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**Theoretical & Applied Science**

**Technological advances**

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**Philadelphia, USA**

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**Theoretical & Applied  
Science**

**03 (35)**

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# International Scientific Journal

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## SYNTHESIS AND TRANSFORMATIONS OF SOME TETRAHYDROPYRIMIDINE-5-CARBOXYLATES

**Abstract:** 2-(methacryloyloxy) ethyl 6-methyl-2-oxo-4-phenyl-1,2,3,4-tetrahydropyrimidine-5-carboxylate, which are cyclic ureas derivatives were synthesized from urea, 2-(methacryloyloxy) ethyl acetoacetate substituted and benzaldehyde.

**Key words:** Benzaldehyde; single-crystal X-ray study; urea; 2-(methacryloyloxy) ethyl acetoacetate.

**Language:** English

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### 1. INTRODUCTION

The pyrimidinethiones display many pharmacological properties, as part of our interest in this kind of materials, we report here the synthesis and crystal structure determination of the title compound<sup>[1]</sup>. Our synthesis is based in the Bidjinelli reaction, which consists on a three-component condensation of an aldehyde, a methylene active compound and an urea derivative in acidic media. This procedure is the most simple and useful for the preparation of 3,4-dihydropyrimidine-2(1H) ones<sup>[2-4]</sup>.

New cyclic ureas were obtained by continuing researches in the field of the synthesis of various classes of organic nitrogen compounds and the study of their transformations. So that first time 2-(methacryloyloxy)ethyl 6-methyl-2-oxo-4-

phenyl-1,2,3,4-tetrahydropyrimidine-5-carboxylate were obtained for the first time by us based on the trifluoroacetic acid catalyst.

### 2. EXPERIMENTAL

#### Chemistry

#### Synthesis of 2-(methacryloyloxy) ethyl 6-methyl-2-oxo-4-phenyl-1,2,3,4-tetrahydropyrimidine-5-carboxylate (1)

Urea (1.20 gr, 0.02 mol) is dissolved in 3:1 ratio of acetylacetone (3 ml) and ethyl alcohol (1 ml) and 2-(methacryloyloxy)ethyl acetoacetate (3.82 ml, 0.02 mol) is added on it drop by drop. After being dissolved in magnetic stirrer for 5 minutes benzaldehyde (2.03 ml, 0.02 mol) is added. After determining that the reaction has been fully completed, the solvent is evaporated. Processing of the reaction mixture was carried out by washing the reaction mixture



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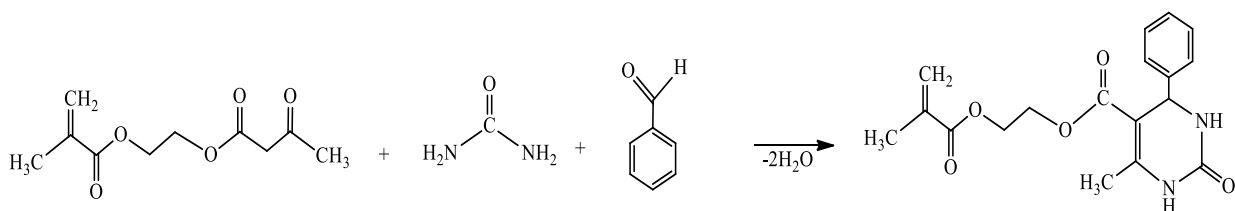
with ice water, the precipitate was filtered, washed with 500 ml of water, dried and recrystallized from ethanol (75 ml). The yield is 2.4 g, mp. 211 °C.

Eluent-ethanol:hexane (5:2). <sup>1</sup>H NMR (300 MHz, DMSO-d<sub>6</sub>) 5.135 (s, 3H, CH<sub>3</sub>), 6.8-7.1 (m, H, Ar), 7.4 (m, H, Ar), 9.35 (s, 1H, NH). <sup>13</sup>C NMR (75 MHz, DMSO-d<sub>6</sub>) 5.24, 29, 37, 51, 86, 117, 122, 129, 132, 141, 151, 205 (C=O).

### Synthesis of allyl 1-(3-chloro-2-hidroksipropyl)-4-metil-6-phenyl-2-thio-1,2,3,6-tetrahydropyrimidine-5-carboxylate (2)

Allyl 6-methyl-4-phenyl-2-thio-1,2,3,4-tetrahydropyrimidine-5-carboxylate (0.908 gr, 0.0033 mol) is dissolved in 2:1 ratio of acetylacetone (10 ml) and ethyl alcohol (5 ml) and epichlorohydrin (0.26 ml, 0.0033 mol) is added on it drop by drop. After being dissolved in the stirrer for 25 minutes, 0.03 gr. aluminiumchloride catalyst is added on it and mixed by heating at 65-70°C. The progress of the reaction is controlled by Sulifol UV 254 plate. After determining the full completion of reaction, solution is evaporated and is cleansed in ethyl alcohol solution. The white crystalline having the melting temperature of 168°C is obtained.

Eluent-ethanol:hexane (5:2). <sup>1</sup>H NMR (300 MHz, DMSO-d<sub>6</sub>) 2.30 (s, 3H, CH<sub>3</sub>), 7.06-7.25 (m, H, Ar), 4.81 (H, OH), 9.84 (s, 1H, NH), 3.40, 3.65 (2H, CH<sub>2</sub>). <sup>13</sup>C NMR (75 MHz, DMSO-d<sub>6</sub>) 15.5, 49.5, 56.3, 67.8, 71.2, 74.5, 106, 116.4, 127.1, 128.6, 133.5, 138, 158.8, 167.2, 178.4.



Scheme 1

At the next stage we have provided the transformation of obtained compounds. So, by the reaction epichlorohydrin had synthesised

### Synthesis of ethyl 1-(2-hidroksibutyl)-4-methyl-6-phenyl-2-thio-1,2,3,6-tetrahydropyrimidine-5-carboxylate (3)

Ethyl 6-methyl-2-thio-4-(p-tolyl)-1,2,3,4-tetrahydropyrimidine-5-carboxylate (1.52 gr, 0.02 mol) is dissolved in 2:1 ratio of acetylacetone (12 ml) and ethyl alcohol (5 ml) and 1,2-epoxobutane (2.03 ml, 0.02mol) is added on it drop by drop. After being dissolved in the stirrer for 30 minutes, 0.02 gr. aluminiumchloride catalyst is added on it and mixed by heating at 60-65°C. The progress of the reaction is controlled by Sulifol UV 254 plate. After determining the full completion of reaction, solution is evaporated and is cleansed in ethyl alcohol solution. The white crystalline having the melting temperature of 192°C is obtained.

Eluent-ethanol:hexane (5:2). <sup>1</sup>H NMR (300 MHz, DMSO-d<sub>6</sub>) 0.96 (s, 3H, CH<sub>3</sub>), 4.59-7.25 (m, 6H, Ar), 4.81 (H, OH), 3.45 (1H, CH), 9.84 (s, 1H, NH), 3.40, 1.48 (2H, CH<sub>2</sub>). <sup>13</sup>C NMR (75 MHz, DMSO-d<sub>6</sub>) 14.2, 28.6, 58.9, 61.7, 71.2, 71.6, 104.2, 127.1, 127.9, 128.6, 129.9, 138, 160.3, 167.2, 178.

## 3. RESULTS AND DISCUSSION

The synthesis of the new compounds is reported in Schemes 1, 2, 3. The reaction of substituted benzaldehyde with methylene active compounds such as 2-(methacryloyloxy)ethyl acetoacetate and urea in the presence of trifluoroacetic acid led to the desired cyclic urea.

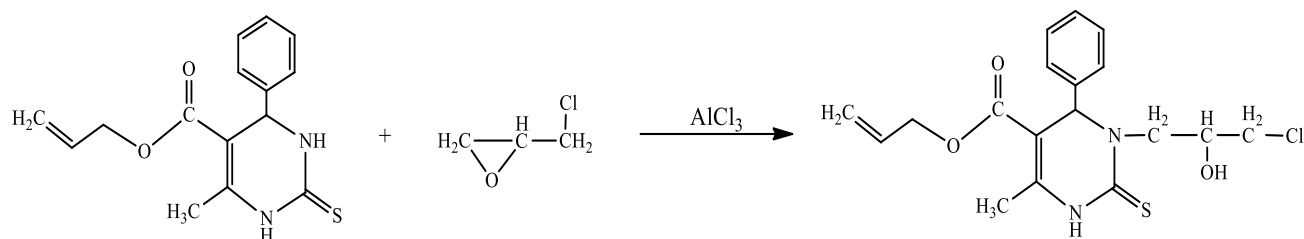
allyl 1-(3-chloro-2-hidroksipropyl)-4-metil-6-phenyl-2-thio-1,2,3,6-tetrahydropyrimidine-5-carboxylate.

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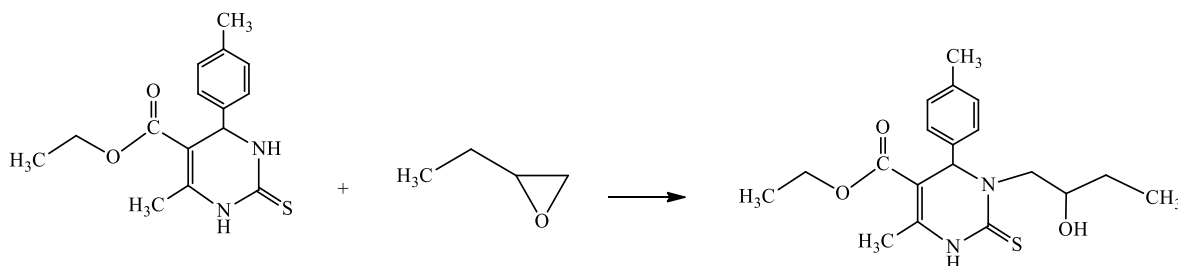
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Scheme 2

At the same time by the reaction 1,2-epoxobutane synthesised ethyl 1-(2-

hidroksibutyl)-4-methyl-6-phenyl-2-thioxo-1,2,3,6-tetrahydropyrimidine-5-carboxylate.



Scheme 3

The three-component condensation reactions come to an end within 2,5-3 hours at 60-75°C. The synthesized compounds were crystalline and their structure was confirmed by spectral and physico-chemical methods, among which IR,  $^1\text{H}$ ,  $^{13}\text{C}$  NMR and X-ray spectroscopy:

The crystal structure of synthesized 2-(methacryloyloxy)ethyl 6-methyl-2-oxo-4-

phenyl-1,2,3,4-tetrahydropyrimidine-5-carboxylate has been determined with X-ray structure analysis method. The structure and crystalline form of new cyclical compound have been shown in the fig.1 and fig.2. Crystalline compound holds two crystallographical independent molecules.

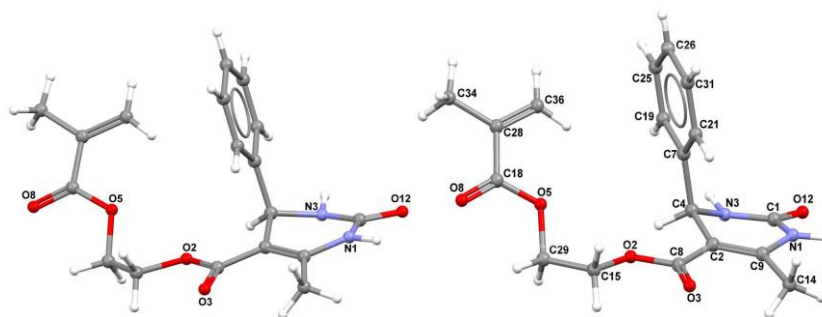
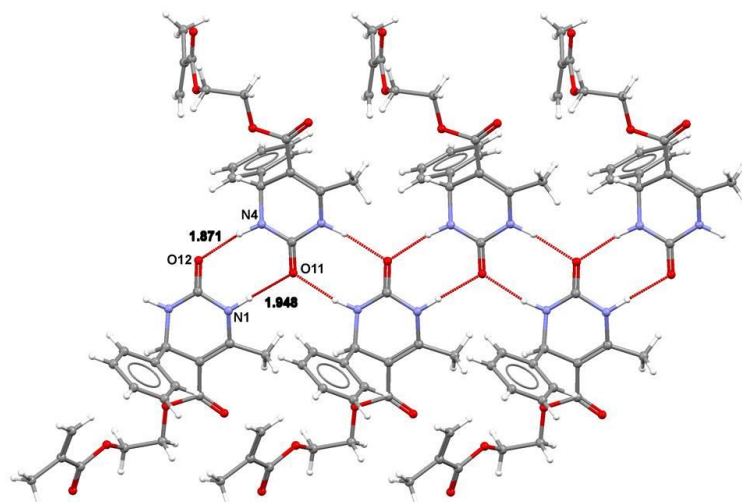


Figure 1 - The molecular structure of the new compound.



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**Figure 2 - Packing diagram of the title compound. N—H—O hydrogen bonds are shown as dashed lines. For clarity only one of the disordered components of the phenyl ring is shown.**

In the compound, the C8, C9, C11 and C12 atoms of the phenyl ring are disordered over two sets of sites in a 0.60 (3):0.40 (3) ratio. The heterocycle ring is essentially planar and form a dihedral angle of with the phenyl ring. The crystal packing is stabilized by intermolecular N3—H3N...O1 hydrogen bonds (Table 1-3), which link the molecules into chains running

parallel to the b axis (Fig.2), with graph-set notation C(6) [5].

Data collection: *APEX2* [6]; cell refinement: *SAINT-Plus* [7]; data reduction: *SAINT-Plus*; program(s) used to solve structure: *SHELXTL* [8-9]; program(s) used to refine structure: *SHELXTL*; molecular graphics: *SHELXTL*; software used to prepare material for publication: *SHELXTL*.

**Table 1**

**Crystal data and structure refinement for a\_a.**

Identification code	a_a	
Empirical formula	C <sub>18</sub> H <sub>20</sub> N <sub>2</sub> O <sub>5</sub>	
Formula weight	344.36	
Temperature	373(2) K	
Wavelength	0.71073 Å	
Crystal system	Monoclinic	
Space group	P 21/c	
Unit cell dimensions	a = 16.441(4) Å	a = 90°.
	b = 27.869(6) Å	b = 91.822(5)°.
	c = 7.1837(15) Å	g = 90°.
Volume	3289.8(12) Å <sup>3</sup>	
Z	8	
Density (calculated)	1.391 Mg/m <sup>3</sup>	
Absorption coefficient	0.102 mm <sup>-1</sup>	
F(000)	1456	
Crystal size	0.12 x 0.14 x 0.18 mm <sup>3</sup>	
Theta range for data collection	1.916 to 26.998°.	
Index ranges	-20<=h<=20, -33<=k<=35, -9<=l<=9	
Reflections collected	21576	
Independent reflections	6215 [R(int) = 0.0544]	
Completeness to theta = 25.242°	92.7 %	
Refinement method	Full-matrix least-squares on F <sup>2</sup>	
Data / restraints / parameters	6215 / 0 / 455	

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Goodness-of-fit on $F^2$	1.059
Final R indices [ $I > 2\sigma(I)$ ]	$R^1 = 0.0862$ , $wR^2 = 0.1890$
R indices (all data)	$R^1 = 0.1206$ , $wR^2 = 0.2065$
Extinction coefficient	n/a
Largest diff. peak and hole	0.491 and -0.311 e. $\text{\AA}^{-3}$

### Special details

**Geometry.** All e.s.d.'s (except the e.s.d. in the dihedral angle between two l.s. planes) are estimated using the full covariance matrix. The cell e.s.d.'s are taken into account individually in the estimation of e.s.d.'s in distances, angles and torsion angles; correlations between e.s.d.'s in cell parameters are only used when they are defined by crystal symmetry. An approximate (isotropic) treatment of cell e.s.d.'s is used for estimating e.s.d.'s involving l.s. planes.

**Refinement.** Refinement of  $F^2$  against ALL reflections. The weighted R-factor  $wR$  and goodness of fit  $S$  are based on  $F^2$ , conventional R-factors  $R$  are based on  $F$ , with  $F$  set to zero for negative  $F^2$ . The threshold expression of  $F^2 > \sigma(F^2)$  is used only for calculating R-factors (gt) etc. and is not relevant to the choice of reflections for refinement. R-factors based on  $F^2$  are statistically about twice as large as those based on  $F$ , and R-factors based on ALL data will be even larger.

Table 2

Atomic coordinates ( $\times 10^4$ ) and equivalent isotropic displacement parameters ( $\text{\AA}^2 \times 10^3$ ) for a\_a.  $U(\text{eq})$  is defined as one third of the trace of the orthogonalized  $U_{ij}$  tensor.

	x	y	z	U(eq)
O(1)	4377(2)	5866(1)	2262(3)	30(1)
N(1)	8372(2)	4725(1)	11017(4)	23(1)
C(1)	7970(2)	4850(1)	9393(5)	22(1)
O(2)	10562(2)	4190(1)	7716(3)	28(1)
N(2)	6542(2)	5330(1)	5902(4)	26(1)
C(2)	9498(2)	4417(1)	9509(5)	21(1)
O(3)	10796(2)	4197(1)	10777(4)	33(1)
N(3)	8334(2)	4734(1)	7851(4)	23(1)
C(3)	6949(2)	5210(1)	4338(5)	24(1)
O(4)	4063(2)	6419(1)	-835(4)	35(1)
N(4)	6582(2)	5331(1)	2741(4)	25(1)
C(4)	8985(2)	4381(1)	7761(5)	23(1)
O(5)	10892(2)	3631(1)	4709(4)	35(1)
C(5)	5744(2)	5472(1)	5859(5)	24(1)
O(6)	4073(2)	5793(1)	5246(4)	38(1)
C(6)	4563(2)	5770(1)	4061(5)	27(1)
O(7)	3104(2)	6969(1)	-1087(4)	46(1)
C(7)	8654(2)	3884(1)	7352(5)	26(1)
O(8)	11800(2)	3283(1)	2941(4)	50(1)
C(8)	10340(2)	4261(1)	9474(5)	24(1)
C(9)	9167(2)	4569(1)	11078(5)	22(1)
C(10)	6314(2)	6189(1)	2500(5)	30(1)
O(11)	7599(2)	4997(1)	4428(3)	25(1)
C(11)	5949(2)	5696(1)	2635(5)	25(1)
O(12)	7324(2)	5070(1)	9420(3)	27(1)
C(12)	3796(3)	6859(1)	-1188(5)	32(1)
C(13)	5338(2)	5431(1)	7662(5)	28(1)
C(14)	9574(2)	4601(1)	12942(5)	28(1)
C(15)	11354(2)	3984(2)	7530(6)	33(1)
C(16)	5415(2)	5634(1)	4262(5)	26(1)



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C(17)	3566(2)	6026(1)	1842(5)	29(1)
C(18)	11114(3)	3339(2)	3364(6)	36(1)
C(19)	8189(2)	3812(2)	5739(6)	34(1)
C(20)	6721(2)	6317(2)	912(6)	34(1)
C(21)	8791(3)	3504(2)	8498(6)	37(1)
C(22)	6300(3)	6520(1)	3921(6)	37(1)
C(23)	3490(2)	6073(2)	-210(6)	33(1)
C(24)	7103(2)	6755(2)	797(7)	40(1)
C(25)	7872(2)	3372(2)	5320(6)	41(1)
C(26)	8008(3)	2994(2)	6490(7)	43(1)
C(27)	4449(3)	7190(2)	-1704(6)	38(1)
C(28)	10421(3)	3088(2)	2481(6)	41(1)
C(29)	11501(2)	3939(2)	5515(6)	36(1)
C(30)	6686(3)	6950(2)	3801(7)	47(1)
C(31)	8474(3)	3062(2)	8070(7)	47(1)
C(32)	4224(3)	7688(2)	-1877(6)	47(1)
C(33)	7095(3)	7069(2)	2246(7)	47(1)
C(34)	10619(4)	2765(2)	962(8)	73(2)
C(35)	5203(3)	7024(2)	-1952(7)	57(1)
C(36)	9671(3)	3154(2)	3056(6)	43(1)

**Table 3****Hydrogen bonds for a<sub>a</sub> [Å and °].**

D-H...A	d(D-H)	d(H...A)	d(D...A)	<(DHA)
N(1)-H(1)...O(11)#1	0.95	1.95	2.897(4)	176.4
N(2)-H(2)...O(12)	0.95	1.95	2.890(4)	171.8
N(3)-H(3)...O(11)	0.95	1.90	2.802(4)	157.8
N(4)-H(4)...O(12)#2	0.95	1.87	2.809(4)	169.1
C(14)-H(14A)...O(3)	0.96	2.32	2.814(5)	111.0
N(1)-H(1)...O(11)#1	0.95	1.95	2.897(4)	176.4
N(2)-H(2)...O(12)	0.95	1.95	2.890(4)	171.8
N(3)-H(3)...O(11)	0.95	1.90	2.802(4)	157.8
N(4)-H(4)...O(12)#2	0.95	1.87	2.809(4)	169.1
C(14)-H(14A)...O(3)	0.96	2.32	2.814(5)	111.0

Symmetry transformations used to generate equivalent atoms:  
#1 x,y,z+1 #2 x,y,z-1 #3 -x+2,-y+1,-z+1

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SECTION 11. Biology. Ecology. Veterinary.

## METHODS OF EVALUATION OF RADON DANGER AREA AND THE IDENTIFICATION OF CRITICAL ZONES RADON HAZARD

**Abstract:** This paper describes an integrated methodological approach for the evaluation of radon hazard area and the search for the critical zones of radon. It presents a complex radon index of the territory, which take into account a number of fundamental ecological and geological factors; transition from complex radon index in volume activity of radon; calculation of the 99th percentile of radon volumetric activity in the locality, it is necessary to determine the affiliation of the locality to the critical area of radon.

**Key words:** radon, radon complex index volume activity, critical radon zone.

**Language:** Russian

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### МЕТОДИКА ПО ОЦЕНКЕ РАДОНОВОЙ ОПАСНОСТИ ТЕРРИТОРИИ И ОПРЕДЕЛЕНИЮ КРИТИЧЕСКИХ ЗОН РАДОНООПАСНОСТИ

**Аннотация:** В статье описан комплексный методический подход по оценке радоновой опасности территории и поиску критических зон радоноопасности. Представлен комплексный радоновый показатель территории, который учитывает ряд фундаментальных экологических и геологических факторов; переход от комплексного радонового показателя к объемной активности радона; расчет 99-ого перцентиля объемной активности радона в населенном пункте, что необходимо для определения принадлежности населенного пункта к критической зоне радоноопасности.

**Ключевые слова:** радона, комплексный радоновый показатель, объемная активность, критические зоны радоноопасности.

#### Введение

Проблема радиоактивного газа радона является важной проблемой биологии, экологии и радиационной медицины, непосредственно касающейся населения многих регионов мира, в том числе и Беларуси.

Радон – благородный радиоактивный газ, тяжелее воздуха, не имеющий вкуса, цвета и запаха, образующийся в радиоактивной цепочке в процессе распада естественных радионуклидов семейств урана и тория. Согласно оценке НКДАР ООН, радон и его дочерние продукты определяют примерно 2/3 годовой индивидуальной эффективной дозы облучения, получаемой населением от земных источников радиации, и примерно половину дозы от всех источников радиации [1]. Наиболее значимым и

распространенным дозовым фактором является воздействие радона, содержащегося в воздухе помещений. Радон, являясь компонентом воздуха, попадает в легкие человека при дыхании. По данным Всемирной организации здравоохранения, воздействие радона повышает риск возникновения и развития рака легкого [2], вследствие воздействия высокоэнергетического  $\alpha$ -излучения при распаде радона на высокочувствительные клетки дыхательной системы. По оценкам экспертов МКРЗ облучение населения за счет радона обуславливает до 15 % общего количества заболеваний раком легких [3].

Принципиально новые подходы к оценке радоновой опасности и радиационной защите от радона и его дочерних продуктов распада (ДПР) были показаны в Публикации № 65 МКРЗ [4].



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Одним из основных тезисов данной публикации является необходимость введение понятия и критериев для оценки радоноопасных зон, что является очень важным в случаях недостатка ресурсов для проведения полномасштабных исследований, как, например, в Беларуси. К критическим зонам, согласно [4], относят территории, на которых 1% помещений имеет десятикратное превышение среднереспубликанского значения объемной активности (ОА) радона.

Главным источником поступления радона в атмосферу являются почва, грунтовые породы и грунтовые воды [5]. Процесс выделения радона в основном связан с его диффузией из структурных частиц породы и зависит от большого количества факторов. Точное определение концентрации радона в помещениях зданий требует существенных денежно-временных затрат. Учитывая это, можно провести оценку радоноопасности территории с использованием экологических и геологических показателей, определяющих концентрации радона и выделить критические зоны радоноопасности без проведения длительных и дорогостоящих исследований.

**Целью** настоящей работы являлась разработка комплексного методического подхода по оценки радоновой опасности территории с использованием косвенных показателей радона.

### Материалы и методика исследований

*Исходные данные для определения комплексного радонового показателя (КРП).* Если принять, что в сельских населенных пунктах (НП) преобладают одноэтажные деревянные строения с простыми фундаментами и деревянными полами, то можно считать, что поступление радона в помещение определяется, в основном, свойствами подстилающих пород. Исходя из этого, для оценки радоновой обстановки и поиска критических зон радоноопасности можно предложить величину, равную произведению значений показателей (в относительных величинах), влияющих на ОА радона, которые представляют собой КРП территории. Обоснование применения таких показателей и концепция КРП приводится в работах [6, 7].

Одним из важнейших факторов, связанных с ОА радона является запас урана в почвах и породах. Принимая во внимание, что уран является материнской породой для образования радона – концентрации урана в почвах будут определять содержание радона и как следствие его ОА. Для исследований использовалась геологическая картосхема Республики Беларусь, на которой показано содержание урана в почвах [8].

Следующим показателем, определяющим ОА радона, является мощность экспозиционной дозы. Учитывая, что гамма-фон на местности определяется, в основном, радионуклидами 3-х естественных радиоактивных рядов уранов и тория, а также калия-40 (мощность дозы от которого принята постоянной) – колебания МЭД определяется концентрацией естественных радионуклидов в почвах. Таким образом, МЭД может опосредованно указывать на наличие радона. Чтобы исключить влияние искусственных радионуклидов, выпавших на территории Беларуси после аварии на Чернобыльской АЭС, в исследованиях использовались дочернобыльские карты МЭД [9, 10].

Необходимо также учитывать, что эксхалация радона зависит от проницаемости почвы, которая в свою очередь, в большей степени, зависит от коэффициента фильтрации радона в грунтах [11]. Исходя из того факта, что период полураспада  $^{222}\text{Rn}$  составляет около 3,8 суток, скорость его прохождения через слой почвы имеет важное значение, и обуславливает конечную ОА радона в помещениях зданий. Для определения коэффициента фильтрации использовалась карта четвертичных отложений Республики Беларусь [12].

Также, важным фактором, определяющим концентрации радона, является уровень залегания первого от поверхности водоносного горизонта. При уровне в 1-2 м от поверхности – почвенный радон почти полностью поглощается, а при уровне более 10 м – весь выделенный радон остается в почвенном воздухе [13]. Значения глубины залегания первого водоносного горизонта были получены по гидрогеологической карте Республики Беларусь [14].

*Исходные данные для определения ОА радона и критических зон радоноопасности по косвенным показателям радона.* Для определения связи ОА радона и КРП, а также составления эталонного распределения значений ОА радона в НП для определения 99-ого перцентиля, были использованы результаты прямых измерений среднегодовых значений ОА радона в жилых помещениях НП Республики Беларусь за период 2004-2015 гг., проведенные специалистами ГНУ «ОИЭиЯИ-Сосны» НАН РБ [15, 16]. Исследования были выполнены по методике, позволяющей проводить мониторинг радона: «Методики определения объемной активности радона в воздухе жилых и производственных помещений с использованием интегральных радонметров на основе твердотельных трековых детекторов альфа-частиц» (МВИ. МН. 1808-2002) [17].

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### Результаты исследований и их обсуждение

*Определение значений косвенных показателей, оказывающих влияние на ОА радона в помещениях зданий.* Степень радоновой опасности территории выражается через КРП и определяется рядом косвенных показателей, оказывающих влияние на ОА радона в жилых помещениях. К таким факторам относятся: концентрация урана в почвах, проницаемость почв для радона (выражается через коэффициент фильтрации почвы), глубина залегания первого от поверхности водоносного горизонта, мощность дозы дочернобыльского фона.

Значения концентрации урана в почвах определяются по картосхеме [8] согласно географическим координатам НП или другим географическим точкам, в которых производится расчет КРП. Полученные значения концентрации урана нормируются на значение максимального содержания урана в почве  $2,5 \cdot 10^{-4}\%$ , соответствующее глине и принятое за 1. Таким образом, относительное содержание урана в почве определяется по выражению (1):

$$U_{отн} = U_k / U_{макс} \quad (1)$$

где  $U_{отн}$  – относительное содержание урана в почве, отн. ед.;

$U_k$  – значение концентрации урана в почве, определенное по картосхеме,  $n \cdot 10^{-4}\%$ ;

$U_{макс}$  – максимальное значение урана в почве;

$$U_{макс} = 2,5 \cdot 10^{-4}\%.$$

Значения МЭД дочернобыльского фона определяются по картам [9, 10] согласно географическим координатам НП или другим географическим точкам, в которых производится расчет КРП. Полученные значения МЭД дочернобыльского фона нормируются на значение максимальной МЭД 12 мкР/час, принятое за 1. Таким образом, относительная МЭД дочернобыльского фона определяется по выражению (2):

$$M_{отн} = M_k / M_{макс} \quad (2)$$

где  $M_{отн}$  – относительная МЭД дочернобыльского фона, отн. ед.;

$M_k$  – значение МЭД дочернобыльского фона, определенное по картосхеме, мкР/час;

$M_{макс}$  – максимальное значение МЭД дочернобыльского фона;

$$M_{макс} = 12 \text{ мкР/час}.$$

Значения коэффициента фильтрации почвы для радона определяются по карте [12] согласно географическим координатам НП или другим географическим точкам, в которых производится расчет КРП. Полученные значения коэффициента фильтрации почвы для радона нормируются на значение максимальной фильтрации почвы 30 м/сут, соответствующее песчано-гравийной

смеси и принятое за 1. Таким образом, относительный коэффициент фильтрации почвы для радона определяется по выражению (3):

$$F_{отн} = F_k / F_{макс} \quad (3)$$

где  $F_{отн}$  – относительный коэффициент фильтрации почвы для радона, отн. ед.;

$F_k$  – значение коэффициента фильтрации почвы, определенное по картосхеме, м/сут.;

$F_{макс}$  – максимальное значение коэффициента фильтрации почвы;

$$F_{макс} = 30 \text{ м/сут}.$$

Значения глубины залегания первого от поверхности водоносного горизонта определяются по карте [14] согласно географическим координатам НП или другим географическим точкам, в которых производится расчет КРП. Полученные значения глубины залегания первого от поверхности водоносного горизонта нормируются на значение максимальной глубины залегания 10 м, принятое за 1. Таким образом, относительная глубина залегания первого от поверхности водоносного горизонта определяется по выражению (4):

$$W_{отн} = W_k / W_{макс} \quad (4)$$

где  $W_{отн}$  – относительная глубина залегания первого от поверхности водоносного горизонта, отн. ед.;

$W_k$  – значение глубины залегания первого от поверхности водоносного горизонта, определенное по картосхеме, м;

$W_{макс}$  – максимальное значение глубины залегания первого от поверхности водоносного горизонта;

$$W_{макс} = 10 \text{ м}.$$

Результаты расчетов по формулам (1)-(4) округляются до трех значащих цифр после запятой.

*Расчет комплексного радонового показателя.* Комплексный радоновый показатель, определяющий степень радоновой опасности территории, является произведением значений факторов (в относительных величинах), оказывающих влияние на ОА радона в жилых помещениях. Таким образом, КРП определяется по выражению (5):

$$R = U_{отн} \cdot F_{отн} \cdot W_{отн} \cdot M_{отн} \quad (5)$$

где  $R$  – значение комплексного радонового показателя, отн. ед.;

$U_{отн}$  – относительное содержание урана в почве, отн. ед.;

$F_{отн}$  – относительный коэффициент фильтрации почвы для радона, отн. ед.;

$W_{отн}$  – относительная глубина залегания первого от поверхности водоносного горизонта, отн. ед.;

$M_{отн}$  – относительная МЭД дочернобыльского фона, отн. ед.

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Результаты расчетов по формуле (5) округляется до трех значащих цифр после запятой.

Т.о., с помощью экологических и геологических факторов, оказывающих влияние на ОА радона в жилых помещениях, можно определить значения КРП, который указывает на «радоновые» особенности местности и является мерилем степени радоноопасности территории.

*Определение среднегодовых значений ОА радона в жилых помещениях по КРП.*

Учитывая, что КРП представлен факторами, оказывающими влияние на ОА радона, между КРП и ОА радона в жилых помещениях имеется сильная прямая достоверная корреляционная связь. Особенности данной корреляционной связи описаны в [6].

В связи с этим при отсутствии или недостатке данных по измерению ОА радона в жилых помещениях среднегодовые значения ОА радона могут быть рассчитаны с помощью КРП по уравнению линейной регрессии вида (6):

$$OA_{ср} = a + b \cdot KPP \quad (6)$$

где  $OA_{ср}$  – среднегодовые значения ОА радона в жилом помещении, Бк/м<sup>3</sup>;

$a$  и  $b$  – эмпирически полученные коэффициенты связи среднегодовых значений ОА радона в жилом помещении и КРП;

$KPP$  – комплексный радоновый показатель, отн. ед.

Для определения эмпирических коэффициентов  $a$  и  $b$  было построено уравнение линейной регрессионной связи измеренных среднегодовых значений ОА радона в жилых помещениях НП Республики Беларусь, накопленных за период 2004-2015 гг. [15, 16] и КРП. Данное уравнение имеет вид (7):

$$OA_{изм} = 40 + 6200 \cdot KPP \quad (7)$$

где  $OA_{изм}$  – измеренные среднегодовые значения ОА радона в жилых помещениях НП Республики Беларусь, накопленные за период 2004-2015 гг., Бк/м<sup>3</sup>;

$40$  и  $6200$  – значения коэффициентов связи среднегодовых значений ОА радона в жилом помещении и КРП ( $a$  и  $b$  соответственно);

$KPP$  – комплексный радоновый показатель, отн. ед.

Т.о., определив значение КРП территории или НП можно восстановить через уравнение линейной регрессии ожидаемые среднегодовые значения ОА радона в жилых помещениях данной территории или НП.

*Определение 99-ого перцентиля значений ОА радона в НП.* С точки зрения МКРЗ первостепенное значение имеет определение критических зон радоноопасности, где концентрация радона в зданиях ожидается выше, чем типичные значения для страны в целом. Согласно [4]: «радоноопасная зона может быть определена как зона, в которой около 1% жилищ имеют концентрацию радона в 10 раз превышающую среднее национальное значение». Определив значение 99-ого перцентиля ОА радона в НП и сравнив его с десятикратным среднереспубликанским значением ОА радона, можно определить принадлежность данного НП к критической зоне радоноопасности.

Для теоретического определения 99-ого перцентиля значений ОА радона в НП необходимо рассчитать параметры эталонного распределения. Распределения в любых других НП будут подобны эталонному, а их параметры будут пропорционально больше или меньше параметров эталонного.

Для построения эталонного распределения взяты наиболее представительные НП по ряду факторов:

1) Количеству измерений в НП (> 20 измерений);

2) Охвату территории (все 6 областей Республики Беларусь);

3) Значениям КРП (низкие, средние, высокие значения);

4) Специфики жилищного фонда (процентное соотношение деревянных, кирпичных, панельных домов и т.д.; одно- и многоэтажных домов и т.д.).

Полученное эталонное распределение среднегодовых значений ОА радона в жилых помещениях НП имеет вид (рисунок 1):

Основные параметры эталонного распределения представлены в таблице 1:

Таблица 1

### Основные параметры эталонного распределения:

Среднее арифметическое	Среднее геометрическое	Медиана	Значение 99-ого перцентиля ОА радона
70	55	60	210

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Согласно эталонному распределению значение 99-ого перцентиля ОА радона в 3 раз больше среднего арифметического значения ОА радона. Учитывая, что распределения в других НП будут подобны эталонному, а их параметры будут пропорционально больше или меньше параметров эталонного распределения, измерив среднее значение по НП или восстановив его по КРП, можно определить значение 99-ого перцентиля ОА радона в любом НП по формуле (8):

$$P_{99} = OA_{срнп} \cdot 3 \quad (8)$$

где  $P_{99}$  – значение 99-ого перцентиля ОА радона в НП, Бк/м<sup>3</sup>;  
 $OA_{срнп}$  – среднее значение ОА радона по НП, Бк/м<sup>3</sup>.

Рассчитав значение 99-ого перцентиля ОА радона в НП необходимо сравнить его с десятикратным среднереспубликанским значением ОА радона. Если значение 99-ого перцентиля превышает десятикратный среднереспубликанский уровень ( $P_{99} > OA_{срРБ} \cdot 10$ ) – НП относится к критической зоне радоноопасности и требует неотложных противорадионовых мероприятий [4].

### Заключение

Описанный комплексный методический подход оценки радоновой опасности территории способствует формированию единого качественного процесса исследования радоновой обстановки.

Определение степени радоноопасности территории по КРП учитывает целый ряд фундаментальных экологических и

геологических факторов, оказывающих влияние на ОА радона, что будет способствовать большей информативности процесса исследования, учитывая ряд радиоэкологических и геологических особенностей местности, а также способствовать более точно оценке ОА радона.

С помощью КРП можно восстановить через уравнение линейной регрессии ожидаемые среднегодовые значения ОА радона в жилых помещениях, что особенно актуально в случае отсутствия или недостатка данных по измерению ОА радона.

Рассчитав значение 99-ого перцентиля ОА радона в НП по предложенному эталонному распределению, и сопоставив его с десятикратным среднереспубликанским значением ОА радона, можно однозначно определить принадлежность НП к критической зоне радоноопасности. По мнению МКРЗ [3, 4] определение географического положения критических зон радоноопасности и составление тематических карт этих территорий является очень важным, т.к. позволяет без проведения дорогостоящих, длительных, широкомасштабных исследований сконцентрировать внимание там, где это наиболее неотложно, при этом действия будут направлены туда, где они более эффективны.

Указанный комплексный подход позволяет повысить уровень радиационной безопасности путем проведения точечных и адекватных противорадионовых мероприятий или изменения подхода к нормированию облучения, а также может быть использован при проведении инженерно-геофизических изысканий, при проектировании и строительстве жилых и общественных зданий.

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**SECTION 21. Pedagogy. Psychology. Innovations  
in the field of education.**

## CONTEMPORARY APPROACHES TO TEACHER PROFESSIONAL DEVELOPMENT

*Abstract: The article analyzes the current state and identifies perspectives of development of professional competence of teachers on training courses.*

*Key words: professional competence, teachers, teachers training.*

*Language: English*

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Statement of the problem in the general form and its connection with the important scientific and practical tasks. In the conditions of information society the modern teacher must not only possess professional knowledge and skills well, but also be able to adapt himself to the rapid processes both in the professional and public spheres of life, and use the means of new information technologies, be competent, able to participate actively in the public life, self-realize and constantly develop himself. Therefore, the problem of professional development of the teachers becomes very topical, and the issue arises what namely and how it is necessary to change on the enhancement training courses, in order that a modern teacher meeting the requirements of time could provide the high level knowledge acquisition by the pupils based on the modern approaches and methods of teaching.

The key moment of the development of modern pedagogue is formation of the professional competences both on the stage of basic functional training, and in post-graduate education, when a specialist realizes his life strategy "education during lifetime".

In the work [10] the essence of teacher's professional competence was determined as the aggregate of his personal characteristics, which provide the effective execution of the tasks and duties of pedagogical activity by him, and is a measure of correspondence of the professional activity.

It shows itself in the activity and can't be isolated from the concrete conditions of its

implementation. The basic features of teacher's professional competence are professional knowledge, experience, motives, values and personal qualities. The conducted analysis of the scientific works and approaches to the determination of teacher's professional competence structure wholly allowed determining:

- 1) invariant constituents of the professional competence (general requirements, which can be demanded from any teacher): common cultural; legal-regulatory; psychological-pedagogical; self-developing; information-computer competence;
- 2) variant constituents of the professional competence (the requirements, demanded exclusively from a teacher); the subject competence; active-communicative competence.

However, the problem of improvement of the enhancement training courses of the teachers requires proper study.

The basic aim of the study is analysis of the modern state and search of prospective directions of the professional competence development of the teachers at enhancement training courses.

The modern system of pedagogues' postgraduate education builds its activity according to the following strategic directions:

- Modernization of the content, forms and methods of improvement training of the managerial and pedagogical staff;
- Scientific-methodical accompaniment of the education content renovation, monitoring and expertise of innovations, developed by the educational institutions, separate pedagogues, and



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external qualification expertise of the educational employees;

- Renovation and expansion of the functions, directions of postgraduate educational structure activity, improvement of the organizational and staff provision of the educational institution.

The compulsory element of modern distance education is implemented distance form of conducting the enhancement training courses, directed on the improvement of the education quality; development of the programmes of distance courses for teachers.

In the modern system of postgraduate education of Azerbaijan the enhancement training courses were implemented. These courses are compulsory for all pedagogues, in spite of the professional direction and level of qualification. The term of passing is 1 time in 5 years. The main task is satisfaction of the demand of each pedagogue in accordance with the qualification, audience experience and demand in deepening their knowledge.

Let's give an example of the typical educational plan of the teacher's enhancement training courses. It consists of three modules and is intended for 180 hours: totally 108 hours for auditorium and 72 hours for the independent work. The first module contains three substantial modules: social-humanitarian, psychological-pedagogical and methodical ones, totally 64 auditorium hours. The second module includes individual creative project of the audience on courses and their protection, totally 6 auditorium hours. The third module – 28 auditorium hours: pedagogical practice – 6 h., auditorium practice – 19 h. and examination – 3 hours. The independent work provides possibility to deepen and fix theoretical knowledge, form practical skills connected with pedagogical activity of a teacher, execute the search of the most effective methods of teaching and educating of pupils, and also possibility to form the teachers' skills to work in the conditions of choice of the pedagogical problem, technology, modern didactic material, content and form of education.

The content of improvement training programme for teachers lies in the implementation of all tasks, required for achievement of the educational results of modules, and is executed by the way of:

- Considering the educational material on mini-lectures;
- Independent study of the educational material based upon the complex of educational-methodical materials developed for the module;
- Execution of the practical tasks, directed at the obtainment of the skills in practice to obtain theoretical knowledge;
- Participation in the disputes, discussions, other types of group interaction with the purpose of critical thinking development;

- Formation of the mindsets and qualities for using of the obtained knowledge and skills in the professional activity;

- Conduction of the introductory and source self-assessment of the physics teachers, summary control testing to a module [10].

Moreover, the audience of the teachers' enhancement training courses pass the pedagogical and auditorium practice.

Together with it, we must notice that the basic shortcoming of the enhancement training courses is insufficient frequency of courses. For 5 years the educational material, forms and methods of teaching can sufficiently change. It is confirmed by the opinion of V. G. Kremen', who states that today: "... the change of ideas, knowledge and technologies take place much faster than the changes of human generation" [5, p. 9].

In our opinion, with the purpose of solving this problem, it is necessary to use the interactive methods of teaching and reflection at the enhancement training courses.

One of the peculiarities of work with adults, as V. I. Putsov says, is their orientation on the immediate application of the results of education. On the assumption of this, it is appropriate to use the methods of interactive education, which correspond to the nature and typical signs of adult education. They allow not only optimally taking into account the educational demands of an adult person, but also creating the conditions for the constant, systemic analysis of own actions. The interactive education can prevent appearance of the patterns and stereotypes in relation to the professional activity in pedagogue's consciousness [9, p. 24-25].

The notion of "interactive education" in the science is considered as:

- education, deepened in the communication; preserves the final aim and basic content of the educational process, however, changes the forms from translational (transmitting) to the dialogue, i.e. based upon mutual understanding and interaction [4];
- special form of organization of the cognitive activity that has concrete intended aim of creating comfortable conditions of education, at which each one feels his success and intellectual ability [2, p. 18].

Organization of the interactive education supposes modelling of the life situations, using of role plays, common solution of the problem based upon the analysis of circumstances and corresponding situation. The interactive education effectively promote to formation of the habits and skills, development of the values, creation of the cooperation and interaction atmosphere.

Interactive methods of postgraduate education are considered as the system of subject-subjective relations (the teacher of postgraduate education system and pedagogue), which basis is acquisition of

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methods, education means and theory of their use for implementation of the education mission, represented in the educational aims of the subject by the pedagogue [8, p. 117].

The reflexive activity of the teacher-listener is no less important at passing the enhancement training courses as an indispensable attribute of the process of development of his professional competence.

In the modern science the notion of reflection is used in two basic meanings. Firstly, reflection is related to self-consciousness of a personality. Reflection is a principle of human thinking, which directs it on understanding of own preconditions; subject consideration of the knowledge itself; critical analysis of its content and methods; self-cognition activity that reveals internal structure and specificity of the spiritual human world. Secondly, reflection is considered as the process of reflecting of the world of other person by one person. Reflection is not only knowledge and understanding of the other, but also knowledge of that how this other understands "reflecting" individual [6].

The key problems of reflection in education include two directions: ontological (connected with the content of subject knowledge) and psychological (i.e. addressed to self-cognition and cognition of own activity) [3, p. 16].

The pedagogical reflection is connected with peculiarities of the content of pedagogical activity and with the experience of own work and is directed both on the own activity, activity of the colleagues, and on the pupils' activity. According to the own activity, the pedagogical reflection is characterized by understanding own pedagogical experience, development of the success criteria, and analysis of the changes, which take place in own education [7]. Reflection as one of the properties of personality is the basis of his self-development, openness to the new experience and other people; professional reflection provides accumulation of the new experience by the pedagogue and development of the pedagogical activity individual style is very important in the context of his professional development [1, p. 141].

Moreover, it should be noted that in the modern world the informatization of education is one of the priority directions of modernizing the native system of education, human training to life in the information society on the assumption of global transformation. This puts the certain range of requirements to the teacher: he must be able to work with computer equipment, own the certain information-computer technologies. Accordingly, teachers' training on the enhancement training courses should be done in the following directions:

training to teaching with assistance of information technologies;

training to using information media as the means of effective physics teaching;

conduction of master classes on teaching one or other topics with using information technologies during demonstrations;

conduction of master classes, laboratory works with application of the innovation technologies;

obtainment of the skills of work with innovation technologies for the control and management of the pupils' work.

Consequently, within the frameworks of modernizing the teachers' enhancement training courses in the regional institute of postgraduate pedagogical education, it would be appropriate to increase the total meaning of activity, oriented on realization of the teachers' intellectual potential based upon the subject-subjective relations, dialogue and experience exchange with colleagues, in particular, improvement of his thinking, reflection and readiness to work with computer equipment and its wide application at the classes.

As it was said above, the development of new organizational forms, ways and methods of education is accomplished all the time. Knowledge paradigm of education moves background. Attention is being increasingly focused on the development of dispositions obtained by a child in the heredity into the corresponding abilities. The new scientifically substantiated approaches to the development of pupils' creative abilities appeared. If earlier it was thought that for the development of human creative abilities it is necessary to involve him to solving the creative tasks (at that, the categories of creative tasks included the tasks with the algorithm of solution unknown for the subject), then now it is believed that it is needed to develop the feeling of harmony in a human, thus, he would be able to detect disharmony between the elements of certain system, in which the creativity lies [4]. Knowing it, teacher can organize the corresponding work with pupils and the development of own creative potential. A lesson is no more a single and impersonated didactical unit.

During the last decade the digital photo and video equipment also became popular. The substantial quantity of pupils use mobile telephones with photo and video cameras mounted in them, which can be used in the research of natural phenomena [3].

On the assumption of above-said it is possible to make several conclusions.

The system of postgraduate pedagogical education requires further development, as it is more dynamic and approached to the teachers' requests.

It is necessary to involve authors of pedagogical innovations or those teachers, who already successfully use them in their practical activity (the material is better perceived "from the first hand", to the conduction of classes at the teachers' enhancement training courses.

In the postgraduate education institutes, it is necessary to create libraries (instead of film archives,

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known in the due time), which would include not only scientific, and scientific-popular video films, but also video records of the teachers' lessons – bearers of the advanced pedagogical experience.

The development of professional competence of teachers on the improvement qualification courses

can happen in the following directions: using the interactive methods of teaching, reflection and wide usage of information-computer technologies.

The problems of teachers' distant education implementation at the enhancement training courses requires further development.

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**SECTION 21. Pedagogy. Psychology. Innovation in Education.**

## ADAPTIVE PREDICTION PEDAGOGOMETRIC STRUCTURE OF INTEGRITY-SYSTEM CYCLE OF EDUCATIONAL FACILITIES

**Abstract:** Offered adaptive prediction pedagogometric structure of integrity-system cycle of educational facilities holistic system of life-through the use of twelve pointed star as the lead Ertsgammy formative processes regarding the psycho-pedagogical activity theory, psycho-pedagogical system analysis and the theory of the formation of mental actions. We consider the holistic development of integrity-system cycle regarding the existence and characteristics of the external and internal structure of the educational space.

**Key words:** forecasting, adaptability, pedagogometric, consistency, integrity, stakeholders, personality analysis, star Ertsgammy, educational space.

**Language:** Russian

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## АДАПТИВНОЕ ПРОГНОЗИРОВАНИЕ ПЕДАГОГОМЕТРИЧЕСКОЙ СТРУКТУРЫ ЦЕЛОСТНО-СИСТЕМНОГО ЦИКЛА ОБРАЗОВАТЕЛЬНЫХ ОБЪЕКТОВ

**Аннотация:** Предложено адаптивное прогнозирование педагогометрической структуры целостно-системного цикла образовательных объектов целостно-системной жизнедеятельности через применение двенадцати конечной звезды Эрцгаммы в качестве ведущего формообразовательного процесса относительно психолого-педагогической теории деятельности, психолого-педагогического системного анализа и теории формирования умственных действий. Рассматривается целостное развитие целостно-системного цикла относительно особенностей внешней и внутренней структуры образовательного пространства.

**Ключевые слова:** прогнозирование, адаптивность, педагогометрика, системность, целостность, субъект деятельность, личность, анализ, звезда Эрцгаммы, образовательное пространство.

Адаптивное прогнозирование педагогометрической структуры целостно-системного цикла образовательных объектов связывается с условиями развития целостно-системной личности относительно дальнейшего формирования целостно-системного цикла жизнедеятельности (ЦСЦЖ), который выражает базисное условие воспитания целостно-системной личности, определяющей профессиональный образ специалиста широкого профиля. Восьмым элементом целостно-системного цикла жизнедеятельности является целостно-системная ритуальная деятельность

(ЦСРД), которая является четвёртым деятельностным компонентом всего цикла жизнедеятельности [1].

Целостно-системная ритуальная деятельность устанавливает новое особенное развитие деятельности на следующей фазе её совершенствования относительно динамически развивающегося целевого-продуктного результата и опредмеченной потребности восходящего субъекта. ЦСРД отражает первую фазу достижения новой целостно-системной личности и показывает преодоление нужды, как деятельностью единицы разрешения проблемы.



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ЦСРД устанавливает деятельную связь между целостно-системным продуктом и целостно-системной опредеченной потребностью. ЦСРД регламентирует обобщённую структуру деятельности и имеет особенные формообразования, которые выражают целостный смысл её происхождения и развития.

Целостно-системная ритуальная деятельность возникает как стремление к новой опредеченной потребности и совершенном субъекту, отражая все этапы интериоризационного и экстериоризационного процессов, которые возникают случайно или планомерно. В зависимости от влияния внешней среды ЦСРД принимает определённые целостные и системные параметры.

Целостно-системная ритуальная деятельность представляется целостными характеристиками: пространственными, временными, силовыми, гравитационными, энергетическими, ориентационными, исполнительными, контрольными – которые выражают внешние формы организованных процессов. ЦСРД имеет различные «вертикальные» и «горизонтальные» масштабы, что определяется целями и условиями существования деятельности. Функциональная сложность выражается структурой выделенного уровня и характером межуровневых отношений. Структура уровня ЦСРД выражается взаимодействием структурных элементов через системообразующие связи уровня. Последовательное преобразование субъекта в направлении овладения целостно-системной опредеченной потребностью раскрывает динамику развития ЦСРД [2].

Целостно-системная ритуальная деятельность принимает определённые формы относительно многоуровневого и всестороннего взаимодействия с объектами окружающего мира. Это порождает различные формы ЦСРД в зависимости от цели опредечивания потребности. Отражая внутренние свойства этой деятельности, возникают различные направления её системного анализа относительно упорядоченности, сложности и разнообразия выделенных параметров. Эти характеристики продолжают детальный анализ деятельности на этапах ориентировочного, исполнительного и контрольного компонентов действия с различными видами их целостно-системных характеристик.

Целостно-системная ритуальная деятельность по параметру упорядоченности характеризуется последовательным развёртыванием всего ритуального целостно-системного цикла жизнедеятельности относительно ритуального целостно-системного субъекта начального состояния, который через

обобщённую ритуальную целостно-системную деятельность овладевает ритуальными целостно-системными средствами направленными на ритуальный целостно-системный предмет через ритуальную целостно-системную технологическую деятельность. В результате организации целостно-системной ритуальной контрольной деятельности происходит формирование ритуального целостно-системного продукта деятельности, который в процессе собственной ритуальной целостно-системной деятельности определяет ритуальную целостно-системную опредеченную потребность. Дальнейшее развёртывание ритуального цикла связывается с образованием ритуальной целостно-системной восходящей деятельности, которая порождает ритуальный целостно-системный компаунд-субъект. Двойственность неустойчивого субъекта изменяется в процессе возникновения ритуальной целостно-системной развивающей деятельности, которая фиксирует образование супернового ритуального целостно-системного субъекта жизнедеятельности, организующего последующие виды и формы новых целостно-системных циклов жизнедеятельности.

Аналогичным образом идёт последующий анализ системных свойств целостно-системной ритуальной деятельности относительно характеристик сложности и разнообразия. Сложность ЦСРД определяется через соответствующий тип ориентировки самой ритуальной деятельности. Тип ориентировки активизирует переформатирование начальных условий деятельности с расширением целостных свойств, анализом выделенных уровней и структуры уровня, последующим исследованием процесса формообразования и системных свойств, а также изучением поведения системы во всех базисных и переходных режимах с организацией прогноза развития системных свойств. Разнообразие ЦСРД определяется развитием всех предметных и деятельностных элементов цикла.

Целостно-системная ритуальная деятельность в процессе формирования и развития принимает основные интериоризационные и экстериоризационные формы: ориентационные, мотивационные, визуальные, акустические, калориметрические, термодинамические, обонятельные, материальные, рецепторные, речевые, письменно-графические и внутренние, которые могут задавать специфические ритуальные целостно-системные процессы. Профессиональная целостно-системная широкопрофильная деятельность порождает новые ритуальные формы, которая задаёт гиперпространство контрастных управляющих задач,

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связанных с минимаксными и максиминными эффектами современного производства в условиях нечёткой логики, но скоростными навыками управления и научения широкопрофильных роборизированных комплексов.

Адаптивное прогнозирование устанавливает структуру целостно-системного цикла жизнедеятельности относительно девятого элемента - целостно-системной опредмеченной потребности. Целостно-системный цикл жизнедеятельности (ЦСЦЖ) – устанавливает базисное положение о воспитании целостно-системной личности, которая задаёт профессиональный образ специалиста широкого профиля. Девятым элементом целостно-системного цикла жизнедеятельности является целостно-системная опредмеченная потребность (ЦСОП), которая является пятым предметным компонентом всего цикла жизнедеятельности.

Целостно-системная опредмеченная потребность определяет начало второй фазы самоформирования целостно-системного субъекта жизнедеятельности (ЦССЖ). ЦСОП есть результат достижения ЦССЖ выделенной цели, реализация всех условий первой фазы самоформирования. При этом осваивались деятельностные и предметные условия: целостно-системные средства, предметы, результаты (продукты деятельности), а также целостно-системная всеобщая деятельность, технологическая, контрольная и ритуальная. Возникшая ЦСОП есть материальный образ разрешения нужды, как единицы реализованной потребности ЦССЖ. В дальнейшем ЦСОП является ведущим предметным условием формирования целостно-системного компаунд-субъекта и высшей формы супер целостно-системного субъекта нового этапа жизнедеятельности [3].

Целостно-системная опредмеченная потребность является ориентировочным предметным условием восхождения и развития целостно-системного супер-субъекта жизнедеятельности (ЦСССЖ). ЦСОП организует новую фазу жизнедеятельного развития субъекта, определяет его новое развитие.

Целостно-системная опредмеченная потребность входит в порождающую среду, как высшая форма представления её современного состояния относительно всех предметных и деятельностных составляющих целостно-системного цикла жизнедеятельности. ЦСОП отражает самые базисные целостные характеристики: пространственные, временные, гравитационные, силовые, энергетические, ориентационные, исполнительные и контрольные параметры. Различные их сочетания, перестановки и размещения задают будущее

направление развития целостно-системных потребностей, направленных на формирование новых качеств целостно-системных супер-субъектов жизнедеятельности и их совершенных профессиональных базисно-широкопрофильных специалистов.

Целостно-системная опредмеченная потребность имеет многоуровневую структуру, которая выражается в возможности реализации многофункциональных состояний выделенных структурных отношений. Существование временной адаптации структурных элементов относительно интегральных функциональных состояний, задаёт организацию системо-образующих связей относительно всех компонентов системных объектов в форме целостно-системных условий организации оперативных отношений, задающих локальные точки сверхскоростного фемтоанализа, исполнения и контроля выделенных параметров. Формируемые межуровневые отношения позволяют устанавливать прямые и обратные связи, выражающие интериоризационные и экстерииоризационные процессы развития ЦСОП.

Целостно-системная опредмеченная потребность выражается реализованной функциональной форме, которая выражает её целостно-системную сущность. Целостные характеристики формы ЦСОП выражаются в максимальной реализации её пространственных, временных, силовых, гравитационных, энергетических, ориентационных, исполнительных и контрольных параметров. Их развитие определяется совершенствованием внутренних, системных характеристик, которые выражают сложный процесс максиминного и минимаксного отношения функции и формообразования в заданных параметрах развития целостно-системного супер-субъекта и его профессионального образа.

Целостно-системная опредмеченная потребность характеризуется внутренними, системными характеристиками, которые устанавливают упорядоченность, сложность и разнообразие данных предметных условий целостно-системного цикла жизнедеятельности. Упорядоченность ЦСОП выражается в системном анализе всего представления опредмеченной потребности. При этом устанавливаются целостно-системные субъектные особенности, выделяются целостно-системные средства её воспроизведения, определяются предметные целостно-системные основы производства, устанавливаются собственные продуктивные результаты, которые в дальнейшем и выражают ЦСОП, соответствующую определённому компаунд-субъекту и супер-субъекту восхождения.



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Целостно-системная опредмеченная потребность относительно параметра сложности выражается особенностями фазового состояния: ориентационными, мотивационными, визуальными, акустическими, калориметрическими, термодинамическими, обонятельными, материальными, рецепторными, речевыми, письменно-графическими и внутренними параметрами. Эти характеристики и формы выражают особенность функционирования ЦСОП относительно предметных и деятельностных условий развития целостно-системной жизне-потребности, формируя новый тип целостно-системной суперличности. При этом возникают новые социальные связи основанные на новых коммуникационных условиях, формирующих генетические конституционные основы [4].

Целостно-системная опредмеченная потребность относительно параметра разнообразия определяется сочетанием упорядоченности и сложности системных параметров, когда образуются совершенные базисные предметные и деятельностные основы целостно-системного цикла жизнедеятельности, которые формируют гиперпространство данных коммуникационных процессов. При этом устанавливаются границы поведения ЦСОП относительно статического и динамического поведения и его переходных состояний от статической статики до динамической динамики. Это позволяет определить прогноз развития целостно-системной опредмеченной потребности относительно целостнообразующего смысла развития системного субъекта и профессиональной личности.

Адаптивное прогнозирование устанавливает структуру целостно-системного цикла жизнедеятельности относительно структуры целостно-системного цикла жизнедеятельности его десятого элемента - целостно-системной восходящей деятельности. Целостно-системный цикл жизнедеятельности (ЦСЦЖ) – определяет базисные условия развития целостно-системной личности, которая устанавливает профессиональный образ специалиста широкого профиля. Десятым элементом целостно-системного цикла жизнедеятельности является целостно-системная восходящая деятельность (ЦСВД), которая является пятым деятельностным компонентом всего цикла жизнедеятельности [5].

Целостно-системная восходящая деятельность определяет продолжение второй фазы самоформирования целостно-системного субъекта жизнедеятельности (ЦССЖ). ЦСВД есть процесс начала формирования супер целостно-системной личности (СЦСЛ), первой формой которой является целостно-системный компанд-субъект (ЦСКС). Двухфазный процесс

воспитания СЦСЛ связан с выполнением двух условий. Первое. На базе целостно-системной опредмеченной потребности возникают новые цели развития, которые спонтанно или преднамеренно формировались в процессе целостно-системной ритуальной деятельности. Новые предметные и деятельностные условия определили следующую порождающую среду, которая установила базисные параметры новой СЦСЛ относительно системных временных, пространственных, гравитационных, силовых, энергетических, ориентационных, исполнительных и контрольных характеристик. Второе. Возникающая целостно-системная восходящая деятельность определяет конкретные условия воспитания СЦСЛ через адаптивный образ целостно-системного компанд-субъекта.

Целостно-системная восходящая деятельность имеет многоуровневое строение. Особенностью каждого уровня является сложность выполняемой функции, которая разделяется на уровневые действия и операции в зависимости от автоматизации выполняемого процесса. Каждая фаза развёртывания ЦСВД задаётся ориентировочным, исполнительным и контрольным компонентами относительно наивысшего целостно-системного смыслоформирующего образа.

Ориентировочным образом для ЦСВД являются базисные параметры будущего целостно-системного компанд-субъекта, которые предварительно представляются в виде системного объекта относительно всех элементов порождающего ЦСЦЖ. При этом уточняются планируемые целостные характеристики, устанавливаются внешние условия их формирования, выделяются уровни функционального состояния, определяется структура уровня, уточняются структурные элементы, устанавливаются системообразующие связи, выделяются межуровневые системообразующие связи, определяется форма организации восходящего действия, уточняются системные свойства по параметрам упорядоченности, сложности и разнообразия, устанавливается проявление восходящего действия в статическом и динамическом состояниях, а так же переходных фазах статической статики, статической динамики, динамической статики и динамической динамики, выделяются перспективы развития восходящей деятельно-сти относительно характера организации процесса её интериоризации.

Переходя к исполнительной части целостно-системной восходящей деятельности, происходит реализация процесса эктериоризации теоретически ориентационной части. При этом исполнительная составляющая имеет формы:

## Impact Factor:

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GIF (Australia) = 0.564	ESJI (KZ) = 1.042	IBI (India) = 4.260
JIF = 1.500	SJIF (Morocco) = 2.031	

ориентационную, мотивационную, визуальную, акустическую, калориметрическую, термодинамическую, обонятельную, материальную, рецепторную, речевую, письменно-графическую и внутреннюю. Параметры данных форм отражают предметно-деятельностную структуру относительно субъекта начального исполнения, всеобщей восходящей деятельности, целостно-системных восходящих технологических средств, целостно-системной восходящей технологической деятельности, целостно-системного восходящего предмета деятельности.

Целостно-системная восходящая деятельность окончательно реализуется через контрольную составляющую, которая возникает при итериоризационно-экстериоризационных процессах реализующих особенности системного контроля и системных средств контрольной восходящей деятельности. При этом восходящие контрольные средства регистрируют целостные свойства восходящей деятельности, устанавливают уровень связи с порождающей восходящей средой, определяют характер контрольных аналитических восходящих уровней, регистрируют контрольную структуру восходящего уровня, устанавливают параметры восходящих контрольных структурных элементов, определяют свойства контрольных системообразующих связей, регистрируют контрольный уровень межуровневых восходящих системообразующих связей, устанавливают контроль восходящей формы организации выделенного процесса, определяют характер контроля восходящих системных свойств по параметрам упорядоченности, сложности и разнообразия, регистрируют восходящее целостно-системное статическое и динамическое поведение системы, включая и переходные процессы через статическую статику, статическую динамику, динамическую статику и динамическую динамику, устанавливают контрольные параметры восходящего целостно-системного прогноза развития компаунд-субъекта. В целом, происходит целостно-системный контроль по пространственным, временным, силовым, гравитационным, энергетическим, ориентационным, исполнительным и собственно контрольным параметрам в различных сочетаниях, распределениях и перестановках с характеристиками упорядоченности, сложности и разнообразия.

Целостно-системная восходящая деятельность определяют уровень подготовки широкопрофильных специалистов, которые в условиях автоматизированного производства организуют полный жизнедеятельностный цикл развития целостно-системной личности,

способной определять, организовывать и контролировать скоростные схемы интеллектуального развития, направленные на воспроизводство целостно-системного образа мира, определяя прогноз его совершенствования на уровне фемто контроли-руемых параметров.

Адаптивное прогнозирование устанавливает структуру целостно-системного цикла жизнедеятельности относительно одиннадцатого элемента - целостно-системного компаунд-субъекта. Целостно-системный цикл жизнедеятельности (ЦСЦЖ) – устанавливает базисные отношения формирования целостно-системной личности, которая определяет профессиональный образ специалиста широкого профиля. Одиннадцатым элементом целостно-системного цикла жизнедеятельности является целостно-системный компаунд-субъект (ЦСКС), который является шестым предметным компонентом всего цикла жизнедеятельности.

Целостно-системный компаунд-субъект устанавливает продолжение второй фазы самоформирования целостно-системного субъекта жизнедеятельности (ЦССЖ). ЦСКС есть процесс начала формирования супер целостно-системной личности (СЦСЛ), первой формой которой является целостно-системный компаунд-субъект (ЦСКС). Относительно супер целостно-системной личности целостно-системный компаунд-субъект есть свое-образный ориентировочный компонент, который в дальнейшем освобождается от прошедших целостно-системных параметров и начинает формирование фундаментальных характеристик на базисных ориентировочных значениях порождающей предметно-потребностной среды в динамических условиях развития.

Целостно-системный компаунд-субъект есть неустойчивое состояние субъекта, который в условиях дальнейшей целостно-системной деятельности развития формирует устойчивые предметно-деятельностные ориентиры саморазвития субъекта с новыми широкопрофильными характеристиками учебно-профессиональной деятельности в условиях автоматизированного труда [6].

Целостно-системный компаунд-субъект в процессе взаимодействия с порождающей средой приобретает современные целостные характеристики относительно гравитационных, пространственных, временных, силовых, энергетических, ориентационных, исполнительных и контрольных параметров. При этом возникают дополнительные характеристики и параметры если рассматривать многовариантные сочетания, перестановки и размещения базисных целостных характеристик. Предметно-деятельностный процесс анализа ЦСКС определяет сам компаунд-субъект как

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<b>ISI (Dubai, UAE)</b> = 0.829	<b>РИИЦ (Russia)</b> = 0.179	<b>PIF (India)</b> = 1.940
<b>GIF (Australia)</b> = 0.564	<b>ESJI (KZ)</b> = 1.042	<b>IBI (India)</b> = 4.260
<b>JIF</b> = 1.500	<b>SJIF (Morocco)</b> = 2.031	

начальный субъект развития, который через целостно-системные обобщённые, технологические, контрольные, ритуальные, восходящие и развивающие деятельности превращается в собственный компаунд – субъект. При этом происходит взаимодействие через внешние предметные целостно-системные условия: средства деятельности, предметы деятельности, продукты деятельности, опредмеченные потребности, которые имеют соответствующие параметры относительно типологии ориентировочных образов каждого компонента процесса жизнедеятельности.

Дальнейший системный анализ целостно-системного компаунд-субъекта показывает на базисную необходимость представлять ЦСКС как систему, устанавливать его порождающую среду, определять целостные характеристики компаунд-субъекта, анализировать уровни строения ЦСКС, представлять структуру уровня целостно-системного компаунд-субъекта, устанавливать его структурные элементы, определять системообразующие связи данного уровня компаунд-субъекта, анализировать межуровневые системообразующие связи ЦСКС, представлять форму организации уровня целостно-системного компаунд-субъекта, устанавливать его системные внутренние свойства по параметрам упорядоченности, сложности и упорядоченности, определять поведение системы в статическом и динамическом состояниях и переходных процессах – статической статики, статической динамике, динамической статики и динамической динамике, анализировать прогноз развития ЦСКС относительно всех фаз развития и анализа – от предметно-деятельностной схемы, её полного системного анализа, до анализа форм состояния и развития компаунд-субъекта.

Процесс интериоризационного и экстериоризационного представления целостно-системного компаунд-субъекта показывает основные его формы многофазного состояния и развития: ориентационная, мотивационная, визуальная, акустическая, калориметрическая, термодинамическая, обонятельная, материальная, рецепторная, речевая, письменно-графическая и внутренняя. Каждая формы существования и развития ЦСКС отражает закономерности взаимного перехода субъекта от внешних к внутренним, духовным формам анализа компаунд-субъекта. Возникающие целостно-системные характеристики формосодержания ЦСКС отражают образный анализ компаунд-субъекта относительно его ориентационности, исполнительности и самоконтроля в условиях динамического развития и совершенствования от форм жизнедеятельности до мгновенных фемто-операционных навыков [7].

Упорядоченность всех форм целостно-системного компаунд-субъекта при предметно-деятельностном анализе показывает необходимость выделения всех начальных состояний компаунд-субъекта, его целостно-системных компаунд-средств, целостно-системных компаунд-предметов, целостно-системных компаунд-продуктов, целостно-системных компаунд-опредмеченных потребностей, которые также переходят через основные интериоризационные и экстериоризационные представления: ориентационные, мотивационные, визуальные, акустические, калориметрические, термодинамические, обонятельные, материальные, рецепторные, речевые, письменно-графические и внутренние.

Аналогичным образом можно представить сложность и разнообразие всех форм целостно-системного компаунд-субъекта. Возникающие различные виды ЦСКС будут отличаться типом ориентировки, характером исполнения и особенностями самоконтроля в различных интериоризационных и экстериоризационных процессах, которые определяют характер смыслообразования жизнедеятельности целостно-системного компаунд-субъекта в условиях подготовки к самоорганизации целостно-системной деятельности развития, целью которой является переход к целостно-системному супер-субъекту, который завершает полную фазу развития жизнедеятельности и начинает новый цикл развития.

Адаптивное прогнозирование устанавливает структуру целостно-системного цикла жизнедеятельности относительно двенадцатого элемента - целостно-системной развивающей деятельности. Целостно-системный цикл жизнедеятельности (ЦСЦЖ) – определяет базисные возможности формирования целостно-системной личности, которая устанавливает профессиональный образ специалиста широкого профиля. Двенадцатым элементом целостно-системного цикла жизнедеятельности является целостно-системная развивающая деятельность (ЦСРД), который является шестым деятельностным компонентом всего цикла жизнедеятельности.

Целостно-системная развивающая деятельность организует завершение второй фазы самоформирования целостно-системного субъекта жизнедеятельности (ЦССЖ). ЦСРД есть процесс окончательного формирования супер целостно-системной личности (СЦСЛ), первой формой которой является целостно-системный компаунд-субъект (ЦСКС). Целостно-системная развивающая деятельность есть высшая форма преобразующего целостно-системного формирования целостно-системного супер-

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<b>GIF (Australia)</b>	<b>= 0.564</b>	<b>ESJI (KZ)</b>	<b>= 1.042</b>	<b>IBI (India)</b>	<b>= 4.260</b>
<b>JIF</b>	<b>= 1.500</b>	<b>SJIF (Morocco)</b>	<b>= 2.031</b>		

субъекта (ЦССС), вторичным порождающим источником которого является целостно-системная опредеченная потребность (ЦСОП), которая изоморфна и псевдо-эквивалентна первичному целостно-системному субъекту. На этом основании можно установить изоморфизм и псевдо-эквивалентность между целостно-системными средствами и целостно-системным компаунд-субъектом, а также между целостно-системным продуктом и целостно-системным супер-субъектом. Параллелизм двух фаз формирования новой личности – целостно-системного широкопрофильного специалиста – является базисной формой процесса жизнедеятельности.

В данном случае можно выделить базисное смещение второй фазы самоформирования целостно-системной личности на первую, когда возникают условия автоформирования целостно-системной супер-личности. Целостно-системная развивающая деятельность в качестве первичной предметной порождающей среды имеет целостно-системный компаунд-субъект, а деятельностью порождающей средой – обобщённые формы всех предшествующих деятельностных компонентов. Поэтому базисная структура ЦСРД определяется: целостно-системным развивающим субъектом, целостно-системной обобщённой развивающей деятельностью, целостно-системными развивающими средствами деятельности, целостно-системной технологической развивающей деятельностью, целостно-системным развивающим предметом деятельности, целостно-системной контрольной развивающей деятельностью, целостно-системным развивающим продуктом деятельности, целостно-системной ритуальной развивающей деятельностью, целостно-системной развивающей опредеченной потребностью, целостно-системным развивающим компаунд-субъектом [8].

Целостно-системная развивающая деятельность имеет три базисные компоненты: ориентировочные, исполнительные и контрольные. Ориентировочный компонент ЦСРД имеет целостно-системный тип структуры, который определяет условия формирования и развития специалиста широкого профиля. Возникающие автоматизированные схемы широкопрофильного мышления устанавливают систему профессиональных навыков, которые формируют исполнительское широкопрофильное мастерство. Контрольный компонент ЦСРД устанавливает целостно-системный контролирующий развивающий комплекс, который фиксирует соответствующие целостные параметры по характеристикам временных, пространственных, гравитационных, силовых и

энергетических значений, а также способу ориентировки, характеру исполнения, особенностям контроля. Это позволяет создать автоматизированный развивающий контрольный комплекс, реализующий всю структуру всеобщего производства на основе системного анализа целостно-системного цикла жизнедеятельности.

Системный анализ целостно-системной развивающей деятельности определяет её как систему, то есть деятельностный компонент всего цикла жизнедеятельности. При этом устанавливается базисная порождающая среда ЦСРД – обобщённая развивающая деятельность. Определяются первичные целостные параметры, которые устанавливают временные, пространственные, силовые, гравитационные, энергетические, ориентационные, исполнительные и контрольные характеристики развивающей деятельности. Устанавливаются уровни анализа ЦСРД, который определяется характером её освоения. При этом выделяют три уровня анализа: целостно-системная жизнедеятельность, жизнедействие и жизнеоперация.

Пуровневый анализ целостно-системной развивающей деятельности устанавливает определение структуры каждого выделенного уровня. Данная структура задаётся строением обобщённого целостно-системного цикла жизнедеятельности. Структурными элементами ЦСРД являются предметные условия целостно-системного цикла жизнедеятельности, которые включают начальное состояние субъекта, его целостно-системные технологические средства деятельности, целостно-системные предметы деятельности, целостно-системные продукты деятельности, целостно-системную опредеченную потребность, целостно-системный компаунд-субъект и потребность, целостно-системный супер-субъект [9].

Далее устанавливаются системообразующие связи внутри уровневые и межуровневые, а также форма организации целостно-системной развивающей деятельности. Внутренние – системные – свойства ЦСРД определяются по параметрам упорядоченности, сложности и разнообразия. Поведение ЦСРД фиксируется в статическом, динамическом и переходных параметрах. Устанавливается прогноз развития ЦСРД. Интериоризационный процесс выделяет формы её формирования: ориентационную, мотивационную, визуальную, акустическую, калориметрическую, термодинамическую, обонятельную, материальную, рецепторную, речевую, письменно-графическую и внутреннюю – что определяет условия подготовки широкопрофильных специалистов.

## Impact Factor:

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<b>GIF (Australia)</b> = 0.564	<b>ESJI (KZ)</b> = 1.042	<b>IBI (India)</b> = 4.260
<b>JIF</b> = 1.500	<b>SJIF (Morocco)</b> = 2.031	

Адаптивное прогнозирование устанавливает структуру целостно-системного цикла жизнедеятельности относительно начала нового цикла в форме нового целостно-системного супер-субъекта. Целостно-системный цикл жизнедеятельности (ЦСЦЖ) – устанавливает базисные условия формирования целостно-системной личности, которая определяет профессио-нальный образ специалиста широкого профиля. Началом нового целостно-системного цикла жизнедеятельности является целостно-системный супер-субъект (ЦССС), который является новым и первым деятельностным компонентом всего цикла жизнедеятельности.

Целостно-системный супер-субъект определяет завершение второй фазы самоформирования целостно-системного субъекта жизнедеятельности (ЦССЖ). ЦССС есть результат окончательного формирования новой целостно-системной личности, первой формой которой являлся целостно-системный компанд-субъект (ЦСКС). ЦССС есть смысл развития всего ЦСЦЖ, который на первых этапах представлял смыслообразующий образ. ЦССС отражает смыслообразующие моменты всех предметных и деятельностных компонентов всего ЦСЦЖ. Частичные элементы и характеристики возникали в первой фазе его развития как некоторые общие, целостные представления, которые по мере развёртывания ЦСЦЖ приобретали внутренние, системные свойства. Это формировало особенные целостно-системные характеристики ЦССС относительно сложности, упорядоченности и разнообразия форм и поведения в статических и динамических режимах. Общая стратегия развития ЦССС устанавливала возможности прогнозировать структурных компонентов, форм организации и определять схему системного анализа профессионального образа личности.

Схема формирования целостно-системного супер-субъекта отражает структурные отношения ЦСЦЖ. На первом этапе возникает начальный целостно-системный субъект, который обладает частичными характеристиками и параметрами относительно ЦССС. На первом этапе происходит его самоформирование относительно всеобщей целостно-системной деятельности, которая характеризуется системным типом ориентировки и высокими скоростными параметрами исполнения и динамического контроля. Это даёт возможность освоить целостно-системные средства деятельности, которые отражают заданные целостные параметры относительно пространственных, силовых, временных, гравитационных, энергетических, ориентационных, исполнительных и контрольных параметров. Целостно-системные средства принимают свою

деятельностную форму через целостно-системную технологическую деятельность, которая определяет последовательное преобразование целостно-системного предмета деятельности в соответствующий целостно-системный продукт. Технологические карты целостно-системной технологической деятельности ориентируются на ориентировочные, исполнительные и контрольные компоненты [10].

Выбранный предмет целостно-системной деятельности отражает общие характеристики будущего результата первой фазы формирования целостно-системного супер-субъекта. Выбор оптимального предмета определяет условия минимаксного и максоминного формирования целостно-системного специалиста широкого профиля. Процесс перехода целостно-системного предмета в целостно-системный продукт деятельности происходит в процессе развёртывания целостно-системной контрольной деятельности, которая определяет степень соответствия с первой целью формирования ЦССС. Целостно-системная контрольная деятельность направлена на фиксирование соответствующих целостно-системных параметров в статических и динамических условиях представления продукта деятельности, если сама контрольная деятельность имеет ориентировочные, исполнительные и контрольные компоненты в статических и динамических состояниях. Полученный целостно-системный продукт деятельности представляет первое предметное условие формирования ЦССС.

Целостно-системный продукт деятельности (ЦСПРД) выполняет вторичную субъектную функцию самоформирования целостно-системного супер-субъекта. ЦСПРД организует целостно-системную ритуальную деятельность (ЦСРД), которая принимает различные эмоциональные формы. Именно ЦСРД подготавливает возникновение целостно-системной опредмеченной потребности (ЦСОП). ЦСРД является своеобразной всеобщей деятельностью по самоформированию ЦССС. Возникающая опредмеченная потребность выполняет соответствующую роль самоформировательного технологического средства, которая через целостно-системные восходящие и развивающие деятельности формирует целостно-системный субъект деятельности и относительно абсолютный целостно-системный супер-субъект.

Системный анализ целостно-системного супер-субъекта последовательно представляет его как системное образование; раскрывается его порождающая среда; устанавливаются целостные характеристики по параметрам ориентации,

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JIF = 1.500	SJIF (Morocco) = 2.031	

исполнения, контроля, а также пространственным, временным, силовым, гравитационным и энергетическим характеристикам; представляется иерархия уровня анализа; формируется структура уровня; раскрываются структурные элементы; устанавливаются системообразующие внутри- и межуровневые связи; представляется форма организации ЦССС; формируются системные свойства по параметрам сложности, разнообразия и упорядоченности; раскрывается статическое и динамическое поведение ЦССС; устанавливается прогноз развития и формирования ЦССС.

Целостно-системный супер-субъект определяет интериоризационные и

экстериоризационные формы существования и развития относительно ориентационного, мотивационного, визуального, акустического, калориметрического, термодинамического, обонятельного, материального, рецепторного, речевого, письменно-графического и внутреннего характера. При этом возникает множество целостно-системных циклов жизнедеятельности, которые образуют гиперпространство взаимосвязанных форм отношений, одной из которых является звезда Эрцгаммы – двенадцать взаимосвязанных базисных отношений Мира.

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### SECTION 30. Philosophy.

## THE PROBLEM OF HUMAN RIGHTS AND FREEDOM OF THE PERSON IN THE WORKS OF S. L. FRANK AND MODERN

**Abstract:** This article discusses one of the most pressing problems of human existence: the problem of the individual, his rights and freedoms as the bearer and creator of spiritual values, the implementation of which in the socio-historical life, according to Frank's, forms the content of the entire culture.

**Key words:** identity, freedom, right, moral unacceptability of economic exploitation.

**Language:** Russian

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УДК 1:3+930.1

### ПРОБЛЕМА ПРАВ И СВОБОДЫ ЛИЧНОСТИ В ТВОРЧЕСТВЕ С. Л. ФРАНКА И СОВРЕМЕННОСТЬ

**Аннотация:** В статье рассматривается одна из самых актуальных проблем существования человечества: проблема личности, ее правах и свободах как носителя и творца духовных ценностей, осуществление которых в общественно-исторической жизни, по мнению С. Л. Франка, образует содержание всей культуры.

**Ключевые слова:** личность, свобода, право, моральная недопустимость хозяйственной эксплуатации.

Семен Людвигович Франк – один из ярких и самобытных философов Русского Ренессанса. С. Л. Франк родился 16(29) января 1877 г. в Москве в интеллигентной семье. Его отец – Людвиг Семенович – врач, за заслуги перед Россией в годы русско-турецкой войны. 1877-78 гг. получил дворянский титул. С. Л. Франк после окончания гимназии поступил в Московский университет на юридический факультет, а завершает образование в Казанском университете. (Связано это с его политической неблагонадежностью – участвовал в студенческом движении). После этого начинается его творческая и преподавательская деятельность. В 1922 г. вместе с большой группой видных ученых, писателей, философов был выслан из России на небезызвестном «философском пароходе» вместе с семьей и поселился в Берлине. Начался долгий, трудный, но плодотворный период его жизни. Вдали от Родины он пишет самые значительные свои

работы: «Крушение кумиров» (1924), «Смысл жизни» (1926), «Духовные основы общества» (1939), «Непостижимое» (1939) и др.

Творчество С. Л. Франка многогранно. Круг его профессиональных интересов широк. Это онтология, гносеология, проблемы общественной жизни, антропология, религиозная тематика, этика и др. Но, как замечает о творчестве С. Л. Франка, В. В. Зеньковский, он обладал «исключительным даром ясного изложения, мысль его, всегда развиваемая систематически, покоряет столько же своей основательностью, сколько и удачными формулами, которые очень часто стоят длинных рассуждений». Кроме того, Франк обладает огромным литературным дарованием, что «делает его анализы и рассуждения прямо мастерскими». Но вместе с тем, рядом с этим «стоит и насколько не уступает глубина его философского усмотрения – ум его синтетический, по существу, оплодотворяется



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той метафизикой всеединства, которую Франк развивает в своих произведениях, всегда оригинально и глубоко. По силе философского зрения Франка без колебания можно назвать самым выдающимся русским философом вообще – не только среди близких ему по идеям». [1. – С.450] С этим высказыванием Зеньковского нельзя не согласиться, поэтому не случайно в последнее время творческое наследие Франка изучается широким кругом исследователей. Сюда можно отнести П. П. Гайденко, Л. Н. Столовича, В. Н. Ильина, М. А. Маслина, С. А. Левицкого и других [7].

Свою собственную философию Франк характеризует как «христианский реализм». Он признает божественную основу мира, религиозную ценность бытия, но в то же время подчеркивает «роковое» несовершенство его эмпирического состояния бытия и поэтому ограниченность возможностей человеческого совершенствования. Это его исходная позиция, с которой он подходит к решению всех других философских проблем, в том числе религиозных, правовых и нравственных. Среди этих проблем особое значение и актуальность в настоящее время приобретает проблема личности, ее прав и свобод [6].

Как и Н. Бердяев, С. Л. Франк исследует проблему личности, возвышения личности. Но ради истины подчеркнем, что в концепции Бердяева, личность онтологична, нравственность как таковая носит у него доисторический характер, т.е. создается Богом. У Франка же, исходя из «Рокового несовершенства эмпирического состояния бытия», личность должна совершенствовать себя самого в несовершенном обществе. Поэтому, по Франку, приходится признать, что условием развития общества является задача самосовершенствования личности и, через нее, и самого общества. И у С.Л.Франка, таким образом, личность первична, самоценна по отношению к обществу. В работе «Политика и идеи» он пишет: «В нашем философско-политическом мировоззрении мы исходим из идеи личности как носителя и творца духовных ценностей, осуществление которых в общественно-исторической жизни образует содержание культуры... Личность, - подчеркивает Франк, - для нас священна сама по себе, в силу присущего нам морального сознания, которое гласит, что человек должен всегда рассматриваться как цель и никогда – как простое средство, и требует от нас уважения ко всякой человеческой личности как таковой». [3. – С.69] Таким образом, Франк вслед за Кантом отстаивает право личности на свободное развитие именно как носитель и творец духовных ценностей.

И хотя мир и Россия переживали не лучшие времена (статья «Политика и идеи» напечатана в декабре 1905 г.), когда в России происходили кровавые события – декабрьское вооруженное восстание рабочих, С.Франком в статье провозглашается непреходящая ценность личности: «И личность для нас, подчеркивает он, - священна, как живая и вечная лаборатория духовного творчества, как единственная на земле реальная точка, в которой и через которую действует божественный дух». [3. - С.69].

Таким образом, у Франка не общество – носитель и средоточие божественного духа, а человек, личность и поэтому нет заботы выше, как забота о человеке, о его благе! А посему, рассуждает Франк, «нет блага, которое было бы благом само по себе, если оно не служит личности; нет священной цели, кроме цели служения свободе и развитию личности». [3. С.69].

И общество, и прежде всего, государство в своей деятельности должно исходить из идеи свободы личности, обеспечения ее неприкосновенности, и свободы, а поэтому государство не может быть неограниченным властителем над личностью. Оно должно быть ограничено вечными и ненарушаемыми правами, вытекающими из ее нравственного значения» мысль и совесть не могут находиться под властью людей – они подчинены лишь своему собственному верховному суду и лишь перед ним повинны отчетом». [3. С.69].

Провозглашая идеи свободы личности, С.Франк опирается на исторический опыт человечества, который свидетельствует о пагубности пути подавления личности. «Старая античная идея» полного поглощения личности государством, - рассуждает Франк, - растворения без остатков всех духовных сил и помышлений в механизме государственной власти», идея, следы которой, еще так сильны и в наших учреждениях, и в наших умах, - противоречит современному нравственному сознанию и должна быть отвергнута решительно и безусловно». [3. - С.70].

Какие же ценности «современного нравственного сознания» составляют его фундамент? Это ценности, провозглашенные Декларацией прав и свобод человека и гражданина. Об этом и пишет в своем памфлете «Политика и идеи» С.Л.Франк. В ту бурную, революционную эпоху эти идеи вновь оказываются востребованными. Это свобода совести и мысли, свобода слова, свобода собраний – суть неотъемлемые права личности, вытекающие из основного права личности на самоопределение и свободное развитие. И «Какова бы ни была форма власти, в чьих руках бы она ни находилась и как бы искренно она ни руководствовалась интересами народного блага,



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действительными потребностями большинства – она не вправе приносить в жертву своей цели эти неотъемлемые права личности». [3. - С.70]. И далее Франк подчеркивает, что личность стоит выше государства, и никакое государство не может (не должно) смотреть на нее только как на свое орудие. А посему «всякая диктатура, от кого бы она ни исходила и какими бы соображениями ни руководствовалась, одинаково безнравственна и недопустима». [3. - С.70]. Здесь мы видим уже существенное отличие марксистского понимания этого вопроса, поскольку там разработано было учение о диктатуре пролетариата. Франк же, как видно из вышесказанного, выступает против всякой диктатуры, ибо, по Франку, «право должно служить обеспечению свободы, и всякий порядок, убивающий свободу, противоположен и беззаконен». [3. – С.70]

Следующее положение, которое рассматривает Франк в указанной статье это проблема равноправия человека, которая также не утратила своей актуальности и в настоящее время. Франк считает, что несмотря на их естественные различия, все люди в государстве равны, как человеческие личности. Они равноценны, т.к. в равной мере выступают как представители священного начала личности. И человек не может быть средством и орудием для другого человека и, следовательно, по Франку, они равны по своему моральному значению. И что очень важно, так это, то что это равенство требует для себя политического выражения в принципе демократии. Франк далее пишет, что в этом вопросе «недопустимы никакие сословные и национальные привилегии, никакие преимущества и отличия, юридически прикрепленные к отдельным избранным группам личностей в силу самого происхождения». [3. - С.70]. И никакие «кремлевские пайки», никакие «мигалки» и крутые денежные оклады, и никакое самоуправство неприемлемо в демократическом обществе. Более того все люди, в силу их свойства как носителей духовного и общественного идеала, имеют право на равное участие в политическом творчестве, в образовании государственной власти. По мнению С.Франка, «власть может принадлежать только всему народу и всем его членам в одинаковой мере». [3. - С.70.]. И главное требование народовластия – всеобщее и равное избирательное право, ответственность власти перед народом. Чего в России, к сожалению, уже давно нет. И морально-политическим постулатом демократического движения должны стать, по Франку, свобода личности и равноценность, а следовательно, и равноправие отдельных личностей.

Но осуществление демократии должно происходить не только в политической, но и в

области хозяйственных и социальных отношений. Человек как личность не может быть средством, орудием в руках другого человека, а отсюда, по Франку, и возникает «моральная недопустимость хозяйственной эксплуатации и социальных привилегий». [3. - С.71]. И далее, по Франку, идея социализма гораздо шире и глубже тех экономических и политических лозунгов, с которыми оно обычно отождествляется: лозунги освобождения личности и демократизации общества, по Франку, примененные к экономической жизни логически приводят к идее социализма, но точнее «ее образуют» [9].

Поэтому то истинная свобода, как и истинное равноправие, осуществимы лишь в обществе, «в котором народ сам так же управляет своей хозяйственной судьбой, как и судьбой политической». [3. - С.71]. И далее очень важная мысль, прозвучавшая у Франка, и которая очень важна для уяснения теории социализма как общественного строя уже в наши дни: «Диктатура пролетариата», экспроприация капиталистов, даже отмена частной собственности и обобществление орудий производства не исчерпывают собой основной идеи социализма и даже совсем не затрагивают ее». [3. - С.71]. Более того, все это – лишь частичные, частью односторонние, частью прямо неверные технические приемы осуществления социализма. Даже тогда, когда социализм понимается как коллективное хозяйствование народа или как известная заранее определенная организация производства, обмена и распределения, по Франку, «не может иметь принципиального морально-политического значения». [3. - С.71]. Ибо принципиально в социализме лишь перенесение идей свободы и равноправия личностей на экономическую и социальную область. И еще принципиально в этом вопросе требование отмены хозяйственной эксплуатации и социальных привилегий. И далее: «Социализм есть великая проблема наших дней, но для решения ее нужны не только практические, но и идейные усилия...» [3. - С.71]. Увы! Таких даже просто идейных усилий в улучшении духовной ситуации в России не произошло [8].

Теперь, экстраполируя эту мысль Франка на сегодняшний момент жизни общества, можно констатировать, что тот советский социализм в СССР был технически осуществлен без решения главной его, сущностной стороны – со стороны решения проблемы истинной свободы и истинного равноправия каждого человека, каждой личности и ответственности общества за судьбу и благосостояние его членов, права личности, как члена солидарного целого. Поэтому необходимо «требовать от общества обеспечения себе условий свободной, разумной и

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достойной жизни – вот великий новый моральный принцип, который следует из социалистического учения [3. - С.72]. Этого требует и философское, морально-политическое понимание затрагиваемой проблемы. И так называемый, «реальный социализм» в СССР главной проблемы социализма не решил, отсюда все коллизии и трагизм первого опыта построения социалистического общества. К сожалению, в СССР был осуществлен другой принцип – первенство, главенство, диктат общества над личностью. Личность здесь – просто винтик в общественном механизме. Произошло подавление личности вплоть до создания Гулага. Таким образом, предостережения русских философов начала XX века не были услышаны партией большевиков, а затем КПСС, отсюда и крах этого общества, отсюда и разрыв между научно-техническим и социальным прогрессом, которого, по-сути, нет.

В настоящее время проблему социальной свободы решают и именуют как либерально-демократические идеи. Но основу этих идей все же должна составлять великая, хотя и старая, но неумирающая формула – свобода, равенство, братство, как обобщение основных моральных мотивов, руководящих политическим и социальным прогрессом.

Но идеи и идеалы нужны нам, по Франку, не только для того, чтобы знать как нужно действовать, но и для того, чтобы знать, какие пути к осуществлению задачи должны быть признаны допустимыми и целесообразными. Франк подчеркивает, что приемы всякой общественной и политической деятельности вытекают из самых основ морального, политического и социального миропонимания. Когда допустим и целесообразен прием насильственной борьбы, когда и как можно добиваться и удерживать в своих руках моральное влияние на общество и политическую власть над ним? Ответы на эти вопросы надо искать во вдумчивом, свободном от предвзятости обсуждении «... иначе, - подчеркивает С.Л.Франк, - мы рискуем, следуя за шаблонами и трафаретами, потерять из виду живую действительность и совершить ряд гибельнейших ошибок. А как мало теперь у нас думают обо всем этом!» [3. - С.73]. Как же прав Семен Людвигович Франк, как часто человечество совершает ошибки, т.е. теряет из виду эту самую «живую действительность»! И далее Франк подчеркивает, что «единственной основой всякого политического и социального порядка, как и единственным и последним двигателем всякого политического и социального прогресса... является общественное мнение, совокупность и равнодействующая господствующих в народе верований, стремлений

и настроений». [3. - С.73]. И следовательно, для этого нужен определенный уровень культурного развития, нужен исторический опыт и политический навык, «чтобы убедиться ясно и непреложно в конечном всемогуществе общественного мнения, в бессилии всех попыток насильственного его подавления и в политической опасности высокомерного пренебрежения им». [3. - С.73]. И далее Франк сетует, что таких условий еще не хватает в России, а пишет он об этом в 1905! А в 2016 году в России по-прежнему этого не хватает. До сих пор в России существует пренебрежение к общественному мнению, т.к. социологическая наука у нас снова не в чести, а государственное принуждение в политике (например, использование в предвыборной компании административного ресурса) присутствует в полном объеме, манипулирование общественным мнением, подкуп голосов и другие приемы. Так что социальный прогресс, мягко говоря, не слишком заметен, а для обозначения социальной свободы теперь часто используется термин «достойная жизнь», предполагающий социальный комфорт личности в обществе. Но этого общество еще не достигло, ибо не может быть свободным, процветающим народ, если хотя бы один человек чувствует себя несвободным. Но пока таких обществ нет на Земле. А в России человек находится в условиях бесконечной борьбы за выживание и о гарантированном жизнеобеспечении гражданин России может только мечтать. Зато олигархи с чиновниками в погоне за личным обогащением утрачивают последний здравый смысл, не видя пагубности подобного безнравственного поведения, грозящему углублению пропасти между богатством наверху и нищетой внизу. Такое общество не является стабильным и может закончиться социальным взрывом и распадом общества. Кстати, об этом уже знал и писал еще Аристотель [10].

Последние выборы – есть, скорее всего, последняя попытка сделки между народом и властью в вопросе решения главных социальных вопросов не выживания, а обустроенности всего общества сверху донизу.

В решении этих насущных задач нужен какой-то очень важный ориентир, идеал, и этот идеал – идея социальной справедливости. Некоторым политикам эта идея как кость в горле. Так, известный политик современной России, доктор экономических наук В.В.Жириновский в своей публичной речи по телевидению заявил примерно следующее: «Справедливости никогда не было и сейчас нет и никогда не будет!» Чтобы на эти сентенции либеральному демократу ответил бы С.Л.Франк? Он сказал бы, что «демократическое движение должно быть и по



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существу является движением социалистическим – борьбой за социальную справедливость и социальную солидарность». А социалистическое движение только в том случае пустит крепкие корни в живой действительности, если оно поймет свое дело как широкую задачу культурной, политической и социальной реформы и примкнет к могучему потоку, стремящемуся к демократическому переустройству и перевоспитанию общества» [3. - С.76]. Так пусть и для этого горе-политика идеалы демократии и свободы и социальной справедливости будут путеводной звездой для действительно демократического преобразования России. Иначе грош им цена этим всем политикам, которые в своих речах, поступках и делах о справедливости и не помышляют! Добавим, что даже демократические принципы Конституции России без активного внедрения их в жизнь ничего не означают.

Учитывая исключительно трагический характер переживаемого периода российской истории (хотя этих периодов у нее было много!), знаем и понимаем, что всегда при этом рождается много зла и слепоты, лукавства и низости. Время таково, говорил в 1923 году С.Франк, и случается так, что «умные и живые люди склонны подлеть и отречься от всякого духовного содержания» и даже честные и духовно глубокие натуры «склонны глупеть и терять живое отношение к действительности». [4.- С.14]. Живое и творческое отношение к кризисному историческому времени дает нам право найти тот ориентир, который поможет устоять и выстоять и выйти на твердую дорогу жизни. И этот ориентир,- говорил Франк,- социальная справедливость. Может не устоять обыватель, но не мыслящая личность, которая сможет оценить ситуацию, стать, как говорил Ницше, по ту сторону добра и зла, преодолеть в себе «жалкое довольство».

Должно же наступить время «умного делания»! Прав ведь Платон, который говорил, что управлять государством должен тот, кто мудр! И Ницше прав: «Не вокруг творцов нового шума – вокруг творцов новых ценностей вращается мир!» И С.Л.Франк прав, который критикуя старую интеллигенцию России XIX в., говорит о возможном повороте новой

интеллигенции «от непроизводительного, противокультурного нигилистического (бесплодного) морализма... перейти к творческому, созидающему культуру религиозному гуманизму».[5. – С.100].

Предвыборная кампания в России не за горами. А прошедшие выборы высветили глубокие недостатки всей выборной системы, способствующей широкой возможности фальсификации выборов. Предвыборная кампания высветила грубые нарушения Конституции РФ в деятельности властных структур, а также системный кризис власти, поэтому стабилизации общественной жизни эти обстоятельства способствовать не могут. Нужны эффективные меры по спасению ситуации, недопущения «оранжевой революции». Но нельзя допустить и консервации, застоя в решении насущных задач развития нашего общества, предания процессам экономического развития новых импульсов. Вызовы истории таковы – пора сдвинуть с мертвой точки развитие промышленности, сельского хозяйства, создание новых рабочих мест. Требуется новое отношение к созданию нормальных условий для работы и жизни населения страны, коренного преобразования властных структур, резкого сокращения госаппарата. Управление страной надо сделать эффективным. Во власть должны прийти профессионалы, люди компетентные и ответственные за свои дела. Коррупцию выжигать надо каленым железом! Надо срочно спасать культуру, науку, образование и здравоохранение нации. Выборы в Государственную думу страны нужно сделать такими, чтобы к власти пришли люди, готовые эффективно решать назревшие проблемы в интересах всего общества, а не отдельного зажившего клана. Этому нас учит наше русская философская мысль и ее ярчайший представитель – Семен Людвигович Франк. Ибо, как справедливо заметила П. П. Гайденко: «Творчество Франка принадлежит к лучшему, что было создано русской философией Серебряного века и отдать должное глубокому мыслителю – значит продолжить дело его жизни и попытаться внести свою посильную лепту в разрешение тех вечных вопросов, которые его волновали». [1. – С.300]

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### SECTION 2. Applied mathematics. Mathematical modeling.

## COMPUTATIONAL EXPERIMENT FOR FORECASTING AND MONITORING THE ENVIRONMENTAL CONDITION OF INDUSTRIAL REGIONS

**Abstract:** The paper presents a mathematical model and the results of numerical calculations for determining the basic physical parameters, which effect in the transfer process and the diffusion of aerosol emissions in the atmosphere for the purpose of monitoring and forecasting the ecological condition in industrial regions. In deriving the mathematical model of the object of study the main parameters: speed and direction of the wind, which are changed with time, absorption coefficient of aerosol particles in the atmosphere, power and coordinates of sources of emissions of harmful substances, also a significant parameter - the topography of the region are taken into account. Short overview of literatures is outlined, which is related to the problem of mathematical modeling and computational experiment that concerning to the distribution of hazardous substances. On the basis of developed model and algorithm, several numerical calculations in computer were conducted by the authors. The results of calculations are illustrated in graphical form and they are implemented with proper conclusions.

**Key words:** mathematical model, numerical algorithm, numerical algorithm, computational experiment, transfer and diffusion of hazardous substances, weather and climatic factor, terrain orography.

**Language:** English

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### INTRODUCTION

Since the ecology of atmosphere - is one of the most important environmental indicators, there is a need for forecasts impurity concentration in the surface layer of the atmosphere for different time frames. In particular, the practical interest show short-term forecasts relating to the coverage of maximum permissible concentration norm of harmful substances in the projection of structures of new enterprises.

Contamination of the surface layer of the atmosphere and land surface, including the transfer and diffusion of pollutants, and their deposition and concentration - this is a very complex process that subjected to the influence of many factors, including geographical and weather and climatic conditions, which are specific to one or another of the region. Moreover, it is important to take into account the fact

that the meteorological conditions are changed during the day and the seasons.

The complexity of the process leads to an integrated approach to the successful achievement of the objective of this research, which consists of developing models, efficient computational algorithms and software tools for the automation of solving the problems of forecasting the ecological state of industrial regions and the adoption of solutions for environmental protection from harmful effects with sufficiently high degree of reliability.

The intense pace of economic development of any country requires the construction and disposition of powerful industrial objects and commercial complexes in different areas depending on the raw capacity and labor supply. Typically, such facilities are constructed in densely populated areas or near them. This imposes special restrictions on the



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placement of objects, which releases harmful substances into the atmosphere by violating the existing environmental condition in this region. In this regard, it is clear that the monitoring and forecasting problem of the transmission process of the diffusion and transfer of harmful substances in the atmospheric boundary layer and the associated acceptance of administrative decisions on the protection of the environment, its protection from technogenic factors are highly relevant, requiring carefully considered decisions.

In addition to industrial objects, the source of emission of harmful particles in the atmosphere is their removal from the soil surface as a result of the turbulent motion of air masses in the atmospheric boundary layer. Every year from the soil surface and the exposed seabed and water tanks and carried into the boundary layer of the atmosphere large amounts of salt dust. In its structure, suspended particles are dominated in the form of aerosols with a impurity of agricultural pesticides, fertilizers and other harmful components of industrial and domestic waste.

It should also be noted that thrown into the atmosphere aerosol particles affect the processes of cloud and precipitation by changing the microstructure of cloud particles and solar radiation and heat transfer processes in the atmosphere, also the temperature conditions of Earth's climate system.

According to climatologists, the impact of ejected particles to the Earth's atmosphere is that aerosols scatter and absorb solar and thermal radiation, altering the radioactive balance of the atmosphere and the underlying surface. Climatic influence of aerosols ejected into the atmosphere industrial facilities causes a change in the radioactive properties (absorption and reflectance) of clouds, and their life time in the atmosphere and change in the relative humidity, which leads to the destruction of the cloud. The presence in the atmosphere spreading aerosol particles leads to a negative effect of radiation, i.e., cooling the Earth's surface.

The above mentioned problem poses the problem for humanity, which requires immediate and indisputable solutions.

The appearance of supercomputers and software has enabled the development of software for the solution of this problem. One of the effective tools that support decision-making on this issue is the development of computer models and conduct computational experiments based on them.

With the usage of computer modeling of transfer process and diffusion of pollutants in the atmospheric boundary layer many studies both applied and fundamental character are carried out. The problem of mathematical modeling of transport and diffusion of pollutants in the process of the atmospheric boundary layer actively solved many scientists.

In particular, the paper [1] is devoted to the creation of an information system for the modeling the process of the spread of hazardous substances in the atmosphere, emitted from industrial objects, using application software «ArcGIS», reflecting on the real state of the air in regions. It should be noted that within the system results can be obtained only at certain points, and they cannot give an adequate picture of the state of the air in the rest area.

In the article [2] a mathematical model of the dynamics and kinetics of aerosol particles in the spread of the atmospheric boundary layer as a multi-component environment is developed, taking into account the photochemical transformation and formation of aerosols in the troposphere of the northern hemisphere, as well as kinetic processes enucleation, condensation and coagulation.

By the author of article [3] software for the study of the ecological state of the region is developed, placing inflammable objects and their optimization taking into account the terrain and spatial form.

Article [4] is devoted to the development of computer models for monitoring and forecasting the transmission process and the diffusion of aerosol particles into the environment of vehicles. The authors present the results of the numerical implementation of the model on a computer using the finite volume method based on the calculation algorithm developed distributed.

In [5] a mathematical model of the spread of harmful substances in the atmosphere is developed, taking into account the field of wind currents on the basis of the Navier-Stokes equations, taking into account the compressibility and turbulence of the air environment, terrain. SIMPLE-algorithm is used as a numerical method.

A study [6] was based on models developed by the regional agents of the diffusion process, described hydro thermodynamic equation, namely the equation of molecular heat conduction in the active layer of soil, taking into account the heat balance of the underlying surface (water, earth). The comprehensive mathematical model of researchers consists of separate units, which each one is a mathematical model that describes the processes hydro thermodynamic in separate environmental objects. This paper considers the environmental problems associated with the distribution of pollutants from known sources and determined the probable location of the source in an water medium.

The process of transfer and diffusion of aerosol particles in the atmosphere, taking into account different climatic factors and external disturbances is considered in [7]. The article discussed the transport of air pollutants from the source based on the advection of pollutants from the average air flow, mixing polluting atmospheric turbulence and mass diffusion. Also in the paper the study the process of

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distribution of aerosol particles in a variety of physical and mathematical aspects related to the transport and diffusion of pollutants in the atmospheric boundary layer at the weak and strong winds is conducted.

It should be noted that the question of mathematical modeling of pollutant transported by water shows considerable interest. Thus, in [8] the studied the process was modeled as a set of four simple models: the land of water flow, leakage, transfer of pollutants runoff and pollutant deposition (accumulation) on the ground. The developed model is based on the diffusion equation with an additional term on the right side. This model takes into account the influence of topography, lithology territory and the intensity of the contamination rate of absorption of earth surface. The shape, the boundaries and the topology of addressing the problem vary over time and depend on the appearance of dry "islands" surrounded by water.

[9] is devoted to the study of processes of dispersion and diffusion of reactive primary pollutants emitted from elevated line sources in a stable boundary layer of the atmosphere with the wind speed and the generalized quadratic function of the vertical height. For this setting, an exact solution using Laplace transform for linear sources in the atmospheric boundary layer. It takes into account the chemical reaction that occurs as a result of interaction with the air mass, as well as the conversion of gaseous pollutants in the solid particles and their deposition on the surface of the area under consideration.

The authors of [10-13] developed software solutions for the multi-component ambient air movement task considering the transfer and diffusion of pollutants in the atmosphere, changes in the thermal regime of the atmosphere, the phase transition, as well as the influence of vegetation.

In [14] the process of dissemination of harmful substances, taking into account changes in the concentration of aerosol particles in the atmosphere and seasonal changes in seasons, and in [15]

developed a mathematical model, numerical algorithms and software for computational experiment on the computer.

Article [16] is devoted to modeling of diffusion and transfer process of the particles in the atmosphere, taking into account changes in hydro-metrological parameters of the atmosphere.

The process of optimal placement of industrial objects in the regions to support the sanitary norms was considered in [17].

### PROBLEM FORMULATION

Consider the one-dimensional equation of transfer and diffusion of hazardous substances in the atmosphere, taking into account orography of the ground as the first boundary value problem [18-21]

$$\begin{aligned} & \frac{\partial \varphi(x,t)}{\partial t} + u \frac{\partial \varphi(x,t)h(x)}{\partial x} + \\ & + \sigma(x,t)\varphi(x,t)h(x) = \\ & = \mu \frac{\partial^2 \varphi(x,t)h(x)}{\partial x^2} + f(x,t), \quad (x,t) \in D, \end{aligned} \quad (1)$$

with the following conditions

$$\varphi(x,0) = \varphi^0, \quad \text{when } t=0; \quad (2)$$

$$0 < x < L_x,$$

$$\left. \begin{aligned} \varphi(0,t) &= v_1, \quad \text{when } x=0; \\ \varphi(L,t) &= v_2, \quad \text{when } x=L. \end{aligned} \right\} \quad (3)$$

Here  $\varphi$  - the aerosol;  $u$  - wind speed;  $\sigma$  - absorption coefficient;  $f(x,t)$  - the power of the source;  $\mu$  - the diffusion coefficient;  $h$  - option to define the terrain;  $v_1, v_2$  - function depending on  $x$ .

For each layer of the model the factor  $h$  ( $0 \leq h \leq 1$ ) is introduced, determining the degree of blocking air flow (Fig. 1).

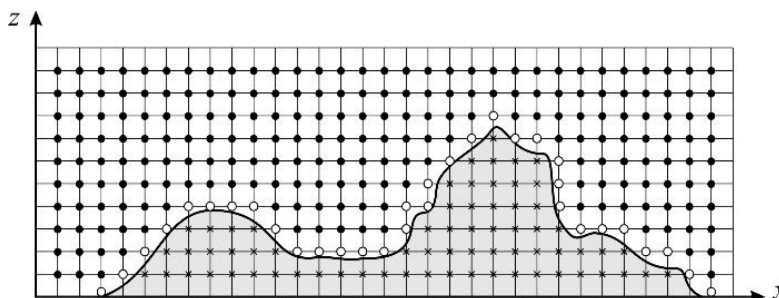


Figure 1 - The relief of terrain along the area of aerosol transfer emissions

$$\circ - h = \frac{\eta - z_{K-0,5}}{\Delta z}, \quad \times - h = 0, \quad \bullet - h = 1.$$

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### METHOD OF SOLUTION

From the statement of the problem (1) - (3) it implied that it is difficult to obtain an analytical solution. Thus, for the numerical integration of tasks we developed a numerical algorithm based on differential operators replaced by a finite-difference [22-23].

### THE DISCUSSION OF THE RESULTS

For research, forecasting and monitoring the environmental condition of industrial regions and making administrative decisions, a series of

numerical calculations on a computer were conducted by setting different values for the parameters of transfer process of harmful substances in the atmospheric boundary layer. The results of numerical calculations are presented in Fig. 2-10.

The numerical calculations showed that (curves in Fig. 2), the main parameter that affects the process of transport and diffusion of pollutants in the atmosphere, is the absorption coefficient of harmful substances in the atmosphere, which depends on the moisture content in the atmosphere and varies by time of day and season.

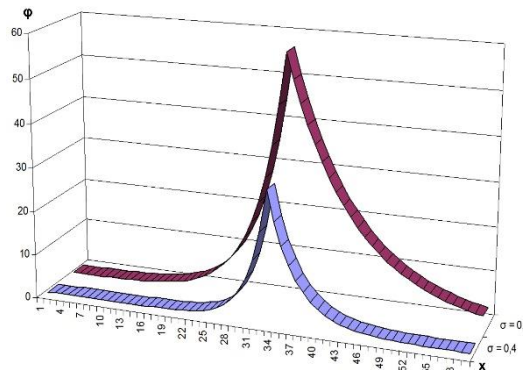


Figure 2 - Changes in the concentration of substances in the air at different values of the absorption coefficient of harmful particles ( $\sigma = 0,1$  and  $\sigma = 0,4$ ).

Another significant physical component, which plays an important role in the spread of aerosol particles in the atmosphere, is the wind speed in three areas in the atmospheric boundary layer (Fig. 3). As follows from the curves in Fig. 3, with the growth rates of the air mass in the horizontal process intensifies the spread of harmful substances, while

the unstable wind stratification for a small period of time there is a sharp change in the concentration of harmful substances in the atmosphere. From the curves in Fig. 3, it is clear that the change in the concentration of pollutants in the atmosphere occurs mainly due to convective particle transfer.

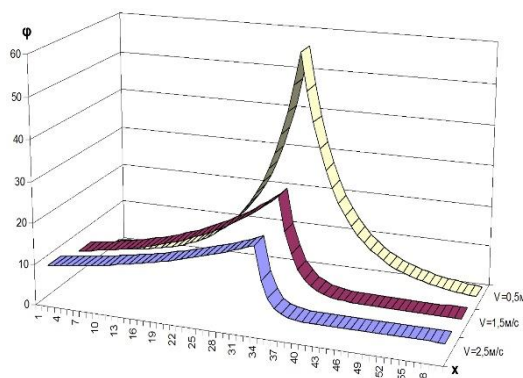


Figure 3 - Changes in the concentration of substances in the atmosphere at various values of the wind velocity in the boundary layer of the atmosphere ( $V = 0.5 \text{ m/s}$ ,  $V = 1.5 \text{ m/s}$ ,  $V = 2.5 \text{ m/s}$ ).

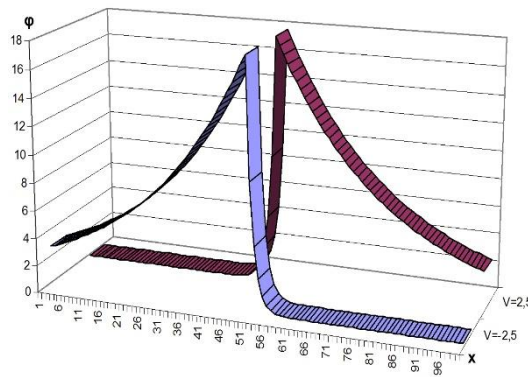
Fig. 4 shows the results of numerical calculation on the computer, changes of the concentration of harmful substances in the atmosphere at the south-west and south-west direction of the wind. The numerical calculation carried out at the positive and negative horizontal

wind speed ( $V = 2,5 \text{ m/s}$ ,  $V = -2,5 \text{ m/s}$ ). From the curves in Fig. 4 it is clear that the transfer of pollutants from the source to occur symmetrically in the left and right (in the direction of the wind).



**Impact Factor:**

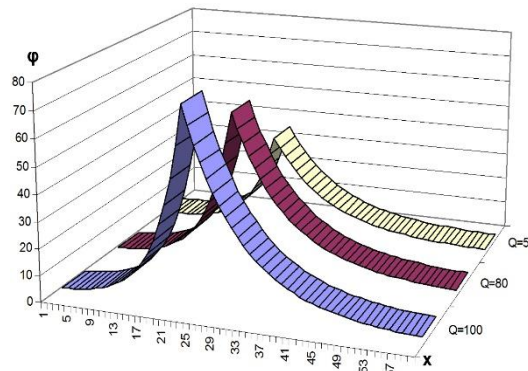
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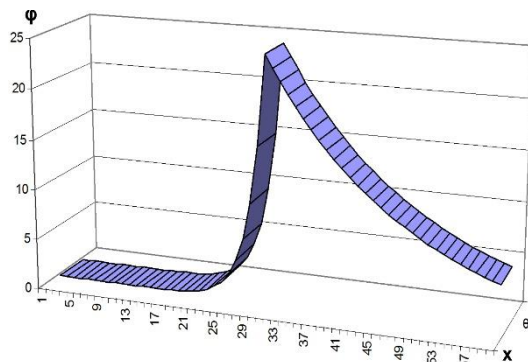
**Figure 4 - Changes in the concentration of substances in the atmosphere in the southwest and south-western direction of the wind**

The numerical calculations in computer have shown that the growth of the concentration of aerosol particles in the atmosphere is the power and the coordinates of the emission source (Fig. 5). This is

especially noticeable when the air mass is with moderate speed.



**Fig. 5. Distribution of concentration of harmful substances in the atmosphere at different values of the source's power**



**Figure 6 - The concentration of aerosol in the atmosphere at t = 10 hours. (with the wind speed V = 1,7 m/s during 6 hours. The blowing in the south-west direction and at a speed V = 1,5 m/s during 4 hours in the south-west direction).**

Fig. 6 shows the change of concentration of aerosol particles in the atmosphere at t = 10 hours. When the wind speed is V = 1,7 m / s for 6 hours. The blowing in a southwest direction, and a speed V = 1,5 m / s for 4 hours in the south-west direction. Based on the results it is clear that a change in the concentration of harmful substances play an

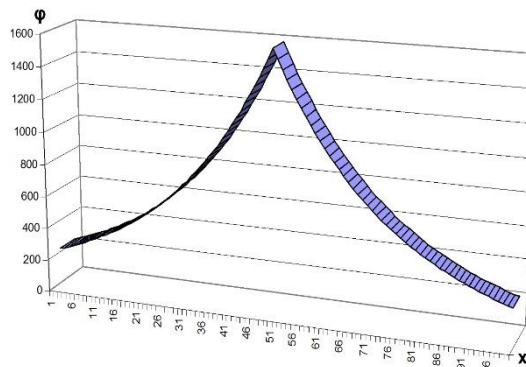
important role wind speed and direction, as well as their duration.

In the absence of wind (air mass resting condition) (Fig. 7), the concentration of harmful substances is distributed symmetrically in four directions with respect to the emission source. The numerical calculations have shown that the

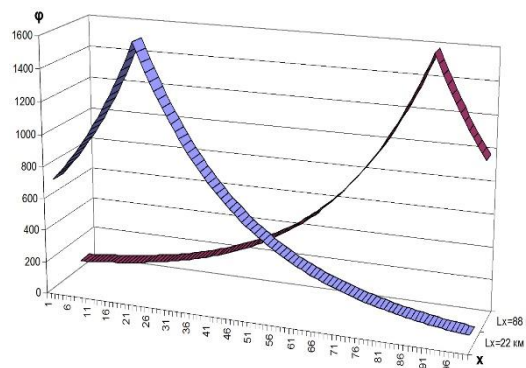
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concentration of particulate matter will accumulate around the source, depending on the power source and the release duration.



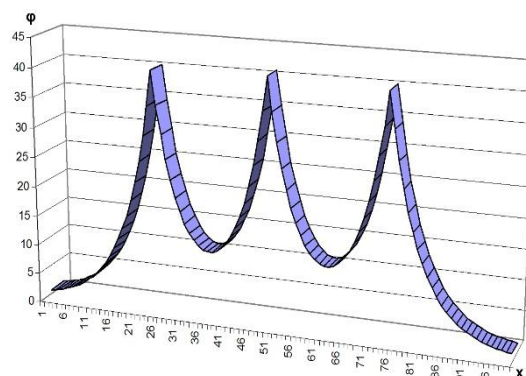
**Figure 7 - Changing the concentration of harmful substances in the atmosphere in the absence of wind in the atmosphere.**



**Figure 8 - Changes in the concentration of harmful substances in the atmosphere, depending on the location of emission sources.**

Fig. 8 shows changes in the concentration of harmful substances in length when the springs are located at the beginning and end (for  $Lx = 22$  km,  $Lx = 88$  km) addressing tasks. As seen from the curves in Fig. 8, the concentration of hazardous substances decreases exponentially along the length of the region considered solutions at moderate atmospheric air mass flow rate. Maximum accumulation of harmful substances is expected around the source of emission of the aerosol particles.

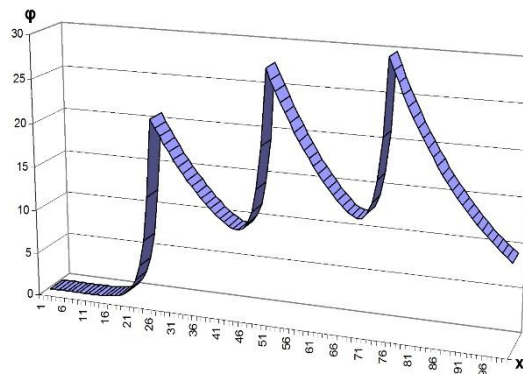
Numerical calculations were performed for the case where there are three sources of emission of harmful substances with the same capacity (Fig. 9). Analysis of the results of numerical experiments showed that the essential physical parameters acting on the change in the concentration of harmful substances in the atmosphere, are the ratio of the particles of the absorption and flow rate of the air mass of the atmosphere.



**Figure 9 - Change of the concentration of hazardous substances in the atmosphere depending on the location of particulate emission sources (three sources with power equals to 50).**

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**Figure 10 - Change of the concentration of hazardous substances in the atmosphere depending on the locations of the ejection of the aerosol particles (three source with power equals to 50 at a wind velocity of  $V = 2,5$  m/s).**

Numerical calculation on the process of transfer and diffusion of pollutants in the atmosphere during operation of the three sources to be equivalent pollutant emissions capacities showed that the total accumulation of aerosol particles occurs in an area where the third source is located, when the wind is blowing at a speed of  $V = 2,5$  to  $3,7$  m / s in the direction of the source (Fig.10).

### CONCLUSION

The analysis of numerical experiments on the computer showed that:

- significant parameters which influence the process of transfer and diffusion of harmful particles in the atmosphere are, firstly, the absorption coefficient of harmful substances into the atmosphere, which is dependent on the moisture content in the atmosphere and varies by time of day and time of year; secondly, wind speed and direction, as well as their duration; thirdly, the power sources of emission of harmful particulate matter;

- the maximum accumulation of harmful substances in the aerosol particle emission area occurs where there are moderate winds or its absence;

- when there is no wind (air mass resting condition) the concentration of harmful substances is distributed symmetrically in four directions with respect to the emission source;

- results of modeling revealed that a significant role in changing the speed and direction of winds play uplands - hill or mountain ranges located in open landscape, recorded in the model parameter  $h(x)$ . Above the uplands, the wind speed is higher than the surrounding plain area. Since the high pressure area actually extends some distance up the hill, the wind changes its direction before reaching it. If the air mass meets a steep hill with a rough surface, the wind speed increases dramatically, this leads to an increase in the coefficient of turbulence. Wind speed increases with the difference of atmospheric pressure and air velocity falls in the ground due to the friction of the underlying surface roughness;

- it is found that an increase in capacity of aerosol generators area of the region grows where the concentration exceeds the permissible sanitary norms, and when the wind is in unstable stratification, the area of distribution of harmful substances, has a spiked character – maximized in a short period of time.

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## THE COMPARATIVE ASPECTS QUALITIES OF LIFE IN RESIDENTS OF TURKESTAN REGION (SOUTH OF KAZAKHSTAN) DEPENDING ON GENDER, AGE AND GEOGRAPHICAL LOCATION

**Abstract:** Investigated the differences between urban and rural population by the quality of life in Turkestan region (South of Kazakhstan), depending on such determinants as age and gender.

**Key words:** quality of life, SF-36, urban population, rural population, Kazakhstan.

**Language:** English

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**Background.** Currently, the definition of the level of quality of life is one of the major healthcare problems. At the same time, in recent years, foreign literature has more research on the impact of health-

related quality of life (HRQL) on public health and medicine [1, p.18; 2. p.8; 3. p.47; 4 p.55]. This situation stems from the fact that the concept of "health" should not be taken unilaterally. Since



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together with this concept, we must take into account many factors such as favorable or adverse environmental effects and the ability to maintain health at a certain level [5, p.48; 6, p.6; 7, p.98; 8, p.71]. According to the WHO definition “Quality of life – it is an integral characteristics of the physical, psychological, social and emotional status of the human, estimated on the basis of its subjective perception” [9, p.293]. Modern doctors are paying particular attention to the study of the impact of quality of life in health, because for the human in time of illness, can affect various aspects of life [10, p.7; 11, p.25; 12, p.17; 13, p.41; 14, p.81; 15, p.102, 16, p.84; 17, p.97]. At the same time, one of the main problems of modern society is to study the quality of life and the opportunity to receive full-fledged medical services, depending on the place of residence of the urban and rural population [18, p.202; 19, p.168; 20, p.7].

**The aim of the study** is to determine the differences in the quality of life of the urban and rural population of the Turkestan region, South of Kazakhstan, depending on age and gender differences.

**Materials and methods.** Design of the study – cross-sectional. The sample type – pre-planned non-probability sampling.

The study involved 972 residents (mean age – 51,9±13,7) Turkestan region, South of Kazakhstan (Turkestan, Karashyk, Kumtyuin etc.). Including 398 men (mean age – 50,1±13,7) and 574 women (mean age – 52,1±13,7). Of these, 571 - the inhabitants of the city (Turkestan) and 401 - the inhabitants of the villages (Karashyk, Kumtyuin etc.). Each study participant signed the papers of agreement to participate in the study.

**Table 1**  
General information about the inhabitants of Turkestan region who participated in the study.

№	Indicators	Men (n=398) M (SD)	Women (n=574) M (SD)
1	Average age	50,1±13,7	52,1±13,7
2	Urban population	238	333
3	Rural population	160	241

In this study to determine the quality of life we used – SF-36 (*The Short Form-36*). The SF-36 is a multi-purpose, short-form health survey with only 36 questions. It yields an 8-scale profile of functional health and well-being scores as well as psychometrically-based physical and mental health summary measures and a preference-based health utility index. The eight sections are: physical functioning (PF), role-physical functioning (RP), bodily pain (BP), general health (GH), vitality (VT), social functioning (SF), role-emotional (RE) and mental health (MH). All eight sections are combined into 2 groups: Physical Health (PH) – PF,

RP, BP, GH and Mental Health (MH) – MH, RE, SF, VT [22, p.2].

Statistical analysis was performed by Student’s T test using proscale package SPSS Statistics 17.0 (Trial Version). The Confidence Interval (CI) – 95% (p=0,05).

**Results and discussion.** The study revealed significant differences in quality of life (SF-36) between inhabitants of Turkestan region (n=972), depending on the place of residence (urban or rural), age and gender.

**Table 2**  
The relationship of quality of life (SF-36) between urban and rural residents of the Turkestan region (n=972).

The quality of life (SF-36)	Urban population (Turkestan) n=571 M (SD)	Rural population (Karashyk, Kumtyuin etc.) n=401 M (SD)	p (95% CI)
Physical Functioning	72,5 (28)	74,8 (28,6)	0,216
Role-Physical Functioning	68,5 (41,5)	69,9 (40)	0,593
Bodily pain	79 (24,2)	78,8 (24)	0,862
General Health	60,5 (17)	58,5 (18,6)	0,089
Vitality	62,2 (15)	63,2 (16,2)	0,294
Social Functioning	76,9 (20,4)	74,6 (19,7)	0,078

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Role-Emotional	70,1 (40,8)	70,7 (39,1)	0,830
Mental Health	65,2 (13,2)	62,8 (14,6)	0,012*

Note. \* - Significant in relation to the control 95% CI

The statistical significance of the relationship of quality of life (SF=36) between urban and rural residents of the Turkestan region (n=972) on a scale of Mental Health (MH) corresponded with 95% CI (p=0,012). In the other scales of SF-36 did not reveal 95% CI: Physical Functioning (PF) - p=0,216; Role-Physical Functioning (RP) - p=0,593; Bodily pain (BP) - p=0,862; General Health (GH) - p=0,089; Vitality (VT) - p=0,294; Social Functioning (SF) - p=0,078; Role-Emotional (RE) - p=0,830. In the

study Mu H. and co-authors (China) was revealed the level of assessment of quality of life between urban and rural populations. As a result of research at the scale of General Health (GH) on the urban and rural residents was the same. However, indicators of scales Vitality (VT) and Mental Health (MH) in rural areas, compared to urban, were lower. Living conditions in rural areas families have led to an increase in their quality of life [21, p.38].

**Table 3**  
The relationship of quality of life (SF-36) between urban and rural residents of the Turkestan region (n=972) associated with the gender difference.

	Common indicators of the SF-36 questionnaire								
	Gender	PF	RP	BP	GH	VT	SF	RE	MH
City	<b>Men (n=238)</b>	78,5 (26,9)	74,2 (39,6)	83,6 (22,5)	63 (17,3)	65,1 (15,9)	80,3 (18,8)	74,6 (39,4)	67,1 (13,3)
	<b>M (SD)</b>								
Village	<b>Men (n=160)</b>	78,8 (27,8)	71,8 (39,9)	80,9 (23,1)	60,6 (20,1)	65,3 (16,9)	75,5 (19,7)	74 (39,1)	63,6 (15,8)
	<b>M (SD)</b>								
	<b>p (95%CI)</b>	0,920	0,547	0,254	0,226	0,909	0,017*	0,864	0,024*
City	<b>Women (n=333)</b>	68,3 (28,1)	64,3 (42,4)	75,8 (24,9)	58,6 (16,5)	60,1 (14)	74,6 (21,2)	66,9 (41,4)	63,8 (13)
	<b>M (SD)</b>								
Village	<b>Women (n=241)</b>	72,2 (28,8)	68,6 (40)	77,4 (24,5)	57 (17,5)	61,9 (15,5)	74 (19,8)	68,5 (39)	62,3 (13,8)
	<b>M (SD)</b>								
	<b>p (95%CI)</b>	0,105	0,219	0,458	0,263	0,153	0,765	0,635	0,201

Note. \* - Significant in relation to the control 95% CI

The statistical significance of the relationship of quality of life (SF-36) between the urban male population and rural male population of the Turkestan region (n=972) on a scale Social Functioning (SF; p=0,017) and on a scale of Mental Health (MH; p=0,024) corresponded with 95% CI. Thus, the study defined that the men of the urban population as compared to men of the rural population social status and mental health was higher, and the Mental Health component was higher than the Physical Health component. With respect to other parameters, there is no statistical significance was found in these scales: Physical Functioning (PF; p=0,920); Role-Physical Functioning (RP; p=0,547);

Bodily pain (BP; p=0,254); General Health (GH; p=0,226); Vitality (VT; p=0,909) and Role-Emotional (RE; p=0,864).

With regard to the quality of life between rural and urban females corresponded to the following scales: Physical Functioning (PF; p=0,105); Role-Physical Functioning (RP; p=0,219); Bodily pain (BP; p=0,458); General Health (GH; p=0,263); Vitality (VT; p=0,153); Social Functioning (SF; p=0,765); Role-Emotional (RE; p=0,635) and Mental Health — MH; p=0,201) in which any differences have been identified, thereby no being statistically significant.

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**Table 4**  
The relationship of quality of life (SF-36) between urban and rural residents of the Turkestan region of young age (<44 years; n=332).

The quality of life (SF-36)	Urban population (Turkestan) n=191 M (SD)	Rural population (Karashyk, Kumtyuin etc.) n=141 M (SD)	p (95% CI)
Physical Functioning	86,2 (20,2)	88,6 (17,5)	0,241
Role-Physical Functioning	86,4 (30,3)	84,4 (30,8)	0,559
Bodily pain	87,8 (21)	87,8 (18,9)	0,994
General Health	67 (15,2)	64,7 (16,7)	0,216
Vitality	66,6 (14,6)	69 (15,2)	0,143
Social Functioning	83,1 (18,8)	81,5 (16,5)	0,418
Role-Emotional	85 (32,6)	82,1 (32,8)	0,420
Mental Health	68,2 (12,5)	64,9 (14,7)	0,032*

Note. \* - Significant in relation to the control 95% CI

**Table 5**  
The relationship of quality of life (SF-36) between urban and rural residents of the Turkestan region of middle age (45-59; n=375).

The quality of life (SF-36)	Urban population (Turkestan) n=212 M (SD)	Rural population (Karashyk, Kumtyuin etc.) n=163 M (SD)	p (95% CI)
Physical Functioning	76,7 (23,4)	75,2 (27,4)	0,561
Role-Physical Functioning	74,4 (37,5)	70,3 (39,3)	0,301
Bodily pain	80,7 (22,4)	76,8 (24,2)	0,110
General Health	60,8 (15,5)	56,3 (18,7)	0,014*
Vitality	62,5 (13,5)	61 (15,8)	0,329
Social Functioning	77,6 (19,4)	73,3 (20,1)	0,038*
Role-Emotional	74,5 (36,5)	69,6 (38,9)	0,214
Mental Health	64,8 (12,4)	62,1 (14,7)	0,059

Note. \* - Significant in relation to the control 95% CI

The quality of life (SF-36) of the rural population of the Turkestan region in the young (<44) and middle (44-59) age groups, scales of SF-36: Mental Health (MH; p=0,032 (<44)), General Health (GH; p=0,014 (45-59)) and Social

Functioning (SF; p=0,038 (45-59)) was lower than urban population, with significant in relation to the control 95% CI.

**Table 6**  
The relationship of quality of life (SF-36) between urban and rural residents of the Turkestan region of elderly age (60-74; n=191).

The quality of life (SF-36)	Urban population (Turkestan) n=129 M (SD)	Rural population (Karashyk, Kumtyuin etc.) n=62 M (SD)	p (95% CI)
Physical Functioning	57 (26,9)	63,5 (27,2)	0,124
Role-Physical Functioning	45,6 (43,4)	52,6 (43)	0,296
Bodily pain	70,6 (24,4)	73,9 (24,5)	0,391



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General Health	54,8 (16,3)	52,9 (19)	0,494
Vitality	58,5 (14,1)	60,3 (15,3)	0,454
Social Functioning	71,5 (19,5)	71 (18,5)	0,849
Role-Emotional	54,3 (44,2)	60,1 (43)	0,387
Mental Health	62,9 (14,1)	61,6 (12,2)	0,513

**Table 7**  
The relationship of quality of life (SF-36) between urban and rural residents of the Turkestan region of senile age (75-89; n=69).

The quality of life (SF-36)	Urban population (Turkestan) n=36 M (SD)	Rural population (Karashyk, Kumtyuin etc.) n=33 M (SD)	p (95%CI)
Physical Functioning	37,2 (30,1)	38 (31,7)	0,919
Role-Physical Functioning	25,7 (38,5)	39,4 (42,4)	0,166
Bodily pain	57,2 (23,5)	61,8 (26,7)	0,458
General Health	45,3 (18)	52,5 (17,1)	0,091
Vitality	51 (18,2)	54,9 (16,4)	0,349
Social Functioning	61,1 (23,9)	59,6 (21,2)	0,784
Role-Emotional	24,1 (38,7)	48,4 (41,7)	0,015*
Mental Health	59,8 (13,6)	60 (17,5)	0,953

Note. \* - Significant in relation to the control 95% CI

All SF-36 scales in elderly people (60-74) are not statistically significant, while the rural population of senile age (75-89) compared to the urban population only scale Role-Emotional (RE; p=0,015) was significant in relation to the control 95% CI.

### Conclusion:

1. In the 95% CI the statistical significance of the relationship of quality of life (SF-36) between the urban and rural male population on a scale Social Functioning (SF; p=0,017) and Mental Health (MH; p=0,024) corresponded; although, in females such changes are not detected.

2. In relation to the control 95% CI the statistical significance of the relationship of the quality of life of the rural population of the Turkestan region, the young (<44) and middle (45-59) age groups, scales of SF-36: Mental Health (MH; p=0,032 (<44)), General Health (GH; p=0,014 (45-59)) and Social Functioning (SF; p=0,038 (45-59)) was lower than urban population, while the rural population of senile age (75-89) compared to the urban population only scale Role-Emotional (RE; p=0,015). All scales in elderly age groups (60-74) have no statistical significance.

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SECTION 21. Pedagogy. Psychology. Innovation in Education.

## INNOVATIVE DIRECTIONS OF THE MULTI-LEVEL TRAINING PROGRAM GENERAL SCIENTIFIC ENGINEERING AND NAVAL PERSONNEL

**Abstract:** The innovative directions of the multi-level educational programs for different categories of students in higher education based on the widespread use of e-learning resources.

**Key words:** general scientific training, different-level educational programs, electronic learning resources, new information technologies.

**Language:** Russian

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### ИННОВАЦИОННЫЕ НАПРАВЛЕНИЯ РЕАЛИЗАЦИИ РАЗНОУРОВНЕВЫХ ПРОГРАММ ОБЩЕНАУЧНОЙ ПОДГОТОВКИ ИНЖЕНЕРНО-МОРСКИХ КАДРОВ

**Аннотация:** Рассмотрены инновационные направления реализации разноуровневых образовательных программ для различных категорий, обучающихся в высшей школе на основе широкого использования электронных обучающих ресурсов.

**Ключевые слова:** общенаучная подготовка, разноуровневые образовательные программы, электронные обучающие ресурсы, новые информационные технологии.

Реформирование экономики и образования, осуществляемое в настоящее время в России, сопровождается формированием новых направлений образовательно-научной деятельности, связанных с осмыслением актуальной образовательной парадигмы и разработкой новых стандартов высшего профессионального образования третьего поколения, соответствующих экономическим интересам современного общества.

Одним из актуальных направлений реформирования системы высшего образования является компетентный подход к проектированию содержания и структуры образовательной сферы [1].

Успех компетентного подхода как в инженерно-морском образовании в целом, так и в рамках общенаучной подготовки в частности, мы видим в формировании разноуровневых

образовательных программ для различных категорий обучающихся на основе широкого использования электронных обучающих ресурсов.

Из всего многообразия инновационных направлений реализации разноуровневых программ по циклу общенаучных дисциплин можно выделить проектное обучение, обучение в сотрудничестве и разноуровневое обучение, так как в условиях традиционной системы занятий эти направления наиболее гармонично вписываются в учебный процесс высшей школы.

Большой вклад в повышение эффективности общенаучной подготовки в морском университете может внести метод проектов, который расширяет возможности инновационных подходов к содержанию, формам и методам учебной деятельности, поднимая на качественно новый уровень всю систему организации



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образовательного процесса. Этот метод направлен на развитие познавательных навыков, творческого мышления, умений самостоятельно ориентироваться в информационной среде и конструировать свои знания. Метод проектов предполагает творческую целенаправленную деятельность по решению поставленной проблемы, требующую, как правило, выхода за рамки одной учебной дисциплины и привлечения знаний из смежных областей, что дает возможность студентам проявить себя, выдвинуть оригинальные идеи, самостоятельно организовывать собственную познавательную деятельность взамен усвоения готовых знаний. Проектный метод может быть использован на любых уровнях обучения независимо от предварительной подготовки и способностей обучаемых [2,3].

Интенсивное развитие процесса информатизации образования в последнее время за счет расширения сферы применения электронных образовательных ресурсов открывает новые перспективы для использования в учебном процессе высшей школы обучения в сотрудничестве. Тесное взаимодействие преподавателя и студента в процессе учебно-познавательной и научно-исследовательской работы в условиях применения электронных образовательных ресурсов ведет к трансформации деятельности педагога и обучаемых [4,5], позволяет поддерживать высокую учебную мотивацию, поощрять личностные достижения, активность и инициативность студентов.

Выступая в качестве посредника между преподавателем и студентом электронные образовательные ресурсы берут на себя ряд дидактических функций, таких как предъявление учебной информации; моделирование и демонстрация объектов, явлений и процессов; производство измерений и обработка их результатов; контроль и коррекция процесса усвоения [6]. При этом преподаватель осуществляет общее управление процессом взаимодействия между обучаемой и информационно-образовательной средой:

- выдвигает проблемы и обсуждает пути их решения;
- создает мотивацию и осуществляет стимулирование учебно-познавательной деятельности;
- оказывает помощь в отработке образовательных действий и усвоении материала учебной дисциплины там, где помощи со стороны средств

информационных технологий оказалось недостаточно;

- подводит итоги занятия и анализирует результаты образовательного процесса.

Таким образом, использование электронных образовательных ресурсов в учебном процессе приводит к видоизменению методов и форм проведения учебных занятий, значительно повышает требования к компьютерной грамотности преподавателя, вынуждает его постоянно повышать свой уровень подготовки и свое методическое мастерство, порождает потребность в изменении традиционных способов деятельности преподавателя [11].

Новый федеральный государственный стандарт высшего профессионального образования, разработанный на основе принятого в 2012 году Государственной думой Российской Федерации Закона об образовании, предполагает активное использование в процессе обучения информационных технологий. Высшим учебным заведениям рекомендуется широко внедрять программы электронного обучения, дистанционные образовательные технологии при всех формах, уровнях обучения и образовательных программах, рекомендуемых в высшей школе [7,8].

Полагают, что качество компетенций, сформированных в учебном процессе с использованием электронных образовательных ресурсов, повышается по сравнению с традиционным обучением за счет реализации инновационных технологий, основанных на использовании виртуальных сред, компьютерных симуляций, виртуальных 3D миров с эффектом погружения. Считается, что виртуальная среда является учебным инструментом нового поколения и задача преподавателя состоит в переориентировании современных виртуальных технологий на обучение соответствующего уровня [9].

Актуальными сегодня могут выступить учебные динамические программы, в рамках которых возможно создание подпрограмм формирования индивидуальных траекторий обучения и поддержание индивидуального пространства обучающей среды [10]. Технологическое обеспечение таких программ с опорой на электронные обучающие ресурсы открывает, на наш взгляд, большие возможности индивидуального подхода к студенту. Причем каждый уровень этих программ, с точки зрения знаний, не исключает возможности следовать основным целям изучения предмета, но вместе с тем может допускать разные результаты обучения.

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## DEVELOPMENT OF CROSS - CULTURAL COMPETENCE AS A FACTOR OF CULTURAL - LINGUISTIC PERSONALITY FORMATION

**Abstract:** This article is devoted to topical problems of formation of intercultural competence of an individual, which is determined by the trends of modern society and education. Examines the principles and approaches underlying the formation of ability to intercultural communicative competence. The success of intercultural communication depends largely on the professional competence of the teacher. The teacher's task is to create a model of real communication, which contributes to students' natural desires and need for interaction with others, confidence in themselves and their abilities for communication. The communicative approach means training to dialogue and formation of ability to intercultural interaction that is the basis for the functioning of the Internet.

**Key words:** Intercultural competence, cultural and linguistic personality, culture, education system, communication, Internet resources, communicative approach, multicultural direction.

**Language:** English

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### Introduction

Topicality of the theme of personality cross-cultural competence formation is stipulated by the trends of modern society and education development. Modern society being at post-industrial or

information stage of its development is characterized by intensification of different cultures interaction, wide use of computer equipment, development of telecommunication facilities, globalization of all fields of social life and growth of cross-cultural and



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inter-personal communication, especially, in computer-mediated environment.

Modern school is intended to join future generation to the culture of native country, to cultivate universal human values in them, to develop tolerant attitude to culture of the countries of other peoples and ability to participate in cross-cultural dialogue. Currently, the students get sufficiently extensive knowledge about the countries of language they learn and, at the same time, they come across enormous difficulties in the course of direct or computer-mediated communication with foreigners, demonstrating inability to understand and accept another culture. For this reason, it is possible to acknowledge that there is inconsistency since school students need practical formation of cross-cultural competence, on the one hand, and, the issue of cross-cultural competence formation is insufficiently developed in the pedagogic theory, on the other hand [1].

### Methodology

Cross-cultural communication study in education system was initiated by the teachers of foreign languages who first became aware that it was not enough to be fluent in foreign language for efficient communication with the representatives of other cultures. Practice of communication with foreigners proved that even deep knowledge of foreign language did not exclude misunderstanding and conflicts with native-speakers. Therefore, foreign language teaching includes students' knowledge of history, customs, traditions, social organization of the country of language being learned. However, as proved by practice, only theoretic knowledge of the relevant culture appears to be insufficient for conflict-free communication with representatives thereof, it became evident that successful and efficient contacts with the representatives of other cultures were impossible without practical skills in cross-cultural communication. It is necessary to prepare school students to efficient cross-cultural contacts at the level of everyday cross-cultural communication. To this effect, knowledge of cross-cultural misunderstanding nature is insufficient, formation of practical skills and competence which would make it possible to understand the representatives of other cultures [2] freely is required here.

At the end of the 90s, the term "cross-cultural competence" became ingrained in the methods of foreign language teaching as an indicator of person's ability to participate in cross-cultural communication efficiently [3].

Competence means ability to carry out the activities creatively based on the motives formed, personal qualities, ability to use regulatory acceptable samples of behavior in the professional conduct. Acquisition of competence forms the basis

for development of professionalism and mastership [4].

### Research and Results

Communication is a social-induced process of information transfer and exchange of ideas and feelings between people in different fields of cognitive-labor and creative activity. Although the concept "communication" may be considered as a synonym of the concept "personal interaction", but communication is wider than personal interaction. Personal interaction is verbal and nonverbal interaction implemented in practice. Telling about the essence of "cross-cultural communicative competence" concept, O.A. Leontovich underlines that cross-cultural competence "is an aggregation of three components: linguistic, communicative and cultural competence that have own features different from each of the components taken apart [5]. Linguistic competence is responsible for correct choice of linguistic means adequate for the situation of communication; communicative competence includes mechanisms, methods and strategies required to ensure efficient process of communication; the concept of cultural competence coincides with the concept of cultural literacy and contemplates knowledge of the political realities, phraseological units, terms and etc."

Essence of cross-cultural communicative competence is defined more specifically by I.L. Pluzhnik: "... it (cross-cultural communicative competence) is the functional skills necessary to understand views and opinions of the representatives of other culture, to correct own behavior, to overcome conflicts in the course of communication and to acknowledge the right for existence of different values and rules of behavior..." [6].

Let's define a range of directions for formation of ability to cross-cultural communicative competence in terms of foreign language learning. They include:

- Multicultural direction (enrichment of own culture due to acceptance of another, readiness to acquisition of other culture): acceptance of new knowledge about foreign culture for deeper understanding of own culture; respect for all cultures; vision in foreign culture rather the things that make us closer and unite us than the things which differ us from each other; ability to consider the events and their participants not from own point of view but from the point of view of another culture;
- Tolerance (orientation to interaction, ability to communicate conflict-free): ability to interact with people of another culture with due consideration of their values, standards, ideas; ability to correct their behavior in the course of communication as to a person of another culture; no hardness in behavior; ability to feel with by response to emotions and feelings of foreign culture bearers and to feel and understand state of people mind;

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- Behavioral direction (sociability of behavior): adequate behavior accepted in business professional conduct; ability to reach constructive compromises; ability to come into contact with and keep it;

- Linguistic social cultural direction (use of linguistic means of language in accordance with the cultural standards of language in the professional conduct): ability to exchange opinions; ability to listen actively based on repetition of the foregoing, to summarize, to be attentive to companion; to put issues that contribute to explanation of the foregoing [6].

The task of formation of ability to cross-cultural communicative competence is reached in the course of voice interaction: listening, reading, speaking, writing both in the course of in-class learning and out-of-class work with trainees.

Let's consider the principles and approaches put to the basis of formation of ability to cross-cultural communicative competence.

Let's consider the following:

- Trainees' awareness of own national culture and native language; for this purpose, combination of communicative-activity approach with social-and-cultural approach makes it possible to form certain culturological ideas about the countries of co-learned languages, peoples and communities and to get knowledge about culturological materials about the native country, to develop representation of native culture in foreign language in an environment speaking another language under conditions of cross-cultural communication;

- Reliance on background knowledge, social and cultural background in terms of which the foreign language being learned operates, since for adequate cross-cultural communication with native speaker we need background knowledge which play some role in use of language and influence foreign communicative competence of trainees;

- Learning of linguistic interaction in terms of cultures dialogue that contemplates extension of cultures and civilizations range, awareness "by trainees that they are cultural-and-historic subjects who are the bearers and expressers of not one but the whole range of mutually-connected cultures for preparation thereof to fulfillment of the role of cultures dialogue subject in society ..." [7];

- Humanistic psychologization of teaching environment understood as nomination of a trainee as the subject of cross-cultural communication and as a subject of linguistic learning process that makes it possible to speak about shift in emphasis in the course of foreign language learning from teaching activity to activity of a trainee and formation of his/her creative individual;

- Interactive type of trainees' activities that contemplates use of modern technologies, providing updating and development of school students'

personal qualities (learning in cooperation, projects method, information technologies (Internet), distance learning based on computer telecommunications); differentiated approach to trainees that induce to choose, to be independent and active and to develop reflection.

Based on the structure of cross-cultural communicative competence and considering the principles of formation of functional skills that make it possible to evaluate the communicative situation adequately and to implement a communicative intention, let's define the pedagogic conditions required to ensure efficient process of communication.

They are comprised of:

- Pedagogic space operation via creation and use of communicative situations demanding display of a complex of skills required for successful participation in cross-cultural communication;

- Sufficient motivation of trainees to foreign language learning comprised of goal orientation, activity, object-subject relations in the course of learning activity, individual-and-psychological qualities of person actuating the ability to carry out cross-cultural communication with native speakers;

- Creation of the positive emotional climate in the entire range of learning environment that promotes upbringing of a person committed to universal human values, absorbed wealth of cultural heritage of the past of native people and peoples of other countries, aimed to mutual understanding with them and ready to inter-personal and cross-cultural communication. Development of ability to cross-cultural communicative competence results in positive personal changes of trainees based on reflection, orientation to achievement of other culture values, extension of civic consciousness when applying to native culture and language.

High level of computerization of society and the growing importance of the Internet as a means of storing and transmitting information require from a modern foreign language teachers introduction into educational practice of information and communication technologies. Their use contributes to the improvement of the linguistic and intercultural competences of learners, a culture of communication in the electronic environment, increasing the information culture in general and the development of computer skills: search, processing, transmission, systematization of information and presentation of the results of research activities of students [8].

There are two areas in which the Internet can bring the teaching of foreign languages to a new level. It is communication and information. The communication is carried out via email and Skype, publishing blogs, huge layers of information are contained within the world network (World Wide Web).





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The teacher's task is to create a model of real communication, which contributes to students' natural desires and need for interaction with others, confidence in themselves and their abilities for communication. The communicative approach means training to dialogue and formation of ability to intercultural interaction that is the basis for the functioning of the Internet. Out of communication the Internet has no meaning – it is an international multinational, cross-cultural society whose livelihoods are based on the electronic communication of millions of people all over the world, speaking at the same time – the most gigantic in size and the number of participants in the conversation ever happened. Joining him on the foreign language lesson, we create a model of real communication.

Communicating in real language environment provided by the Internet, the students find themselves in these situations. Involved in a wide range of meaningful, realistic, interesting and achievable tasks, the students learn spontaneously and adequately on them to react, that stimulates creation of original utterances, not of template manipulation language formulas [8].

Communication with peers from another country may occur by electronic messaging (e-mailing), which gives students more time to analyze the letter and figuring out the answer, and communication can be both individual and group. The exchange of electronic messages is a great tool contributing to the development of communicative qualities of students, as well as writing skills. Socializing with peers in a foreign language, regardless of whether they are native speakers or are also learning the language, will contribute to the formation of intercultural competence of students and expand their horizons [9].

At a more advanced stage of learning, when the learners of speaking skills can be used technology allows you to communicate "live" with members of the studied culture. At the moment the most popular service that provides this capability is "Skype" (free software that provides voice communication over the Internet between computers).

Also, the Internet communication may occur through the publication of blogs. There are many educational (and not only) Internet resources where students can communicate via blogs (eng. blog, from web log — web log, online diary). An example is a service for learners of English provided by the British Broadcasting Corporation (BBC) on the pages [www.bbc.co.uk](http://www.bbc.co.uk). One of the most popular services for micro-blogging is Twitter – [www.twitter.com](http://www.twitter.com). After registration, members may post short messages ("twits"), on any topic. Any user can read your micro blog and immediately to answer

it or to continue the theme. Although Twitter is conceived, it can be widely used for teaching writing. Posting a microblog, students can meet with their peers abroad and to continue the dialogue.

### Conclusion

The success of intercultural communication depends largely on the professional competence of the teacher. A. Müller-Hartmann investigated the question of the influence of ability of teachers to adapt to new learning tools (Internet technologies) in the formation of intercultural competence. In classes where the teacher owned the Internet-technologies and methods of their integration in the process of foreign language teaching, the results of the formation of the components of intercultural competence were significantly higher than in classes where due to a technical incompetence of the teacher students gained full autonomy, but has not received instructions with the received information.

Internet resources – vast source of information that can be used by both the teachers and students. With proper organization of the educational process, in addition to communicative competence in a variety of its components students will develop information competence, which involves mastery of new information technologies, an understanding of the range of their application, as well as a critical attitude to the information disseminated [10].

Using search engines (Google, Yahoo, Yandex, etc.), you can find a huge amount of information, including concerning the culture of the country of the studied language. The task of the teacher is that in addition to the use of the proposed school textbooks and audio-visual materials, actively use the Internet resources, expanding their horizons and constantly bringing something new in their classes: it can be interesting and unusual facts about a foreign culture, authentic audio and video materials, interesting photos, illustrations, lesson plans, workbooks in General, anything that can increase students' interest in the culture of the country of the target language will help them to take a fresh look at the culture of his country, hence raising their level of intercultural competence. Students interested in further study of a foreign language and getting acquainted with the culture of the country can successfully use Internet resources independently.

Summarizing the results of study, it may be noted that the problem of cross-cultural competence formation will not take the back seat in future. The demand for the specialists who are fluent in foreign languages and ready to interact with the representatives of other countries successfully is growing day by day.



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## CHARACTERISTICS OF ELECTROCARDIOGRAPHIC ABNORMALITIES AMONG RESIDENTS OF TURKESTAN REGION IN POPULATION-BASED STUDY

**Abstract:** In this article is presented the prevalence of ECG abnormalities, depending on the gender, nationality and geographical location in Turkestan.

**Key words:** electrocardiogram, major and minor abnormalities.

**Language:** English

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**BACKGROUND:** Electrocardiography (ECG) is the most important and initial method in the diagnosis of electrical potentials abnormalities of the myocardium [1]. Nowadays, there are many other visualized and invasive diagnostic methods of cardiac electrophysiology, but in spite of it, ECG remains as more economy, affordable and non-

invasive method of investigating the electrical potentials of the heart [2].

In the middle of the last century there was developed Minnesota coding system for improving ECG results standardization, which was significantly improved the process of decoding ECG determinants



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and for comparing it with another epidemiological studies in different population and countries [3].

Starting from using the Minnesota coding system, several epidemiological surveys were focused on the assessment of the prevalence of ECG changes. The majority of these surveys investigated ECG changes among men, and only a few of them, among women. In one of these studies showed, that the prevalence of pathological ECG changes is occurs more frequently among males [4], while another scientists informs about the similar frequency rates of occurrence among both genders [5]. However, there were results of other reports that some determinants of the ECG changes occurs more frequently - in females [6].

As well as gender, there are many scientific works, which were aimed for studying the differences of prevalence ECG changes between urban and rural population. Thus, it was shown that ECG abnormalities are more common among city residents, compared with the rural dwellers [7]. Simultaneously, there were studies that showed pathological changes in cardiac electrophysiology also often met among rural dwellers. [8].

ECG changes were also explored depending on ethnicity. For instance, Turkish scientists examined ECG abnormalities, who identified that ECG changes registered more frequently in Turkish origin in comparison with Japanese [9]. Analogous works had been done among the Arab and African origin, and it was revealed that the prevalence of ECG abnormalities of the Arabs was lower (0.3%), than African residents (1.2%) [10]. There were also studied ECG abnormalities within one nationality. And one of these researches was investigated among the Kazakh population living in Hinzhiang (China). Analyze of ECG data showed a high prevalence of abnormalities of the heart electrophysiology among Kazakhs, and changes more frequently found among women compared to men. The most frequent pathology among Kazakh nationality was atrial fibrillation and authors of this work note, that prevalence of atrial fibrillation is much higher than it was declared in a previous studies [11].

**AIM:** To study the prevalence of ECG changes depending on gender, ethnicity and geographical location of dwellers of Turkestan.

**DESIGN, MATERIALS AND METHODS:** Design of the study is based on a cross-sectional population-based study conducted in Turkestan region. Out of whole sample (1143 respondents), ECG changes have been studied in 14% (158). The data was obtained using statistical package of programs: MS Excel (2010), Biostat.

Out of all 158 patients, number of men was 48, women 110, respectively. The average rate of age of the studied men and women was  $50.1 \pm 13.7$  and  $52.1 \pm 13.7$  consequently.

Registration of ECG was carried out with the help of special software program in the standard 12-lead ECG. Results of ECG were carried out according to the recommendation of the British Cardiovascular Association [12]. Standardization of ECG abnormalities were coded by the Minnesota coding system, which was recommended by World Health Organization and the American Heart Association [13]. Electrocardiogram abnormalities were divided into major and minor abnormalities according to the Minnesota code.

### Major abnormalities:

- 3-1,4-1-Left ventricular hypertrophy
- 4-1, 4-2-Major ST-T abnormalities
- 7-1-Complete left bundle branch block (LBBB)
- 8-3-Atrial fibrillation (AF)

### Minor abnormalities

- 5-3-Minor ST-T abnormalities
- 7-3-Incomplete right bundle branch block (RBBB)
- 7-6-Left posterior fascicular block
- 7-7-Left anterior fascicular block
- 8-1-1, 8-1-2, 8-1-3 Extrasystoles
- 8-7-Sinus tachycardia
- 9-7-Early repolarization
- Sinus arrhythmia

Comparative analysis of the prevalence of ECG abnormalities determined using Pearson's  $\chi^2$ .

**RESULTS:** Determinants of ECG changes of 158 patients showed in Table 1.

**Table 1**

**Structure of ECG changes according to the Minnesota coding system.**

	Minne sota code	ECG abnormalities	n=158
	-	Normal	36,7%
<b>Major abnormalities</b>	3-1 and 4-1	LVH	16,5%
	4-1, 4-2	Major ST-T abnormalities	1,3%
	7-1	Complete LBBB	1,3%
	8-3	AF	0,6%

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Minor abnormalities	5-3	Minor ST-T abnormalities	1,3%
	7-3	Incomplete RBBB	8,9%
	7-6	LPFB	0,6%
	7-7	LAFB	25,9%
	8-1-1,8-1-2, 8-1-3	Extrasystoles	1,9%
	9-7	Early repolarization	3,2%
	8-7	Sinus tachycardia	1,3%
	-	Sinus arrhythmia	0,6%
<b>Overall</b>			<b>100%</b>

In 36.7% of patients pathological ECG changes were not registered. Out of major abnormalities the

most often pathology was LVH, of minor abnormalities was incomplete bundle branch blocks.

**Table 2**

### The prevalence of ECG abnormalities by gender differences.

	ECG abnormalities	Men		women	
		n	%	n	%
Major abnormalities	LVH	7	14,3%	19	<b>17,5%</b>
	Major ST-T abnormalities	1	<b>2%</b>	1	0,9%
	Complete LBBB	1	<b>2%</b>	1	0,9%
	AF	-	-	1	<b>0,9%</b>
Minor abnormalities	Minor ST-T abnormalities	-	-	2	<b>1,8%</b>
	Incomplete RBBB	2	4,1%	12	<b>11%</b>
	LPFB	-	-	1	<b>0,9%</b>
	LAFB	16	<b>32,7%</b>	25	23%
	Extrasystoles	-	-	3	<b>2,7%</b>
	Early repolarization	3	<b>6,1%</b>	2	1,8%
	Sinus tachycardia	1	<b>2%</b>	1	0,9%
	Sinus arrhythmia	-	-	1	<b>0,9%</b>
Normal	18	36,7%	40	36,7%	
<b>Overall</b>	49	100%	109	100%	

$\chi^2=9,835; p=0,043$

Major ECG abnormalities in particular LVH, AF, were more often among women, and was confirmed by a statistically significant p-value.

While minor abnormalities, such as LPFB, early repolarization occurred more among men.

**Table 3**

### The prevalence of ECG abnormalities by national differences.

	ECG abnormalities	Kazakh		Uzbek	
		n	%	n	%
Major abnormalities	LVH	16	16,8%	10	16,1%
	Major ST-T abnormalities	2	2,1%	-	-
	Complete LBBB	1	1%	1	1,6%
	AF	-	-	1	1,6%
Minor abnormalities	Minor ST-T abnormalities	1	1%	1	1,6%
	Incomplete RBBB	8	8,3%	6	9,8%
	LPFB	1	1%	-	-

## Impact Factor:

<b>ISRA (India)</b> = 1.344	<b>SIS (USA)</b> = 0.912	<b>ICV (Poland)</b> = 6.630
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<b>JIF</b> = 1.500	<b>SJIF (Morocco)</b> = 2.031	

<b>Minor abnormalities</b>	LAFB	23	23,9%	18	29%
	Extrasystoles	1	1%	2	3,2%
	Early repolarization	2	2,1%	3	4,8%
	Sinus tachycardia	1	1%	1	1,6%
	Sinus arrhythmia	1	1%	-	-
	Normal	39	40,7%	19	30,7%
	<b>Overall</b>	96	100%	62	100%
$\chi^2=7,753; p=0,101$					

These ECG data did not differ by nationality.

**Table 4**

### Prevalence of ECG abnormalities among urban and rural population.

	ECG abnormalities	Urban		Rural	
		n	%	n	%
<b>Major abnormalities</b>	LVH	18	<b>18,9%</b>	8	12,7%
	Major ST-T abnormalities	2	<b>2,1%</b>	-	-
	Complete LBBB	1	<b>11,1%</b>	1	1,6%
	AF	-	0	1	1,6%
<b>Minor abnormalities</b>	Minor ST-T abnormalities	2	<b>2,1%</b>	-	0
	Incomplete RBBB	8	8,4%	6	<b>9,4%</b>
	LPFB	-	-	1	<b>1,6</b>
	LAFB	22	23,1%	19	<b>30,2%</b>
	Extrasystoles	1	1,1%	2	<b>3,2%</b>
	Early repolarization	2	2,1%	3	<b>4,8%</b>
	Sinus tachycardia	1	1,1%	1	<b>1,6%</b>
	Sinus arrhythmia	1	<b>1,1%</b>	-	-
	Normal	37	38,9%	21	33,3%
	<b>Overall</b>	95	100%	63	39,2%
$\chi^2=10,237; p=0,037$					

Studying the prevalence of ECG abnormalities, depending on the place of residence showed that the major abnormalities statistically significantly met more frequently among citizens and the minor abnormalities are more common among rural residents.

**DISCUSSIONS.** As the result of our study ECG changes the highest prevalence of ECG changes in men. Similar results were obtained by researchers De Bacquer and Assantachai [14,15]. Nevertheless, many works in the literature showed the same prevalence of ECG changes as men so in women [16, 17]. In the contrast to this, some researchers report that ECG abnormalities more often registered in women, compared to men [18, 19].

As it shown in Table - 2, there were no statistically significantly differences in the prevalence of ECG abnormalities amongst Kazakh and Uzbek nationality. Similar results were obtained while comparing the ECG abnormalities of Arab, Indian, Jordanian, Filipino, Caucasian origins where were no significant differences among examining determinants [20]. In addition, there have been a lot

of researches with statistically significant changes among different nationalities [21,22].

The results of our study showed that ECG abnormalities are most often encountered in rural region and it is comparable with the study carried out in Tanzania, which revealed a higher incidence of ECG abnormalities in rural residents [23]. While the researchers from Turkey found in their research the same prevalence of ECG abnormalities, as for citizens, so for urban residents [24].

### CONCLUSION:

1. In the result of our population-based study we revealed that only 36.7% of people had not registered ECG changes.

2. Major ECG abnormalities, in particular LVH, AF were more often among women while minor abnormalities, such as LPFB, early repolarization occurred more among men.

3. Changes in cardiac electrophysiology were not varies by ethnicity.

4. Major ECG abnormalities' determinants were more often among city dwellers, while minor ECG abnormalities were occurred in rural areas.

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## THE ROLE OF THE COMBINATIONS OF GENES POLYMORPHISMS OF THE BETA 1- AND BETA 3 ADRENERGIC RECEPTORS IN A HEART VASCULAR DISEASES AND DIABETES MELLITUS TYPE 2

**Abstract:** In this article we studied clinical metabolic determinants depending on the genes polymorphism combinations of beta 1- and beta 3 adrenergic receptors.

**Key words:** gene polymorphism, beta 1- and beta 3 adrenergic receptors, clinical and metabolic determinants.

**Language:** English

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**BACKGROUND:** The main role in developing of heart vascular diseases (HVD) and diabetes mellitus type 2 acts genes [1]. Many studies have discussed genes which are responsible for evolution HVD and diabetes mellitus type 2 [2-4]. Similar researches were performed in Kazakhstan [5-8].

Nowadays is determined that genes polymorphism combinations have impact on the development of HVD and diabetes mellitus type 2. Researchers from Chile studying the link between the gene polymorphism combinations of beta 1 (ADRB1) and beta 3 adrenergic receptors (ADRB3) with sudden death, determined that people with ADRB1Arg389Gly and ADRB2 Gln27Glu gene polymorphisms combinations have a high risk of sudden death [9]. The aim of the Polish scientists was to study the association of polymorphisms gene between beta 1 adrenergic receptors (Ser49Gly, Arg389Gly) and beta 2 adrenergic receptors (Arg16Gly, Gln27Glu, Thr164Ile) with idiopathic dilated cardiomyopathy. The results showing that, beta-adrenergic receptor polymorphisms did not seem to play a significant role in IDCM in the Polish population. [10]. There was also determined the association of gene polymorphism combinations of beta 1 and beta 3 adrenergic receptors Arg389Gly and Trp64Arg with the evaluating of metabolic changes of the patients with diabetes mellitus type 2 and metabolic syndrome [11].

**AIM:** To study combinations of the genes polymorphism of beta 1 and beta 3 adrenergic receptors depending on clinical metabolic and death rates.

**DESIGN:** We conducted this as a retrospective cohort study.

**MATERIAL AND METHODS:** We took the initial material of Shalkharova Zh.S., 2003 [12], Nuskabaeva G.O., 2003[7], Askarova S.S., 2003 [13] and were able to examine 130 patients with the gene polymorphism combinations of beta 1 and beta 3 adrenergic receptors, which were included further in our research. From whole 130 people 21 were deaths.

We investigated 109 alive patients, whose mean age was 57,42±13,34. All patients, which were included in our study gave their agreement to participate in it. They were divided into 5 groups, depending on the genes of polymorphism combinations of beta 1 and beta 3 adrenergic receptors:

1. Arg/Arg+Trg/Trg – 66 volunteers – 50,8%
2. Arg/Arg+Trg/Arg – 21 volunteers – 16,1%
3. Arg/Gly+Trg/Trg – 30 volunteers – 23,1%
4. Arg/Gly +Trg/Arg – 10 volunteers – 7,7%
5. Arg/Arg+ Arg/Arg – 3 volunteers – 2,3%

We made analysis by the next determinants:

1. Clinical antropometric: weight, height, waist (WC) and thigh circumstanes, body mass index (BMI)

2. Biochemic analyses: glucose level of blood (norm is 3.89-5.6 mmol/l), total cholesterol (norm 3.3-5.0 mmol/l), HDL cholesterol (norm for men ≥ 1.0, for women ≥ 1.20 mmol/l), triglycerides (norm < 1.70 mmol/l). LDL cholesterol was claimed by Friedewald W.T. [14]: LDL cholesterol= Total cholesterol - HDL cholesterol- Triglycerides/2,2.

Molecular genetic analysis of genes polymorphism combinations of beta 1 and beta 3 adrenergic receptors examined 12 years ago in a laboratory of human being genome by Scientific Research Institute of molecular biology and genetics of plants in the Republic of Uzbekistan under the direction of doctor of medicine, prof. Mukhamedov R.S. [13].

Statistical analysis was made using MS EXCEL, Biostat software.

**RESULTS:** By the results of our study from 130 volunteers 21 were dead by the time of the research (Table 1). In the group with the genes polymorphism combinations of beta 1 and beta 3 adrenergic receptors Arg/Arg+Trg/Trg died 14 respondents (21.2%), Arg/Arg+Trg/Arg – 1 respondents (4.8%), Arg/Gly+Trg/Trg – 4 respondents (13.3%), Arg/Gly+Trg/Arg – 2 respondents (20%), consequently.

**Table 1**  
**Distribution of deaths by the genes polymorphism combinations of beta 1- and beta 3 adrenergic receptors.**

Genes polymorphism combinations of beta 1 and beta 3 adrenergic receptors	Arg/Arg+ Trg/Trg		Arg/Arg+ Trg/Arg		Arg/Gly+ Trg/Trg		Arg/Gly+ Trg/Arg	
	n	%	N	%	n	%	n	%
Total	66	100%	24	100%	30	100%	10	100%
Death	14	21,2%	1	4,1%	4	13,3%	2	20,0%

Acute stroke was statistically significantly frequently founded by distributing the causes of death (42.1%). And 12.1% of people with genes polymorphism combinations of beta 1 and beta 3 adrenergic receptors Arg/Arg+Trg/Trg died with acute stroke (Table 2).

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**Table 2**

**Causes of death of patients with the genes polymorphism combinations of beta 1- and beta 3 adrenergic receptors.**

Gene polymorphism combinations of beta 1 and beta 3 adrenergic receptors	Arg/Arg+ Trg/Trg		Arg/Arg+Trg/Arg		Arg/Gly+Trg/Trg		Arg/Gly+ Trg/Arg	
	n	%	N	%	n	%	n	%
Acute cerebrovascular accident	8	12,1%			3	10,0%	2	20,0%
Ischemic heart disease	1	1,5%	1	4,8%				
Diabetes mellitus type 2	1	1,5%						
Other causes	4	6,1%			1	3,3%		
Total	14	21,2%	1	4,8%	4	13,3%	2	20,0%

$\chi^2=11,792$  p=0,01

Thus, analyzing the results by deaths with depending the gene polymorphism combinations of beta 1 and beta 3 adrenergic receptors, we can say that people the gene polymorphism combinations of beta 1 and beta 3 adrenergic receptors Arg/Arg+Trg/Trg were founded more frequently, than other combinations. The proportion of deaths less met with a combination of polymorphisms beta 1 and beta 3 adrenergic receptors Arg/Arg+Trg/Arg. Based on the data obtained by us can be divided into combination of polymorphisms of beta 1 and beta 3 adrenergic receptors on the «favorable» (Arg/Arg+Trg/Arg) and «non-favorable» (Arg/Arg+Trg/Trg, Arg/Gly+Trg/Trg, Arg/Gly+Trg/Arg) combinations of polymorphisms of genes. With «non-favorable» combinations of polymorphisms genes beta 1 and beta 3 adrenergic receptors most frequent cause of death was acute cerebrovascular accident (CVA).

Studying in alive patients anthropometric and biochemic parameters, we identified key differences

by genes polymorphism. It was examined average clinical metabolic figures in the contrast with the 2003 year's parameters by the genes polymorphism combinations of beta 1 and beta 3 adrenergic receptors. Looking each combinations of the genes polymorphism combinations of beta 1 and beta 3 adrenergic receptors individually we took statistically significant changes of such determinants as BMI, WC, triglycerides and glucose values in people with «non-favorable» combinations Arg/Arg+Trg/Trg (Table 3). But there were no statistically significant differences in patients with genes polymorphism combinations of beta 1 and beta 3 adrenergic receptors Arg/Arg+Trg/Arg (Table 4) and Arg/Gly+Trg/Trg (Table 5). Volunteers with the genes polymorphism combinations of beta 1 and beta 3 adrenergic receptors Arg/Gly+Trg/Arg (Table 6) and Arg/Arg+Trg/Trg had statistically significant p-value changes in BMI and WC.

**Table 3**

**12-year developing metabolic risk factors depending on the genes polymorphism combinations of beta 1- and beta 3 adrenergic receptors Arg/Arg+Trg/Trg.**

Indicators	Arg/Arg+Trg/Trg M(SD)		P
	2003	2015	
BMI, kg/m <sup>2</sup>	26,29±5,68	29,3±5,65	0,002
WC, m	87,84±13,64	95,22±14,33	0,001
total cholesterol, mmol/l	5,19±0,96	5,33±1,07	0,296
HDL, mmol/l	1,2±0,31	1,33±0,35	0,032
<b>Triglycerides</b> , mmol/l	1,46±0,43	1,73±0,96	0,043
LDL, mmol/l	3,34±0,97	3,25±0,77	0,586
<b>Glucose</b> , mmol/l	5,61±2,07	6,43±3,01	0,000
Systolic blood pressure, mmHg	132,5±25,52	133,5±23,86	0,838
Diastolic blood pressure, mmHg	84,5±12,13	84,2±11,57	1,000

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**Table 4**

**12-year developing metabolic risk factors depending on the genes polymorphism combinations of beta 1- and beta 3 adrenergic receptors Arg/Arg+Trg/Arg.**

Indicators	Arg/ Arg+Trg/ Arg M(SD)		P
	2003	2015	
BMI, kg/m <sup>2</sup>	27,31±5,00	29,2±6,07	0,282
WC, m	89,77±14,74	95,11±9,51	0,176
total cholesterol, mmol/l	5,14±0,8	5,69±1,1	0,074
HDL, mmol/l	1,18±0,22	1,29±0,38	0,261
Triglycerides, mmol/l	1,55±0,52	1,5±0,52	0,760
LDL, mmol/l	3,26±0,78	3,62±1,27	0,276
Glucose, mmol/l	5,78±1,85	5,77±1,22	0,984
Systolic blood pressure, mmHg	124,7±23,54	128,61±24,6	0,586
Diastolic blood pressure, mmHg	81,66±12,83	83,88±9,78	0,551

**Table 5**

**12-year developing metabolic risk factors depending on the genes polymorphism combinations of beta 1- and beta 3 adrenergic receptors Arg/Gly+Trg/Trg.**

Indicators	Arg/Gly+Trg/Trg M(SD)		P
	2003	2015	
BMI, kg/m	27,73±7,13	29,51±6,032	0,260
WC, m	95,21±18,77	98,04±13,28	0,506
total cholesterol, mmol/l	5,17±1,1	5,35±0,88	0,361
HDL, mmol/l	1,2±0,32	1,29±0,41	0,304
Triglycerides, mmol/l	1,59±0,41	1,65±0,6	0,660
LDL, mmol/l	3,25±1,31	3,22±0,79	0,919
Glucose, mmol/l	7,16±5,14	7,03±3,25	0,917
Systolic blood pressure, mmHg	136,08±20,39	136,30±27,22	0,947
Diastolic blood pressure, mmHg	87,82±12,77	86,08±13,39	0,406

**Table 6**

**12-year developing metabolic risk factors depending on the genes polymorphism combinations of beta 1- and beta 3 adrenergic receptors Arg/Gly+Trg/Arg.**

Indicators	Arg/Gly+Trg/Arg M(SD)		P
	2003	2015	
BMI, kg/m <sup>2</sup>	26,12±4,28	29,41±2,14	0,05
WC, m	91,12±8,67	97,62±8,76	0,007
total cholesterol, mmol/l	5,35±0,73	5,03±0,9	0,416
HDL, mmol/l	1,1±0,21	1,03±0,24	0,519
Triglycerides, mmol/l	1,62±0,63	2,07±0,99	0,257
LDL, mmol/l	3,51±0,75	2,86±0,64	0,069
Glucose, mmol/l	5,6±2,87	6,25±1,77	0,584
Systolic blood pressure, mmHg	121,25±13,56	123,75±7,3	0,701
Diastolic blood pressure, mmHg	77,5±7,07	78,75±12,46	0,791

There were statistically significant p-value changes in BMI and WC in people with HVD and diabetes, depending on genes polymorphism

combinations of beta 1 and beta 3 adrenergic receptors Arg/Arg+Trg/Trg and Arg/Gly+Trg/Arg (Table 7).

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**Table 7**

**Average values of WC and BMI in people with HVD and diabetes mellitus type 2 by the genes polymorphism combinations of beta 1- and beta 3 adrenergic receptors**

genes polymorphism combinations of beta 1 and beta 3 adrenergic receptors	Arg/Arg+Trg/Trg		Arg/Arg+Trg/Arg		Arg/Gly+Trg/Trg		Arg/Gly+Trg/Arg	
	2003	2015	2003	2015	2003	2015	2003	2015
Indicators	2003	2015	2003	2015	2003	2015	2003	2015
WC	91,8±15,3	112,0±9,2	99,7±6,4	101,5±12,2	101,2±16,1	102,8±15,9	95,4±5,9	103,2±5,1
	p=0,014		p=0,634		p=0,410		p=0,0015	
BMI	27,9±7,1	35,6±3,1	29,9±1,0	30,9±2,7	30,4±5,7	30,9±7,6	28,9±3,6	32,1±6,3
	p=0,014		p=0,475		p=0,935		p=0,353	

### CONCLUSION:

The genes polymorphism combinations of beta 1 and beta 3 adrenergic receptors acts in HVD and diabetes mellitus type 2 [11].

The genes polymorphism combinations of beta 1 and beta 3 adrenergic receptors were divided into two groups: "favourable" and "non-favourable".

The genes polymorphism combinations of beta 1 and beta 3 adrenergic receptors Arg/Arg+Trg/Trg were founded more frequently, than other combinations. The least proportion of deaths were people with the genes polymorphism combinations of beta 1 and beta 3 adrenergic receptors Arg/Arg+Trg/Arg and the most proportion contained people with the gene polymorphism combinations of beta 1 and beta 3 adrenergic receptors

Arg/Arg+Trg/Trg. Among all causes of death acute stroke statistically significant founds more frequently than others.

"Non-favourable" genes polymorphism combinations of beta 1 and beta 3 adrenergic receptors were Arg/Arg+Trg/Trg and Arg/Gly+Trg/Arg, because of their predictors such classic factors as obesity, hyperglycemia, hypertriglyceridemia, which raise the risk of HVD and diabetes mellitus type 2. In patients with HVD and diabetes mellitus type 2 were determined changes with the gene polymorphism combinations of beta 1 and beta 3 adrenergic receptors Arg/Arg+Trg/Trg и Arg/Gly + Trg/Arg.

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SECTION 12. Geology. Anthropology.  
Archaeology.

## DISTRIBUTION REGULARITIES OF OIL SHALE IN AZERBAIJAN

**Abstract:** The paper is devoted to a detailed study of oil shale that is considered a new alternative energy resource for Azerbaijan. More than 60 surface manifestations of oil shale, related to sediments between Cretaceous period and Miocene epoch in the territories (Shamakhi-Gobustan, Absheron, Pre-Caspian-Guba, Ismayilli and etc.) of the Republic are investigated. The analysis of oil shale objects in Azerbaijan shows that greater manifestations are mainly developed in Gobustan and Absheron regions, during the Middle Eocene - Upper Miocene. The main practical features of Azerbaijan oil shale relates with its distribution regularities along the areas. Connected with different geological age, oil shale manifestations (Kichik Siyaki, Boyuk Siyaki, Islamdag, Baygushgaya, Uchtepe etc.) have found development within the same area (mainly in Gobustan) and closely spaced from each other. Such regularities create favorable conditions in joint development of these manifestations for future exploitation. To be away from the tracts of forest and the housing unit, is extra superiority of Azerbaijan oil shale from an economic and environmental point of view.

**Key words:** Azerbaijan, distribution regularity, geochemistry, organic matter, oil shale, shale gas.

**Language:** English

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### Introduction and Background

The rich hydrocarbon potential of Azerbaijan has a great influence in the status of country. Integrated studies are expanded for further enrichment of hydrocarbons reserves of Republic. To explore new oil and gas fields in deeper sediments of onshore and offshore territories becomes very relevant. However, the energy potential of the country should not depend only on oil and gas resources, and together with them the Republic is rich in non-traditional, alternative sources of energy, such as natural bitumen, oil shale and gas hydrates [16, p. 31].

Currently, a number of countries are widely used of oil shale to produce shale gas (US, Canada, China and etc.), cement (Estonia China, Germany), agricultural fertilizers (Estonia, Switzerland), burn at power plants (Estonia, China, Germany, etc.), obtain medical (France, Russia, China) [13, p. 45] and chemical products (China, Estonia, Russia) and etc.

Researches on oil shale of Azerbaijan have

been carried out at the beginning of the last century [3, p. 5-8; 7, p. 40-42; 8, 28 p.; 9, 48 p.; 10, 52 p.; 11, 37 p.; 12, p. 189-208]. More detailed studies have been carrying out since 2000 by scientists of Institute of Geology and Geophysics of the Azerbaijan National Academy of Sciences. Employees of Department "Mud Volcanism" of the Institute have been studying geological, geochemical properties and probably reserves of oil shale [2, p. 32-35; 6, p. 7-11].

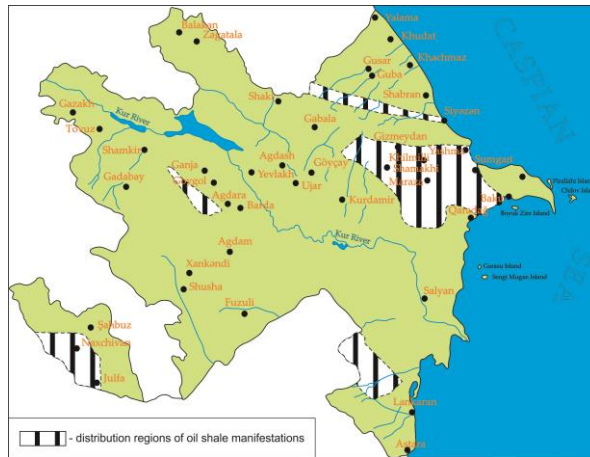
### Distribution regularities of oil shale in Azerbaijan

The most widespread areas of oil shale in the Republic are observed in Shamakhi-Gobustan, Absheron, Pre-Caspian-Guba and Vandam-Lahij and etc. regions (figure - 1). There are more than 60 surface manifestations of oil shale in these regions, distributed in a wide stratigraphic range (from the Cretaceous to Miocene).



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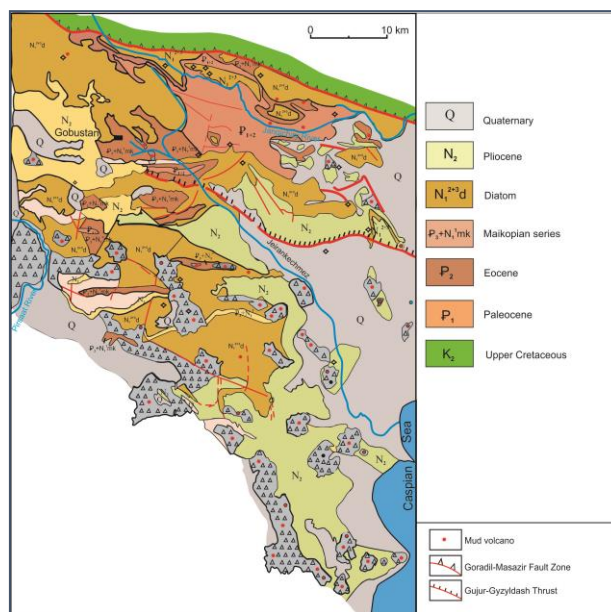
**Figure 1 - Schematic map of oil shale distribution regions in Azerbaijan.**

**Shamakhi-Gobustan region**

The region is located in the south-eastern part of the Greater Caucasus and has a very complex geological and tectonic structure. There are about 120 mud volcanoes, more than 30 manifestations of oil shale, as well as some oil and gas fields in the region. The known oil shale manifestations are developed mainly in the Central Gobustan and

Shamakhi tectonic zone.

The geological structure of the region consists of Mesozoic-Cenozoic sediments. In generally, related to Goradil-Masazir Fault Zone and Gujur-Gyzyldash Thrust, three blocks: north allochthonous, central para-autochthonous and southern autochthonous are separated in Gobustan (figure - 2).



**Figure 2 - Geological map of Gobustan [4, p. 130].**

Oil shale of the Northern Gobustan belonging to the Cretaceous deposits, have no commercial value [2, p. 33].

Many of oil shale manifestations are observed in areas of the Central Gobustan associated with Paleogene-Miocene sediments. The Central Gobustan covers areas, relating to para-autochthonous tectonic block (Bayanata), which

indicates favorable paleogeographic and paleotectonic conditions of the zone for the formation of oil shale. Paleogene-Miocene sediments are involved in the geological structure of Bayanata block, have thickness of 2.5-4.5 km. In contrast to these structural and facies complexes, deposits of the same age, observed in north of Geradil-Masazir fault zone (north allochthonous) are located under the

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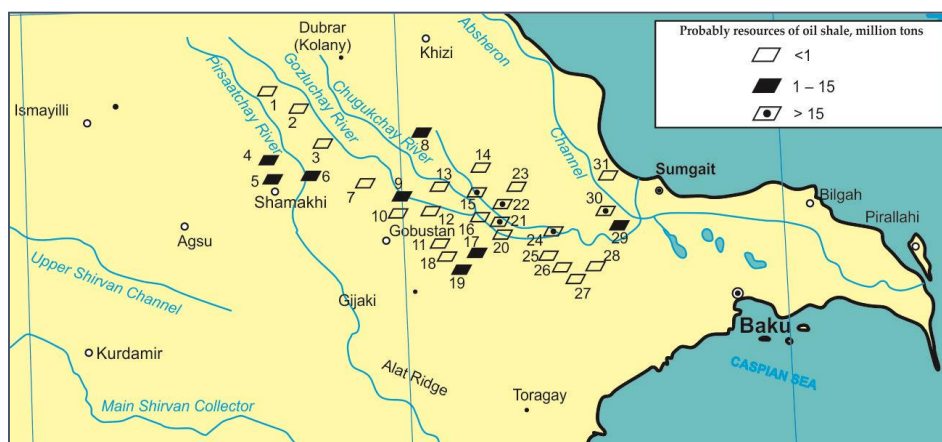
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Cretaceous sediments (consisting of flyshoids). It is assumed that the sediments of Paleogene-Miocene age in Bayanata block have been compressed between the carbonate complexes (Upper Cretaceous age) of allochthonous and the sediments (Cenozoic age) of autochthonous, increasing up to 11 km. In such a complex tectonic environment, there were favorable facies and paleogeographic (accumulation of organic matters in silt sediments, existence of shallow, broad bays and continental lagoons) conditions for the accumulation of organic compounds, which forming oil shale. The sediments accumulated with short geochronological breaks and at subsequent stages, a result of dynamic

metamorphism these exposed to the process of oil shale formation.

According to the spatio-temporal distribution, the development of oil shale in the Central Gobustan are associated with complex tectonic structure of the region and accumulation of organic compounds with breaks, started from the Middle Eocene, continued in the Maikopian and Konk, ended in the Meotian during the process of lithogenesis.

In general, the number of oil shale manifestations in Gobustan and their probably resources are reduced in the direction from the center to the south-east [1, p. 26] (figure - 3).



**Oil shale manifestations:** 1 - Gizmeydan; 2 - Talishnuru; 3 - Khillmilli; 4 - Angakharan; 5 - Shamakhi; 6 - Arabshalbashi; 7 - Jeirli; 8 - Agdara; 9 - Garaja; 10 - Ahudag; 11 - Baygushlu; 12 - Shaiblar; 13 - Tuva; 14 - Shahandag; 15 - Kichik Siyaki; 16 - Garayokhush; 17 - Garigishlag; 18 - Alagishlag; 19 - Baygushgaya; 20 - Jangichay; 21 - Jangidag; 22 - Boyuk Siyaki; 23 - Gibradag; 24 - Kechallar; 25 - Sungur; 26 - Bayanata; 27 - Girdag; 28 - Saridag; 29 - Pirekeshkyul; 30 - Islamdag; 31 - Agburun.

**Figure 3 - Map of probable resources of oil shale in Shamakhi-Gobustan region (scale 1:1,000,000).**

### Absheron region

The geological structure of Absheron consists of clastic-carbonate rocks of the Upper Cretaceous and Cenozoic. There are more than 15 surface manifestations of oil shale in the region, relate mainly to the sediments of the Upper Maikopian, Konk and Meotian. The exceptions are related to two manifestations (Goytapa and Uchtepe), the age of Eocene, are located on the border with Shamakhi-Gobustan region.

Conditional border between clay and sandy-clay facies of the Upper Maikopian, traced in the direction of the north wing of Shorbulag folds over of mountains Garaheybat and Bozdag-Qobu, and further to the southeast to Puta Cape. Clay facies of the Upper Maikopian developed in the northern, north-western parts of the Absheron Peninsula and linked to the nature of folding - diapirism occurrence, composing the crest of folds. The most representative section is Riki horizon, situated in the northern slope

of Mountain Uchtepe-Shorchala, with thickness of 112 m, composed layers of dark, chocolate-brown clay and black oil shale. The last traced in sections of Mountains Goytepe, Orjandag and Fatmai.

Thus, a broad band of oil shale in the section of Riki horizon coincides with the deepest part of the Upper Maikopian Basin and extends from Willage Gorjevan through Shamakhi region to River Sumgaitchay.

Oil shale of Konk horizon developed within the Shorbulag and Garaeybat areas in the Western Absheron, has a thickness of 30 m. Whitish foliated oil shale is traced in Uchtepe-Ilkhdag syncline and 2 km north-west of station Guzdek along the south-eastern end of Geytepe folds. Here, 120 m thickness of Konk-Karagan sediments are observed as a pack of gray, brown-gray foliated oil shale, with a thickness of 18.7 m. Within the southern pericline of Kechaldag- Zigilpiri fold, has been found Karagan-Konk sediments with frequent interlayers of oil



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shale, traces for several kilometers: in a section, near the Mountain Zigilpiri with a thickness of 26 m, allocated 7 layers of gray, dark gray oil shale. In addition, they are also recorded to south of the village Masazir and north of the mud volcano Kechaldag, in the western part of the Lake Shirinnour in a distance of 1.5 km. Further to east from station Binagadi, oil shale have been found in Karagan-Konk sediments, have a thickness of 125-130 m [5, p. 69].

In the north-western and northern parts of Absheron Peninsula, oil shale is observed in sections of the north-eastern wing of Fatmai, Orjandag and Saray folds. Total thickness of Konk sediments in the area is 20-25 m. In Absheron Peninsula, oil shale is traced in section of Meotian, spreads throughout the area and characterizes by different thicknesses.

In the southern part of West Absheron, oil shale is observed in Shorbulaga area, Kosmalidag synclines and Uchtepe, as well as and in a considerable part of the hill Damlamaja down to the town Garaeybat. The others distributions of oil shale are traced in the areas of Ateshgah, Khirdalan, Shabandag, Binagadi and to the north of the mud volcano Keyreki, near Kerpyukshor syncline [15, p. 21] with 1.5 km length and 4.5 m thickness to the west of station Masazir and district Guzdek. In the northern part of Absheron, oil shale found along the right bank of Sumgaitchay River, in the northern Geytepe Mountain, western and eastern periclinal folds, north-east wing of Orjandag (thickness of 22 m, length of 650 m), Saray (thickness of 6 m, length more than 1 km) and Fatmai folds. The thickness of Meotian in these areas ranges from 72 to 130 m.

### Pre-Caspian-Guba region

Related to Upper Cretaceous deposits, oil shale are mostly located in the north-east wing of Zarat syncline. The most studied section is in Atachay River, near the village of Bakhishli in Khizi region. The section consists of dark gray bituminous marl, black oil shale and the total thickness is 27 m. The bituminous oil shale also has been found in the

section of the Lower Cretaceous (Albian), in the south-eastern pericline of Kemchi fold with the thickness of 3.5 m in Altiagaj area.

The Eocene sediments are presented in two facies in the area: bituminous marl in the north-west (from Samur River to the city of Shabran) and clay, clay shale in the south-east. The thickness of Middle Eocene in this layer is not more than 40-50 m. Here, there are basically no significant oil shale manifestations with much practical value. Also, minor interlayers of oil shale encountered in some sections of the wells (Siyazan, Saadan and Shuraabad) [3, p. 6].

The layers of Maikopian series (Oligocene-Upper Miocene) oil shale found in the north-west of Pre-Caspian-Guba region do not attract the attention of the economic prospect.

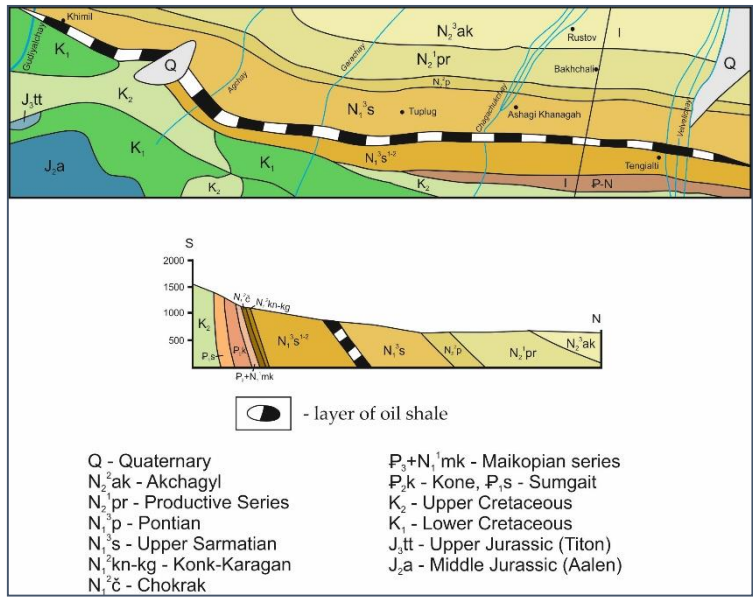
Oil shale of Konk sediments observes in the Chandagar coast with thickness of 8 to 15 m, but Meotian sediments only in the southeast of Shuraabad district. In the Yashma area, two layers of oil shale are separated in the section of Meotian.

### Guba oil shale deposit

Guba oil shale deposit is located 25 km south of Guba city. Oil shale of deposit relates to Upper Sarmatian, ranges from 27 to 255 m and alternates with layers of clay shale, which hardly differ from oil shale. The greatest practical interest is associated with the segment of the Upper Sarmatian layer, length of 29 km, elongated in the NW-SE direction from Gudiyalchay River to Velvelichay River (figure - 4), although the individual manifestations of oil shale are found to Gilgilchay River. To the north-west of Gudiyalchay River, oil shale appears like an individual spots in the watershed Gusarchay-Tahirjalchay and village Aniq [6, p. 9]. In this direction, the overall thickness of the upper Sarmatian increases up to 1350 m and transgressive bedding of oil shale also traces in the Middle and Lower Sarmatian. Sheet black oil shale in the section has a monoclinical bedding.

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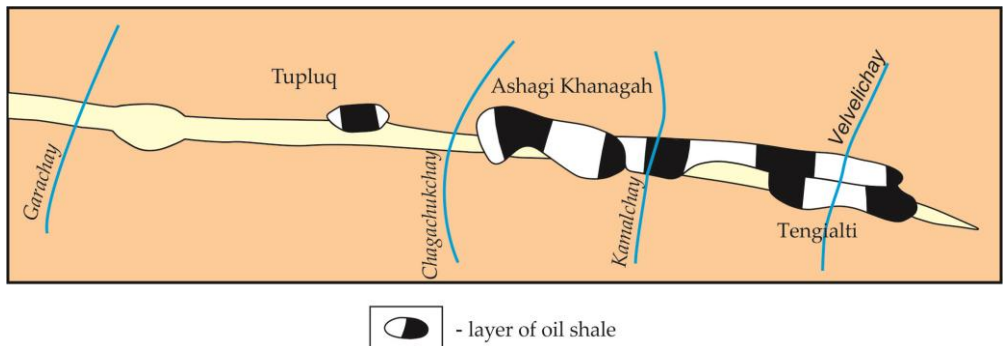
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**Figure 4 - Schematic geological map and profile of Guba oil shale deposit.**

Larger manifestations of oil shale have been studied in the area between rivers Velvelichay and Garachay. There are three areas that contain oil shale with the most favorable properties for practical use. The first area, a length of 4.7 km, includes 11 layers

of oil shale. The second area, situated between rivers Kamalchay and Chagachukchay, a length of 3 km, includes 14 layers. The third area, 1.5 km, located on the right bank of Garachay River contains 16 layers of oil shale (figure - 5).



**Figure 5 - Schematic map of oil shale containing areas, located between the rivers and Velvelichay and Garachay.**

**Diyally oil shale deposit**

The deposit is located 7 km east of Ismailly city, 1.5 km the northeast of Diyally village, in strong cross wooded area, at an altitude of 800 m. Tectonically point view, the area relates to the complicated zone of Vandam Lahij where at the Upper Sarmatian time there were favorable geological and geochemical conditions for the formation of oil shale. The main structural element is tilted to the south anticlinal fold of the northwest with a torn stretch to fault the southern wing, with dips 50-55°. The core of the folds in the west is composed of Upper Cretaceous rocks, in the south-east of the Maikopian and Upper Sarmatian

sediments. North of these folds at a distance of 1.5 km there are two troughs (moulds), relates to Sarmatian sediments, and which belonging to Diyally oil shale deposit. The thickness of oil shale layer varies 300-370 m, in the north is hidden under limestone thrust of Kemchi suite. At the base of the section of the Upper Sarmatian, lies pack of basal conglomerates, with a thickness of up to 70 m, under which a pack of layered clays with interbedded sandstone and oil shale. The last one confined to the upper half of the section, black and light brown (weathered) colors, 1.5 km long and contains 12 layers. [14, p. 148] (figure - 6).

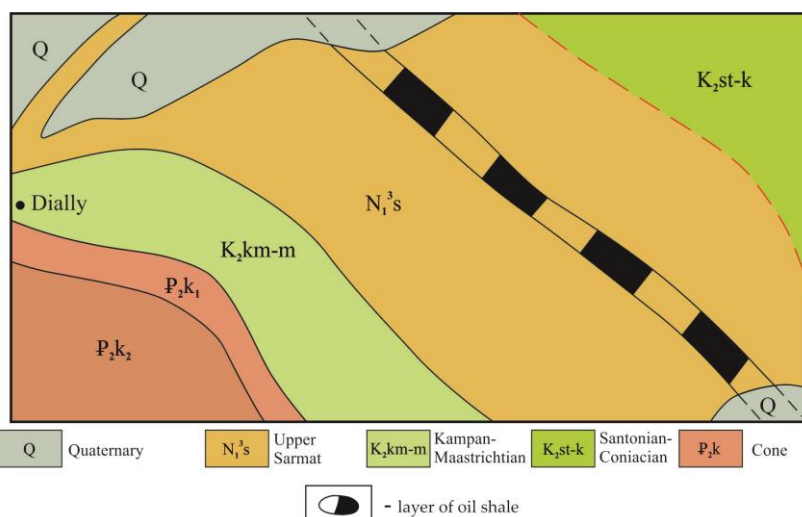


Figure 6 - Schematic geological map of Diyally oil shale deposit.

### Conclusion

The analysis of oil shale objects in Azerbaijan shows that greater manifestations are developed in Gobustan and Absheron, during the Middle Eocene (Kone) and the Upper Miocene (Meotian). But Diyally oil shale deposits belong to Sarmatian age. Regarding the conditions of formation of oil shale (within the shale facies) in these areas, it should be noted that a relatively significant manifestation (sustained by length and thickness) observed in large synclines or trough: in the northern areas of Gobustan they trace in the cores of synclines (Charkishlak, Ambizlar, Shahandag, Agburun and etc.), in the southern areas, in the wings of synclinal folds (Boyuk Siyaki, Kichik Siyaki, Mayash, Jangidag, Islamdag and etc.) and in the front wings

of anticlines (Buransiz-Bayanata, Jangichay and etc.).

The main practical features of Azerbaijan oil shale relates with its distribution regularities along the areas. Connected with different geological age, oil shale manifestations (Kichik Siyaki, Boyuk Siyaki, Islamdag, Baygushkaya, Uchtepe etc.) have found development within the same area (mainly in Gobustan) and closely spaced from each other. Such a regularities creates favourable conditions on joint development of these manifestation for their future exploitation. To be away from the tracts of forest and the housing unit, is extra superiority of Azerbaijan oil shale from an economic and environmental point of view.

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### SECTION 30. Philosophy.

## THE ROLE OF TECHNOGEN CIVILIZATION AND FACTORS OF DEALING PERIODS

**Abstract:** On the following article were complex –systematic analyzed characteristics dynamic changes of objective conditions and system subjective factors, globalization of technogencivilization in context escalation “huge culture”

**Key words:** technogen civilization, globalization, detormalizing factor, human factor, spiritual and moral wealthy, technological derminism, technological culture, escalation “huge culture”, entropotechnogen culture, technogenthinking.

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Any historical period, the level of public availability of appropriate technological culture of the emerging trend of social development, as well as man-made form of tsivilizatsiya an important factor in determining the structural element. In fact, of technological culture established.

At any historical periods for the existence rate of the society has created equal technologic culture and counted as internal element and main factor which define of rising technogen civilization and development tendency of society. In fact, the ancient written sources, archaeological findings, the results of ethnographic research in ancient times, people's way of life and its expression associated with the formation of a technological civilization elements are proving that the technologic culture have been developed.

It is true that in early history of mankind: technogen civilization, technological culture, general forces of production, the level of development of the material means, particularly in the labor were defined the character of the socio-economic relations. For example, the primitive technological culture [1] in the everyday level of moral activity: it has an instinctive-reflective character, which was directed prove the utility-economic needs of the society. However, primitive technological culture technological civilization was not influenced to the system of "nature-society-human" relations, because

"areal circulation", "social place" was nearly small and few of population.

In other words, the limit of cultural and economic activity of human and also caused the limit in the sphere of influence to the technogen civilization. Because, on the first side, the development characteristics of the force production of technological culture (mainly factors) were originated from the daily natural needs and purposes of society. On the other hand, science, engineering, technology, intellectual potential, which was a result of the development of the "technological human" (the influence to the nature of point of view), had not become the subject of antropotexnogen culture.

The socio-economic life of the people in the first primitive "technically cultural influence" method is belonged to the Neolithic period, or 5-8 centuries earlier period. In fact, in this period human labor was differentialized, formation of agriculture and livestock was determined brief couture of technogen civilization or "architecture". That is, science directions which study characteristics of technogen civilization equal for the sphere of the first labor of human in socio-economic activity and lifestyle(even it was simple).

The changes of characters (as a relatively independent social phenomenon)of adequate economic production method has been base for the development technological culture. Especially, the occurrence of a major division of labor in the



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production of technological culture and their tools and methods of transformatizing system were developed. For example, technological culture of its period: farming, husbandry, veterinary culture of practical experience and propaganda of "Avesta" holy book Zoroastrianism were played an important role. The most important, we could meet prohibiting technological culture or restricting the actions and penalties for human being moral norms, developed legal mechanisms in these sources.

The development of the society in the next historical period: social, economic, political, and cultural relations differentializing, integration and globalization processes unit was caused to the structure of technogen culture, its activities anthropotechnogen were done in concrete. Nowadays, this system is getting legal status for the further development of the society, the severity of subjective factors – in all spheres of factors of technologic human.

We will recognized that in our history of human civilization, culture in general, especially on the basis of determination of technological civilization of technological culture, it is relatively common and preferred definition, or: "the collection of the culture – the nature of human, change of environment and economic and spiritual wealthy during the change process and rebuilding this wealthy and its rebuilding methods and styles" [2, 104]. Thus, this comment was importance with the classic sense and the complex-systematic.

It requires to "edit" it is description on the reason of the historical development of the cultural phenomenon of the paradigm of society and changes of functional status, new features, reflected qualities. Present aggravation of the current global problems, to be not changed the environment by human in its definition, but it consists of rebuilding and protecting them. Technology culture to define current stage of development and in the rising system was not accidental. So, the functional principle of technological culture must be assessed on the following methodological factors.

In our opinion, technogen civilization is one of the developing stages which consists of realization of potential possibilities, using factors and technologic styles which was directed to economic life of the present and future generations of specific nation, state and world culture. While giving the definition of technological civilization in general: it has a connection between human and social relationships of technological culture, it must be paid attention in its essence, the functional significance of the origin of the transformation method tools [3]. However, at any technological civilizations performance were independent, even if it was unique, the general public, social, economic, political and cultural relations divorces were formed and developed.

Civilizations property of accumulated technological culture was: on the one hand, human is the result of intellectual potential, science, engineering, development of technology. It must be real opportunity and objective condition of ensuring the stability of society. On the other hand, the present technogen civilization were developed the infrastructure and influence of method-factors communication of human mind, current life style "pressure of information", "mass culture", with the strengthen its threats of morality had been aggravated the social and political contradictions of society. Therefore, to eliminate them became one of the current global problems and civilization in general, and in particular caused errors which were the made in the history of civilization were briefly analyzed, it was allowed to define the objective of assessing the effects of socio-political and ideological-theoretical basis.

It is necessary, it was explained by to determine the spiritual appearance of the society, its marginalizing and being far from the nation, negative influence of life style, human mind which were the subjects technological civilization at any stages of historical development of human history. But, the development of human society, rising the level of these events escalation, it is extending its influence areas, it is put new strategic tasks to fight against them.

If we approach the solution of global problems of human being of technological civilization in the context the level of interest results will be: Firstly, it will be created technological culture system of universal theoretical and methodological basis, transformation of positive results, of the solution of negative effects; Secondly, it requires any field of science was directly or indirectly related to tecnogen civilization and technogen culture, their integration general philosophical theoretical and methodological basis; Third, it was defined individual influence direction of the globalization of technogen civilization to the technological culture and their functional significance and modern trends; Fourthly, if it was looked as a factor of approaching technological culture of special subject it would be concretized the functional relation between technological civilization of it; Fifth, the status of the disciplines in the field of technological civilization will be developed and it will become the factors which create in determining the level of other elements "intellectual discipline"; Sixth, In the influence of technogen civilization will be signed various fields of science, integration of social consciousness, the development of new technological directions of culture and development trend; Seventh, international transformation of the result of man-made global technological civilization and culture were created its methods and tools aimed at improving science.

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The main objective of the study the impact of technological culture to the globalization of technological civilization was to formulate a scientific outlook of people. Because, it determines technological, scientific worldview and their spiritual transformation (or even material life) and plays an important regulatory function. At the same time, it will be seen in the impact of technological culture caused damage to the universality of the complex-systematic and other cultural forms of reintegration opportunities. However, the possibility of this process and its role of determining could be lead to confusing conclusions. For this reason, the human nature of things antropotexnogen attitude were caused the formation of the technogen thinking and culture of the importance of knowledge-oriented system, as well as other conditions, the subjective factors will be depended on an objective assessment of the role.

At the same time, the opportunity of technic-technologic influence of human in the main issue of "nature-society-man" attitude was to recognize the factors that ensure the stability of the system. Because the current socio-political system to enhance the role of the human factor in the stability of its technological thinking and culture was directly related to the level of technological development, it must be seen as an important sign of civilization. In fact, the growing role of the human factor, having objective social nature and its level of development was one of particular importance in the history of man civilization. In this process: on the one hand, people meet their physical and spiritual needs of technical and technological capabilities. But, on the other hand, it isn't given positive results all the time. Therefore, it was arisen for the purposes of technical-technological development level seem to understand the need for rational use of the role of the human factor related to alternative concepts.

Various interests, even if it was based on common concepts, technological civilization to solving the negative effects of globalization and to recognize the importance of the role of the human factor was very important. In particular, a person's "technological moral qualities" of things antropotexnogen impact of management by raising the issue of unity is observed.

The development of internal and personal quality of person, social transformation and to ensure the development of civilizations were formed on the basis of ideas of improving a person's self-concept "performance revolution in the mind" in the concept "New humanism" of Roman club which created and developed in the West in the 60-70<sup>th</sup> of the twentieth century [4, 211].

In general, there were two directions seen in the relations of "Club of Rome" strategy of technogen civilization: At first, it as allowed to refuse "false optimistic" technocratic illusion about the future of

our society and to use "shock therapy" to make people think about the real state of the world; the second: to move to the change a common global problems from particularly technological civilization of the results of the quantitative analysis, which is the main object and the subject of human nature, to manage of the purpose and spiritual values of the rational system.

In fact, all of the positive results which is achieved in various stages of human history - (different futurologic: optimistic, pessimistic, skeptical, alarmistic, despite of fatalistic approaches), technological civilization, technological culture and human activity was the result of conscious control, it helps to determine its status in society, the nature of social relations, targets and to determine the value of targets.

Today, the international community's attention derivatives of human technological civilization "mass culture" in relation to the threat, to focus the formation of active citizenship, social and political position was one of the global problem. Accordingly, the international political community and the scientific community of mankind "mass culture" of globalization were warned about the threat of a serious crisis. "In particular, currently the world's growing spiritual challenges, "mass culture" to protect the minds of our children from the harmful effects of science and culture community, the role of art and the role is growing" [5, 133]. Because this illness is being influenced by a person's dependent and marginalizing. Among young people to go to the severity of the crime, norcomania, drugs and nihilistik attitude to the historical heritage, unethical behavior is caused "mass culture" escalation. It was spreading new anti-humanistic social dangerous, "virus", non-moral "infections" among those social life. Pedagogical-didactic function of moral values in technogen civilization which created in the history of their prevention is very important. Because, it should have a certain theoretical knowledge and practical skills of the education system in to overcome the threat of them and every citizen should understand the meaning of "mass culture".

In this occasion, the grows of the persons requires of humanistic, cultural and civilization relations to the social life have been grown and the criteria has been changed. These requirements are as follows:

- to get ready for a high probability of extreme events which create technogen civilization on bases of historically formed humanistic and moral values and legal norms;
- to have active civil position on the basis of organization and implementation norms and democratic principles of technogen civilization of socio-political relations system;
- the result of the foundation of the spiritual and cultural life of the nation of the technogen

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civilization and the history of technological culture, learning their mental development laws were getting more global.

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## THE MORTALITY RATE DEPENDING ON GENDER, ETHNICITY AND RISK FACTORS IN TURKESTAN REGION

**Abstract:** This article presents the results of a retrospective analysis of the mortality rate of Turkestan region's population, depending on gender, ethnicity and risk factors. We studied risk factors such as smoking, alcohol, lack of physical activity, overweight. A comparative analyze of the urban and rural dwellers.

**Key words:** Mortality, gender, ethnicity, smoking, alcohol, lack of physical activity, overweight.

**Language:** English

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**Background.** Mortality – is a species extinction process and one of two main sub-processes of human reproduction. It is depending on a big amount of biological and social factors (climatic, genetics, economic, politic, cultural, etc.).

Mortality is a mass process, which consists of a large number of single instances, happened in different ages, which determine in his own aggregate real or hypothetic generation's attrition. It is an initial vital one, demographic statistic's system collect and

combine data for. Death statistics as analyze of mortality is needed for demographic aims and for practice, firstly for public health agencies and social politics [1-3].

Mortality data is necessary as for analyze past demographic trends, so for demographic forecast development. The last one, as it is known, is used almost in all spheres: for planning housing services development, education and health care systems, for realization social protection programs, for production



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of consumer goods for different social group of population. Mortality statistics is needed for morbidity analyzing, as on the national, so on the regional levels [4].

Death rate depends on an influence of a huge amount of factors, divided into 4 most important groups:

1. natural-biological factors – heredity, environmental, etc.;
2. social-economic factors- lifestyle, living, peculiarities and working conditions, health care system developing, war, etc.
3. demographic (structured) factors – gender, age, marriage, territorial and other composition of the population;
4. harmful habits - death accomplices: smoking, alcohol, drugs, etc. [5].

More than third of all deaths in a world, to one extent or another, are related to a small amount of risk factors. Appreciation the role of these risk factors is a key to an effective and a clear-cut strategy of significant improvements in health in a whole world. Hypertension (cause of 13% of mortality in a world), smoking (9%), high level of glucose in a blood (6%), lack of physical activity (6%), overweight and obesity (5%) are the main global risk factors of death in a world. These factors increase risks of developing chronic diseases such as cancer, heart disease and diabetes. All these risk factors influence on a population of countries with all groups of income level: high, middle and low [6].

Nowadays, there are about a 1 billion smokers in the world. Cigarettes, cigars, hookah and chewing tobacco are the main types of tobacco products. WHO estimates, that the most highest rate of prevalence of using tobacco is almost 31% in the European region, and the lowest is 10% - in the African Region. Not only the direct using of tobacco is the threat to health, but also a passive smoking is harmful. Every year about 6 million people die from addictive tobacco use and passing smoking, mortality rate is 6% of female and 12% male. WHO forecasts that by 2030 year, the annual rate of death linked to tobacco use, more than 8 million people [7-12].

Lack of physical activity is the fourth leading risk factor of the mortality. Every year, it is associated with 3.2 million deaths and 32.1 million of DALY (disability-adjusted life year), representing approximately 2.1% of the global total DALY [8]. For people with a lack of physical activity, the risk of death from all causes is higher to 20-30%, comparing to people who are involved in no less than 30-minute episodes of physical activity most days of the week. In 2008, the lack of physical activity showed 31.3% of people aged 15 years and older (28.2% men and 34.4% women). The WHO reports about the situation about NCDs in the world, it was shown, that the most highest rate of prevalence of lack of physical activity observed in the WHO Region for America and the

WHO Eastern Mediterranean Region [9]. In all WHO regions, men are more active than women, but the highest data's of differences in the prevalence of low level of physical activity between men and women exists in the WHO of the Eastern Mediterranean Region. [13]

Addictive drinking of alcohol is a risk factor for numerous adverse medical and social outcomes. The harmful consuming of alcohol led to 2.5 million deaths in 2004 year (3.8% of the total) [8, 14-15].

Annually, no less than 2.8 million people die because of the overweight or obese in the world. [9]. In a 2008, 34% of the adults, older than 20 years had an overweight, in men 33.6%, and 35% of women had them. According to the data for that year, 9.8% of men and 13.8% of women had obesity, and their BMI was equal to or greater than 30 kg / m<sup>2</sup>. According to the data from prospective epidemiological studies from whole world, there is a link between overweight or obesity, on the one hand, and cardiovascular morbidity, mortality from CVD and total mortality. Obesity is closely associated with the main of cardiovascular risk factors, such as hypertension, impaired glucose tolerance, diabetes type mellitus II and dyslipidemia [9,16-19].

Canadian researchers conducted a cohort study about the impact of overweight to all causes of death. The respondents were older than 40 years. The study included 49,476 women (average rate of age was 63.5 years, mean of BMI 27.0 kg / m<sup>2</sup>, the average fat deposits rate- 32.1%) and 4944 men (average age rate was 65.5 years, average rate of body mass index of 27.4 kg / m<sup>2</sup>, average body fat, 29.5%). Death occurred in 4965 women earlier to a 6.7 years and 984 men to a 4.5 years, respectively. They concluded that a low body mass index and a high percentage of body fat deposits independently associated with increased rate of mortality [20].

Considering the mortality by a gender differences, according to the World Bank among men of Eastern Europe and Central Asia, the probability of untimely death is higher than in women, and this tendency is due to the increasing number of cases of chronic diseases resulting from alcohol consumption, smoking and unhealthy diet. While indicators of women's mortality declined for the period of four decades, in men in some age groups there was an increase in mortality, but in others progress has been negligible or absent altogether.

Europe is on a second place after Africa by the total mortality. However, there is a one of the highest rate of an average life expectancy in Europe. Due to a low rate of birth and as the result of a high rate of life expectancy there is a large proportion of older people, despite the fact that high death is more common to an older people, than young [21-23].

Scientists from the US have been studied the link between ethnicity and mortality from all causes.

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The study involved 12.181 African-American race and 17.436 European race, older than 45 years. Despite on the adjustment on demographic indicators, estimation (self-estimation) of health, health status, mortality rates from all causes were significantly lower in African-American race than in those people with the white race. In older ages (75-80 years), race performance in African American individuals may be reduced [24].

Exploring the mortality statistics of Russian Federation, scientists identified, that there is a tendency of mortality reduction in the period from 2002 till 2014 y.y., and moreover this determinant decrease to 0.1 every year [25]. There was also a research dedicated for analyzing the mortality in different regions. For example, in Tver region there were realized complex scientific works, where were worked out a mortality decreasing programming methods. In additional there were solved problems of loss prevention due to reducing death from traffic accidents, diseases of the digestive tract and infant mortality [26].

The total rate of mortality in the Republic of Kazakhstan, starting from a number 769.3 in 1990 year. raised to 1046 in 2003 year. Further there was a trend of decreasing of this rate According to the Health Care System of Kazakhstan, there was marked declines in the rate of the total mortality to 19% (2010 - 9.0 per 1,000 population in 2014 - 7.57). At the same time the death rate in men among the productive age is for 24% higher than in women [27].

According to the WHO - the annual rate of addictive drinking alcohol in Kazakhstan (Equivalent F/h of the alcohol / per capita) decreased slightly: from 7.1 (2007 y.) till 6.6 (2012 y.), the prevalence of tobacco smoking (% of tobacco  $\geq$  15 years aged people) - from 23.1 (2007 y.) to 22.4. According to the results of a nationally representative study 12% of girls, 17% of boys and 53.1% of adults have an overweight or obese [28-29].

Nowadays high mortality- is one of the flash points of demographic situation the Republic of Kazakhstan. One of the ways of it is decreasing is

prioritization by identifying the main preventable causes of death and capabilities of troubleshooting. In particular, promoting science-based approaches may contribute for exploring and identifying preventable causes of death for decreasing mortality rate.

**AIM:** To study the mortality indicators depending on gender, nationality and risk factors in Turkestan (South Kazakhstan).

**Design:** Retrospective study.

### Materials and methods:

Analyze of mortality indicators was undertaken on the base of population - based study, directed by Shalkharova Zh.S., 2003 [30].

After 12 years from the previous study- 1822 volunteers, who were explored in 2003 were taken response from 1143. As it turned out, that from 1143 person 166 - were dead. All 166 death were divided into 4 groups by the place of residence and nationality:

- Urban population (128 died from 704)
- Rural population (38 died from 439)
- Kazakh nationality (79 died from 455)
- Uzbek nationality (72 died from 642)

Patients' medical record of 2003 year were analyzed for retrospective study with associative links, from which were collected data as nationality, place of residence, body mass, height, waist circumference, hip circumference, body mass index and data on risk factors: smoking, alcohol drinking, lack of physical activity, overweight.

Statistical analysis was made with the using of packages as MS EXCEL, BIostat. The Pearson's  $X^2$  was used for the comparative analysis.

### Results:

By the results of our research it was determine that from 1143 patients- urban population accounts 61.6% and rural population – 38.4%. From 1143 respondents - 166 were dead.

**Table 1**

**Data about death depending on gender, nationality and place of residence.**

	Overall (N=1143)		Urban (n=704)		Rural (n=439)	
	N	%	N	%	N	%
Death	166	14,5	128	18,2	38	8,7
Man	96	8,4	72	10,2	24	5,5
Women	70	6,1	56	8,0	14	3,2
Kazakh	79	6.9	65	9.2	14	3.2
Uzbek	72	6.3	48	6.8	24	5.5
Other nationalities	15	1.3	15	2.1	0	0

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JIF = 1.500	SJIF (Morocco) = 2.031	

In the structure of mortality rates male and female were 8.4% and 6.1%, respectively. While dead male in rural areas- were less for 4.7%, than in urban areas. For female the same - in rural is less than 4.8%, than in urban. As for nationality, and for

Kazakh and for Uzbek people it was a big number of death in the urban compared to rural.

Mortality data according to risk factors, identified in 2003, showed in a Table 2.

**Table 2**

### Mortality rate depending on risk factors

	Overall		Urban		Rural	
	N	%	N	%	n	%
Death	166	100,0	128	100	38	100
Smoke	37	22.3	29	22.7	8	21.1
Alcohol	126	76.0	103	80.5	23	60.5
lack of physical activity	50	30.1	37	29.0	13	34.2
Overweight	82	49.4	64	50.0	18	47.4

Investigating the mortality rate according to risk factors there were no differences between urban and

rural areas. It should be noted, that volunteers in rural using alcohol is less for 20%.

**Table 3**

### Mortality rate depending on risk factors and nationality.

	Overall		Kazakh (n=455)		Uzbek (n=642)	
	N	%	N	%	n	%
Death	166	100.0	79	100.0	72	100.0
Smoke	37	22.3	16	20.3	17	23.6
Alcohol	126	76.0	63	79.7	50	69.4
lack of physical activity	50	30.1	43	54.4	38	57.8
Overweight	82	49.4	38	48.1	21	29.2

The comparative analyzing of mortality rate depending on the risk factors and ethnicity showed us that there were no significant changes. It should be noted, that among the Uzbeks for 18,9% less death than in Kazakhs.

#### Conclusions:

Investigating mortality according to the gender the following data were identified: death in male in the rural for 4.7% less, than in the urban. For female the similar in rural is less than 4.8% than in urban.

As for nationality, and for Kazakh and for Uzbek people it was a big number of death in the urban compared to rural.

Researching mortality rate according to the risk factors identified differences between urban and rural areas. It should be noted, that rural dwellers use alcohol for 20% less than urban. The comparative analyzing of mortality rate depending on the risk factors and ethnicity showed us that there were no significant changes. It should be noted, that among the Uzbeks for 18,9% less death than in Kazakhs.

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**SECTION 2. Applied mathematics. Mathematical modeling.**

## ANALYTICAL SOLUTION OF PARTIAL DIFFERENTIAL EQUATIONS WITH CONSTANT COEFFICIENTS IN THE MAPLE

**Abstract:** We consider the problem of finding analytical solutions of linear partial differential equations with constant coefficients.

**Key words:** Maple, analytical solution, linear equation.

**Language:** Russian

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### АНАЛИТИЧЕСКОЕ РЕШЕНИЕ УРАВНЕНИЙ В ЧАСТНЫХ ПРОИЗВОДНЫХ С ПОСТОЯННЫМИ КОЭФФИЦИЕНТАМИ В СРЕДЕ MAPLE

**Аннотация:** Рассматривается задача нахождения аналитического решения линейных уравнений в частных производных с постоянными коэффициентами.

**Ключевые слова:** Maple, аналитическое решение, линейное уравнение.

Нахождение аналитических решений уравнений в частных производных в среде Maple 17 осуществляется с помощью пакета PDEtools. Несмотря на достаточно большой набор инструментов пакета для работы с дифференциальными уравнениями в частных производных поиск их решения представляет собой достаточно сложную задачу, которая требует знания математических методов в данной области. Учитывая, тот факт, что СКМ имеют развитый язык программирования,

который содержит средства процедурного программирования, имеется возможность разрабатывать универсальные алгоритмы с помощью которых можно программировать формальное построение решения уравнения в частных производных, которые будут использованы для конкретных физических задач.

Рассмотрим задачу нахождения аналитического решения линейного уравнения в частных производных с постоянными коэффициентами:

$$a_{11} \frac{\partial u}{\partial x^2} + 2a_{12} \frac{\partial u}{\partial x \partial y} + a_{22} \frac{\partial u}{\partial y^2} + a_1 \frac{\partial u}{\partial x} + a_2 \frac{\partial u}{\partial y} + a_0 u + d = 0, \quad (1)$$

где  $a_{11}, a_{12}, a_{22}, a_1, a_2, a_0, d = const$ ,  
 $u = u(x, y)$  - неизвестна функция.

Для нахождения общего решения воспользуемся стандартными средствами Maple.

`restart; with(PDEtools);`

Вводим значения постоянных  $a_{11}, a_{12}, a_{22}, a_1, a_2, a_0, d$  исходного уравнения, а затем уравнение (1):

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$$a11 := ; b := ; a22 := ; a1 := ; a2 := ; a0 := ; d := ; a12 := \frac{b}{2};$$

$$PDE1 := a11 \cdot \text{diff}(u(x, y), x, x) + 2 \cdot a12 \cdot \text{diff}(u(x, y), x, y) + a22 \cdot \text{diff}(u(x, y), y, y) + a1 \cdot \text{diff}(u(x, y), x) + a2 \cdot \text{diff}(u(x, y), y) + a0 \cdot u(x, y) + d = 0;$$

Находим значение определителя

$$D = a_{12}^2 - a_{11} \cdot a_{22}, \quad (2)$$

для последующего установления факта принадлежности к типу исходного уравнения

используем составной оператор условного перехода :

```
dt := a122 - a11·a22;
if (dt > 0) then uravnenie giperbolicheskogo tipa; fi;
if (dt < 0) then uravnenie elipticheskogo tipa; fi;
if (dt = 0) then uravnenie parabolicheskogo tipa; fi;
```

Принадлежность к типу уравнения дает возможность использовать программу `Maple-mapde ( )`, которая преобразует исходное уравнение к каноническому уравнению в частных производных другого вида, которое, будет решаться командой `pdsolve( )`. При этом надо иметь в виду, программа `mapde ( )` преобразовывает исходное уравнение к каноническому виду, исходя из его принадлежности к типу. Это означает, если программу записать в виде `mapde (PDE, canom )`, то каноническая форма будет содержать только одну смешанную

производную, что соответствует гиперболическому типу. Если же программу записать в виде

`mapde (PDE, canop )`, то каноническая форма будет содержать частные производные 2 -го порядка по переменным и не будет содержать смешанную производную, что соответствует эллиптическому и параболическому типу. Для того, чтобы программа работала в общем случае и сама выбирала выполнение `canop` или `canom` снова используем составной оператор условного перехода:

```
if (dt = 0) then mapde(PDE1, canop); fi;
if (dt > 0) or (dt < 0) then mapde(PDE1, canom); fi;
```

Общее решение находим, как указано выше, используя программу `pdsolve( )`, которая найдет решение по новым переменным, согласно команды `mapde ( )`. Для того, чтобы записать решение в исходных переменных подключаем программу `sol( )`. Удостовериться в правильности нахождения найденного решения возможно с помощью команды `simplify ( )`.

Описанную программу применим для нахождения общего решения уравнения в частных производных:

$$49 \frac{\partial u}{\partial x^2} - 14 \frac{\partial u}{\partial x \partial y} + \frac{\partial u}{\partial y^2} + 14 \frac{\partial u}{\partial x} - 2 \frac{\partial u}{\partial y} = 0$$

```
restart; with(PDEtools);
```



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>

```
a11 := 49; b := -14; a22 := 1; a1 := 14; a2 := -2; a0 := 0; d := -2; a12 :=  $\frac{b}{2}$ ;
```

```
PDE1 := a11·diff(u(x, y), x, x) + 2·a12·diff(u(x, y), x, y) + a22·diff(u(x, y), y, y) + a1·diff(u(x, y), x) + a2·diff(u(x, y), y) + a0·u(x, y) + d = 0;
```

```
dt := a122 - a11·a22;
```

```
if (dt > 0) then uravnenie giperbolicheskogo tipa; fi;
```

```
if (dt < 0) then uravnenie elipticheskogo tipa; fi;
```

```
if (dt = 0) then uravnenie parabolicheskogo tipa; fi;
```

```
if (dt = 0) then mapde(PDE1, canop); fi;
```

```
if (dt > 0) or (dt < 0) then mapde(PDE1, canom); fi;
```

```
a11 := 49
```

```
a22 := 1
```

```
a1 := 14
```

```
a2 := -2
```

```
a0 := 0
```

```
d := -2
```

```
a12 := -7
```

$$PDE1 := 49 \left( \frac{\partial^2}{\partial x^2} u(x, y) \right) - 14 \left( \frac{\partial^2}{\partial y \partial x} u(x, y) \right) + \frac{\partial^2}{\partial y^2} u(x, y) + 14 \left( \frac{\partial}{\partial x} u(x, y) \right) - 2 \left( \frac{\partial}{\partial y} u(x, y) \right) - 2 = 0$$

```
dt := 0
```

uravnenie parabolicheskogo tipa

$$\left( -2 + 14 \left( \frac{\partial}{\partial \xi_2} u(-\xi_1, -\xi_2) \right) + 49 \left( \frac{\partial^2}{\partial \xi_2^2} u(-\xi_1, -\xi_2) \right) \right) \&where \left\{ \begin{array}{l} -\xi_1 = y + \frac{1}{7}x, \\ -\xi_2 = x \\ = x \end{array} \right.$$

>

```
> op(%);
```

$$-2 + 14 \left( \frac{\partial}{\partial \xi_2} u(-\xi_1, -\xi_2) \right) + 49 \left( \frac{\partial^2}{\partial \xi_2^2} u(-\xi_1, -\xi_2) \right), \left\{ \begin{array}{l} -\xi_1 = y + \frac{1}{7}x, \\ -\xi_2 = x \end{array} \right.$$

```
> pdsolve(%[1]);
```

$$u(-\xi_1, -\xi_2) = -\frac{7}{2} e^{-\frac{2}{7} - \xi_2} \_F1(-\xi_1) + \frac{1}{7} \_ \xi_2 + \_F2(-\xi_1)$$

```
> sol := u(x, y) = subs(%%[2], rhs(%));
```

$$sol := u(x, y) = -\frac{7}{2} e^{-\frac{2}{7}x} \_F1\left(y + \frac{1}{7}x\right) + \frac{1}{7}x + \_F2\left(y + \frac{1}{7}x\right)$$

```
> simplify(subs(sol, PDE1));
```

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$$49 \left( \frac{\partial^2}{\partial x^2} \left( -\frac{7}{2} e^{-\frac{2}{7}x} {}_2F_1\left(y + \frac{1}{7}x\right) + \frac{1}{7}x + {}_2F_2\left(y + \frac{1}{7}x\right) \right) \right) - 14 \left( \frac{\partial^2}{\partial y \partial x} \left( -\frac{7}{2} e^{-\frac{2}{7}x} {}_2F_1\left(y + \frac{1}{7}x\right) + \frac{1}{7}x + {}_2F_2\left(y + \frac{1}{7}x\right) \right) \right) + \frac{\partial^2}{\partial y^2} \left( -\frac{7}{2} e^{-\frac{2}{7}x} {}_2F_1\left(y + \frac{1}{7}x\right) + \frac{1}{7}x + {}_2F_2\left(y + \frac{1}{7}x\right) \right) + 14 \left( \frac{\partial}{\partial x} \left( -\frac{7}{2} e^{-\frac{2}{7}x} {}_2F_1\left(y + \frac{1}{7}x\right) + \frac{1}{7}x + {}_2F_2\left(y + \frac{1}{7}x\right) \right) \right) - 2 \left( \frac{\partial}{\partial y} \left( -\frac{7}{2} e^{-\frac{2}{7}x} {}_2F_1\left(y + \frac{1}{7}x\right) + \frac{1}{7}x + {}_2F_2\left(y + \frac{1}{7}x\right) \right) \right) - 2 = 0$$

> *simplify(lhs(%));*

0

Таким образом,

$$u(x, y) = -\frac{7}{2} e^{\frac{2}{7}y} F_1 \left( y + \frac{1}{7}x \right) + F_2 \left( y + \frac{1}{7}x \right) + \frac{1}{7}x,$$

$F_1, F_2$  - постоянные.

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## SECTION 9. Chemistry and chemical technology.

 INFLUENCE OF FUNCTIONAL GROUPS ON THE ANTIMICROBIAL  
 PROPERTIES IN LUBRICATING OF OIL M-11

**Abstract:** In this scientific work have been investigated the basic features of influence of functional groups on the antimicrobial properties in lubricating of oil M-11.

It should be noted that this class of sulphides, meaningfully diameter of microbial growth inhibition zone, second only benzilalkoksikarbonilmetildisulfids.

These results suggest that the best antimicrobial properties are polar compounds, ester having at the edges and in the middle disulfide functional groups. Aromatic disulfides containing an oxycarbonyl group, the additives are effective antimicrobial lubricating oil M-11.

The structure of the synthesized sulphides confirmed by IR - and NMR - spectroscopy. IR spectra of synthesized compounds were recorded on a spectrophotometer "UR-20" in the range of 400-4000  $cm^{-1}$ .

**Key words:** lubricating of oil M-11, functional groups, antimicrobial properties.

**Language:** English

**Citation:** Azizova SM (2016) INFLUENCE OF FUNCTIONAL GROUPS ON THE ANTIMICROBIAL PROPERTIES IN LUBRICATING OF OIL M-11. ISJ Theoretical & Applied Science, 03 (35): 186-188.

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## Introduction

From the scientific literature identified [1, 41] that various additives are used for improving the antimicrobial properties of lubricating oils. These additives, generally have a different structure, and since they contain different functional groups which further affect their antimicrobial properties [3, 22].

## Materials and Methods

To this end, using techniques developed by us previously synthesized disulfides [4, 31-57] structure containing a carbonyl, oxycarbonyl, and disulfide (C = O, -OC (O) - and -S-S-) functional groups.

Physico-chemical characteristics of the synthesized compounds. These results are shown in Table 1.

Table 1

Physical and chemical synthesis of unsymmetrical sulfides.

№	Compound	Exit, %	T <sub>mp.</sub> (°C) (C/0,2 mm pr.cr.)	n <sub>D</sub> <sup>20</sup>	d <sub>4</sub> <sup>20</sup>	MR <sub>D</sub>		Elemental composition, %					
						found	calculated	found			calculated		
								C	H	S	C	H	S
1	C <sub>6</sub> H <sub>5</sub> CH <sub>2</sub> SSC <sub>3</sub> H <sub>7</sub>	45.6	90-92	1.5662	1.0734	60.3 2	60.6 2	60.56	7.12	32.32	60.17	6.65	33.13
2	C <sub>6</sub> H <sub>5</sub> CH <sub>2</sub> SSC <sub>5</sub> H <sub>11</sub>	48.2	118-120	1.5496	1.0423	69.5 3	69.8 6	63.65	8.02	28.3 2	62.82	8.06	29.12

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JIF = 1.500	SJIF (Morocco) = 2.031	

3	$C_6H_5CH_2SSC(O)C_3H_7$	50,1	118 - 120	1,546 0	1,093 5	65,5 7	65,2 5	56,1 6	5,7 8	29,0 6	58,3 6	6,2 4	28,3 3
4	$C_6H_5CH_2SSC(O)C_5H_{11}$	48,6	132 - 134	1,522 8	1,036 2	75,0 2	74,4 3	60,9 5	6,8 4	26,0 4	61,3 7	7,1 3	25,2 1
5	$C_6H_5CH_2SSCO(O)C_3H_7$	43,5	63	-	-	-	-	55,6 7	5,8 8	25,8 2	56,2 1	6,2 9	25,0 1
6	$C_6H_5CH_2SSC(O)C_5H_{11}$	48,2	56	-	-	-	-	58,7 2	6,64	23,1 2	59,1 2	7,0 9	22,5 5

The structure of the synthesized sulphides confirmed by IR - and NMR - spectroscopy.

IR spectra of synthesized compounds were recorded on a spectrophotometer "UR-20" in the range of 400-4000  $cm^{-1}$ .

The IR - spectra of ethyl benzyl disulfide band appears stretching vibrations, -S-S- characteristic of communication at  $460 \pm 10 cm^{-1}$ .

The TMR - amilbenzildisulfida observed spectrum signals from aromatic (in  $7 \div 7,17 ppm$ ) and methylenes (in the range  $4.83 \div 4.42 ppm$ ) of protons S5N11 signals from n (-S- S-CH<sub>2</sub>  $\delta = 2,68 ppm$  (CH<sub>2</sub>) 3  $\delta = 1 \div 2 m ppm$ , -SN3-  $\delta = 0,95 ppm$  triplet distorted).

The IR - spectrum benzildekanoildisulfida detected absorption bands at  $460 \pm 10 cm^{-1}$ , characteristic for the group -S-S- and stretching vibrations  $1710 \pm 10 cm^{-1}$  corresponding to the C = O group.

The TMR - spectrum contains signals characteristic for aromatic (in  $7 \div 7,17 ppm$ ) and methylenes (in the range  $4.83 \div 4.42 ppm$ ) of protons. In addition to these signals from n-C<sub>3</sub>H<sub>7</sub>, there are, respectively, -C-CH<sub>2</sub>-  $\delta = 2,45 ppm$  triplet, -CH-  $\delta = 1,61 ppm$  sextet, -SN3-  $\delta = 0,90 ppm$  triplet.

The IR - spectrum benzilpropoksikarbonilmetildisulfida detected absorption bands at  $460 \pm 10 cm^{-1}$ , characteristic for the group -S-S- and stretching vibrations  $1270 \pm 10 cm^{-1}$  corresponding to the -C-O- group, and in  $1700 \pm 10 cm^{-1}$ , corresponding to the C = O group.

The TMR - spectrum contains signals from aromatic (in  $7 \div 7,17 ppm$ ) and methylenes (in the range  $4.83 \div 4.42 ppm$ ) of protons. In addition to these signals in said disulfide observed from S5N11-n (-C-O-CH- ppm  $\delta = 4,23 t$  (CH<sub>2</sub>) 3  $\delta = 1,1 \div 2,1 ppm$ , m, -CH<sub>3</sub>  $\delta = 0,95 ppm$  doublet garbled).

With increasing concentration of sulphate in the oil of their antimicrobial properties efficacy increases. For example, at a concentration of 1.5% benzilpropoksikarbonilmetildisulfid appreciably increases the resistance of the oil to M-11

microorganisms (24, 22, 16 mm), especially bacterial and fungal cultures.

Tests alkilbenzildisulfids oil M-11 have shown that elongation of the alkyl radical of the antimicrobial efficacy is reduced.

For example, M-11 oil containing 1.5% propilbenzildisulfida diameter of microbial growth inhibition zone is respectively 14, 12, 20 mm, and in case amilbenzildisulfida it is respectively 16, 14 and 20 mm.

Alkilalkoildisulfids test results show that the compounds tested, mainly, are more effective antimicrobial additives than alkilbenzildisulfidy.

It should be noted that this class of disulfides meaningfully diameter of microbial growth inhibition zone, second only benzilalkoksikarbonilmetildisulfids.

### Conclusion

1. It should be noted that this class of sulphides, meaningfully diameter of microbial growth inhibition zone, second only benzilalkoksikarbonilmetildisulfidam.

2. These results suggest that the best antimicrobial properties are polar compounds, ester having at the edges and in the middle disulfide functional groups. Aromatic disulfides containing an oxycarbonyl group, the additives are effective antimicrobial lubricating oil M-11.

3. With increasing concentration of sulphate in the oil of their antimicrobial properties efficacy increases. For example, at a concentration of 1.5% benzilpropoksikarbonilmetildisulfid appreciably increases the resistance of the oil to M-11 microorganisms (24, 22, 16 mm), especially bacterial and fungal cultures.

4. Tests alkilbenzildisulfids oil M-11 have shown that elongation of the alkyl radical of the antimicrobial efficacy is reduced. For example, M-11 oil containing 1.5% propilbenzildisulfida diameter of microbial growth inhibition zone is respectively 14, 12, 20 mm, and in case amilbenzildisulfida it is respectively 16, 14 and 20 mm.

## Impact Factor:

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<b>GIF (Australia)</b> = 0.564	<b>ESJI (KZ)</b> = 1.042	<b>IBI (India)</b> = 4.260
<b>JIF</b> = 1.500	<b>SJIF (Morocco)</b> = 2.031	

5. The TMR - amilbenzildisulfida observed spectrum signals from aromatic (in 7 ÷ 7,17 ppm) and methylenes (in the range 4.83 ÷ 4.42 ppm) of protons S5N11 signals from n (-S- S-CH2  $\delta$  = 2,68 ppm (CH2) 3  $\delta$  = 1 ÷ 2 m ppm, -SN3-  $\delta$  = 0,95 ppm triplet distorted).

6. The TMR - spectrum contains signals from aromatic (in 7 ÷ 7,17 ppm) and methylenes (in the range 4.83 ÷ 4.42 ppm) of protons. In addition to these signals in said disulfide observed from S5N11-n (-C-O-CH- ppm  $\delta$  = 4,23 t (CH2) 3  $\delta$  = 1,1 ÷ 2,1 ppm, m, - CH3  $\delta$  = 0,95 ppm doublet garbled).

7. Comparative tests of the antimicrobial properties of the synthesized disulfide give reason to place them in the following number:

S6N5SN2SSR <C6H5CH2SSC (O) R  
<C6H5CH2SSCH2CO (O) R.

8. The results of the research allowed to identify among disulfides synthesized antimicrobial additives with optimal structure and on their basis to develop new lubricant compositions.

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SECTION 2. Applied mathematics. Mathematical modeling.

## SOME ERROR COMPUTER ALGEBRA SYSTEMS WHEN SOLVING SYSTEMS OF INEQUALITIES

**Abstract:** Discusses several cases of errors in the answers, when solving systems of inequalities in the system of computer algebra.

**Key words:** Computer algebra system, error, inequalities.

**Language:** English

**Citation:** Shevtsov AN, Suleymenova SA (2016) SOME ERROR COMPUTER ALGEBRA SYSTEMS WHEN SOLVING SYSTEMS OF INEQUALITIES. ISJ Theoretical & Applied Science, 03 (35): 189-192.

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When solving systems of inequalities with application of computer algebra systems there are some errors that lead to incorrect results in the response. Consider the basic command for solving inequalities.

The command `solve ()` is used to solve inequalities and systems of inequalities in real numbers exactly the same as for solving equations and systems of equations [1-5]. The answer is expressed either as a set of inequalities, either through function `RealRange ()` and `Open ()`. The first

specifies a closed interval of real numbers, and the second is used to specify that the boundary point is not included in the constructed solution. To specify the solution as a set, should be set as a set of either inequality or unknown, regarding which the decision is searched. If this is not done, then the answer will be obtained using these functions in determining the actual intervals.

Example solution of inequalities:

```
> solve ((x+3)/(4-x)>4, x);  
  
solve ((x+3)/(4-x)>4, {x});  
  
solve (log[1/2] (log[2] (x^2-8)) >=-1);  
  
solve ({log[1/2] (log[2] (x^2-8)) >=-1});
```

$$\text{RealRange}\left(\text{Open}\left(\frac{13}{5}\right), \text{Open}(4)\right)$$
$$\left\{\frac{13}{5} < x, x < 4\right\}$$
$$\text{RealRange}(-2\sqrt{3}, 2\sqrt{3})$$
$$\{-2\sqrt{3} \leq x, x \leq 2\sqrt{3}\}$$

In this example, solved two inequalities, for each of which the solution is constructed as a set and in the form of real intervals. As observed there is no

problem. Now consider several systems of equations [6-10].

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```
> solve(5*x>10, x);
```

```
RealRange(Open(2), ∞)
```

```
> solve(5*x>=10, x);
```

```
RealRange(2, ∞)
```

```
> solve(ln(x)>2, x);
```

```
RealRange(Open(e2), ∞)
```

```
> solve(exp(x)>10, x);
```

```
RealRange(Open(ln(10)), ∞)
```

```
> solve(a*x>b, {x});
```

$$(-\text{signum}(a) x < -\frac{\text{signum}(a) b}{a})$$

```
> eqns:=abs(z)^2/(z+1)<exp(2)/(exp(1)-1);
```

$$\text{eqns} := \frac{|z|^2}{z+1} < \frac{e^2}{e-1}$$

```
> solve(eqns, {z});
```

$$\left\{ z < \frac{1}{2} \frac{e^2 + \sqrt{(e^2)^2 + 4e^2e - 4e^2}}{e-1}, \frac{1}{2} \frac{e^2 - \sqrt{(e^2)^2 + 4e^2e - 4e^2}}{e-1} < z \right\}, (z < -1)$$

```
> eqns:=exp(x)*x^2>=1/2;
```

$$\text{eqns} := \frac{1}{2} \leq e^x x^2$$

```
> solve(eqns, {x});
```

$$(2 \text{LambertW}\left(-1, -\frac{1}{4}\sqrt{2}\right) \leq x, x \leq 2 \text{LambertW}\left(-\frac{1}{4}\sqrt{2}\right)), (2 \text{LambertW}\left(\frac{1}{4}\sqrt{2}\right) \leq x)$$

```
> eqns:=abs((z+abs(z+2))^2-1)^2=9;
```

$$\text{eqns} := |(z+|z+2|)^2 - 1|^2 = 9$$

```
> solve(eqns, {z});
```

```
(z=0), (z≤-2)
```

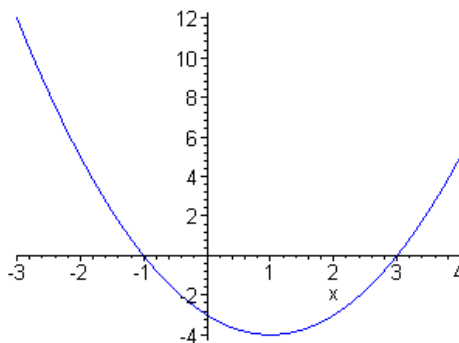
```
> evalf(%);
```

```
(z=0.), (z≤-2.)
```

```
solve(x^2-2*x-3>0, x);
```

```
RealRange(-∞, Open(-1)), RealRange(Open(3), ∞)
```

```
plot(x^2-2*x-3, x=-3..4, color=blue);
```



```
> solve(eqns, {x, y});
```

$$(-1 \leq y, y \leq 1, x + y < \frac{1}{2}, -1 < x, x < 1)$$

```
> solve({x*y*z>0, x>-1, y+z>10}, {x, y, z});
```

```
(z=0, -1 < x, 10 < y), (-1 < x, y=0, 10 < z)
```

As observed there is no problem. Define the system of inequalities:

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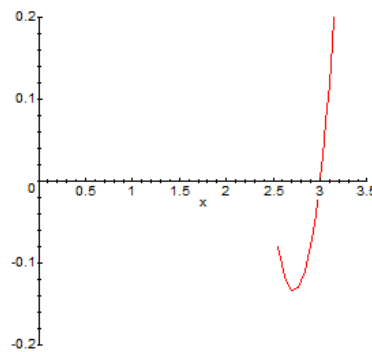
```
> restart;
d1:=2*x-5<=0;
d2:=x*x-5*x+6<=0;
d3:=x*x-5*x+6>=0;
d4:=2*x-5>=0;
r1:=evalf(solve({d1,d2},x));
r2:=evalf(solve({d3,d4},x));
```

$$\begin{aligned}
 d1 &:= 2x - 5 \leq 0 \\
 d2 &:= x^2 - 5x + 6 \leq 0 \\
 d3 &:= 0 \leq x^2 - 5x + 6 \\
 d4 &:= 0 \leq 2x - 5 \\
 r1 &:= \{2. \leq x, x \leq 2.500000000\} \\
 r2 &:= \{3. \leq x\}
 \end{aligned}$$

Solve the system of inequalities:

```
> solve((x*x-5*x+6)*sqrt(2*x-5)>=0,x);
solve((x*x-5*x+6)*sqrt(2*x-5)<=0,x);
r:=(x*x-5*x+6)*(2*x-5)^(1/2);
plot(r,x=0..3.5,y=-0.2..0.2);
```

$$\begin{aligned}
 &\text{RealRange}(-\infty, 2), \text{RealRange}\left(2, \frac{5}{2}\right), \text{RealRange}(3, \infty) \\
 &\text{RealRange}(-\infty, 2), \text{RealRange}\left(2, \frac{5}{2}\right), \text{RealRange}\left(\frac{5}{2}, 3\right) \\
 r &:= (x^2 - 5x + 6)\sqrt{2x - 5}
 \end{aligned}$$



Observed for the first system of inequalities is the appearance of two gaps identifying where in reality function can not exist.

$$\begin{aligned}
 &\text{RealRange}(-\infty, 2), \text{RealRange}\left(2, \frac{5}{2}\right), \\
 &\text{RealRange}(-\infty, 2), \text{RealRange}\left(2, \frac{5}{2}\right),
 \end{aligned}$$

For the second system of inequalities observed a similar situation.



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