chemical reactions       1       2         12       Lee 11. Thermodynamic calculation of the equilibrium characteristics of 4       5       5         13       Sem 12. Approximate methods of chemical kinetics. Bodenstein's stationary 7       1       2         14       Lee 13. SH5-technologies for obtaining materials       1       1       2         14       13       Seem 12. Calculation of the volume rate of heat release according to the 4       5       5         15       Lee 13. SH5-technologies for obtaining materi	9	Sem 9. Influence of temperature on the rate of chemical reactions. Part 2	1	2
electronic absorption spectra. Charting and lab report         1           10         Lec 10. Types of flames. Normal burning rate. Detonation         1           11         Lec 10. Types of flames. Normal burning rate. Detonation         1           12         Lab 10. Thermodynamic calculation of the equilibrium characteristics of combustion processes. Submission of theory and methodology         2           10         IWST 4. Colloquium (situational task). Solution of tasks in the kinetics of chain reactions         11           11         Lec 11. Vibrational chemical reactions         1         2           11         Lee 11. Vibrational chemical reactions         1         2           11         Lee 11. Thermodynamic aspect of the activated complex theory         1         2           11         Lee 11. Thermodynamic calculation of the equilibrium characteristics of combustion processes. Processing laboratory results. Charting and lab report         2           12         Lee 12. Self-propagating high temperature synthesis (SHS). SHS 1         1         1           12         Lee 12. Calculation of the volume rate of heat release according to the 4         5         1           12         Lab 12. Calculation on the implementation of IWS 3. Calculations of explosive reaction parameters         1         2           12         IWST 5. Consultation on the implementation of IWS 3. Calculations of the volume rate of hea	9	Lab 9. Determination of the decomposition rate of a manganese oxalate ion from	4	5
10       Lec 10. Types of flames. Normal burning rate. Detonation       1         10       Sem 10. Calculation of rate constants according to the theory of active collisions       1         10       Lab 10. Thermodynamic calculation of the equilibrium characteristics of combustion processes. Submission of theory and methodology       1         10       IWST 4. Colloquium (situational task). Solution of tasks in the kinetics of chain reactions       11         11       Lec 11. Vibrational chemical reactions       1         11       Sem 11. Thermodynamic calculation of the equilibrium characteristics of 4       5         11       Sem 11. Thermodynamic calculation of the equilibrium characteristics of 4       5         12       Lec 12. Self-propagating high temperature synthesis (SHS). SHS 1       1         14       thermodynamics       2         12       Sem 12. Approximate methods of chemical kinetics. Bodenstein's stationary 1       2         12       Lab 12. Calculation of the volume rate of heat release according to the 4       5         13       Lee 13. SHS-technologies for obtaining materials       1         14       Lee 13. SHS-technologies for obtaining materials       1         15       Lee 13. Calculation of the volume rate of heat release according to the 4       5         14       Lee 14. Sufformation at combustion of hydrocarbons. Phenomenology of low 1 <td></td> <td>electronic absorption spectra. Charting and lab report</td> <td></td> <td></td>		electronic absorption spectra. Charting and lab report		
10       Sem 10. Calculation of rate constants according to the theory of active collisions       1         10       Lab 10. Thermodynamic calculation of the equilibrium characteristics of combustion processes. Submission of theory and methodology       1         10       IWST 4. Colloquium (situational task). Solution of tasks in the kinetics of chain reactions       1         11       Lee 11. Vibrational chemical reactions       1         11       Lee 11. Vibrational chemical reactions       1         11       Sem 11. Thermodynamic aspect of the activated complex theory       1         12       Lab 11. Thermodynamic aspect of the activated complex theory       1         12       Lab 11. Thermodynamic aspect of the activated complex theory       1         12       Lee 12. Self-propagating high temperature synthesis (SHS). SHS       1         12       Lee 12. Calculation of the volume rate of heat release according to the temperature profile. Submission of theory and methodology.       1         12       Lab 12. Calculation on the implementation of IWS 3. Calculations of explosive reaction parameters       1         13       Sem 13. Approximate methods of chemical kinetics. Bodenstein's stationary principle. Part 2       1         13       Sem 13. Approximate methods of chemical kinetics. Bodenstein's stationary principle. Part 2       1         14       Lee 13. SHSt-technologies for obtaining materials	10	Lec 10. Types of flames. Normal burning rate. Detonation	1	
International content of the equilibrium characteristics of combustion processes. Submission of theory and methodology         Image: Content of the equilibrium characteristics of content of the equilibrium characteristics of the equilibrium characteristics of the equilibrium characteristics.         Image: Content of the equilibrium characteristics of the equilibrium characteristics.           12         Lec 12. Self-propagating high temperature synthesis (SHS). SHS 1         1           12         Leb 12. Calculation of the volume rate of heat release according to the temperature profile. Submission of theory and methodology.         1           13         Lec 13. SHS-technologies	10	Sem 10. Calculation of rate constants according to the theory of active collisions	1	2
10       Eds 1:3       Sem 13. Approximate calculation of theory and methodology       1         10       IWST 4. Colloquium (situational task). Solution of tasks in the kinetics of chain reactions       11         11       Lec 11. Vibrational chemical reactions       1       2         11       Lec 11. Vibrational chemical reactions       1       2         11       Let 11. Thermodynamic aspect of the activated complex theory       1       2         11       Lab 11. Thermodynamic aspect of the activated complex theory       1       2         12       Let 12. Self-propagating high temperature synthesis (SHS). SHS 1       1       1         12       Lec 12. Self-propagating high temperature synthesis (SHS). SHS 1       1       2         12       Let 12. Calculation of the volume rate of heat release according to the 4       5       5         12       Lab 12. Calculation of the outme rate of heat release according to the 4       5       1         13       Sem 13. Approximate methods of chemical kinetics. Bodenstein's stationary 1       2       2         14       Let 13. SHS-technologies for obtaining materials       1       2         13       Sem 13. Approximate methods of chemical kinetics. Bodenstein's stationary 1       2       2         14       Let 13. SHS-techonologies for obtaining materials	10	Lab 10 Thermodynamic calculation of the equilibrium characteristics of	1	5
10       IWST 4. Colloquium (situational task). Solution of tasks in the kinetics of chain reactions       11         11       Lec 11. Vibrational chemical reactions       1         11       Lec 11. Vibrational chemical reactions       1         11       Lec 11. Vibrational chemical reactions       1         11       Lec 11. Thermodynamic aspect of the activated complex theory       1       2         11       Let 11. Thermodynamic calculation of the equilibrium characteristics of combustion processes. Processing laboratory results. Charting and lab report       2         12       Let 12. Self-propagating high temperature synthesis (SHS). SHS 1       1         12       Let 12. Calculation of the volume rate of heat release according to the 4       5         12       Lab 12. Calculation on the implementation of IWS 3. Calculations of explosive reaction parameters       1         13       Lec 13. SH5-technologies for obtaining materials       1       2         13       Let 13. Calculation of the volume rate of heat release according to the 4       5       5         13       Let 13. SH5-technologies for obtaining materials       1       2         14       Lab 13. Calculation of the volume rate of heat release according to the 4       5       5         14       Lab 13. Calculation of the volume rate of heat release according to the 4       5       5	10	combustion processes. Submission of theory and methodology	-	, ,
10       Invest 4. conception (structure task). Solution of tasks in the kinetics of chain       11         11       Lec 11. Vibrational chemical reactions       1         11       Let 11. Thermodynamic aspect of the activated complex theory       1       2         11       Lab 11. Thermodynamic calculation of the equilibrium characteristics of 4       5         12       Lec 12. Self-propagating high temperature synthesis (SHS). SHS       1         12       Lec 12. Self-propagating high temperature synthesis (SHS). SHS       1         12       Lab 12. Calculation of the volume rate of heat release according to the 4       5         12       Lab 12. Calculation of the volume rate of heat release according to the 4       5         13       Lec 13. SHS-technologies for obtaining materials       1         14       Let 13. SHS-technologies for obtaining materials       1         15       Lab 13. Calculation of the volume rate of heat release according to the 4       5         16       temperature profile. Processing laboratory results. Charting and lab report       1         13       Lec 13. SHS-technologies for obtaining materials       1       2         14       Let 14. Soot formation at combustion of hydrocarbons. Phenomenology of low 1       1       2         14       Lee 14. Soot formation at combustion of hydrocarbons. Phenomenology of low	10	IWST 4 Colloquium (situational task) Solution of tasks in the kinetice of their		1 1
Module III Macrokinetic           11         Lec 11. Vibrational chemical reactions         1           11         Sem 11. Thermodynamic aspect of the activated complex theory         1         2           11         Lab 11. Thermodynamic calculation of the equilibrium characteristics of a combustion processes. Processing laboratory results. Charting and lab report         2           12         Lec 12. Self-propagating high temperature synthesis (SHS). SHS 1         1           12         Lec 12. Approximate methods of chemical kinetics. Bodenstein's stationary principle. Part 1         2           12         Lab 12. Calculation of the volume rate of heat release according to the temperature profile. Submission of theory and methodology.         1           12         IWST 5. Consultation on the implementation of IWS 3. Calculations of explosive reaction parameters         1           13         Lee 13. SHS-technologies for obtaining materials         1         2           13         Leb 13. Calculation of the volume rate of heat release according to the temperature profile. Processing laboratory results. Charting and lab report         11           14         Lee 14. Soot formation at combustion of hydrocarbons. Phenomenology of low temperature soot formation         11           14         Lee 14. Soot formation of the calorific value and combustion parameters of combustion and detonation processes.         11           14         Lee 14. Soot for	10	<b>IWST 4.</b> Conoquium (situational task). Solution of tasks in the kinetics of chain		11
Module III Macrokinetic           11         Lec 11. Vibrational chemical reactions         1           11         Sem 11. Thermodynamic aspect of the activated complex theory         1         2           11         Lab 11. Thermodynamic calculation of the equilibrium characteristics of combustion processes. Processing laboratory results. Charting and lab report         2           12         Lec 12. Self-propagating high temperature synthesis (SHS). SHS         1           12         Lec 12. Self-propagating high temperature synthesis (SHS). SHS         1           12         Let 12. Calculation of the volume rate of heat release according to the temperature profile. Submission of theory and methodology.         1           12         Lab 12. Calculation of the volume rate of heat release according to the explosive reaction parameters         1           13         Lec 13. SHS-technologies for obtaining materials         1           13         Sem 13. Approximate methods of chemical kinetics. Bodenstein's stationary principle. Part 2         1           13         Lec 14. Soot formation at combustion of hydrocarbons. Phenomenology of low temperature profile. Processing laboratory results. Charting and lab report         1           14         Lee 14. Kinetics of solid-phase reactions. Part 1         1         2           14         Lee 14. Soot formation at combustion of hydrocarbons. Phenomenology of low temperature soot formation         1		reactions		
11       Lee 11. Vibrational chemical reactions       1         11       Sem 11. Thermodynamic aspect of the activated complex theory       1       2         11       Lab 11. Thermodynamic calculation of the equilibrium characteristics of combustion processes. Processing laboratory results. Charting and lab report       4       5         12       Lec 12. Self-propagating high temperature synthesis (SHS). SHS thermodynamics       1       2         12       Sem 12. Approximate methods of chemical kinetics. Bodenstein's stationary principle. Part 1       2       2         12       Lab 12. Calculation of the volume rate of heat release according to the temperature profile. Submission of theory and methodology.       4       5         12       IWST 5. Consultation on the implementation of IWS 3. Calculations of explosive reaction parameters       1       2         13       Let 13. SHS-technologies for obtaining materials       1       2       2         13       Lab 13. Calculation of the volume rate of heat release according to the temperature profile. Processing laboratory results. Charting and lab report       11       11         14       Lee 14. Soot formation       1       2       11       14         14       Lee 14. Soot formation of the calorific value and combustion parameters of combustion parameters of combustion geneses. Submission of theory and methodology       1       11         14 </td <td></td> <td>Module III Macrokinetic</td> <td></td> <td>1</td>		Module III Macrokinetic		1
11       Sem 11. Thermodynamic aspect of the activated complex theory       1       2         11       Lab 11. Thermodynamic calculation of the equilibrium characteristics of combustion processes. Processing laboratory results. Charting and lab report       4       5         12       Lec 12. Self-propagating high temperature synthesis (SHS). SHS thermodynamics       1       2         12       Sem 12. Approximate methods of chemical kinetics. Bodenstein's stationary principle. Part 1       2       2         12       Lab 12. Calculation of the volume rate of heat release according to the temperature profile. Submission of theory and methodology.       1       2         13       Lec 13. SHS-technologies for obtaining materials       1       1       2         13       Lec 13. SHS-technologies for obtaining materials       1       1       2         13       Lec 13. SHS-technologies for obtaining materials       1       1       2         13       Lec 14. Soot formation of the volume rate of heat release according to the temperature profile. Processing laboratory results. Charting and lab report       1       1       2         14       Lec 14. Soot formation at combustion of hydrocarbons. Phenomenology of low temperature soot formation       1       11         14       Lee 14. Soot formation at calorific value and combustion parameters of combustion and detonation processes.       11       2		Lec II. Vibrational chemical reactions	1	
11       Lab 11. Thermodynamic calculation of the equilibrium characteristics of combustion processes. Processing laboratory results. Charting and lab report       4       5         12       Lec 12. Self-propagating high temperature synthesis (SHS). SHS       1         12       Sem 12. Approximate methods of chemical kinetics. Bodenstein's stationary principle. Part 1       2         12       Lab 12. Calculation of the volume rate of heat release according to the temperature profile. Submission of theory and methodology.       1         12       IWST 5. Consultation on the implementation of 1WS 3. Calculations of explosive reaction parameters       1         13       Lec 13. SHS-technologies for obtaining materials       1         13       Sem 13. Approximate methods of chemical kinetics. Bodenstein's stationary principle. Part 2       1         13       Lab 13. Calculation of the volume rate of heat release according to the temperature profile. Processing laboratory results. Charting and lab report       1         14       Lec 14. Soot formation at combustion of hydrocarbons. Phenomenology of low temperature soot formation       1         14       Sem 14. Kinetics of solid-phase reactions. Part 1       1       2         14       Lec 14. Soot formation of the calorific value and combustion parameters of combustion and detonation processes.       1       2         14       Lec 14. Colloquium (situational task). Calculation of parameters of combustion and detonation proces	11	Sem 11. Thermodynamic aspect of the activated complex theory	1	2
combustion processes. Processing laboratory results. Charting and lab report           12         Lec 12. Self-propagating high temperature synthesis (SHS). SHS         1           12         Sem 12. Approximate methods of chemical kinetics. Bodenstein's stationary principle. Part 1         2           12         Lab 12. Calculation of the volume rate of heat release according to the temperature profile. Submission of theory and methodology.         1         2           12         IWS 5. Consultation on the implementation of IWS 3. Calculations of explosive reaction parameters         1         2           13         Lec 13. SHS-technologies for obtaining materials         1         2         1           13         Let 13. Calculation of the volume rate of heat release according to the temperature profile. Processing laboratory results. Charting and lab report         1         2           13         Lab 13. Calculation of the volume rate of heat release according to the temperature profile. Processing laboratory results. Charting and lab report         1         1           14         Lee 14. Soot formation at combustion of hydrocarbons. Phenomenology of low temperature soot formation         1         2           14         Sem 14. Kinetics of solid-phase reactions. Part 1         1         2         2           14         Lee 14. Colloquium (situational task). Calculation of parameters of combustion and detonation processes.         11         11	11	Lab 11. Thermodynamic calculation of the equilibrium characteristics of	4	5
12       Lec       12. Self-propagating high temperature synthesis (SHS). SHS       1         12       Sem 12. Approximate methods of chemical kinetics. Bodenstein's stationary principle. Part 1       2         12       Lab 12. Calculation of the volume rate of heat release according to the temperature profile. Submission of theory and methodology.       4       5         12       IWST 5. Consultation on the implementation of IWS 3. Calculations of explosive reaction parameters       1       2         13       Lec 13. SHS-technologies for obtaining materials       1       2       2         13       Let 13. Calculation of the volume rate of heat release according to the temperature profile. Processing laboratory results. Charting and lab report       1       2         13       Lab 13. Calculation of the volume rate of heat release according to the temperature profile. Processing laboratory results. Charting and lab report       11       1         14       Let 14. Soot formation at combustion of hydrocarbons. Phenomenology of low temperature soot formation       1       1       2         14       Lab 14. Determination of the calorific value and combustion parameters of combustion processes.       1       2       1         15       Let 15. Environmental pollution by nitrogen oxides. The formation of nitrogen oxides       1       2         14       Lab 14. Determination of the calorific value and combustion parameters of combustion parame		combustion processes. Processing laboratory results. Charting and lab report		
12       Sem 12. Approximate methods of chemical kinetics. Bodenstein's stationary principle. Part 1       1       2         12       Lab 12. Calculation of the volume rate of heat release according to the temperature profile. Submission of theory and methodology.       4       5         12       Lab 12. Calculation on the implementation of IWS 3. Calculations of explosive reaction parameters       1       1         13       Lec 13. SHS-technologies for obtaining materials       1       1       2         13       Lec 13. SHS-technologies for obtaining materials       1       2         13       Lab 13. Calculation of the volume rate of heat release according to the temperature profile. Processing laboratory results. Charting and lab report       1       2         13       Lab 13. Calculations of explosive reaction parameters       11       1       1       2         13       Lab 13. Calculations of explosive reaction parameters       11       1       1       2         14       Lec 14. Soot formation at combustion of hydrocarbons. Phenomenology of low temperature soot formation       1       2         14       Sem 14. Kinetics of solid-phase reactions. Part 1       1       2         14       Lab 14. Determination of the calorific value and combustion parameters of combustion and detonation processes.       11       11         15       Lec 15. Environmental po	12	Lec 12. Self-propagating high temperature synthesis (SHS). SHS thermodynamics	1	
12       Sent 12. Approximate intendeds of chemical kinetics. Bodenstein's stationary principle. Part 1       1       2         12       Lab 12. Calculation of the volume rate of heat release according to the temperature profile. Submission of theory and methodology.       4       5         12       IWST 5. Consultation on the implementation of IWS 3. Calculations of explosive reaction parameters       1       1         13       Lec 13. SHS-technologies for obtaining materials       1       1         13       Sem 13. Approximate methods of chemical kinetics. Bodenstein's stationary principle. Part 2       1       2         13       Lab 13. Calculation of the volume rate of heat release according to the temperature profile. Processing laboratory results. Charting and lab report       1       1         14       Lec 14. Soot formation at combustion of hydrocarbons. Phenomenology of low temperature soot formation       1       1       2         14       Sem 14. Kinetics of solid-phase reactions. Part 1       1       2       1         14       Lab 14. Determination of the calorific value and combustion parameters of combustion and detonation processes.       11       1         15       Lec 15. Environmental pollution by nitrogen oxides. The formation of nitrogen oxides. The formation of nitrogen oxides.       1       2         15       Let 15. Determination of the calorific value and combustion parameters of combustion axides <t< td=""><td>12</td><td>Sam 12 Approximate methods of chemical kinetics. Redenstein's stationary</td><td>1</td><td>2</td></t<>	12	Sam 12 Approximate methods of chemical kinetics. Redenstein's stationary	1	2
12       Lab 12. Calculation of the volume rate of heat release according to the temperature profile. Submission of theory and methodology.       4         12       IWST 5. Consultation on the implementation of IWS 3. Calculations of explosive reaction parameters       1         13       Lec 13. SHS-technologies for obtaining materials       1         13       Sem 13. Approximate methods of chemical kinetics. Bodenstein's stationary principle. Part 2       1         13       Lab 13. Calculation of the volume rate of heat release according to the temperature profile. Processing laboratory results. Charting and lab report       4         13       IWS 3. Calculations of explosive reaction parameters       11         14       Lec 14. Soot formation at combustion of hydrocarbons. Phenomenology of low temperature soot formation       1         14       Sem 14. Kinetics of solid-phase reactions. Part 1       1       2         14       Lab 14. Determination of the calorific value and combustion parameters of 4       5         14       IWS T 4. Colloquium (situational task). Calculation of parameters of combustion and detonation processes.       11         15       Lec 15. Environmental pollution by nitrogen oxides. The formation of nitrogen oxides       1       2         15       Let 15. Determination of the calorific value and combustion parameters of 4       5       5         15       Let 15. Determination of the calorific value and	12	sem 12. Approximate methods of chemical kinetics. Bodenstein's stationary	1	2
12       Lab 12. Calculation of the volume rate of hear release according to the 4       5         12       IWST 5. Consultation on the implementation of IWS 3. Calculations of explosive reaction parameters       1         13       Lec 13. SHS-technologies for obtaining materials       1         13       Sem 13. Approximate methods of chemical kinetics. Bodenstein's stationary principle. Part 2       1         13       Lab 13. Calculation of the volume rate of heat release according to the 4       5         13       Lab 13. Calculation of the volume rate of heat release according to the 4       5         13       Lab 13. Calculation of the volume rate of heat release according to the 4       5         14       Lec 14. Soot formation at combustion parameters       11         14       Lec 14. Soot formation of the calorific value and combustion parameters of 4       5         14       Sem 14. Kinetics of solid-phase reactions. Part 1       1       2         14       Let 15. Environmental pollution by nitrogen oxides. The formation of nitrogen oxides       11         15       Let 15. Environmental pollution by nitrogen oxides. The formation of nitrogen oxides       1       2         15       Let 15. Determination of the calorific value and combustion parameters of 4       5       5         15       Let 15. Environmental pollution by nitrogen oxides. The formation of nitrogen oxides	10		4	
12       IWST 5. Consultation on the implementation of IWS 3. Calculations of explosive reaction parameters         13       Lec 13. SHS-technologies for obtaining materials       1         13       Sem 13. Approximate methods of chemical kinetics. Bodenstein's stationary principle. Part 2       1         13       Lab 13. Calculation of the volume rate of heat release according to the temperature profile. Processing laboratory results. Charting and lab report       1         13       IWS 3. Calculations of explosive reaction parameters       11         14       Lec 14. Soot formation at combustion of hydrocarbons. Phenomenology of low temperature soot formation       1         14       Sem 14. Kinetics of solid-phase reactions. Part 1       1       2         14       Lab 14. Determination of the calorific value and combustion parameters of 4       5         14       IAB 14. Colloquium (situational task). Calculation of parameters of combustion and detonation processes.       11         15       Lec 15. Environmental pollution by nitrogen oxides. The formation of nitrogen oxides       1       2         15       Let 15. Determination of the calorific value and combustion parameters of 4       5       5         15       Let 15. Determination of the calorific value and combustion parameters of 4       5         16       WST 4. Colloquium (situational task). Calculation of nitrogen oxides       1       2	12	Lab 12. Calculation of the volume rate of heat release according to the	4	5
12       IWST 5. Consultation on the implementation of IWS 3. Calculations of explosive reaction parameters         13       Lec 13. SHS-technologies for obtaining materials       1         13       Sem 13. Approximate methods of chemical kinetics. Bodenstein's stationary principle. Part 2       1         13       Lab 13. Calculation of the volume rate of heat release according to the temperature profile. Processing laboratory results. Charting and lab report       4         13       IWS 3. Calculations of explosive reaction parameters       11         14       Lec 14. Soot formation at combustion of hydrocarbons. Phenomenology of low temperature soot formation       1         14       Sem 14. Kinetics of solid-phase reactions. Part 1       1       2         14       Lab 14. Determination of the calorific value and combustion parameters of 4       5         14       Lab 14. Determination of the calorific value and combustion parameters of 4       5         15       Lec 15. Environmental pollution by nitrogen oxides. The formation of nitrogen oxides       11         15       Let 15. Determination of the calorific value and combustion parameters of 4       5         15       Let 15. Environmental pollution by nitrogen oxides. The formation of nitrogen oxides       1         15       Let 15. Determination of the calorific value and combustion parameters of 4       5         16       UWST 7. Consultation of the cal		temperature profile. Submission of theory and methodology.		
explosive reaction parameters       1         13       Lec 13. SHS-technologies for obtaining materials       1         13       Sem 13. Approximate methods of chemical kinetics. Bodenstein's stationary principle. Part 2       1       2         13       Lab 13. Calculation of the volume rate of heat release according to the temperature profile. Processing laboratory results. Charting and lab report       4       5         13       IWS 3. Calculations of explosive reaction parameters       11       14       Lec 14. Soot formation at combustion of hydrocarbons. Phenomenology of low temperature soot formation       1       2         14       Sem 14. Kinetics of solid-phase reactions. Part 1       1       2         14       Lab 14. Determination of the calorific value and combustion parameters of combustion gameters of combustion gameters of combustion gameters of combustion and detonation processes.       11         14       IWST 4. Colloquium (situational task). Calculation of parameters of combustion and detonation processes.       11         15       Lec 15. Environmental pollution by nitrogen oxides. The formation of nitrogen oxides       1       2         15       Let 15. Determination of the calorific value and combustion parameters of 4       5       5         15       Let 15. Environmental pollution by nitrogen oxides. The formation of nitrogen oxides       1       2         15       Lab 15. Determination of the	12	<b>IWST 5.</b> Consultation on the implementation of IWS 3. Calculations of		
13       Lec 13. SHS-technologies for obtaining materials       1         13       Sem 13. Approximate methods of chemical kinetics. Bodenstein's stationary principle. Part 2       1       2         13       Lab 13. Calculation of the volume rate of heat release according to the temperature profile. Processing laboratory results. Charting and lab report       4       5         13       Lw 3. Calculations of explosive reaction parameters       11       1       2         14       Lec 14. Soot formation at combustion of hydrocarbons. Phenomenology of low temperature soot formation       1       2         14       Sem 14. Kinetics of solid-phase reactions. Part 1       1       2         14       Lab 14. Determination of the calorific value and combustion parameters of combustion gases. Submission of theory and methodology       1       1         14       IWST 4. Colloquium (situational task). Calculation of parameters of combustion and detonation processes.       1       2         15       Lec 15. Environmental pollution by nitrogen oxides. The formation of nitrogen oxides       1       2         15       Lab 15. Determination of the calorific value and combustion parameters of 4       5       5         15       Let 15. Environmental pollution by nitrogen oxides. The formation of nitrogen 0       1       2         15       Let 15. Chermination of the calorific value and combustion parameters of 4		explosive reaction parameters		
13       Sem 13. Approximate methods of chemical kinetics. Bodenstein's stationary principle. Part 2       1       2         13       Lab 13. Calculation of the volume rate of heat release according to the temperature profile. Processing laboratory results. Charting and lab report       4       5         13       IWS 3. Calculations of explosive reaction parameters       11         14       Lec 14. Soot formation at combustion of hydrocarbons. Phenomenology of low temperature soot formation       1       2         14       Sem 14. Kinetics of solid-phase reactions. Part 1       1       2         14       Lab 14. Determination of the calorific value and combustion parameters of combustible gases. Submission of theory and methodology       4       5         14       IWST 4. Colloquium (situational task). Calculation of parameters of combustion and detonation processes.       11       1         15       Sem 15. Kinetics of solid-phase reactions. Part 2       1       2         15       Let 15. Determination of the calorific value and combustion of nitrogen oxides       1       2         15       Sem 15. Kinetics of solid-phase reactions. Part 2       1       2         15       Let 15. Determination of the calorific value and combustion parameters of 4       5         15       Sem 15. Kinetics of solid-phase reactions. Part 2       1       2         15       Lab 15. Dete	13	Lec 13. SHS-technologies for obtaining materials	1	
principle. Part 2       13       Lab 13. Calculation of the volume rate of heat release according to the temperature profile. Processing laboratory results. Charting and lab report       4       5         13       IWS 3. Calculations of explosive reaction parameters       11         14       Lec 14. Soot formation at combustion of hydrocarbons. Phenomenology of low temperature soot formation       1         14       Sem 14. Kinetics of solid-phase reactions. Part 1       1       2         14       Lab 14. Determination of the calorific value and combustion parameters of combustible gases. Submission of theory and methodology       1       1         14       IWST 4. Colloquium (situational task). Calculation of parameters of combustion and detonation processes.       11       1         15       Lec 15. Environmental pollution by nitrogen oxides. The formation of nitrogen oxides       1       2         15       Sem 15. Kinetics of solid-phase reactions. Part 2       1       2         15       Lec 15. Environmental pollution by nitrogen oxides. The formation of nitrogen oxides       1       2         15       Sem 15. Kinetics of solid-phase reactions. Part 2       1       2         15       Lab 15. Determination of the calorific value and combustion parameters of 4       5         15       Lab 15. Determination of the calorific value and combustion parameters of 4       5         15 <td>13</td> <td>Sem 13. Approximate methods of chemical kinetics. Bodenstein's stationary</td> <td>1</td> <td>2</td>	13	Sem 13. Approximate methods of chemical kinetics. Bodenstein's stationary	1	2
13       Lab 13. Calculation of the volume rate of heat release according to the temperature profile. Processing laboratory results. Charting and lab report       4       5         13       IWS 3. Calculations of explosive reaction parameters       11         14       Lec 14. Soot formation at combustion of hydrocarbons. Phenomenology of low temperature soot formation       1         14       Sem 14. Kinetics of solid-phase reactions. Part 1       1       2         14       Lab 14. Determination of the calorific value and combustion parameters of combustible gases. Submission of theory and methodology       1       2         14       IWST 4. Colloquium (situational task). Calculation of parameters of combustion and detonation processes.       11       2         15       Lec 15. Environmental pollution by nitrogen oxides. The formation of nitrogen oxides       1       2         15       Sem 15. Kinetics of solid-phase reactions. Part 2       1       2         15       Lec 15. Environmental pollution by nitrogen oxides. The formation of nitrogen oxides       1       2         15       Sem 15. Kinetics of solid-phase reactions. Part 2       1       2         15       Lab 15. Determination of the calorific value and combustion parameters of 4       5         15       Lec 15. Environmental pollution by nitrogen oxides. Charting and lab report       1       2         15       Lab		principle. Part 2		
temperature profile. Processing laboratory results. Charting and lab report       11         13       IWS 3. Calculations of explosive reaction parameters       11         14       Lec 14. Soot formation at combustion of hydrocarbons. Phenomenology of low temperature soot formation       1         14       Sem 14. Kinetics of solid-phase reactions. Part 1       1       2         14       Lab 14. Determination of the calorific value and combustion parameters of combustible gases. Submission of theory and methodology       1       2         14       IWST 4. Colloquium (situational task). Calculation of parameters of combustion and detonation processes.       11       1       2         15       Lec 15. Environmental pollution by nitrogen oxides. The formation of nitrogen oxides       1       2         15       Sem 15. Kinetics of solid-phase reactions. Part 2       1       2         15       Lab 15. Determination of the calorific value and combustion parameters of combustible gases. Processing laboratory results. Charting and lab report       4       5	13	Lab 13. Calculation of the volume rate of heat release according to the	4	5
13       IWS 3. Calculations of explosive reaction parameters       11         14       Lec 14. Soot formation at combustion of hydrocarbons. Phenomenology of low temperature soot formation       1         14       Sem 14. Kinetics of solid-phase reactions. Part 1       1       2         14       Lab 14. Determination of the calorific value and combustion parameters of combustible gases. Submission of theory and methodology       4       5         14       IWST 4. Colloquium (situational task). Calculation of parameters of combustion and detonation processes.       11       1         15       Lec 15. Environmental pollution by nitrogen oxides. The formation of nitrogen oxides       1       2         15       Sem 15. Kinetics of solid-phase reactions. Part 2       1       2         15       Lab 15. Determination of the calorific value and combustion parameters of 4       5         15       Sem 15. Kinetics of solid-phase reactions. Part 2       1       2         15       Lab 15. Determination of the calorific value and combustion parameters of 4       5         16       Lab 15. Determination of the calorific value and combustion parameters of 4       5         16       Lab 15. Determination of the calorific value and combustion parameters of 4       5         17       Lab 15. Determination of the calorific value and combustion parameters of 4       5         16		temperature profile. Processing laboratory results. Charting and lab report		
14       Lec 14. Soot formation at combustion of hydrocarbons. Phenomenology of low temperature soot formation       1         14       Sem 14. Kinetics of solid-phase reactions. Part 1       1       2         14       Lab 14. Determination of the calorific value and combustion parameters of combustible gases. Submission of theory and methodology       4       5         14       IWST 4. Colloquium (situational task). Calculation of parameters of combustion and detonation processes.       11       1         15       Lec 15. Environmental pollution by nitrogen oxides. The formation of nitrogen oxides       1       2         15       Sem 15. Kinetics of solid-phase reactions. Part 2       1       2         15       Lab 15. Determination of the calorific value and combustion parameters of 4       5         15       Sem 15. Kinetics of solid-phase reactions. Part 2       1       2         15       Lab 15. Determination of the calorific value and combustion parameters of 4       5         15       Lab 15. Determination of the calorific value and combustion parameters of 4       5         16       Lab 15. Determination of the calorific value and combustion parameters of 4       5         15       Lab 15. Determination of the calorific value and combustion parameters of 4       5         16       LwST 7. Consultation of parameters is processing laboratory results. Charting and lab report       5	13	IWS 3. Calculations of explosive reaction parameters		11
14       Sem 14. Kinetics of solid-phase reactions. Part 1       1       2         14       Lab 14. Determination of the calorific value and combustion parameters of 4       5         14       Lab 14. Determination of the calorific value and combustion parameters of 4       5         14       Lab 14. Determination of the calorific value and combustion parameters of 4       5         14       IWST 4. Colloquium (situational task). Calculation of parameters of combustion and detonation processes.       11         15       Lec 15. Environmental pollution by nitrogen oxides. The formation of nitrogen 1       0         15       Sem 15. Kinetics of solid-phase reactions. Part 2       1       2         15       Lab 15. Determination of the calorific value and combustion parameters of 4       5         15       Lab 15. Determination of the calorific value and combustion parameters of 4       5         16       Lab 15. Determination of the calorific value and combustion parameters of 4       5         15       Lab 15. Determination of the calorific value and combustion parameters of 4       5         16       LwST 7. Computation of the calorific value and lab report       1	14	Lec 14. Soot formation at combustion of hydrocarbons. Phenomenology of low	1	
14       Sem 14. Kinetics of solid-phase reactions. Part 1       1       2         14       Lab 14. Determination of the calorific value and combustion parameters of 4       5         combustible gases. Submission of theory and methodology       4       5         14       IWST 4. Colloquium (situational task). Calculation of parameters of combustion and detonation processes.       11         15       Lec 15. Environmental pollution by nitrogen oxides. The formation of nitrogen 1       0         15       Sem 15. Kinetics of solid-phase reactions. Part 2       1       2         15       Lab 15. Determination of the calorific value and combustion parameters of 4       5         15       Lab 15. Determination of the calorific value and combustion parameters of 4       5         16       Lab 15. Determination of the calorific value and combustion parameters of 4       5         15       Lab 15. Determination of the calorific value and combustion parameters of 4       5         16       LWST 7. Computation of the calorific value and lab report       1		temperature soot formation	å	
14       Lab 14. Determination of the calorific value and combustion parameters of 4       5         14       Lab 14. Determination of the calorific value and combustion parameters of 4       5         14       IWST 4. Colloquium (situational task). Calculation of parameters of combustion and detonation processes.       11         15       Lec 15. Environmental pollution by nitrogen oxides. The formation of nitrogen 1       1         15       Sem 15. Kinetics of solid-phase reactions. Part 2       1       2         15       Lab 15. Determination of the calorific value and combustion parameters of 4       5         15       Lab 15. Determination of the calorific value and combustion parameters of 4       5         16       Lab 15. Determination of the calorific value and combustion parameters of 4       5         15       Lab 15. Determination of the calorific value and combustion parameters of 4       5         15       Lab 15. Determination of the calorific value and combustion parameters of 4       5         15       IWST 7. Consultation of parameters include the port       1	14	Sem 14 Kinetics of solid-phase reactions Part 1	1	2
14       Lab 14. Determination of the calorific value and combustion parameters of combustion parameters of combustion gases. Submission of theory and methodology       4       3         14       IWST 4. Colloquium (situational task). Calculation of parameters of combustion and detonation processes.       11         15       Lec 15. Environmental pollution by nitrogen oxides. The formation of nitrogen oxides       1         15       Sem 15. Kinetics of solid-phase reactions. Part 2       1       2         15       Lab 15. Determination of the calorific value and combustion parameters of combustible gases. Processing laboratory results. Charting and lab report       4       5         15       IWST 7. Consultation processing laboratory results.       Charting and lab report       5	14	Leb 14. Determination of the colorific value and combustion perspectators of		2
14       IWST 4. Colloquium (situational task). Calculation of parameters of combustion and detonation processes.       11         15       Lec 15. Environmental pollution by nitrogen oxides. The formation of nitrogen oxides       1         15       Sem 15. Kinetics of solid-phase reactions. Part 2       1       2         15       Lab 15. Determination of the calorific value and combustion parameters of combustible gases. Processing laboratory results. Charting and lab report       4       5	14	combustible gases. Submission of theory and methodology	4	5
and detonation processes.       15         15       Lec 15. Environmental pollution by nitrogen oxides. The formation of nitrogen 1 oxides         15       Sem 15. Kinetics of solid-phase reactions. Part 2       1       2         15       Lab 15. Determination of the calorific value and combustion parameters of 4       5         15       Lab 15. Determination of the calorific value and combustion parameters of 4       5         15       LwST 7. Computation parameters is processing laboratory results. Charting and lab report       15	14	IWST 4. Colloquium (situational task). Calculation of parameters of combustion		11
15       Lec 15. Environmental pollution by nitrogen oxides. The formation of nitrogen 1         15       Sem 15. Kinetics of solid-phase reactions. Part 2       1       2         15       Lab 15. Determination of the calorific value and combustion parameters of 4       5         combustible gases. Processing laboratory results. Charting and lab report       1       2		and detonation processes.		
15     Sem 15. Kinetics of solid-phase reactions. Part 2     1     2       15     Lab 15. Determination of the calorific value and combustion parameters of combustible gases. Processing laboratory results. Charting and lab report     4     5	15	Lee 15 Environmental pollution by nitrogen oxides. The formation of nitrogen	1	
15       Sem 15. Kinetics of solid-phase reactions. Part 2       1       2         15       Lab 15. Determination of the calorific value and combustion parameters of combustible gases. Processing laboratory results. Charting and lab report       4       5         15       IWST 7. Computation on parameters in parameters of computation parameters in parameters	1.5	oxides	1	
15     Semi 15. Kinetics of sonu-phase reactions. Part 2     1     2       15     Lab 15. Determination of the calorific value and combustion parameters of combustible gases. Processing laboratory results. Charting and lab report     4     5       15     IWST 7. Computation on examination issues (     5     5	15	Sem 15 Kinetics of colid phase reactions Dart 2	1	2
15     Lab 15. Determination of the calorific value and combustion parameters of 4     5       combustible gases. Processing laboratory results. Charting and lab report     4     5	15	Sell 15. Kiletics of solid-phase reactions. Part 2	1	<u> </u>
compustible gases. Processing laboratory results. Charting and lab report	15	Lab 15. Determination of the calorific value and combustion parameters of	4	5
IN INVERT Consultation on evaluation issues		computible gases. Processing laboratory results. Charting and lab report		
15 INFST /. Consultation on examination issues/	15	IWST 7. Consultation on examination issues/		
15 LEVEL CONTROL 2 100	15	LEVEL CONTROL 2		100
15 LEVEL CONTROL 2 , 100	<u>15</u> 15	combustible gases. Processing laboratory results. Charting and lab report IWST 7. Consultation on examination issues/ LEVEL CONTROL 2		100

Head of the Department

۲



L. Kudreeva M.Tulepov Y.Ongarbayev