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GENERAL HYGIENE DEPARTAMENT

ALIONA TIHON

General Hygiene

Workbook
for medical students

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Department in General Hygiene

This workbook is intended for medical students for laboratory classes on General Hygiene. The workbook was developed by **Aliona Tihon, associate professor.**

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The guidelines for practical classes correspond to the syllabus of the student curricula of faculties of Medicine, Pharmacy and Dentistry.

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This copybook for laboratory works for GENERAL HYGIENE was elaborated by the team of authors: Aliona Tihon, associate professor, order to facilitate learning of required knowledge in accordance with the study plans.

The copybook corresponds to student curricula of Medicine, Pharmacy and Dentistry faculties and is a guide for individual tasks required by the study plan.

ABBREVIATIONS

AFA	analitic filter of aerosoli
ANSI/ASHRAE	Standard 62.1-2004
Assessment of the state of environment and its effect on the population's health (hygiene and ecology), 6th year	
ECTS	European Credit-Transfer System
BMI	body mass index
CFI	central fan integrated
COD	chemical oxygen denant
CNI	coefficient of natural illumination
CL	coefficient of luminosity
CP	coefficient of penetration
CU	coefficient unifomity
DCV	demand control ventilation
DL	daylinght lamp
DF	daylight factor
EET	equivalent effective temperature
EPP	educational-professional program
ERV	energy recovery ventilator
ET	effective temperature
EQC	educational-qualifying characteristic of quality of education
IIAQ	Improved Indoor air quiality
ILO	International labour organization
HRV	heat recovery ventilator
HVAC	heating ventilation and air conditioning
LB	bactericidae lamp
LE	erythemal lamp
LC	light coefficient
LR	light radiation
MAL	mercury-arc lamp
MAC	maximum allowable
MPC	maximum permissible contrations
MQL	mercury quartz lamp
RC	reflection coefficient
RT	resultant temperature
SBS	sich building syndrome
SI	sign-intellectual knowledge and skills
S I W	student's individual work
SP	sign-practical knowledge and skills
SNF	solides Non Fat
UV(meter)	ultravioletmeter
UVR	ultraviolet radiation
WL	white light lamps
WHO	World Health Organization
WWL	warm white light lamp

units of measure

m^3	cubic meter
^0C	degree Celsius
^0R	Reaumier degree
^0F	Fahrenheit degree
tg	tanhents
dB	decibel

INTRODUCTION TO HYGIENE

Hygieia (Greek Ὑγιεία or Ὑγεία, Latin Hygēa or Hygīa), was the daughter of the god of medicine, Asclepius, and Epione, goddess of soothing.

She was the goddess of health.

Hugieia (ύγιεία: health) was used as a greeting among the Pythagoreans.


Hygeia

History of Hygiene

The word **hygiene** comes from Hygeia, the Greek goddess of health, who was the daughter of Aesculapius, the god of medicine. Since the arrival of the Industrial Revolution (c.1750-1850) and the discovery of the germ theory of disease in the second half of the nineteenth century, hygiene and sanitation have been at the forefront of the struggle against diseases

Hygiene is a set of practices performed for the maintenance of health . According to the World Health Organization (WHO), "Hygiene refers to conditions and practices that help to maintain health and prevent the spread of diseases."

Whereas in popular culture and parlance it can often mean mere 'cleanliness', hygiene in its fullest and original meaning goes much beyond that to include all circumstances and practices, lifestyle issues, premises and commodities that engender a safe and healthy environment.

While in modern medical sciences there is a set of standards of hygiene recommended for different situations, what is considered hygienic or not can vary between different cultures , genders and etarian groups . Some regular hygienic practices may be considered good habits by a society while the neglect of hygiene can be considered disgusting, disrespectful or even threatening .

First attested in English in 1677, the word *hygiene* comes from the French *hygiene* , the latinisation of the Greek ὑγιεινή (τέχνη) *hugieinē technē* , meaning "(art) of health", from ὑγιεινός *hugieinos* , "good for health, healthy", in turn from ὑγιής (*hugiēs*), "healthful, sound, salutary, wholesome".In ancient Greek religion , Hygeia (Ὑγίεια) was the personification of health, cleanliness and hygiene.

Hygiene is a concept related to cleanliness, health and medicine, as well as to personal and professional care practices related to most areas of living. In medicine and at home (domestic) and everyday life settings, hygiene practices are employed as preventative measures to reduce the incidence and spreading of disease. In the manufacture of food, pharmaceutical, cosmetic and other products,i.e.,

good hygiene is a key part of quality assurance i.e ensuring that the product complies with microbial specifications appropriate to its use.The terms cleanliness (or cleaning) and hygiene are often used interchangeably, which can cause confusion. In general, hygiene mostly means practices that prevent spread of disease-causing organisms. Since cleaning processes (eg, hand washing) remove infectious microbes as well as dirt and soil, they are often the means to achieve hygiene.

Other uses of the term appear in phrases including: *body hygiene, personal hygiene, sleep hygiene , mental hygiene , dental hygiene ,* and *occupational hygiene* , used in connection with public health . *Hygiene* is also the name of a branch of science that deals with the promotion and preservation of health, also called hygienic.

Hygiene practices vary widely, and what is considered acceptable in one culture might not be acceptable in the other.

Medical hygiene pertains to the hygiene practices related to the administration of medicine, and medical care, that prevents or minimizes a disease and the spread of the disease.

Medical hygiene practices include:

- Isolation or quarantine of infectious persons or materials to prevent the spread of infection.
- Sterilization of instruments used in surgical procedures .
- Use of protective clothing and barriers, such as masks , gowns , caps , eyewear and gloves .
- Proper bandaging and dressing of injuries .
- Safe disposal of medical waste .
- Disinfection of reusables (i.e linen, pads, uniforms)
- Scrubbing up, handwash, especially in an operating room, but in more general health-care settings as well, where diseases can be transmitted .

Date_____

Practical class

Introduction to general hygiene. Study of metohods used in hygiene.

The objectives:

1. To master the knowledge of hygiene as a science and sanitation, their goals, tasks, components, significance of hygienic knowledge for doctors of different profile.
2. To learn the classification of hygienic methods of investigation of environment and its influence on the organism and health.

You should know:

1. A concept of «prophylaxis» as one of the basics of medicine, hygiene and sanitation as its components.
2. Basic concepts, methods and knowledge of preceding courses in physics, chemistry, biology, microbiology, physiology and others which are used in the research of environmental factors and their influence on human health.
3. The basics of mathematical processing of biomedical research results.

You should have the following skills:

1. Physical, chemical and bacteriological measuring of environmental objects and their influence on an organism.
2. The use of computers or calculators in the statistical processing of results of hygiene researches

Nr.	***Name of methods***	***Essence of the method***	***Objects of research***
I. Methods of studying the objects of the environment			
1	organoleptic methods		
2	physical methods		
3	chemical methods		
4	physical and chemical methods		

5	biochemical methods		
6	microscopic methods		
II.Microbiological methods			
1	bacteriological methods		
2	mycological methods		
3	serological methods		
4	helminthological methods		
III. Methods of studying responses of the organism			
	physiological methods		
	psychological methods		
	biochemical methods		
	toxicological methods		

IV.Experimental methods			
1	natural experiment		
2	laboratory experiment		
4	chamber experiment		
V.Specific methods			
1	epidemiological methods		
2	sanitary and statistical methods		
3	method of sanitary inspection		

Test questions

1. Classification of methods used in hygiene.
2. Methods of studying the objects of the environment, their essence.
3. Methods of studying the organism responses, their essence.
4. Epidemiological methods used in hygiene.
5. Experimental methods, their kinds.
6. Sanitary and statistical methods used in hygiene.
7. The method of sanitary inspection and description of the object of sanitary supervision.

Signature of Lecturer_____ Signature of Student _____

Date _____

Practical class

Methodological and methodical fundamentals for studying the influence of a complex of environmental factors on the population's health.

The objectives:

1. Master theory fundamentals and basic assessment scheme of environmental factors' influence on population health.

You should know :

1. Methodological and technique principles of general hygiene (in the extent of the previous lecture courses and practical studies on given discipline).
2. Elements of theory of probability, mathematical statistics, principles of information science and computer engineering (from the course of biological and medical physics).
3. To examine environmental objects for the purpose of sanitation and hygienic assessment, to master sanitary-descriptive technique and other most popular analyses of organism responses to harmful environmental influences
4. To consider principal statistic indices, which characterize environment and population health denaturation.
5. To use reference and normative materials.

Tasks for self-training:

At home, the student should give definitions to the following terms:

Term	Definition
Methodology	
Method	
Technique	
Definition of concept "health" (WHO)	
Kinds of effect of environmental factors	1._____ _____ 2._____ _____ 3._____ _____

Class work – solve a situational problem and make the record:

Problem 1.

In settlement A., 35 cases of typhoid fever are registered at the same time. All patients used water from a public well which was equipped in correspondence with hygienic requirements but there was not equipped toilet 15 m higher by relief. Pathogen of typhoid was found in the well water and in people who used the toilet. Luminophor added to the toilet's cesspool was revealed in the well water in 3 days, that allowed to confirm possibility of getting the agent to the well water.

List research methods used during the investigation of typhoid fever outbrake.

_____
_____
_____
_____
_____
_____
_____
_____

Problem 2

What groups of health indices do such indices belong to:

morbidity_____

mortality (general and infant mortality) _____

physical development invalidity

_____
_____
_____
_____

Problem 3.

What groups of health indices do such indices belong to:

demographic

situation_____

state of environment_____

mode of life_____

level of medical care_____

social-hygienic indices_____

Problem 4.

What groups of health indices do such indices belong to:

mental disease morbidity_____

frequency of neurotic states and psychopathy_____

psychologic microclimate

_____
_____
_____
_____

Problem 5.

According to information about atmpspheric air pollution, the following CO2 и NO2 exceeding is revealed: in settlement A – by 3 times; B – by 7 times; C – в 100 times. What prognosis of changes in the level of population health state in these settlements is possible?

_____
_____
_____
_____
_____

Problem 6.

Population in town X. is constantly influenced by factors of various nature (physical, chemical, social). Coefficient of determination for these factors is 12, 8, 8 correspondingly. Assess the degree of influence of each factor on population health

_____
_____
_____
_____
_____
_____

Problem 7.

Population in town K. is constantly influenced by factors of various nature (physical, chemical, biological).Coefficient of determination for these factors is 17, 12, 8 correspondingly. Assess the degree of influence of each factor
on population health.

_____
_____
_____
_____
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_____

Problem 8.

Ratio of exceeding MPC for pollutants in town D. is 9. What prognosis of changes in level of population health is possible?

_____
_____
_____
_____
_____
_____

Problem 9.

Population in town D. is constantly influenced by factors of various nature (physical, chemical). Coefficient of determination for these factors is 3 and 13 correspondingly. Assess the degree of influence of each factor on population health.

_____
_____
_____
_____
_____

Theoretical questions:

1. Hygiene as a science, its place in work of doctors of general practice. The purpose, the task and methods of research. Principles of hygienic normalization.
2. The basic directions of scientific research of modern hygiene. Laws of hygiene. Bases of the legislation of Moldova about public health services and sanitary-and-epidemiologic well-being of the population.
3. Methodological and methodical bases of studying the environmental factors and their influence on health state of the population.
4. The basic plan of hygienic control over working conditions, life and factors of the environment.
5. The general plan of studying and estimation of interrelations of environmental factors and population's health.
6. The technique of the qualitative (conceptual) analysis of the condition of environment and "normilized" forecasting of changes of the level of population's health by condition of pollution of atmospheric air, water, soil.
7. The technique of the quantitative analysis of condition of the environment.
8. Zones of observation, definition of concept. The technique for choice of zones of observation.
9. Concept about basic schemes for research of influence of environmental factors on health of the population.
10. Health of the population as an integrated parameter of the condition of the environment.
11. Concept about epidemiological method of studying health state of the population and the basic ways of its realization.
12. The technique of the qualitative (conceptual) analysis of the level of population's health and its use in doctor's practical activities.
13. The technique of the quantitative analysis of the level of population's health, its use in doctor's practical activities.

Signature of Lecturer_____ Signature of Student _____

Date_____

Practical class

Hygienic assessment of a potential risk, produced by environmental factors on the human organism and health of the population.

Objective:

1. Master theoretical knowledge and general scheme on the risk assessment for population health caused by the environment factors.

You should know :

1. Main definitions used in the risk assessment methodology.
2. Main stages of the risk assessment methodology.

You should have the following skills :

1. To calculate the relative and population health risk.
2. To operate with microcomputer.
3. To identify the hazard factor and state the qualitative value of harmful effects for health.
4. To substantiate the scheme and content of main stages of the risk methodology.
5. To apply information and normative materials.

Problem for self-training:

At home, the student should give definitions to the following terms:

Term	Difinition
Rsk factor	
Risk	
Danger	
Source of danger (harmful factor)	
Exposition	
Dose	

Conclision:_____

_____

_____

_____

_____

_____

_____

_____

Class work – solve a situational problem and make the record:

Stages of situational task solving	Results
1.Hygienic assessment of the situation	
2.Establishing risk factors for individual (collective) health	
3.Prognosis of the consequences of risk factors on the individual (collective) health state	
4.Planning and substantiation of hygienic, prophylactic, improving and rehabilitation measures	
5.Normative provision of the specialist's activity	

Theoretical questions:

1. Methodology of risk estimation. Characteristic of the problem and the basic terms.
2. The basic stages of methodology of risk estimation.
3. Connection between risk estimation and its management. Risk management and hygienic normalization.
4. Problems of application of risk estimation methodology in Moldova.

Signature of Lecturer_____ Signature of Student _____

Date _____

Practical class

Hygienic evaluation of actual individual feeding. Study of personal alimentation.

The purpose of study:

_____
_____
_____
_____

Information note

How to calculate BMI?

The body Mass Index (BMI) is a value calculated from a person's weight and height data. BMI is equal to a person's weight in kilograms divided by the square of the body or BMI=kg/m2. The resulting number provides a dependable value of body fat levels for most people and is used to identify weight categories that could result in health problems. The body mass index is the preferred method of measurement for many physicians and researchers who study obesity.

weight (kg) / [height (m)]^2

BMI is a measurement index for the human body. BMI stands for body mass index, also officially known as Quetelet index. It was developed by Adolphe Quetelet, a Belgian polymath. It was formulated between the years of 1830 and 1850, while Quetelet was working on developing "social physics."

BMI is calculated by dividing a person's body mass by the square of their height.

SI units	$\mathrm{BMI} = \frac{\text{mass (kg)}}{(\text{height(m)})^2}$
Imperial units	$\mathrm{BMI} = \frac{\text{mass (lb)} \times 703}{(\text{height(in)})^2}$
	$\mathrm{BMI} = \frac{\text{mass (lb)} \times 4.88}{(\text{height(ft)})^2}$

1. **Essentially, BMI (kg/m^2) = weight (in kg) / (height (in meters))^2**

2. **BMI (lb/ft^2) = (weight (in lb) / (height (in feet and inches))^2) x 703**

	WEIGHT															
HEIGHT	**100**	**110**	**120**	**130**	**140**	**150**	**160**	**170**	**180**	**190**	**200**	**210**	**220**	**230**	**240**	**250**
5'0"	20	21	23	25	27	29	31	33	35	37	39	41	43	45	47	49
5'1"	19	21	23	25	26	28	30	32	34	36	38	40	42	43	45	47
5'2"	18	20	22	24	26	27	29	31	33	35	37	38	40	42	44	46
5'3"	18	19	21	23	25	27	28	30	32	34	35	37	39	41	43	44
5'4"	17	19	21	22	24	26	27	29	31	33	34	36	38	39	41	43
5'5"	17	18	20	22	23	25	27	28	30	32	33	35	37	38	40	42
5'6"	16	18	19	21	23	24	26	27	29	31	32	34	36	37	39	40
5'7"	16	17	19	20	22	23	25	27	28	30	31	33	34	36	38	39
5'8"	15	17	18	20	21	23	24	26	27	29	30	32	33	35	36	38
5'9"	15	16	18	19	21	22	24	25	27	28	30	31	32	34	35	37
5'10"	14	16	17	19	20	22	23	24	26	27	29	30	32	33	34	36
5'11"	14	15	17	18	20	21	22	24	25	26	27	28	30	32	33	35
6'0"	14	15	16	18	19	20	22	23	24	26	27	28	30	31	33	34
6'1"	13	15	16	17	18	20	21	22	24	25	26	28	29	30	32	33
6'2"	13	14	15	17	18	19	21	22	23	24	26	27	28	30	31	32
6'3"	12	14	15	16	17	19	20	21	22	24	25	26	27	29	30	31
6'4"	12	13	15	16	17	18	19	21	22	23	24	26	27	28	29	30

The classification of BMI goes as:

1. BMI of less than 18.5 is considered underweight
2. BMI in-between 18.5 – 24.9 is considered normal weight
3. BMI in-between 25.0 – 29.9 is considered overweight
4. BMI in-between 30.0 – 34.9 is considered class I obesity
5. BMI in-between 35.0 – 39.9 is considered class II obesity
6. BMI of more than 40.0 is considered class III obesity

Weight by Measured BMI	Under weight	Normal weight	Over weight	Class I Obesity	Class II Obesity	Class III Obesity
Perception of Weight by Respondents	Underwt.	Normal weight		Overweight		
					Obese	
		Healthy				

Weight by Measured BMI	Under weight	Normal weight	Over weight	Class I Obesity	Class II Obesity	Class III Obesity
Perception of Weight by Respondents	Underwt.					
		Normal weight				
				Overweight		
					Obese	
		Healthy				

Work report

Complete this table:

Index	Body weight	Energy (Q)	Corrections	Your Opinion
Real				
Ideal theoretical				

BMI = height,cm × 0.7-50

For men Q=815+36.6 × BMI

For women Q=530+31.1 × BMI

Situational problem:

John is a 20 – years - old student, 167 cm in height and weighing 62 kg. Daily he has 3 hot meals from fast food. For breakfast he has a cup of coffe with milk and a cake, at 12 o'clock he has meat with salad, vegetable, a cup of hot tea, and he has 2 portions of French fries (70 g) and 2 hamburgers (350 Kcal each) and some water. During the day he also eats some fruits and candy

a) Evaluate the student's nutrition?

_____

What can you recommend to John

_____
_____
_____
_____
_____
_____
_____

Conclusion :

your body weight is:

_____
_____
_____
_____
_____
_____
_____
_____
_____
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_____
_____
_____
_____

1. Your ITBW is _____ (Britman's)
2. What is Q for your body _____ Kcal
3. The difference between your ideal body weight and real one is_____ kg .

Signature of Lecturer _____ Signature of Student _____

Date _____

Practical class

Evaluation of individual alimentation. Determination of the organism's requirements in energy.

The purpose of study:_____

_____

_____

Work report

nr	Activities	Duration (min)	Kcal/kg (Q)	min × Kcal/kg
		24 hours (1140 min)		kcal× BW

The result is added 10-15% of the obtained number, provided for unaccounted activities.

The obtained result of energy consumption is compared with the norms of energy necessity for different groups of population.

Conclusion:_____

_____

My energy consumption is _____ **kcal**

Signature of Lecturer_____ **Signature of Student** _____

Energy consumption, including basal metabolism for 1 kg of body weight per minute

nr	*Activities*	Energy consum. kcal/kg/min	nr	*Activities*	Energy consum. kcal/kg/min
1	*lessons*	0.0243	**20**	*Taking a shower*	0.0570
2	*Laboratory classes*	0.0360	**21**	*Cleaning clothes, shining shoes*	0.0493
3	*Practical classes (without laboratory analysis)*	0.0250	**22**	*Dressing and undressing*	0.0264
4	*Practical classes in a food catering establishment*	0.0400	**23**	*Rest in the lying position*	0.0183
5	*Therapeutic class practice*	0.0266	**24**	*Rest in the sitting position*	0.0229
6	*Surgery class practice*	0.0243	**25**	*Rest while standing up*	0.0264
7	*Lesson breaks*		**25**	*reading*	0.0230
8	*Getting ready for the classes*	0.0250	**27**	*Reading in a loud voice*	0.0250
9	*Walking on a paved road*	0.0597	**28**	*singing*	0.0250
10	*Walking on a country road*	0.0625	**29**	*Dancing (waltz)*	0.0596
11	*Transport moving*	0.0267	**30**	*Morning exercises*	0.0648
12	*Doing farm chores around the house*	0.0757	**31**	*Running (speed 8 km/h)*	0.1357
13	*Taking care of children*	0.0360	**32**	*Running (speed 180 m/min)*	0.1780
14	*Room clean-up*	0.0402	**33**	*Running (speed 320 m/min)*	0.3200
15	*Hand-washing of clothes*	0.0511	**34**	*Riding the bike (13-26 km/h)*	0.1285
16	*Washing dishes*	0.0313	**35**	*Skating*	0.1071
17	*Hand sewing*	0.0264	**36**	*Swimming*	0.1190
18	*Having a meal*	0.0236	**37**	*Sleeping*	0.0155
19	*Washing the body*	0.0514			

HYGIENE OF NUTRITION

Date_____

Practical class

Methods of study and hygienic assessment of collective nutritional adequacy

Objective:

1. To master the method of hygienic evaluation of collective nutrition (by the data of weekly menu).

You should know:

1. Types of nutrition, their hygienic features.
2. Physiological and hygienic requirements to rational nutrition.
3. Groups of population and nutritional norms.
4. Hygienic ground of rational nutrition.
5. Physiological and hygienic requirements and nutritional principles of making a daily and weekly menu.

You should have the following skills:

1. Assesment of quantitative and qualitative adequacy of nutrition.
2. Making the menu for a week.
3. Hygienic estimation of the menu.
4. Proposal of measures on hygienic correction of the menu.
5. Doing the hygienic estimation of a menu for a week for persons in the recreation centre using this scheme (answer all questions).

The scheme of hygienic estimation of a menu

1. Variety of food-stuffs for a week and a day.
2. Ratio of liquid (first) and concentrated (second) courses during a day.
3.Some meals contain dishes, cooked from identical or the same products.
4.Presence of dishes stimulating appetite at each meal.
5. Daily and weekly alternation of cereals and vegetable garnishes for meals.
6. Day by day alternation of the first spicy and neutral dishes.
7. Variety of dessert dishes for meals.
8. Keeping rules of limited repetition of identical dishes within a week.
9. Daily distribution of dishes for meals.

Situational problem:

Make the hygienic estimation of a menu per week for persons in the recreation centre using the following scheme (answer all questions) The structure of hygienic estimation of a menu is:

1. Variety of food-stuffs per week and per day.

2. Ratio of the liquid (first) and concentrated (second) courses during a day.

3.Some meals are cooked from identical or the same products.

4. Presence of dishes stimulating appetite at each meal.

5. Alternation of cereals and vegetable garnishes for meals for each day and week.

6. Daily alternation of the amouht of spices in dishes.

7. Variety of dessert dishes for meals.

8. Keeping rules of limited repetition of identical dishes within one week.

9. Daily distribution of dishes in the week menu.

10. **Conclusion.**

Menu for week-1

	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
Breakfast	2egg omelette w/ tomatoes and avocado	protein shake w/ strawberries	scrambled eggs bacon, sauteed spinach, tomatoes	protein shake w/ strawberries	sausage topped w/ mozzarella and tomatoes	2egg omelette w/ tomatoes and avocado	protein shake w/ strawberries
Snack 1	cucumber slices w/ranch dressing	cherry tomatoes	cucumber slices w/ranch dressing	bell pepper slices w/ dressing	celey w/ cream cheese	bell pepper slices w/ dressing	celey w/ cream cheese
Lunch	chicken guater (w/skin) lettuce and tomatoes	burger (no bun) w/ cheese, avocado and tomato salad	protein shake w/ strawberries and banana	lettuce wrapped chicken breast, fresh guacamole and salsa	letture wrapped chicken breast, fresh guacamole and saisa	Burder on chopped salad	tuna with avocado, cucumber and tomato salad bell pepper
Snack 2	celery w/ cream cheese	cucumber slices w/ ranch dressing	bell pepper slices w/ dressing	cherry tomatoes	cucumber sices w/ ranch dressing	cherry tomatoes	bell pepper sices w/ dressing
Supper	pork tenderloin, sauteed spiinach, grilled sguash	sirloin steek, sauteed bok choy, mixed green salat	chicken, steamed broccoli, chopped spinach salad	grilled burger w/ cheddar, baked sweet ppotato fries, mixed greens	chicken breast, steamed broccoli and cauliflower, mixed gree salad	banders and sweet potato mash, sauteed spinach	steak, asparagus, mixed green salad

Menu for week-2

	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
Breakfast	Mashed potatoes with a cutlet Bread and butter Cheese Tea	Mushroom soup Milk Bread and butter Cheese	Regular coffee Curds with sour cream	Curds with sour cream Cheese Pancakes Tea Bread	Mashed potatoes Borsch with meat Tea Bread	Macaroni with meat Juice Stewed apple Bread	Boiled eggs Cucumber salad Mashed potatoes Milk Bread
Lunch	Borsch with meat Stewed cabbage Milk Bread	Fish soup Stew with mashed potatoes Apple juice Bread	Stewed meat with vegetables Baked apples Bread	Fish soup Fried fish with mashed potatoes	Borsch with meat Stew Black coffee	Macaroni with meat Juice Bread	Borsch with meat Mashed potatoes with meat Coffee
Dinner	Rice cereals with milk Omelette Black coffee Bread	Mashed potatoes with a cutlet Rice gruel Bread	Porridge with milk Bread and butter Cheese Sour milk	Porridge with milk and fruit Tea Bread	Crab salad Semolina with milk Bread	Potato soup Mashed potatoes with meat Sour milk	Macaroni with a cutlet Black coffee Bread and butter

Conclusion

Test questions

1. Biological essence of nutrition.
2. Classification of food nutrients and food products.
3. Types of nutrition.
4. Hygienic requirements to rational nutrition.
5. Hygienic requirements to a week menu.
6. The main criteria of qualitative variety of nutrition in a menu for a week.
7. Distribution of first, second and third courses in a menu for a week.
8. Principle of variety of food - stuffs during a week.
9. Right alternation of cereals and vegetable garnishes, spicy and neutral courses and desserts in a menu.

Signature of Lecturer_____ Signature of Student _____

Date _____

Practical class

Calculation method to assess individual nutrition adequacy estimation

Objectives:

1. To master the methods of medical control of energy expenditure and nutrition in different social and professional, sex and age groups.
2. To master methods of determination of individual or organized collective nutrition and its adequacy to the energy expenditure and nutrient needs.

You should know :

1. Physiological basics of metabolism in the human organism.
2. Energy metabolism and its features. Constituents of the daily energy expenditure.
3. Physiological and hygienic characteristics of the basal metabolism and specific dynamic effect of food.
4. Dependence of the human energy metabolism on climate and weather conditions, microclimate, emotional stress and physical load.
5. Rational nutrition as the basis of the sufficient energy supply for the human organism.
6. Hygienic requirements to chemical composition and caloric content of the ration for different professional groups.

You should have the following skills:

1. Monitoring the daily activity of an individual or a group with similar daily routine and nutrition.
2. Using directives, reference materials, formulas, tables; make the necessary calculations (analyses).
3. Calculating chemical composition and caloric content of the ration; to evaluate the results.

Situational problem:

Give hygienic estimation of the daily ration of a 30-year-old nurse, her weight is 65 kg.
Chemical composition and caloric content of the daily ration:

Animal proteins = 30,4 g
Phosphorus = 800 mg
Vitamin B6 = 1.5 mg
Vegetable proteins = 20 g
Magnesium = 300 mg
Niacinum =10 mg
Animal fats = 80 g
Iron= 12 mg
Vitamin C = 40 mg
Caloricity of dinner = 670 kcal
Saccharum = 125 g
Vitamin A = 0.5 mg

Caloricity of breakfast = 504 kcal
Vegetable fats = 15 g
Starch = 152 g
Vitamin B1 =0.7 mg
Caloricity of animal origin = 913.7 kcal
Calcium = 500 mg
Vitamin B2 = 1.1 mg

Caloricity = 1032 kcal

	Evaluated	The actual content in the ration	Physiological standard	Discrepancy
1	Total caloric value (kcal)			
2	Calories of animal origin			
	a) kcal			
	b) % to total caloric value			
3	Proteins (gram)			
4	Animal proteins a) grams b) % of total quantity of proteins			
5	Caloric value at the expense of proteins			
	a) kcal			
	b) % of total caloric value			
6	Fats (gram)			
7	Vegetable fats a) grams			
	b) % of total quantity of fats			
8	Caloric value at the expense of fats			
	a) kcal			
	b) % of total caloric value			
9	Carbohydrates (gram)			
10	Saccharum a) grams			
	b) % of total quantity of carbohydrates			
11	Caloric value at the expense of carbohydrates			
	a) kcal			
	b) % of total caloric value			
12	Ratio between proteins, fats and carbohydrates (gram)			
13	Vitamins (mg) a) A			
	b) B_1			
	c) B_2			
	d) B_6			
	e) PP			
	f) C			
14	Mineral substances (mg) a) Calcium			
	b) Phosphorus			

	c) Magnesium			
	d) Iron			
15	Caloricity of breakfast			
	a) kcal			
	b) % of total caloric value of ration			
16	Caloricity of lunch			
	a) kcal			
	b) % of total caloric value of ration			
17	Caloricity of dinner			
	a) kcal			
	b) % of total caloric value of ration			

Conclusion_____

Recommendations

Test questions

1. The essence of the quantitative adequacy law.
2. The essence of the qualitative adequacy law.
3. Coefficient of physical activity of different professional groups and its significance.
4. Proteins in nutrition, their physiological functions and daily need. The method of calculation of daily necessity in proteins.
5. Fats in nutrition, their physiological functions and daily need. The method of calculation of daily necessity in fats.
6. Carbohydrates in nutrition, their physiological functions and daily need. The method of calculation of daily need for carbohydrates.
7. Physiological functions and hygienic standard of vitamins.
8. Mineral substances and their physiological need.
9. Proportion of proteins, fats and carbohydrates in daily ration.
10. Proportion of proteins and fats of animal and vegetable origin and saccharums and starch in the ration.
11. The balance of daily calories in the ration according to the daily meals.

Signature of Lectures_____ Signature of Student _____

Date _____

Practical class

Chemical composition and calculation of caloric value of diet.

The purpose of study:

_____
_____
_____

Work report: **Menu:**

The name of meals, alimentary products	Quantity (g)	proteins	fats	Carbo-hydrates	Ca	P	Vitam. C	kcal
Breakfast								
Totally for breakfast								
Lunch								
Totally for supper								
Dinner								
Totally for dinner								
Totally per day								

Conclusion:

Meals		Caloric value (norm)	My data
Breakfast		30%	
Lunch		30-40%	
Dinner		20-25%	

Caloric value of different nutrients

Name of nutritious substances		Caloric value of 1 g nutritious substances during its oxidation in the organism
1	Proteins	4.1 Kcal
2	Fats	9.3 Kcal
3	Carbohydrates	4.1 Kcal

Share of nutrients in daily ration

Name of nutritious substances		Share
1	Proteins	11-13
2	Fats	25-30
3	Carbohydrates	56-61
	Total sum	100

Recommendations:

_____
_____
_____
_____
_____
_____
_____
_____
_____

Signature of Lecturer_____ Signature of Student _____

Chemical composition of food products

Products	Proteins, g	Fats, g	Carbo-hydrates, g	Caloric value	Vitamins, mg					Minerals, mg			
					A	B_1	B_2	PP	C	Ca	Mg	P	Fe
Breakfast													
Lunch													

Chemical composition of food products

Products	Proteins, g	Fats, g	Carbo-hydrates, g	Caloric value	Vitamins, mg					Minerals, mg			
					A	B_1	B_2	PP	C	Ca	Mg	P	Fe
Dinner													

Chemical composition of same food products

(per 100 g of products)

Products	Proteins, g	Fats, g	Carbo-hydrates, g	Caloric value	Vitamins, mg					Minerals, mg			
					A	B_1	B_2	PP	C	Ca	Mg	P	Fe
Rice	7.3	2.0	63.1	284	-	0.52	0.12	3.82	-	66	96	328	2.6
Peas	23.0	1.2	53.3	303	-	0.81	0.15	2.20	-	115	107	329	9.4
Haricot beans	22.3	1.7	54.5	309	-	0.50	0.18	2.10	-	150	103	541	12.4
Flour wheaten, the highest quality	10.3	0.9	74.2	327	-	0.17	0.08	1.20	-	18	16	86	1.2
Flour wheaten the1 dass	10.6	1.3	73.2	329	-	0.25	0.12	2.20	-	24	44	115	2.1
Rye flour	8.9	1.7	73.0	325	-	0.25	0.13	1.02	-	34	60	189	3.5
Buckwheat (serial)	9.5	1.9	72.2	326	-	0.42	0.17	3.76	-	48	-	253	4.9
Millet	12.0	2.9	69.3	334	-	0.62	0.04	1.55	-	27	101	233	7.0
Macaroni of the highest quality	10.4	0.9	75.2	332	-	0.17	0.08	1.21	-	18	16	87	1.2
Macaroni class I	10.7	1.3	74.2	333	-	0.25	0.12	2.22	-	24	45	116	2.1
Rye-bread	6.5	1.0	40.1	190	-	0.18	0.11	0.67	-	38	49	156	2.6
Wheaten bread class II	8.1	1.2	46.6	220	-	0.23	0.10	1.92	-	32	53	128	2.4
Long loaf wheaten of I class biscuit highest quality	7.9	1.0	51.9	236	-	0.16	0.08	1.59	-	25	35	86	1.6
Sugar biscuit of the highest quality	7.5	11.8	74.4	417	traces	0.08	0.08	0.70	-	20	13	69	1.0
Ban biscuit	10.4	5.2	76.2	376	traces	0.08	0.08	0.75	-	43	22	122	1.8
Puff-pastry with cream	5.4	38.6	46.4	544	0.15	0.04	0.05	0.51	-	37	4	58	0.6
Sponge cake	4.7	20.0	49.8	386	0.07	0.10	0.10	0.50	-	45	16	76	1.0
Pasteurized milk	2.8	3.2	4.7	58	0.02	0.03	0.13	0.10	1.0	121	14	91	0.1
Sour cream with fat content of 20%	2.8	20.0	3.6	205	0.15	0.03	0.11	0.10	0.3	86	8	60	0.2

Products	Proteins, g	Fats, g	Carbo-hydrates, g	Caloric value	Vitamins, mg					Minerals, mg			
					A	B_1	B_2	PP	C	Ca	Mg	P	Fe
Fatty curds (cottage cheese)	14.0	18.0	1.3	226	0.10	0.05	0.30	0.30	0.5	150	23	217	0.4
Not fatty curds (cottage cheese)	18.0	0.6	1.5	86	traces	0.04	0.25	0.64	0.5	176	24	224	0.3
Fatty kefir	2.8	3.2	4.1	59	0.02	0.03	0.17	0.14	0.7	120	14	95	0.1
Not salt butter	0.6	82.5	0.9	748	0.50	traces	0.01	0.10	-	22	3	19	0.2
Russian cheese	23.4	30.0	-	371	0.26	0.04	0.30	0.30	1.6	1000	47	544	0.6
Cheese with fat of 40% (processed)	23.0	19.0	-	270	-	0.01	0.35	-	-	686	-	-	-
Ice cream	3.3	10.0	19.8	176	0.04	0.03	0.20	0.05	0.6	148	22	107	0.1
Margarine	0.3	82.3	1.0	746	0.4	traces	0.01	0.02	traces	12	1	8	traces
Mayonnaise	3.1	67.0	2.6	627	-	-	-	-	-	28	11	50	
Mutton of the I category	16.3	15.3	-	203	-	0.08	0.14	2.5	traces	9	18	178	2.0
Beef of the I category	18.9	12.4	-	187	traces	0.06	0.15	2.8	traces	9	21	198	2.6
Rabbit meat	20.7	12.9	-	199	-	0.08	0.10	4.0	-	7	25	246	4.4
Veal	19.7	1.2	-	90	traces	0.14	0.23	3.3	traces	11	24	189	1.7
Doctor’s sausage	13.7	22.8	-	260	-	-	-	-	-	29	22	178	1.7
Liver sausage	12.2	28.0	-	301	-	0.25	0.18	2.47	-	7	17	146	1.7
Chickens of the I	18.2	18.4	0.7	241	0.07	0.07	0.15	3.70	-	6	27	228	3.0
and the II category	20.8	8.8	0.6	163	0.07	0.07	0.14	3.60	-	20	32	298	3.0
Gooses of the I	15.2	39.0	-	412	0.02	0.08	0.23	2.20	-	12	35	154	3.0
and the II category	17.0	27.0	-	317	0.02	0.09	0.26	2.60	-	20	40	221	3.0
Ducks of the I	15.8	38.0	-	405	0.05	0.12	0.17	2.80	-	23	25	200	3.0
and the II category	17.2	24.2	-	287	0.05	0.18	0.19	3.0	-	30	35	218	3.0
Chicken eggs	12.7	11.5	0.7	157	0.35	0.07	0.44	0.19		55	54	185	2.7
Far - Eastern flaunder	15.7	3.0	-	90	-	0.06	0.11	1.0	traces	-	-	-	-

Products	Proteins, g	Fats, g	Carbo-hydrates, g	Caloric value	Vitamins, mg					Minerals, mg			
					A	B_1	B_2	PP	C	Ca	Mg	P	Fe
Bream	17.1	4.1	-	105	0.03	0.12	0.10	2.0	-	26	28	-	0.3
Burbot	18.8	0.6	-	81	-	-	-	-	-	32	64	191	1.4
Marine perch	17.6	5.2	-	117	-	0.11	0.12	1.6	traces	36	21	213	0.5
Fatty Atlantic herring	17.7	19.5	-	242	0.03	0.03	0.30	3.90	2.7	102	30	278	0.9
Hake	16.6	2.2	-	86	-	0.12	0.10	1.1	3.2	20	17	-	-
Pike	18.8	0.7	-	82	-	0.11	0.14	1.0	1.6	-	-	-	-
Tinned foods	18.3	23.3	-	283	-	0.03	-	2.8	-	-	-	-	-
Tinned foods „Atlantic mackerel in oil”	13.1	25.1	-	278	-	-	-	-	-	-	-	-	-
Sprats in oil	17.4	32.4	0.4	364	-	0.05	0.12	1.0	-	297	53	348	-
Green peas	5.0	0.2	13.3	72	-	0.34	0.19	2.0	25.0	26	38	122	0.7
Potatoes	2.0	0.1	19.7	83	-	0.12	0.05	0.9	20.0	10	23	58	0.9
Spring onions (leaf)	1.3	-	4.3	22	-	0.02	0.10	0.3	30.0	121	18	26	1.0
Carrot yellow	1.3	0.1	7.0	33	-	0.16	0.02	-	5.0	46	36	60	1.4
Cucumbers (subsoil)	0.8	-	3.0	15	-	0.03	0.04	0.2	10.0	23	14	42	0.9
Green sweet pepper	1.3	-	4.7	23	-	0.06	0.10	0.6	150.0	6	10	25	0.8
Parsley (greens)	3.7	-	8.1	45	-	0.05	0.05	0.7	150.0	245	85	95	1.9
Garden radish	1.2	-	4.1	20	-	0.01	0.04	0.1	25.0	39	13	44	1.0
Lettuce	1.5	-	12.2	14	-	0.03	0.08	0.6	15.0	49	17	34	0.9
Beetroot	1.7	-	10.8	48	-	0.02	0.04	0.2	10.0	37	43	43	1.4
Tomatoes (subsoil)	0.6	-	4.2	19	-	0.06	0.04	0.5	25.0	14	20	26	1.5
Garlic	6.5	-	21.2	106	-	0.08	0.08	1.0	10.0	90	30	140	1.5
Sorrel	1.5	-	5.3	28	-	0.19	0.10	0.3	43.0	47	85	90	2.0
Pickled cabbage	0.8	-	1.8	14	-	-	-	-	20.0	51	17	34	1.3
Pickled cucumbers	2.8	-	1.3	19	-	-	-	-	-	25	-	20	1.2
Mushrooms	0.9 27.6	0.4 68	3.2 10.0	19 209	- -	0.02 0.27	0.27 3.23	4.6 40.4	11.0 150.0	27 184	- -	89 606	5.2 35.0
Water-melon	0.7	-	9.2	38	-	0.04	0.03	0.24	7.0	14	224	7	1.0

Products	Proteins, g	Fats, g	Carbo-hydrates, g	Caloric value	Vitamins, mg					Minerals, mg			
					A	B_1	B_2	PP	C	Ca	Mg	P	Fe
Pumpkin	1.0	-	6.5	29	-	0.05	0.03	0.5	8.0	40	14	25	0.8
Cherry	0.8	-	10.7	42	-	0.03	0.03	0.4	15.0	37	26	30	1.4
	1.1	-	12.3	52	-	0.01	0.01	0.4	15.0	33	24	28	1.8
Pear	0.4	-	10.7	42	-	0.02	0.03	0.1	5.0	19	12	16	2.3
Gargen plum	0.8		9.9	43	-	0.06	0.04	0.6	10.0	28	17	27	2.1
Apples	0.4	-	11.3	46	-	0.01	0.03	0.3	13.0	16	9	11	2.2
Oranges	0.9	-	8.4	38	-	0.04	0.03	0.2	60.0	34	13	23	0.3
Lemons	0.9	-	3.6	31	-	0.04	0.02	0.1	40.0	40	12	22	0.6
Grapes	0.4	-	17.5	69	-	0.05	0.02	0.3	6.0	45	17	22	0.6
Strawberries	1.8	-	8.1	41	-	0.03	0.05	0.3	60.0	40	18	23	1.2
Gooseberries	0.7		9.9	44	-	0.01	0.02	0.3	30.0	22	9	28	1.6
Raspberries	0.8	-	9.0	41	-	0.02	0.05	0.6	25.0	40	22	37	1.6
Red currants	0.6	-	8.0	38	-	0.01	0.03	0.2	25	36	17	33	0.9
Black currants	1.0	-	8.0	40	-	0.02	0.02	0.3	200	36	35	33	1.3
Hips (dried fruits)	4.0	-	60.0	253	-	0.15	0.84	1.5	1200	66	20	20	28.0
Black tea bags	20.0	-	6.9	109	-	0.07	1.0	8.0	10.0	495	440	825	82.0
Black coffee	13.9	14.4	4.1	223	-	0.07	0.2	17.0	-	147	-	198	5.3
	15.0	3.6	7.0	119	-	-	1.0	24.0	-	100	-	250	6.1
Green peas	3.1	0.2	7.1	41	-	0.11	0.05	0.7	10	16	21	0.7	53
Tomato juice	1.0	-	3.3	18	-	0.01	0.03	0.3	10	13	26	0.7	32
Plum juice	0.3	-	16.1	65	-	0.02	0.04	0.6	6	-	-	-	-
Apple juice	0.5	-	11.7	47	-	0.01	0.01	0.1	2	8	5	0.2	9
Apple jam	0.4	-	65.3	247	-	0.01	0.02	-	0.5	14	7	1.8	9
Dried plum	2.3	-	65.6	264	-	0.1	0.2	1.5	3.0	80	102	15.0	83
Dried apples	3.2	-	68.0	273	-	0.02	0.04	0.9	2.0	111	60	-	77

Date_____

Practical class

Method of determination and hygienic estimation of nutritious status by the index of the organism

Learning objective

1. To master the methods of detection and assessment of the vitamin sufficiency in the organism and the methods and measures of hypo- and avitaminosis prevention.

You should kno :

1. Classification and physiological significance of vitamins in the organism.
2. The most frequently occuring hypovitaminosis states in cases of both individual and collective nutrition. Their causes.
3. Avitaminosis and its clinical features.
4. Hygienic principles of prophylaxis of hypovitaminosis and avitaminosis.

You should have the following skills:

1. To detect hypo- and avitaminosis in cases of both individual and collective nutrition.

2. To organize taking measures to prenent hypovitaminosis and assess their effectiveness.

3. To reveal the deficit of vitamins in the human organism by determination of the quantity of vitamin C in urine and to estimate the results.

Urine sampling for analysis.

1.The second sample of urine was taken by laboratory assistant_____ from _____ children in a boarding-school

_____

2. Determination of vitamin C in urine

2.1 . Method of determination_____

2.2.Principle of the method_____

2.3. Chemical reaction of determination_____

_____

2.4. Chemical reagents for the determination of vitamin C and laboratory utensils

_____

_____

_____

_____

_____

_____

_____

_____

Result of the "direct" experiment Xd _____

2.5 "blind" experiment_____

_____

_____

Result of the "blind" experiment Xb _____

2.5.1. correction factor for Tillman's reagent titer K

_____

_____

_____

2.6. Calculation of daily excretion of vitamin C with urine .

$$DE = \frac{(Xd - Xb)}{5} \frac{Kx0{,}088x1150}{} \quad \text{═══} \quad \text{———} \quad = (\text{mg/day})$$

where :

- **0.088** – equivalent of Tillman's reagent (1 ml of 0.001N solution) by ascorbic acid;
- **1150** – average daily diuresis (ml):
- **5** – volume of urine under study (ml).

Conclusion_____

_____

_____

_____

_____

_____

_____

_____

_____

<u>Test questions</u>

1. The physiological role of vitamins and hygienic norm of vitamins in daily ration.
2. Main food sources of vitamin C in nutrition.
3. Etiology, pathogenesis, clinical picture of avitaminosis and hypovitaminosis C.
4. Methods of vitamin C sufficiency control in the human organism.
5. Method of vitamin C determination in urine (by Tillman's reagent).
6. Methods of prophylaxis of avitaminosis and hypovitaminosis C.

Signature of Lecturer_____ **Signature of Student** _____

Date _____

Practical class

Hygienic assessment of vitamin value of food stuffs. Determination of the contents of vitamin C content in some alimentary products.

The purpose of study:

_____

_____

Work report:

Note: $x = \frac{nFN \times 100 \times 0{,}088}{ap}$

Determination of ascorbic acid by the titer method with Tillman's reagent.

_____
_____
_____
_____
_____
_____
_____
_____

Conclusion:

What is the level of vitamin C in potatoes? _____ (norm: 20mg/100g of product)

What is the level of vitamin C in boiled potatoes?_____

What is the level of vitamin C in onions?_____(norm: 10mg/100g of product)

What is the level of vitamin C in cabbages? _____(norm: 30mg/100g of product)

What is the result of the Nesterov test? _____(norm: to 15 red points)

What is the result of the Tillman's test?_____

Signature of Lecturer_____ Signature of Student _____

Date_____

Practical class

Hygienic examination of quality of some food stuffs (sanitary test).

Expert assessment of food products according to their laboratory analysis.

Objective:

1. To master the methods of food product quality and freshness assessment according to their organoleptic criteria and laboratory analyses results.

You should know:

1. Organoleptic criteria of food product quality and freshness.
2. Principles of hygienic regulation of food product quality and freshness.
3. Full value indices and deterioration indices of main food products.

You should have the following skills:

1. Food stuffs and ready meals, sampling, their sending to a laboratory for analysis, filling in the accompanying form.
2. Assessment of organoleptic quality and deterioration indices of food products.
3. Using the State Standards and other normative documents during the assessment of the results of food products and ready meals laboratory analysis.
4. Making the expert conclusion according to these results.

The purpose of study :

_____
_____
_____
_____

Work report:

Explain what the hygienic importance of milk is?

_____
_____
_____
_____
_____
_____
_____

What kinds of counterfeit milk occur?

_____
_____

Result table

Organoleptic property	Test 1	Test 2	Test 3	Test 4	Test 5	Norm
taste						
color						
smell						
density						1.027-1.034
soda						-
starch						-
Acidity						20-25˚T

Conclusion:_____
_____
_____
_____
_____
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_____

Signature of Lecturer_____ Signature of Student _____

Determination of main properties of milk quality

1.Sampling of milk for analysis.
The sample of milk was taken by _____
(who) from _____ (where, when) for analysis in the amount of _____
Producer _____
Shelf life
_____

2. Results of the analysis:
1. Organoleptical properties:
2. color _____
3.smell
_____
4. taste
_____
5.aftertaste
_____
6. consistence
_____
7. mechanical admixture
_____

3. Physical properties:
1. temperature
_____
2. Density (readings of lactodensimeter) q
_____
Density (with correction for temperature) qt
_____

4. Chemical composition:
1. acidity
_____
_____
_____
_____
2.quantity of fats F
_____
_____
_____
_____

3. dry residue by Farrington's formula

$$X = \frac{4.8F + A}{4} + ... + 0.5 = (\%)$$

Where:

- **A** – specific gravity of the milk (only two last figures)
- **F** – quantity of fats (%)

5. Falsification of milk:

1 Determination of sodium carbonate

_____
_____
_____

2 Determination of starch

_____
_____
_____

3. Bacteriological indices:

4. microbial number

_____

5. coli-titer _____

6. titer of pathogenic microbes

_____
_____
_____

Conclusion:

_____
_____
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Signature of Lecturer_____ Signature of Student _____

Table for recalculation of milk density

Reading of lactodensi-meter	Specific gravity of milk at 20^0 C										
	Temperature of milk										
	15	16	17	18	19	20	21	22	23	24	25
25.0	23.4	23.7	24.0	24.4	24.7	25.0	25.3	25.6	26.0	26.3	26.6
25.5	23.9	24.2	24.5	24.9	25.2	25.5	25.8	26.1	26.5	26.8	27.1
26.0	24.4	24.7	25.0	25.4	25.7	26.0	26.3	26.6	27.0	27.3	27.6
26.5	24.9	25.2	25.5	25.9	26.2	26.5	26.8	27.1	27.5	27.8	28.1
27.0	25.4	25.7	26.0	26.4	26.7	27.0	27.3	27.6	28.0	28.3	28.6
27.5	25.9	26.2	26.5	26.9	27.2	27.5	27.8	28.1	28.5	28.8	29.1
28.0	26.4	26.7	27.0	27.4	27.7	28.0	28.3	28.6	29.0	29.3	29.6
28.5	26.9	27.2	27.5	27.9	28.2	28.5	28.8	29.1	29.5	29.8	30.1
29.0	27.4	27.7	28.0	28.4	28.7	29.0	29.3	29.6	30.0	30.3	30.6
29.5	27.9	28.2	28.5	28.9	29.2	29.5	29.8	30.1	30.5	30.8	31.1
30.0	28.4	28.7	29.0	29.4	29.7	30.0	30.3	30.6	31.0	31.3	31.6
30.5	28.9	29.2	29.5	29.9	30.2	30.5	30.8	31.1	31.5	31.8	32.1
31.0	29.4	29.7	30.0	30.4	30.7	31.0	31.3	31.6	32.0	32.3	32.6
31.5	29.9	30.2	30.5	30.9	31.2	31.5	31.8	32.1	32.5	32.8	33.1
32.0	30.4	30.7	31.0	31.4	31.7	32.0	32.3	32.6	33.0	33.3	33.6
32.5	30.9	31.2	31.5	31.9	32.2	32.5	32.8	33.1	33.5	33.8	34.1
33.0	31.4	31.7	32.0	32.4	32.7	33.0	33.3	33.6	34.0	34.3	34.6
33.5	31.9	32.2	32.5	32.9	33.2	33.5	33.8	34.1	34.5	34.8	35.1
34.0	32.4	32.7	33.0	33.4	33.7	34.0	34.3	34.6	35.0	35.3	35.6
34.5	32.9	33.2	33.5	33.9	34.2	34.5	34.8	35.1	35.5	35.8	36.1
35.0	33.4	33.7	34.0	34.4	34.7	35.0	35.3	35.6	36.0	36.3	36.6
35.5	33.9	34.2	34.5	34.9	35.2	35.5	35.8	36.1	36.5	36.8	37.1
36.0	34.4	34.7	35.0	35.4	35.7	36.0	36.3	36.6	37.0	37.3	37.6

Hygienic estimation of bread quality

1. Sampling of bread for analysis

The sample of bread _____ was taken by the _____
(name of bread) (who)
From _____
(where, when)
for analysis in the amount _____
Producer _____

2. Results of the analysis:

- outward appearance:
  - surface _____
  - color _____
  - crust _____
  - shape _____

3.State of crumb:

- quality of being baked through _____
- elasticity _____
- freshness _____

4. Determination of organoleptic properties:

- taste _____
- aftertaste _____
- smell _____
- Determination of physical properties: 2.4.1 porosity
  _____
  _____
  _____
  _____
  _____
  _____
- humidity _____
  _____
  _____
  _____
  _____

- **5. Determination of chemical properties:**
  acidity
  _____
  _____
  _____
  _____
  _____
  _____
  _____
  _____

Conclusion:

Signature of Lecturer_____ Signature of Student _____

1. Sampling of meat for analysis

The sample of meat _____
was taken for analysis in _____
(pork, beef or other) _____
when_____
in the amount of _____

2. Results of the analysis:

appearance and color of the surface

_____
_____

consistence _____

_____

smell _____

_____

state of muscles_____

_____

state of fat _____
state of tendons_____

_____

transparency and smell of broth

_____
_____

3. Chemical analysis for freshness of meat

determination of ammonia

_____
_____
_____

determination of hydrogen sulfide

_____
_____
_____

4. Helminthological analysis

measles analysis (pork measles)

_____
_____

trichinella analysis (porkworm)

_____
_____
_____

Conclusion:

_____
_____
_____
_____
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_____

Test questions

1. Nutritive value of milk.
2. The main hygienic requirements to milk quality.
3. Methods of determination of organoleptic indices of milk quality.
4. Methods of determination of physical and chemical indices of milk quality.
5. Methods of determination of bacteriological indices of milk quality.
6. Methods of determination of falsification of milk (by sodium carbonate and starch).
7. Nutritive value of bread.
8. Hygienic standards of bread quality.
9. Methods of determination of organoleptic properties of bread.
10. Methods of determination of physical properties of bread.
11. Methods of determination of chemical properties of bread.
12. Nutritve value and classification of meat.
13. Hygienic demands to meat quality.
14. Method of determination of organoleptic properties of meat.
15. Chemical analysis for freshness of meat.
16. Methods of bacteriological and helminthological analysis of meat.

Signature of Lecturer_____ Signature of Student _____

Date_____

Practical class

Investigation of food poisoning of microbial etiology.

Objective

1.To master the knowledge of food poisonings, their etiology, clinical picture, methods of investigation, general and specific prophylaxis.

You should know :

1. Definition of "food poisoning" and its classification.
2. Food poisoning etiology, pathogenesis, clinical picture and prevention.
3. Sanitary-hygienic feautres of food poisonings of microbial etiology and their prophylaxis.

***You should have the following skills*:**

1. To determinine the type of food poisoning and its cause, to provide medical care in these cases.
2. To organize investigation and determination of the cause (food product or meal) of food poisoning of microbial origin.
3. Organizing preventive measures for elimination of food poisoning causes and food poisoning prevention.
4. Practical implimentation of food poisoning investigation (food product or dish).

Main causes of food toxicoinfections

<table>
<tr><th>Sources of infectioning of food products</th><th>Vielation of technological processes in food cooking</th><th>Violation of norms sanitary and hygienic conditions in storing and trading of food products</th></tr>
<tr><td>Sick animals.</td><td rowspan="3">Insufficient thermal treatment of food products (meat, fish, and so on).</td><td rowspan="2">Delay in realization of ready food storing.</td></tr>
<tr><td>Polluted water.</td></tr>
<tr><td>Polluted utensils.</td><td rowspan="2">Storage of cooked food under high temperature conditions.</td></tr>
<tr><td rowspan="2">Polluted equipment.</td><td rowspan="2">Insufficient sterilization of tinned food.</td></tr>
<tr><td rowspan="2">Storage of boiled food in thick layers.</td></tr>
<tr><td>Polluted transport.</td><td>Insufficient pasteurization.</td></tr>
<tr><td>Polluted rooms of food department.</td><td rowspan="2">A small quantity of preservatives (antiseptics, sugar, vinegar, salt and others</td><td>Storage of cooked food under unsanitary conditions</td></tr>
<tr><td rowspan="2">Infected food products.</td><td rowspan="4"></td></tr>
<tr><td>Carriers of bacilli:
humans, cats, dogs, poultry.</td></tr>
<tr><td>Carriers of microbes:
flies, etc.</td></tr>
<tr><td>Breaking the rules
of personal hygiene.</td></tr>
</table>

Situational problem 1

Students living in the neighboring rooms of a dorm became sick. During the investigation it was found out, that the disease began on the 12.09.20__ after a "beer" party where one of the students brought dried fish bought in a spontaneous street market near the underground. In addition to the fish, the young men ate chips and crackers, bongt at a kiosk.

2 persons out of 6 participants, were sick. At night, 5 hours after the fish had been eaten, all of them had nausea, headache, stomach ache, dryness in the mouth, and one of the students had numerous vomiting. The next day a sharp deterioration of sight, hallucination, infringement of swallowing were noted. One of the students had an absolute speech disturbance (aphonia). The body temperature was normal. At 12 o'clock the both victims were hospitalized in a grave condition.

Food poisoning investigation certificate

1. Date (year, month, date) of food poisoning

_____

2. Number of sick people

_____

3. Contingent of sick people

_____

_____

_____

4. Main clinical symptoms of the disease_____

5. Duration of the disease, its severity_____

6. Number of hospitalized persons

_____

_____

7. Number of persons who have sick-leave certificates

_____

_____

8. Detailed information on patient's food intake during the last two days

_____

_____

_____

_____

9. How many hours passed between the last meal and the first symptoms of the disease?

_____

_____

_____

10. Possible reasons of the disease: what are the most probable food stuffs that could cause this disease?

_____

_____

_____

11. Supposed origin of disease (microbial or non-microbial)

_____

_____

_____

12. Sanitary characteristics of cooking conditions (quality of products, their storage conditions, transportation, and so on)

_____

13. What meals and foodstuffs must be withdrawn from the use and sent for laboratory analysis?

14. What samples should be taken for analysis?

15. After determining the reasons of the disease the following measures should be taken to treat it

16. The final conclusion about the nature (origin) of the disease, its reasons, therapeutic measures and prophylaxis can be drawn after receiving the laboratory analysis results

Situational problem 2

The disease began on 17.11.20__ after celebrating a birthday in a student's group for which a cream cake, some chocolates and oranges were bought at a confectionery shop. In 2 hours 6 out of 10 persons, who participated in the tea party, felt sick and had fever, nausea, a sharp pain in the upper part of the abdomen. Two girls experiemed uncontrollable vomiting and diarrhea were marked in two girls. One of them was in a state of collapse when she was delivered to the hospital by the ambulance. The condition of the others started to improve and in 6-8 hours the symptoms were controlled.

Protocol of food poisoning investigation

1. Date (year, month, date) of a food poisoning

2. Number of sick people

3. Contingent of sick people

4. Address

5. Main clinical symptoms of the disease

6. Duration of the disease, its severity

7. Number of hospitalized persons

8. Number of persons who have sick-leave certificates

9. Detailed information on patient's food intake during the last two days

10. How many hours passed between the last meal and the first symptoms of the disease?

11. Possible reasons of the disease: what are the most probable foodstuffes that could cause this disease?

12. The supposed nature (origin) of disease (microbial or non-microbial)

13. Sanitary characteristics of cooking conditions (quality of food stuffs, their storage conditions, transportation, and so on)

_____
_____
_____

14. What food stuffs must be withdrawn from the use and sent for laboratory analysis?

_____
_____
_____

15. What samples should be taken for analysis?

_____
_____
_____

16. After determining the reasons of the disease the following measures should be taken to treat it_____
_____
_____

17. The final conclusion about the nature (origin) of the disease, its reasons, therapeutic measures and prophylaxis can be drawn after receiving the laboratory analysis results

_____
_____
_____
_____

Test questions

1. The notion of food poisonings and their classification.
2. The main features of food poisoning.
3. Causes of food toxic infections.
4. Sanitary and epidemiological features of toxicoinfections and their prophylaxis.
5. Sanitary and epidemiological features of food toxicoinfections caused by spore-producing microorganisms and their prophylaxis.
6. Sanitary and epidemiological features of staphylococcus toxicosis and its prophylaxis.
7. Sanitary and epidemiological features of botulism and its prophylaxis.
8. Mycotoxicosis, its classification and prophylaxis

Signature of Lecturer_____ Signature of Student _____

Date _____

Practical class

Food poisonings and their prophylaxis

The purpose of study:

_____
_____
_____

Work report:

Case problem_____
_____
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_____
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Conclusion:

_____
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_____
_____

Signature of Lecturer_____ **Signature of Student** _____

HYGIENE OF THE AIR ENVIRONMENT

Date _____

Practical class

Hygienic evaluation of microclimate of different rooms.

Methods of determining the temperature, humidity and air movement direction and velocity indoors.

The purpose of study:

_____

_____

_____

Work report:

1. Determination of humidity in the room:

a) ***August*** psychrometers:

Absolute humidity ($A = f-\alpha (t-t_1) B$)_____

Relative humidity,% ($R = \frac{A \times 100}{F}$, and according to)_____

2. Speed of movement of air currents in the room _____ m / s

3. Atmospheric pressure _____ mm Hg.

Height from the floor , m	**temperature on the diagonal, ºC**			**temperature difference on the horizontal °C**
	from the inner wall	**the center of the room**	**the outer wall**	
0.1				
1.0				
1.5				
temperature difference on the vertical				

Conclusions and proposals to improve the microclimate

_____

_____

See annex - Determination of the relative humidity based on the Assmann psychrometer data, %

Relative Humidity %

Dry Bulb Temperature (Celsius)	Difference Between Wet-bulb and Dry-bulb Temperatures (°C)															
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
-20	100	28														
-18	100	40														
-16	100	48														
-14	100	55	11													
-12	100	61	23													
-10	100	66	33													
-8	100	71	41	13												
-6	100	73	48	20												
-4	100	77	54	32	11											
-2	100	79	58	37	20	1										
0	100	81	63	45	28	11										
2	100	83	67	51	36	20	6									
4	100	85	70	56	42	27	14									
6	100	86	72	59	46	35	22	10								
8	100	87	74	62	51	39	28	17	6							
10	100	88	76	65	54	43	33	24	13	4						
12	100	88	78	67	57	48	38	28	19	10	2					
14	100	89	79	69	60	50	41	33	25	16	8	1				
16	100	90	80	71	62	54	45	37	29	21	14	7	1			
18	100	91	81	72	64	56	48	40	33	26	19	12	6			
20	100	91	82	74	66	58	51	44	36	30	23	17	11	5		
22	100	92	83	75	68	60	53	46	40	33	27	21	15	10	4	
24	100	92	84	76	69	62	55	49	42	36	30	25	20	14	9	4
26	100	92	85	77	70	64	57	51	45	39	34	28	23	18	13	9
28	100	93	86	78	71	65	59	53	47	42	36	31	26	21	17	12
30	100	93	86	79	72	66	61	55	49	44	39	34	29	25	20	16

Table of tangents

tgα	<α^0	tgα	<α^0	tgα	<α^0	tgα	<α^0
0.0175	1	0.2867	16	0.6009	31	1.0355	46
0.0349	2	0.3056	17	0.6249	32	1.1106	47
0.0524	3	0.3249	18	0.6494	33	1.1918	48
0.0699	4	0.3443	19	0.6745	34	1.2799	49
0.0875	5	0.3640	20	0.7002	35	1.3764	50
0.1051	6	0.3839	21	0.7265	36	1.4826	51
0.1228	7	0.4040	22	0.7536	37	1.6003	52
0.1405	8	0.4245	23	0.7813	38	1.732	53
0.1584	9	0.4452	24	0.8098	39	1.881	54
0.1763	10	0.4663	25	0.8391	40	2.050	5
0.1944	11	0.4877	26	0.8693	41	2.246	56
0.2126	12	0.5095	27	0.9004	42	2.475	57
0.2309	13	0.5317	28	0.9325	43	2.747	58
0.2493	14	0.5543	29	0.9657	44	3.078	59
0.2679	15	0.5774	30	1.0000	45	3.487	60

Learning objective

1. To substantiate the hygienic significance of microclimate for different premises (residential, public/social, industrial) and to master the measurement and hygienic assessment of its following parameters: air temperature, radiant temperature, relative humidity, air velocity.
2. To master, complement and systematize the students' knowledge about the hygienic significance of the atmospheric and indoor air movement direction and speed as the microclimate factor in residential, public and industrial premises.
3. To master the methods of determination and hygienic assessment of the air movement direction andspeed.

You should know:

- Definition of «microclimate» and factors, which influence its formation.
- Physiological bases of human heat exchange and thermoregulation, their dependence on themicroclimate: physiological reactions in the comfortable or uncomfortable (hot or cold) microclimate.
- Hygienic significance of the atmospheric and indoor air, its role in the microclimate formation and mechanisms of the organism heat exchange.
- Methods and devices for determination of the air movement direction and speed outdoors and indoors.

You should have the following skills :

- To measure the indoor air temperature, radiant temperature, air humidity and to assess the temperature and humidity conditions of different premises (residential, public/social, industrial).
- To determine the air movement direction and speed, wind strength.
- To draw the hygienic conclusions and to assess the results of the outdoor and indoor air movement direction and speed measurement

I. Measurement of the air temperature in the class-room:

1. Devices used for the measurement_____

_____

2. The place the measurement is taken _____

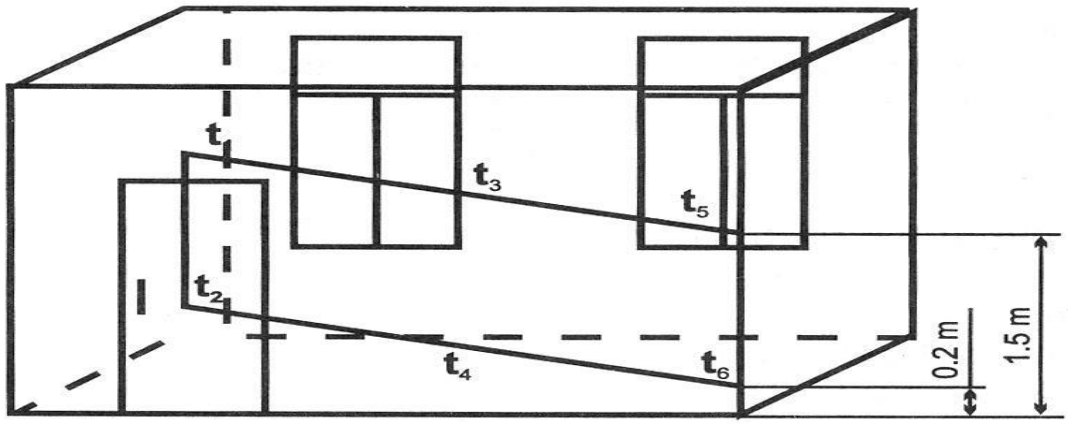
3.Points and results of the measurements along the horizontal and vertical line

_____

_____

_____

t_1(h=1.5m) = _____°C
t_2(h=0.2m) = _____°C
t_3(h=1.5m) = _____°C
t_4(h=0.2m) = _____°C
t_5(h=1.5m) = _____°C
t_6(h=0.2m) = _____°C



1.4. Calculation of the average temperature:

Total $\sum t_6$ =

$$t_{av} = \frac{\sum tb}{n},$$

1.5. Calculation of the temperature differences.

- on the vertical line

$$t_v = \frac{t_1 + t_3 + t_5}{3} + \frac{t_2 + t_4 + t_6}{3} =$$

- on the horizontal line

$$t_h = \frac{t_5 + t_6}{2} + \frac{t_1 + t_2}{2} =$$

II.The measurement of the air humidity.

1. Devices used for the measurement of air humidity_____
_____
_
2. Place the measurement is taken_____
3. The measurement of the relative humidity:_____
4. with the help of the hygrometer: R = %_____
5. with the psychrometer by the table:
- reading of the "dry" thermometer t d.t. = ^{o}C_____
- reading of the "wet" thermometer t w.t. = ^{o}C_____
- result by the table R = % in the table._____

III. Conclusion

_____
_____
_____
_____
_____
_____
_____

IV. The measurement of atmospheric pressure

1. Devices for the measurement_____
2. Place where the measurement is taken_____
3. Result of the measurement

_____

***V.*Conclusion**_____
_____
_____
_____
_____

VI. Measurement of air velocity outdoors

1. Devices for the measurement

_____

2.The place where the measurements is taken

Indices of anemometer: before the measurement

after the measurement

the time of the measurement

Calculation the anemometer rotations number per second

4. Determining the air movement velocity by the graph

VII. Measurement of the air movement velocity indoors.

1. Devices for the measurement
2. The place the measurement is taken

the time when the alcohol falls down from 38° to 35° C

F is the factor of catathermometer

Q_1 is the average temperature of catathermometer

_____

_____

Q_2 is the air temperature in the room

_____

_____

H is cooling ability of air

$$_H = \frac{F}{t} =,$$

Q = Q_1 - Q_2 =

4. Determining the velocity of air movement V

_____

_____

4.1. using the table

$\frac{H}{Q}$ _____, V = _____

4.2. by the formula

$$V = \left(\frac{\frac{H}{Q} - 0{,}20}{0{,}40} \right)^2 =$$ _____for the air movement less than l m/s

$$V = \left(\frac{\frac{H}{Q} - 0{,}13}{0{,}47} \right)^2 =$$ _____for the air movement more than l m/s

Conclusion_____

_____

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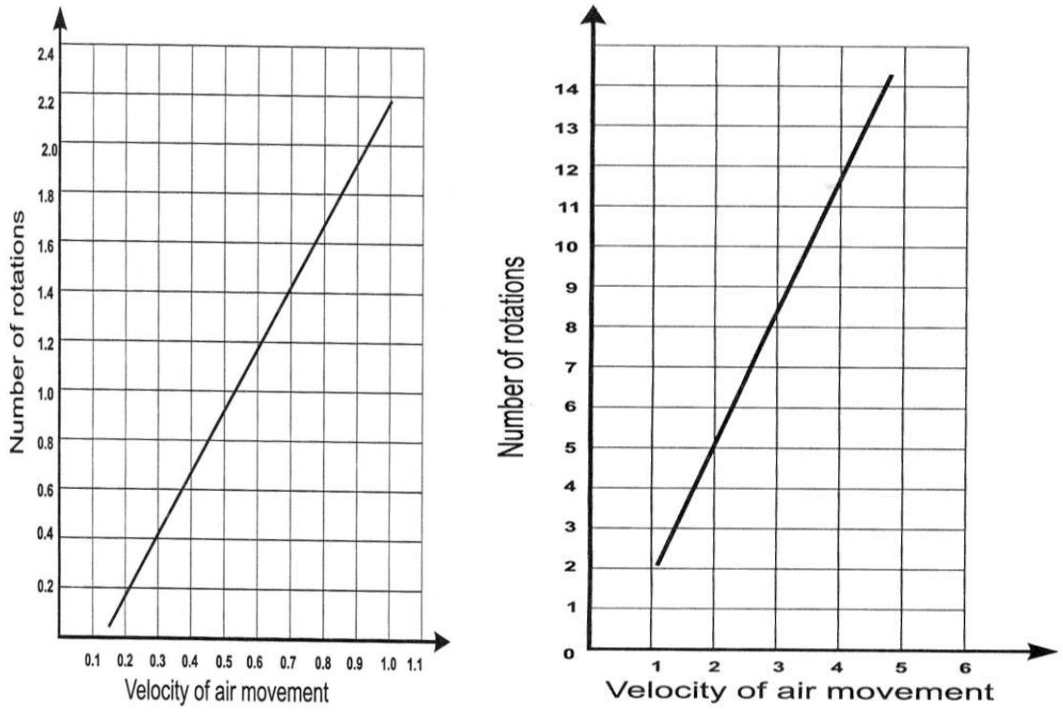
_____

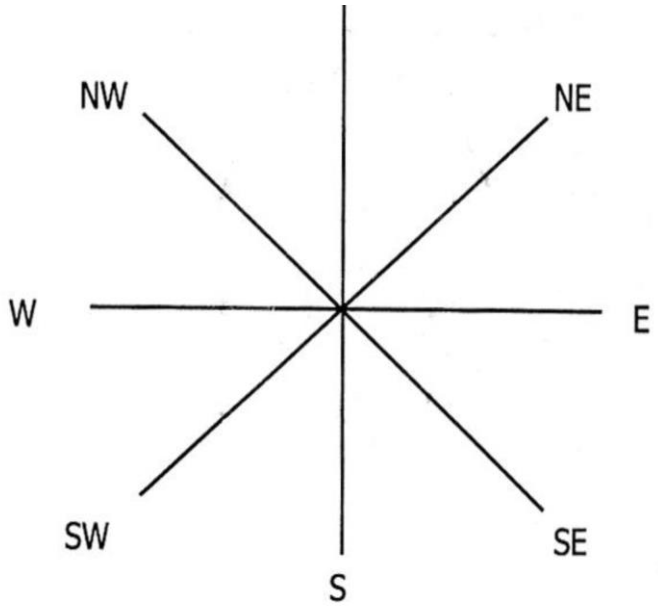
Graph for determining the air movement velocity



from 0.3 to 1 m/s from 1 to 5 m/s

7. Hygienic estimation of the air movement direction

Situational problem



In the given place the wind blows over the year:

1. The north wind was blowing for 90 days, North-West wind was blowing for 45 days,
2. The west wind was blowing for 30 days,
3. The south-West wind was blowing for 40 days,
4. The south wind was blowing for 30 days,
5. The south -East wind was blowing for 30 days,
6. The east wind was blowing for 30 days,
7. The north-East wind was blowing for 45 days,
8. Days without wind - 25.

Draw the "wind-rose"
S: l cm corresponds to 20 days

Answer the following questions:

1.What wind direction prevails in this place?
2.Where must living zone be built?
3.Where must industrial enterprises be built?

Conclusion_____
_____
_____
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Signature of Lecturer_____**Signature of Student**_____

Test questions

1. The mechanism of thermoregulation in the human organism and ways of heat transmission.
2. Influence and prophylaxis of high and low temperatures of the environment on the human organism.
3. Rules of measuring the air temperature indoors.
4. Influence of high and low temperatures with high humidity on the human organism.
5. Prophylaxis of low and high humidity effects on the human organism.
6. Kinds of air humidity.
7. Methods of measuring absolute and relative air humidity.
8. Physiological and hygienic significance of atmospheric pressure.
9. Low and high atmospheric pressure, its influence on the human organism.
10. Methods of measurement of atmospheric pressure. Devices for its measurement.
11. Physiological and hygienic significance of air movement.
12. Methods of measurement of air velocity outdoors. Devices used for its measurement.

Signature of Lecturer_____ Signature of Student _____

Date _____

Practical class

Methods of hygienic evaluation of complex influece of microclimate on human heat exchange.

Objectives:

1. To master the methods of hygienic assessment of the effects of microclimate on human heat exchange using subjective and objective physiological parameters.
2. To master the objective methods of assessment of the effects of microclimate on human heat exchange using the effective temperature (ET), the equivalent-effective temperatur (EET), resultant temperatures (RT) nomograms, the catathermometer method and the organism heat balance calculation.

You should know:

1. The main thermodynamical and physiological principles of human heat exchange and thermoregulation (based on biophysics, biochemistry and physiology knowledge).
2. Hygienic significance of microclimate in different types of premises, its variants and characteristics.
3. Influence of comfortable and uncomfortable (hot and cold) microclimate on the human body.
4. Subjective and objective features characteristics of the organism heat balance.

You should have the following skills:

1. To measure and assess the microclimate features (air temperature, radiant temperature, air humidity and air movement).
2. To measure and assess influence of microclimate on physiological parameters of the organism heat exchange and thermoregulation (respiratory rate, heartbeat rate, blood pressure, body and skin temperature, sweating intensity, skin electroconductivity), to evaluate the subjective temperature sensation of the patient.

Situational problem

Problem # 1

The indoor air temperature is 25^0C according to the dry thermometer and 19^0C according to the wet thermometer of the Assman`s psychrometer, the indoor air movement is 1 m/sec. Determine the indoor equivalent-effective temperature and make a conclusion about the organism heat balance.

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Problem # 2

The indoor air temperature is 30^0C according to the dry thermometer of the Assman`s psychrometer, indoor air movement is 0.8 m/sec, the absolute humidity is 12 Hg mm, the average radiant temperature is 25^0C. A man has a hard physical job. Determine the indoor resultant temperature and make a conclusion about the organism heat balance.

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Problem # 3

Give the hygienic assessment of the microclimate in a class-room: - the average temperature is 22°C, - the difference of the temperature on a vertical is 5.5°C, on a horizontal is 2°C, - the reading of the dry thermometer of the psychrometer is 21 °C, - the reading of the wet thermometer is 18°C; - the period of time when the alcohol in the catathermometer drops from 38°C to 35°C is 128 seconds, - the factor of the catathermometer (F) is 615.

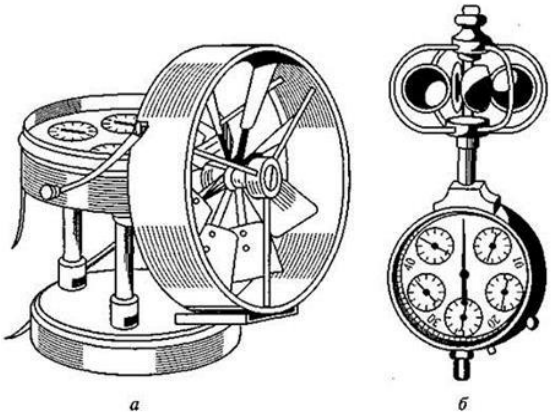
Problem #4

Give the hygienic assessment of microclimate in a secondary school gym: - the average temperature is 19°C, the difference of the temperature on a vertical is 2°C, on a horizontal is 3.5°C; - the reading of the dry thermometer of the psychrometer is 20°C, the reading of the wet thermometer is 12°C; - the period of time when alcohol in the catathermometer drops from 38°C to 35°C is l min 42sec, - the factor of the catathermometer (F) is 615.

Problem #5

Give the hygienic assessment of microclimate of a therapeutic ward for adults. It is characterized by the following parameters: - the average temperature is 24°C, - the temperature difference on a vertical is 3°C, the temperature difference on horizontal is 1.5°C; - reading of the dry thermometer of the Assman's psychrometer is 24°C, - reading of the wet thermometer is 17°C; - the period of time when alcohol in the catathermometer drops from 38 °C to 35°C is 133 seconds, - the factor of the catathermometer (F) is 615.

Name the devices in the picture and indicate the scope of application.



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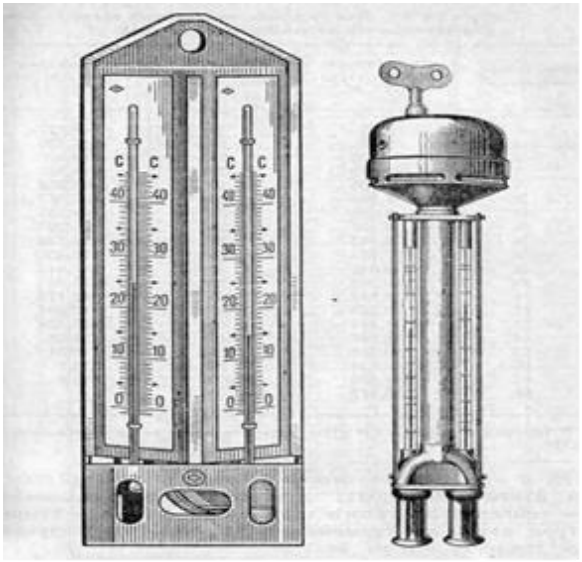


750
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760
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770
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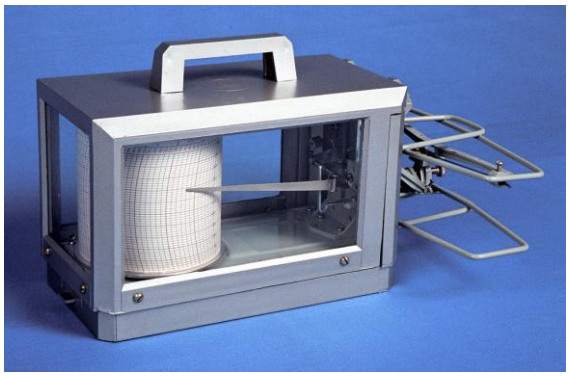
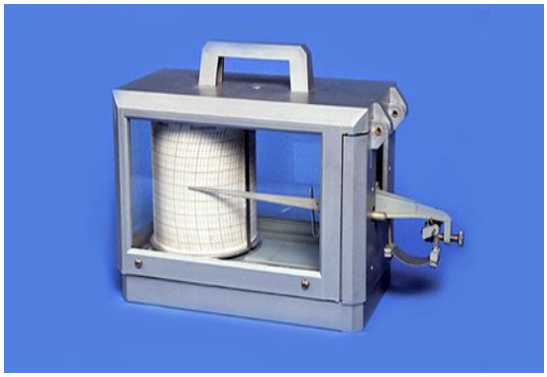
800
Нормальное
Низкое
Высокое





Test questions:

1. The factors, forming the microclimate.
2. Kinds of the microclimate.
3. Physiological principles of heat exchange in the human being and its connection to the microclimate of the environment.
4. Complex influence of physical factors of the atmospheric air on the heat exchange in humans.
5. Cooling microclimate and its influence on the human organism. Meteorological conditions that cause cooling.
6. Heating microclimate and its influence on the human organism. Conditions that cause heating.
7. General methods of hygienic study and assessment of microclimate in the rooms. Norms of the temperature, humidity and velocity of air movement in dwellings, hospital rooms, class-rooms, and so on.
8. Assessment methods of the indoor microclimate influence on humans: the catathermometer method, the methods of effective temperature nomograms, equivalent-effective temperature, resultant temperature, their comparative hygienic characteristics.

Signature of Lecturer_____ Signature of Student _____

Date _____

Practical class

Air pollution with chemical substances and dust. Determination of the chemical substances in air by means of express- methods.

The purpose of study:

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Work report:

1. Methods of taking air samples:

   _____
   _____
   _____

2. Express method of determining toxic substances in the air:

   _____
   _____
   _____

3. Conditioning of the air volume:

   _____
   _____
   _____

4. Methods of determining CO_2 :

   principle of the method_____
   _____
   _____
   _____

Conclusions:_____
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Information note

Methods and devices of the air sampling for chemical analysis

There are two groups of methods – laboratory and express. These methods were elaborated and are widely used in the sanitary inspection units for determination of the air pollution in the atmosphere, indoor and in factory working areas.

The aspiration method of the air sampling is one of the laboratory methods. Using this method of sampling the required air volume is passed through selected absorbing solutions in absorbing devices of different constructions (fig.2) by an aqueous aspirator (fig.1a), a vacuum cleaner or the electrical aspirator (fig.1b). The investigated air is delivered into the absorbing solution through the long tube of this device, then it is passed by short tube of the aspirator. Crystal absorbing reagents located in tubes – allonges of special forms are widely used for this purpose.

The air volume passed through the absorbing solution or the allonge is determined using a gas meter, an aqueous rheometer (fig.3) or a ball rotameter measuring the air aspiration speed in l/min. The gas meter or rheometer is concatenated between the absorbing device and the aspirator. The required air volume is determined for the particular chemical research (analyses) in accordance.

The air sampling for laboratory analyses may be selected in tubes of definite capacities by blowing the investigated indoor air through them, or by pouring the water out from the tube inside the investigated room. Gas pipettes flasks and other devices are used.

The universal gas-analyzer UG-2 (УГ-2), the gas-analyzer GMK-3 (ГМК-3) and other devices may be used for the express methods.

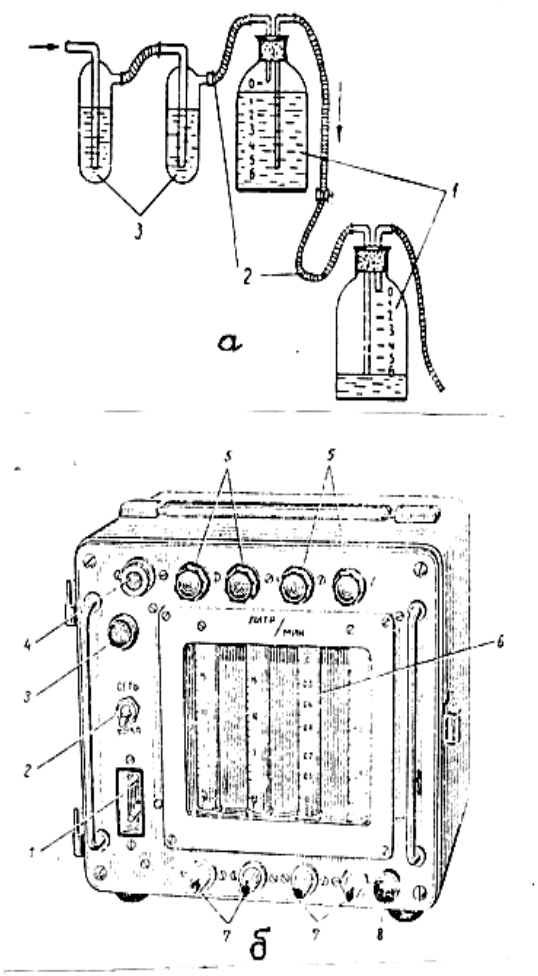

Fig. 1

a – Aqueous aspirator (1), connected by rubber tube (2) with absorbing devices;
b – electrical aspirator "Liot".

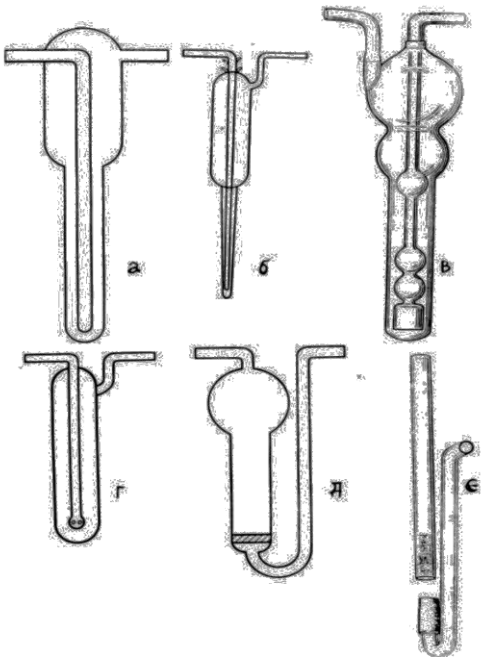

Fig. 2 Absorbing devices for the air sampling with liquid solutions

a) Zaitzev;
b) Polezhaev;
c) Rikhter;
d) Petri;
e) with porous membrane;
f) with crystal reagent.

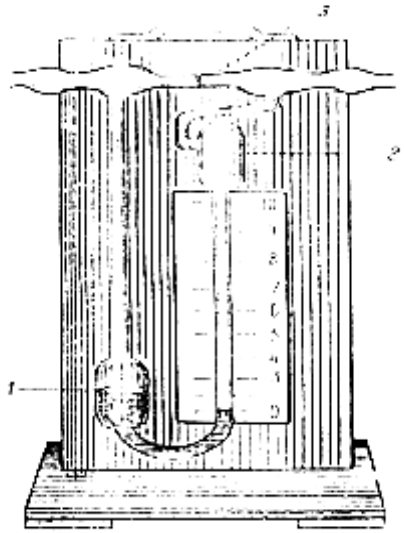

Fig. 3 Aqueous rheometer

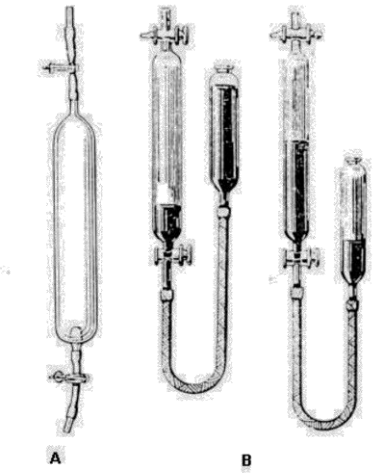

Fig .4 Air sampling into gas pipettes:
a – by air inflow (leak-in) or pouring out; b – by siphon method.

The sample form of the protocol of the air sampling

Date of sampling: _____ year _____ month _____
_____ date _____

1. Name of the manufacture _____
(place of the air sampling)
2. The air research for _____
(to indicate what is determined)
3. Meteorological factors during the air sampling: temperature _____^{o}C, relative air humidity (outside the apartment) _____ %, temperature _____^{o}C, relative air humidity in the air sampling place _____ %
4. Work operations during the air sampling _____
5. Ventilation type, its action _____
6. Absorbing device, its № _____
7. Distance between the device and the source of pollution _____ meters
8. Time of the air sampling: from _____ h _____ min till _____ h _____ min
9. Extending air volume _____ liters
Speed per minute _____ liters
10. The air sampling was done by (name, surname)_____
11. The air sample was sent for analysis to_____
12. Additional information _____

Determination of chemical pollutants in the air using gas-analyzer UG-2 (УГ-2)

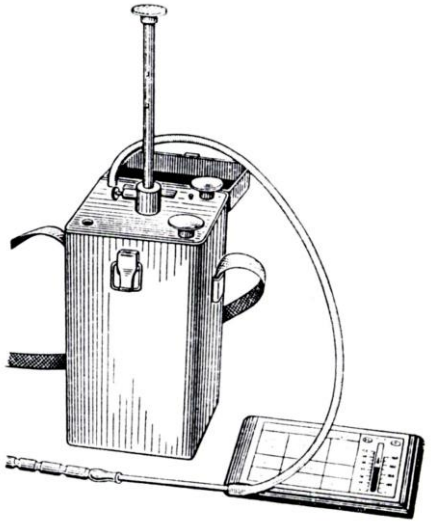

Fig. 5 Universal gas-analyzer UG-2 (УГ-2) with the coloristical scale

The gas-analyzer is built using the linear-colorimetric principle: concentration of a chemical pollutant in the air is determined by the coloring of the indicating reagent in a glass pipe after blowing the certain volume of the investigated air though this. The indicating tube with the reagent is put on to the colorimetric scale. The different scale is provided with the device for each air pollutant. Concentration of the searched substance is pointed on this ruler in mg/m3.

14 chemical pollutants, usually met at manufacture may be determined using this device: ammonia, acetone, acetylene, benzene, benzole, xylol, carbon oxide, nitric oxides, sulfurous anhydride, hydrogen sulfide, toluol, oil hydrocarbons, chlorine, ethylic ether.

Table. 1 Maximum allowable concentrations (MAC) of hazardous substances in the working zone air (extract from the industrial safety standards ―General sanitary and hygienic requirements for the working zone air condition‖

Substance	***MAC, mg/m3***	***Usual aggregate state in factory conditions***	***Hazard type***	***Impact on human***
Acetylene	5	vapours	III	
Ammonia	20	vapours	IV	
Acetone	200	vapours	IV	
Benzene	100	vapours	IV	
Benzole	15/5	vapours	II	Carcinogen
Xylol	50	vapours	III	
Carbon oxide (CO)	20	vapours	IV	Acute effect on the blood
Nitric oxide (recalculation to NO2)	5	vapours	III	Acute effect on the blood
Sulfurous anhydride	1	aerosol	II	
Hydrogen sulfide	10	vapours	II	Acute effect
Toluene	50	vapours	III	Acute effect, allergen
Chlorine	1	vapours	II	Acute effect, allergen
Ethylic ether	10	vapours	III	

in numerator – maximum, in denominator – average monthly

Signature of Lecturer_____ Signature of Student _____

Date _____

Practical class

Sanitary protection of atmospheric air. Hygiene in the planning of inhabited areas. Hygiene of living spaces and public buildings and constructions.

Objective:

1. Strengthen the student's knowledge about chemical composition of the air, the atmospheric and the indoor air pollution sources.
2. Master the main methods of sanitary and chemical analysis of the air samples.
3. Master the methods of the air express analysis using the gas-analyzer UG-2 (УГ-2).
4. Master the methods of the hygienic assessment of the indoor air purity.

You should know :

1. Physiological and hygienic significance of the air components and their influence on the human health and sanitary living conditions.
2. Atmospheric, indoor and working chemical air pollution factors and indices and their hygienic regulation.
3. Classification of the air sampling methods.
4. Principal scheme of the aspiration method of the air sampling for chemical analyses, devices and measures used for this procedure.

Youshould have the following skills :

1. To justify the choice of the air sampling method for sanitary and chemical research.
2. To calculate the air volume required for analysis and to convert its value to the value in the standard conditions. (0°C and 760 mm Hg)

Tasks for self-training:

At home, the student should give definitions to the following terms:

Term	Definition
Sanitary protection of atmospheric air	
District planning	
Practical application of wind-rose	

Class work – solve a situational problem and make the record:

Situational problem 1.

When studying the temperature regimen of the hostel room, it is established: air temperature is 17ºC in the middle of the room 10 sm above the floor, 1 m – 19ºC, 1.5 m – 20ºC. Fluctuations in temperature made 6ºC in the daytime. Area - 30 m², room height - 3 m, carbon dioxide content - 0,2%, the number of people in the room – 10. The air laboratory investigation established: oxidizability - 4 mg/m^3, number of microbs - 5000 CFU, staphylococci -75, streptococci - 20.

Stages of situational task solving	**Results**
1.Hygienic assessment of the situation	
2.Establishing risk factors for individual (collective) health	
3.Prognosis of the consequences of risk factors on the individual (collective) health state	
4.Planning and substantiation of hygienic, prophylactic, improving and rehabilitation measures	
5.Normative provision of the specialist's activity	

Situational problem 2.

In the ward, the temperature of dry thermometer of Assman psychrometer is 26.5 ºC, wet thermometer - 24ºC, barometric pressure - 755 mm Hg. The area of 2-bedded postoperative ward is 20 m^2, height - 3 m. Air exchange is 1.5. Laboratory investigation: air oxidability 1 mg/m^3, microorganism number - 2000 CFU, staphylococci - 25, streptococci- There is one window in the ward, area - 2 m^2, natural illumination 50 lux, the external horizontal illumination is 5000 lux.

Stages of situational task solving	**Results**
1.Hygienic assessment of the situation	
2.Establishing risk factors for individual (collective) health	
3.Prognosis of the consequences of risk factors on the individual (collective) health state	

4.Planning and substantiation of hygienic, prophylactic, improving and rehabilitation measures	
5.Normative provision of the specialist's activity	

Conclision:_____
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Situational problem 3

When studying one-room apartment in a sectional building the following results were obtained: floor - the first, residential area - 32 m^2, living room orientation – north-west, light coefficient - 1/ 6, room height - 2.7 m. The floor and furniture - chipboard, air temperature - 23º, vertical gradient 5º , horizontal - 2º, air velocity - 0.5 m / s, humidity - 20%. There is forced-air heating. The formaldehyde content in the air - 0.1 mg / m^3.

Stages of situational task solving	Results
1.Hygienic assessment of the situation	
2.Establishing risk factors for individual (collective) health	
3.Prognosis of the consequences of risk factors on the individual (collective) health state	
4.Planning and substantiation of hygienic, prophylactic, improving and rehabilitation measures	
5.Normative provision of the specialist's activity	

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Conclision:_____
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Theoretical questions:

1. Chemical composition of atmospheric and exhaled air.
2. Basic sources, criteria and parameters of chemical pollution of atmospheric air, air of residential, public premises.
3. Influence of air pollution with chemicals on human health.
4. Parameters and requirements to air sampling for sanitary-chemical and bacteriological research.
5. Calculation of the minimal volume of air sample necessary for analysis. Units for measurement.
6. Aspiration method of air sampling, devices for air aspiration.
7. Devices for determination of aspirated air volume. Importance and technique of air volume reduction to normal conditions.
8. Absorbing devices, absorbing media, their properties, kinds, destination.
9. Sampling air in vessels of the limited capacity (gas pipettes and others).
10. Concept about express methods (colorimetric, linearly-colorimetric), determination of chemical admixtures in air. Universal gas analyzer UG-2, design and principle of operation. Krotov's device, principle of its operation and ways of application.
11. Living conditions in settlements and human health. Features of formation of the city environment and hygienic aspects of life in a modern city. Urbanization as a socially-hygienic problem.
12. Planning and building of territory of settlement. Principles of functional zoning of territory of settlements, accommodation of inhabited, industrial, building-warehouse and recreational zones in them.
13. Hygienic importance of green plantations.
14. Hygienic importance of microclimate and air environment in inhabited and public buildings.
15. Characteristic of sources of pollution of atmosphere in settlement. Regularities of distribution of pollution in the atmosphere, factors on which the level of air pollution depends. Transformatio.
16. Influence of polluted air on health and conditions of residing of the population.
17. Direct measure on the organism: acute poisonings, chronic, specific and nonspecific diseases
18. Ways and means of prophylaxis of negative influence of polluted atmospheric air on health.
19. The state sanitary supervision over construction of inhabited and public buildings, their sanitary-engineering equipment.

Signature of Lecturer_____ Signature of Student _____

Date _____

Practical class

Methods of invesigation and hygienic evaluation of dustiness and chemical pollution of air in the workplace

Objectives:

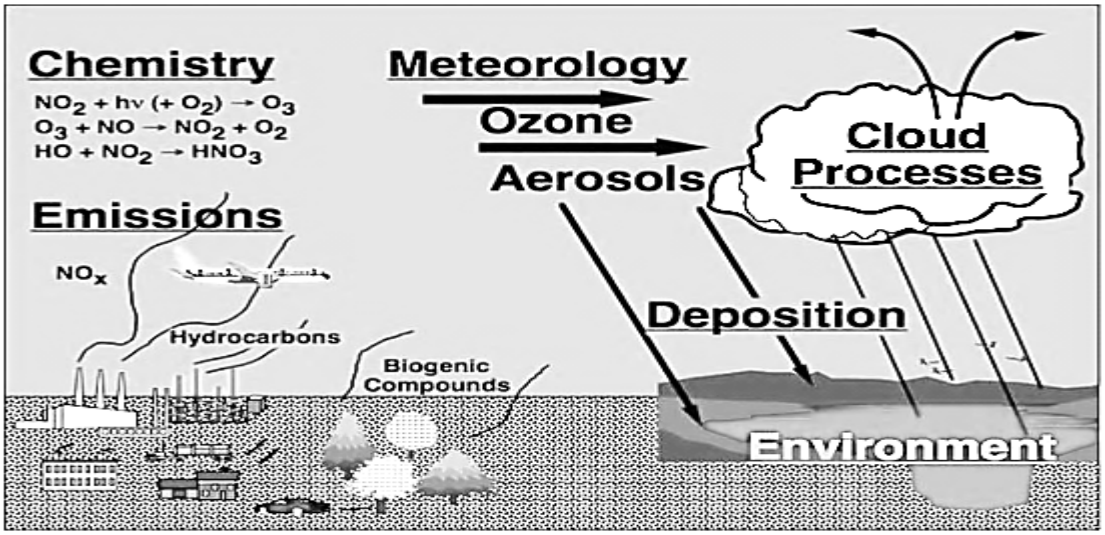
1. To master the knowledge of air pollution sources in industrial premises (dust and harmful chemical substances)
2. To master the basic methods of sampling the work area air for the sanitary-chemical analysis
3. To master the main methods of sanitary and chemical analysis of air samples.
4. To master the techniques of the qualitative and quantitative analyses of dust content of air and the technique of definition of carbon monoxide and sulphureous gas concentration in the air of industrial premises

You should know:

1. Chemical composition of air.
2. Hygienic and pathogenic significance of certian pollutants of air in working zone.
3. Hygienic character of dust, its sources and classifications, influence of dust on the human body,
4. Methods and devices for determination of dust, - sources of carbon monoxide and sulfurous gas,
5. Measures of dust control.

You should have the following skills:

1. Calculating the amount of dust in air
2. Determination of carbon monoxide and sulfurous gas in air
3. Estimating the results of analysis.
4. Substantiation and implementation of out sanitary and hygienic measures to ensore safe working conditions.



Determination and hygienic evaluation of dustiness in air

Situational problem 1

A sample of dust was taken using the method of sedimentation on the porcelain cup of 20 cm2 placed on the roof of a house, which is located on the lee from cement works. Date of experiment. The weight of covering glass before dust sampling is 155 mg. The weight of covering glass after dust sampling is 158 mg. The duration of experiment is 24 hours.

1 Devices for determination

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_____

2.Principle of determination

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3.Date of determination

_____
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4. Area of the slide

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_____

5.Weight of the slide before sampling of dust

_____
_____
_____

6.Weight of the slide after sampling of dust

_____
_____
_____

7.Calculate the quantity of dust settled from the atmospheric air:
1.7.1. in g / m2 •24 hours
1.7.2. in t / km2 •1 year

Conclusion_____
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Situational problem 2

A sample of dust was taken using the method of aspiration on an AFA(analytic filter of aerosole) filter in the industrial area of the city. The air was aspirated through the filter with velocity of 10 L/m. The time of exposition was 30 min. The weight of the AFA filter before the dust sampling was 67mg. The weight of the AFA filter after dust sampling was 67.5 mg. The temperature of air at the moment of dust sampling was 27 °C, the atmospheric pressure was 751 mmHg.

1.Devices for determination
_____
_____
2.Place of the experiment_____
3.Results of determination:

- weight of the AFA filter before dust sampling P_1_____
- 2 weight of the AFA filter after dust sampling P_2_____
- velocity of the air movement using the device_____
- time of exposition_____
- volume of tested air_____
- air temperature at the moment of determination_____
- atmospheric pressure at the moment of determination_____

Reduction of the volume of the tested air to normal condition is calculated using the formula

$$V_{760}^{0} = \frac{V^{t}}{(1+at)} x \frac{B}{760} = - =,$$

$$X = \frac{(P_1 - P_2)x1000}{V_{760}^{0}} = - =,$$

Conclusion_____
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Situational problem 3

There are the following dust particles on the filter AFA:

- Dust particles size up to 2 μ= 30.
- Dust particles size from 2 to 4 μ= 35.
- Dust particles size from 4 to 6 μ= 40.
- Dust particles size from 6 to 10 μ = 25.
- Dust particles size from 10 μ and more in 10.

the amount of dust particules according to the dust formula and draw the conclusion on the degree of dust dispersion. Fill in the table.

Dust formula

Size of dust particles	**up to2 μ**	**from 2 to 4 μ**	**from 4 to 6 μ**	**from 6 to 10 μ**	**more than 10 μ**
Quantity of dust particles (in absolute figures) in%					

Conclusion _____
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3**. Hygienic features of main industrial air pollutants**.

3.1. Carbon monoxide

3.1.1. Sources of carbon monoxide in the industrial air

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_____
_____
_____

3.1.2. Influence of carbon monoxide on the human organism

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_____
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3.2. Sulfurous gas

3.2.1. Sources of sulfurous gas in the industrial air

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3.2.2. Influence of sulfurous gas on the human organism

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Signature of Lecturer_____ Signature of Student _____

Practical work

Determination of carbon monoxide

3.1. Devices for determination_____

3.2. The method of determination

_____

_____

3.3. The principle of the method_____

_____

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_____

_____

3.4. The course of the work

3.4.1. preparation of indicator tubes for analysis_____

_____

_____

3.4.2. aspiration of tested air through the indicator tubes

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_____

3.4.3. visual colorimetry_____

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3.5 Calculation

$$C = \frac{a \times 1000}{n}$$

Where:

- **C** is the quantity of carbon monoxide in air,
- **n** is the number of aspirations,
- **1000** is recalculation in 1 m^3
- **a** is the amount CO on the indicator tube.

Conclusion_____

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Test questions

1. Hygienic significance of chemical composition of air.
2. Carbon monoxide as an air pollutant, sources of carbon monoxide in the air, its toxic effect and allowed concentration.
3. Express-method of evaluation of carbon monoxide using "CO–apparatus".
4. Sulfurous gas as an air pollutant, sources of sulfurous gas in air, its toxic effect and permissible concentration.
5. Prophylaxis of unfavorable influence of carbon monoxide and sulfurous gas on the organism.

Signature of the Lecturer_____ Signature of Student _____

Date _____

Practical class

Methods of hygienic evaluation of physical and chemical factors of microclimate in industrial plants

Objectives:

1. To learn about general hazards caused by industrial environment and occupational injuries and diseases as their consequences.
2. To learn about methods and techniques for determination of the most common types of occupational hazards and their impact on employees' organism and health; about legislative, administrative, technical measures for health protection and prevention of occupational diseases.

You should know:

1. Fundamentals of Moldovian legislation in the field of hygiene and labour protection.
2. Classification and characteristics of occupational hazards.
3. Physiologic, biochemical and pathophysiological signs and beatures of organism's response to occupational hazards.
4. Method of investigation and measures of prophylaxis of occupational diseases and occupational poisonings

You should have the following skills:

1. Determining basic agents of industrial environment and work process that may have negative impact on employees, revealing and assessing the signs of such impact on organism.
2. Substantiation and implimentation of sanitary and hygienic measures to ensure safe working conditions.
3. To draw the act of investigation with a conclusion and recommendations for prophylaxis of occupational diseases and poisonings.

Situational problem

The results of complex investigation of working conditions at the metallurgical plant 2016 June, 15.

1. Determination of industrial microclimate.
   - The air temperature is 30°C
   - Readings of wet thermometer of psychrometer is 14 °C
   - Readings of catathermometer:
   - Factor of catathermometer (F) = 600
   - The time of spirit dropping from + 38°C to 35°C (T) = 2 min 17 sec.
   - Atmospheric pressure (B) = 763 mm Hg
2. Measuring the noise.
   - The level of noise = 85 dBA

3. Assesment of dust quantity in air:
- Weight of filter before the analysis (P1) = 130 mg
- Weight of filter after the analysis (P2) = 130.7 mg
- The time of exposition (a) = 25 l/min; Velocity of aspiration (b) = 5 1 per min

4. Determination of chemical composition of air:
- Concentration of carbon monoxide = 30 mg/m3
- Concentration of sulphureous gas = 7.5 mg/m3

It is necessary to determine parameters of industrial conditions at the workplace and to make their hygienic evalution.

Solution of the problem

1. Determination of relative humidity of air using the table in % _____

2. Determination of velocity of air movement using the formula:

$$H = \frac{F}{T} =$$

$$Q = Q1 - Q_2 =$$

$$V = \left(\frac{\frac{H}{Q} - 0.20}{0.40} \right)^2$$

Where:
- **H**- is cooling ability of air.
- **F** -is factor of catathermometer.
- **T** -is the time of spirit dropping from + 38°C to + 35°C
- **Q_1** - average temperature of catathermometer
- **Q_2** - air temperature at the working place

3. Determination of dust in the air

Calculate the volume of tested air_____

$$V_{760}^{0} = \frac{V^{t}}{(1+at)} x \frac{B}{760} = - =,$$

Calculate dust quantity in the air_____-

$$K = \frac{(P_1 - P_2)x1000}{V_{760}^{0}} = - =,$$

4. Compare of the results of determination and calculation of physical and chemicalparameters of industrial conditions with hygienic standards and make up theconclusion.

4.1 What are the unfavorable factors of industrial conditions?

_____

_____

_____
_____
_____
_____
_____
_____
_____
_____

4.2 What occupational diseases may occur in these conditions?

_____
_____
_____
_____
_____
_____
_____
_____
_____

4.3 Measures for prophylaxis of occupational diseases are:

_____
_____
_____
_____
_____
_____
_____
_____
_____

Test questions

1. Classification of unfavorable industrial factors of physical origin
2. Industrial noise and its classification.
3. Noise disease, its pathogenesis, clinical symptoms and prophylaxis.
4. Industrial vibration, its classification.
5. Vibration disease, its pathogenesis, clinical symptoms and prophylaxis.
6. Industrial microclimate and its classification.
7. Diseases associated with unfavorable microclimate and their prophylaxis.
8. Industrial dust and its classification. Sources of dust at the industrial enterprises.
9. Dust pathology and its prophylaxis.

Signature of Lecturer_____ Signature of Student _____

Date _____

Practical class

Methods of determination of ultraviolet radiation intensity.

Objectives:

1. To learn physical and biological features of ultraviolet radiation (UVR).
2. To master the measuring methods of ultraviolet radiation intensity.
3. To master the measures of ultraviolet radiation intensity and calculation of the exposure to it using different measuring methods.

You should know:

1. The nature, physical features and spectral distribution of solar radiation.
2. Physical features, spectral distribution and biological effect of UVR.
3. Dosimetric units and measuring methods of UVR.

You should have the following skills:

1. Working with ultravioletmeter (UV-meter) according to its manual.
2. Using the mathematical methods of the UVR intensity and dose assessment.

1. Hygienic features of solar radiation.

1.1.

_____
_____
_____

1.2.

_____
_____
_____

1.3._____
_____
_____

2. Hygienic features of UV radiation.

2.1.

_____
_____
_____

2.2.

_____
_____
_____

2.3.

_____
_____
_____

3. Measurement of UV radiation.

3.1. Devices for.measurement

_____

3.2. Place of measurement _____

_____

3.3. Results of measurement_____

_____

4. The erythemal dose of UV radiation and the method of its determination

_____

_____

_____

_____

5.The physiological dose of UV radiation

$$Dph = \frac{Der}{2},$$

6. Determination of prophylactic dose of UV radiation using the formula

$$Dph = \left(\frac{B}{C}\right)^2 x \frac{1}{8} Der$$

Where:

- **B** is the distance between the patient and the source of UV irradiation,
- C is the standard distance for determining Der (50 cm)

7. Artificial sources of UV radiation_____

_____

_____

_____

8. Schemes of prophylactic radiation of children and adults by artificial sources of UV radiation_____

_____

_____

_____

_____

<u>Test questions</u>

1**.** Hygienic characteristics of solar radiation.
2. Hygienic characteristics of UV radiation.
3. Diseases associated with insufficiency of UV radiation and their prophylaxis.
4. Diseases associated with surplus of UV radiation and their prophylaxis.
5. Methods of measuring of UV radiation. Measurement devices.
6. Erythemal, physiological and prophylactic doses of UV radiation.

Signature of Lecturer_____ Signature of Student _____

The solar radiation, its physical characteristics and spectral distribution.

The solar radiation is an integral corpuscular flow (consisting of protons, alfa-elements, electrons, neutrons, neutrinos) and electromagnetic (photon) radiation.

Electromagnetic portion of the solar radiation
(according to R.F.Donnelly, O.R.White, 1980)

	Wave lenght λ, nanometers
Frequency band	> 100 000
Far-infrared region	100 000 – 10 000
Infrared region	10 000 – 760
Visible (optical) region	760 – 400
Ultraviolet region	400 – 120
Terminal ultraviolet region	120 – 10
Soft X-rays	10 – 0,1
High-energy (gamma) rays	< 0.1

The solar ultraviolet radiation wave length less then 290 nm is completely absorbed by oxygen and ozone of the upper atmosphere. Atmospheric pollution by factory waste helps the ozone layer destruction resulting in appearance of –ozone holes. The shortest and the most harmful UV waves reach the earth surface through these –ozone holes.

Artificial UVR sources:

- direct mercury-quartz lamps (MQL), mercury-arc lamps (MAL) generate UVR wave lengths of 240 – 380 nm;
- erythemal lamps (LE-15, LE-30, LE-30) – wave lengths of 285-380 nm;
- bactericidal lamps (LB-30) – wave lengths of 240-380 nm.

The solar and artificial UVR band consists of three regions:

- region A – long-wave ultraviolet radiation: λ = 315-400 nm;
- region B – middle-wave ultraviolet radiation: λ = 280-315 nm;
- region C – short-wave ultraviolet radiation: λ = 10-280 nm.

Spectral distribution and the main characteristics of the ultraviolet radiation are shown in figure 1.

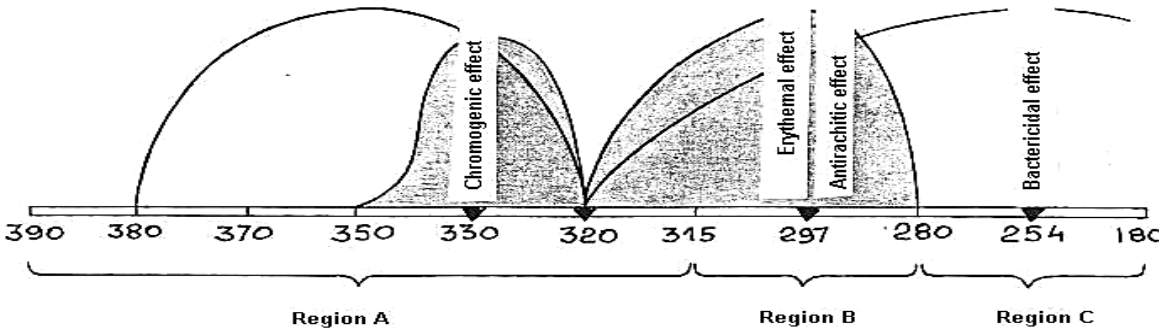


Fig. 1. Spectral distribution and the main characteristics of the ultraviolet radiation (UVR)

Biological effects of the ultraviolet radiation may be biogenic (general-stimulatory, vitamin D formation, chromogenic) and non-biogenic (bactericidal, carcinogenic, etc.).

1. General-stimulatory (erythemal) effect of the ultraviolet radiation is typical for the wave length of 250-320 nm, reaching the maximum at 250 and 297 nm (double peak) and the minimum at 280 nm. This effect results in the photolysis of skin proteins (the UV rays may penetrate the skin as deep as 3-4 mm). The following toxic products of photolysis are generated during this process: histamine, choline, adenosine, pyrimidine etc. These substances are absorbed by blood, they can stimulate metabolism, reticuloendothelial system (RES), marrow, rise the levels of haemoglobin, erythrocytes and leucocytes, increase enzyme activity and liver function, stimulate the activity of the nervous system etc.

The UVR general-stimulatory effect is emphasized by its erythemal effect, which consists in reflex dilation of capillary vessels, particularly when exposed to the intensive infrared radiation. The erythemal effect may result in the skin burn if exposed to the extensive radiation.

2. Vitamin D forming (antirachitic) effect of the UVR is typical for the 315-207 nm wave length (region B), reaching the maximum at 280-297 nm. This effect consists in the decomposition of calciferols: ergosterin (7,8-dehydrochplecterol) of the skin fat (in sebaceous glands) turns into the vitamines D_2 (ergocholecalciferol), D_3 (cholecalciferol), and the provitamin 2,2-dehydroergosterin – into the vitamin D_4 under the UVR influence due to the decomposition of the benzene ring.

3. Chromogenic (tanning) effect of the UVR is typical for regions A, B with wave lenght of 280-340 nm, reaching the maximum at 320-330 nm and 240-260 nm. Transformation of tyrosine (amino acid), dioxyphenilalanine and the products of adrenaline decay helps to generate the black pigment melanin under the influence of the UVR and the enzyme tyrosinase. This pigment protects the skin and the whole body from the ultraviolet, optical and infrared radiation surplus.

4. Bactericidal (non-biogenic) effect of the UVR is typical for regions C and B with wave lenght from 300 to 180 nm, reaching maximum at 254 nm (according to some other sources – 253.7-267.5 nm). First, the irritation of bacteria under the influence of the UVR activates their metabolism, then a dose increase provokes the bacteriostatic effect and further - photodecomposition, protein denaturation and microorganisms death.

5. Photo-ophthalmic effect of the UVR (the inflammation of the eye mucous membrane) may be observed high in the mountains (―snow disease‖ among the alpinists), and also among the electric welders and physiotherapists that don't follow the security rules during the work with the artificial UVR sources.

6. Cancerogenic effect of the UVR is more evident in hot tropical climate conditions and during an exposure to high levels and long-term action of the UVR technical sources (electric welding etc.).

Date _____

Practical class

Hygienic evaluation of ventilation and heating systems for different rooms.

The purpose of study:

_____
_____
_____
_____

Work report:

1. Hygienic evaluation of heat:

- Type of heating system used _____
- Volume of laboratory _____ m^3.
- Necessary number of battery sections for study room _____

2. Conclusion:

real_____

necessary_____

Hygienic appreciation of room ventilation:

_____

- Volume of the room _____ m^3.
- Necessary volume of ventilation _____ m^3.
- Necessary volume of air in the study room _____
- Real of coming air for ventilation _____ m^3
- Real volume of air in the study room _____
- Speed of air flow___ _____ m/s

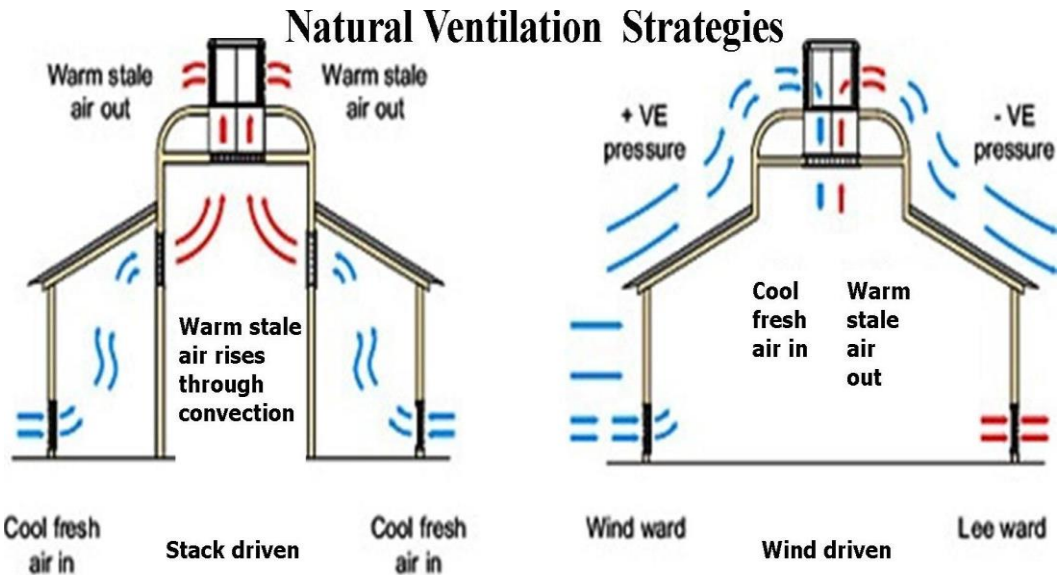
Index	Necessary	Real	Conclusion
Volume of ventilation	$L_n = \frac{C}{p-q}$	L=a×v×3600 (m^3/h)	Compare $L_{n\ with}$ L
Volume in the study room	$S_n = \frac{L_n}{W}$	$S_r = \frac{L}{W}$	Compare $S_{n\ wth}$ S_r
Volume of ventilation			
CO_2	0.1%		

Conclusion:

Signature of Lecturer_____ Signature of Student _____

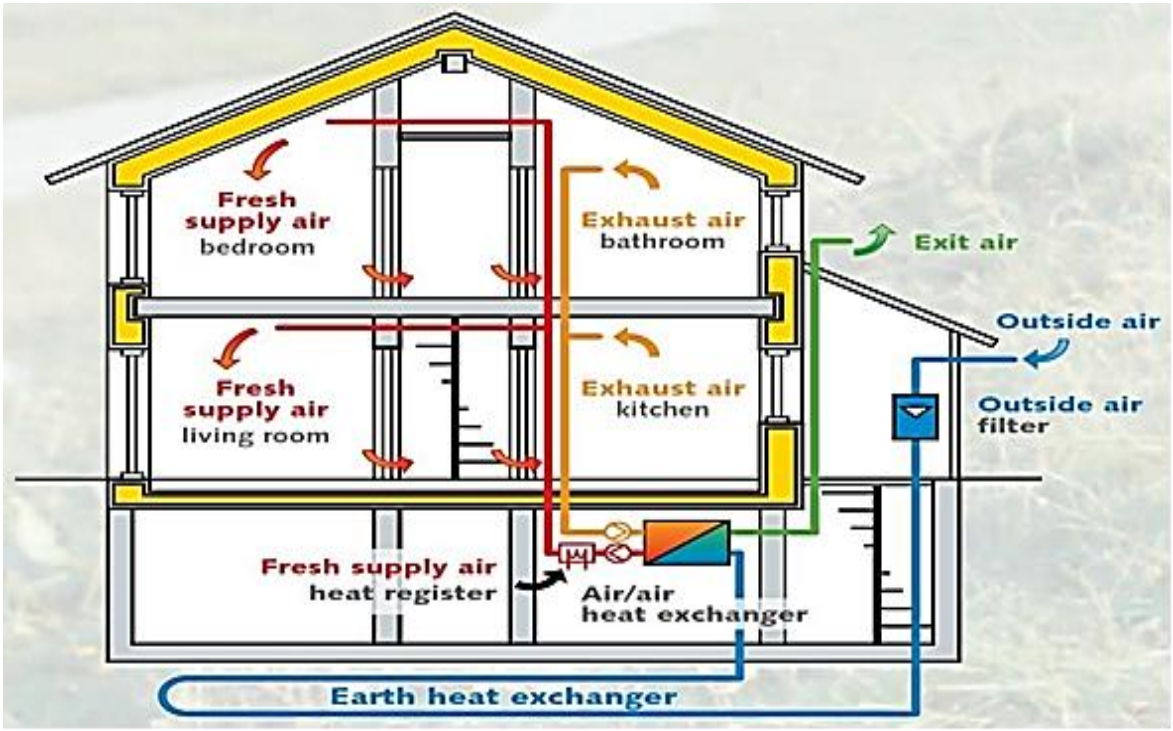
Basic requirements for a ventilation system by dilution

System component or function	Requirement
Dilution by outside air	A minimum volume of air by occupant per hour should be guaranteed.
	The aim should be to renew the volume of inside air a minimum number of times per hour.
	The volume of outside air supplied should be increased based on the intensity of the sources of pollution.
	Direct extraction to the outside should be guaranteed for spaces where pollution-generating activities will take place.
Air intake locations	Placing air intakes near plumes of known sources of pollution should be avoided.
	One should avoid areas near stagnant water and the aerosols that emanate from refrigeration towers.
	The entry of any animals should be prevented and birds should be prevented from perching or nesting near intakes.
Location of air extraction vents	Extraction vents should be placed as far as possible from air intake locations and the height of the discharge vent should be increased.
	Orientation of discharge vents should be in the opposite direction from air intake hoods.
Filtration and cleaning	Mechanical and electrical filters for particulate matter should be used.
	One should install a system for the chemical elimination of pollutants.
Microbiological control	Placing any porous materials in direct contact with air currents, including those in the distribution conduits, should be avoided.
	One should avoid the collection of stagnant water where condensation is formed in air-conditioning units.
	A preventive maintenance programme should be established and the periodic cleaning of humidifiers and refrigeration towers should be scheduled.
Air distribution	One should eliminate and prevent the formation of any dead zones (where there is no ventilation) and the stratification of air.
	It is preferable to mix the air where the occupants breathe it.
	Adequate pressures should be maintained in all locales based on the activities that are performed in them.
	Air propulsion and extraction systems should be controlled to maintain equilibrium between them.



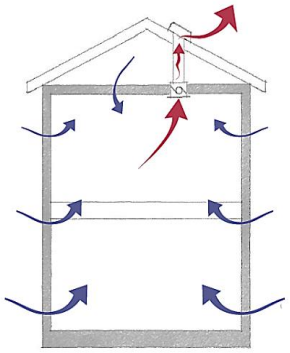
Ventilation can only be realized if there are two openings, one for the air to enter and one for the air to escape. Natural ventilation is predominatly used to expel warm stuffy air from a building through convection instead of mechanical ventilation.

TYPES OF MECHANICAL VENTILATION



There are three types of whole-house mechanical ventilation systems: exhaust-only, supply-only and balanced. Each system uses a combination of fans, ducting, dampers and controls, and they each have different pros, cons and costs associated with them.

2. **Exhaust-only ventilation**

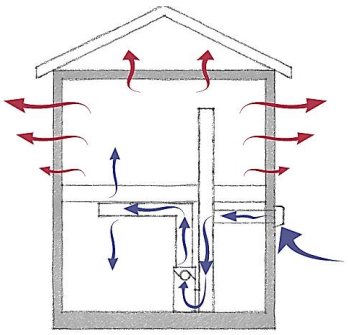


Exhaust-only ventilation tends to consist of a fan, commonly a bath fan, exhausting indoor air. Outdoor air is drawn into the house through leaks in the building enclosure.

Advantages of exhaust-only ventilation:

- Contaminants may be drawn into the house from an attic, garage, crawlspace or wall cavity
- Potential to draw moist outdoor air into the wall cavity that could condense during the cooling season and cause moisture problems, particularly in warm humid climates
- In can cause or contribute to back-drafting of combustion appliances
- Lowest installation cost and low operating cost.

3. **Supply-only ventilation**

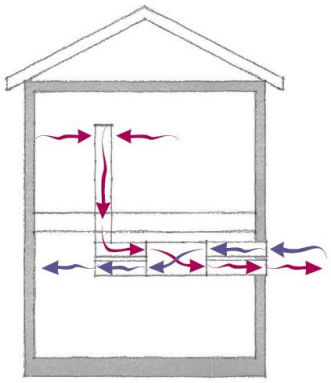


Supply-only ventilation consists of a fan drawing outdoor air into the house. Indoor air escapes through the building enclosure and exhaust fan ducts. Supply-only ventilation can be a dedicated system, or more commonly a central-fan integrated (CFI) system. With a CFI system, outdoor air is ducted to the return plenum of an HVAC (heating, ventilation and air conditioning) air handler that draws in and distributes the outdoor air.

Advantages of supply – only ventilation:

- Supply-only ventilation minimizes contaminants entering through the building enclosure
- Outdoor air is drawn from a single, known location for best air quality
- Supply-only ventilation has potential to drive moist indoor air into the wall cavity that could condense and cause moisture problems during the heating season in colder climates
- Low installation cost, however for a CFI system, the electronically commutated motor may increase the initial cost and operating cost may be higher.

4. **Balanced ventilation**



Balanced ventilation systems are a combination of exhaust and supply methods providing approximately equal indoor exhaust and outdoor supply air flows (e.g. an exhaust fan combined with a supply fan or passive inlet vents). A balanced system may include a heat recovery ventilator (HRV) or an energy recovery ventilator (ERV).

Advantages of balanced ventilation:

- An HRV transfers a portion of the heat between the exhaust air and the fresh air; an ERV transfers heat and moisture
- An HRV or ERV provides the benefits, but limits the drawbacks, of supply-only and exhaust-only methods
- Generally, an HRV is recommended for dry, cold climates and an ERV is recommended for moist, warm climates
- Highest installation cost for HRV or ERV due to equipment and additional ducting

There are pros and cons to each type of mechanical ventilation but one type may work better for your home than the other two. By consulting a certified professional, you can better your home's air quality with the right mechanical ventilation system.

Date _____

Practical class

Methods of determination and hygienic assessment of natural lighting and artificial illumination in diferent premises.

Learning objective

1. To learn the hygienic requirements for natural lighting in different premises.
2. To master the geometrical, lighting engineering methods of natural lighting indices determination, to learn how to assess the results of instrumental measuring, and to draw a hygienic conclusion about natural lighting in differing premises.
3. To learn the role and significance of rational artificial illumination as the means of lengthening the activity period of people, and disease and fatigue prevention.
4. To master the methods of the measurement and hygienic assessment of artificial illumination in different premises with the help of a luxmeter and calculation methods.

You should know:

1. Physical features and hygienic significance of natural lighting, tasks and criteria of its assessment considering the type of visual work and functions of the premises.
2. External and internal factors that natural lighting level of the premises depends on.
3. Basic physiological functions of the visual analyzer (visual acuity, contrast sensitivity etc). Vision as an integral function of visual analyzer.
4. Main harmful effects of insufficient and excessive lighting on human health and work capacity. The influence of lighting on myopia development.
5. Measuring methods and indices of natural lighting.
6. Physical basis of illumination, concepts and measurement units for light.
7. Physiological functions of the visual analyzer, their dependence on illuminance.
8. Hygienic requirements and significance of artificial illumination in different premises.
9. Types of artificial illumination and their comparison (advantages and disadvantages).
10. Factors that influence the level of artificial illumination.
11. Methods of artificial illumination assessment and principles of its hygienic regulation.

You should have the following skills:

1. To determine and assess the geometrical indices of natural lighting in different premises.
2. To measure and assess the lighting using a luxmeter, the daylight factor (DF) determination and their hygienic assessment.
3. To assess the regimen of premises insolation
4. To measure the illuminance and brightness, and other indices using instrumental and calculating methods.
5. To give a comprehensive hygienic assessment of artificial illumination of premises and workplaces, considering the type of visual work and premise function.
6. To draw motivated conclusions and make recommendations concerning the optimization of artificial illumination.

Work report:

Hygienic assessment of natural illumination:

- Configuration of windows _____
- Orientation of windows is _____
- Distance between two windows is _____
- Distance from the floor and window is _____
- Distance from the ceiling and window is _____
- Distance from the floor and top of window is _____
- Surface of window is _____
- Coefficient of penetration is (CP)_____
  Coefficient of luminosity is (CL)_____
- Coefficient of natural illumination is (CNI)_____
- Coincidence angle is _____ grades
- Opening angle is _____ grades

Hygienic assessment of artificial illumination:

- Reflection coefficient (RC), from the wall is _____
- Reflection coefficient from the table is _____
- Uniformity coefficient is (UC)_____

Evaluation of natural lighting

1. The geometrical method

1.1. Devices for measurement_____

1.2. Determination of the light coefficient

1.2.1. Characteristics of the windows in the room:

number of windows_____

their face_____

shape of the windows_____

height_____

width_____

the area of one window _____

the area of all windows _____

the area of the glazed surface of the windows _____

1.2.2. The length of the floor in the room

_____

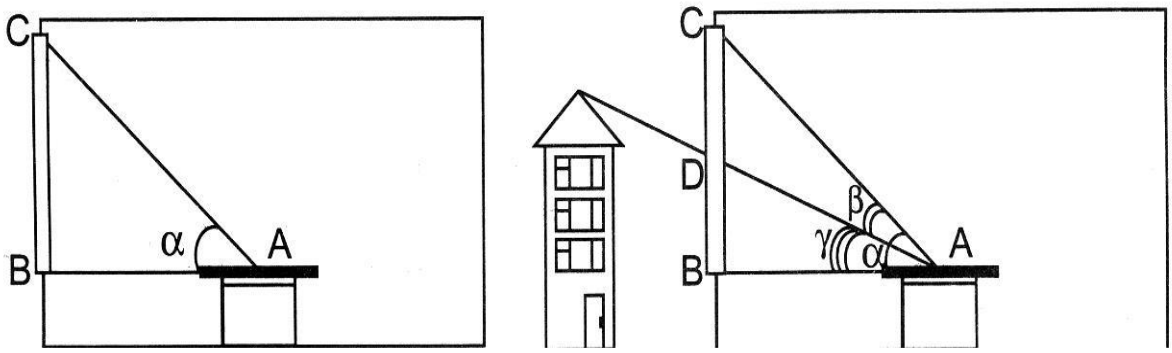
the width of the floor in the room

_____

the area of the floor _____

$$\mathbf{LC} = \frac{area\ of\ glazed\ windows}{area\ of\ floor} =$$

1.3.Determination of the angle of incidence (Fig. 1)



- **AB** is the distance from the working place to the lower line of the window _____
- **BC** is the height of the window _____
- $\frac{BC}{AB}$ is tg of angle **α** _____
- **α** in the table angle is _____

1.4. Determination of the angle of opening (Fig. 2)

- **BD** is the distance between the line on the window glass from the opposite subject and the lower line of window _____
- $\frac{BD}{AB}$ is tg of angle γ _____
- **γ** in the table angle is _____
- the angle of opening **β** = angle **α** - angle **γ** _____

2. The technical lighting method

2.1 Determination of the coefficient of natural illumination (daylight factor)

- E_1 is natural illumination inside (in luxes) on the working place_____
- E_2 is natural illumination _____

Conclusion: _____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____

Estimation of artificial lighting

1.Devices for measuring artificial lighting

_____

_____

2. Measurement of artificial lighting:

2.1. Measurement of artificial lighting with help of the objective luxmeter

_____

2.1.1. during the hours of darkness (without natural lighting) _____

2.1.2. in the conditions when windows are hidden with the help of dark blinds in the day time

_____

_____

2.2. The "Watts" method for calculating illumination:

2.2.1. the kind of sources of artificial lighting in the room _____

2.2.2. the number of sources of artificial lighting in the room_____

2.2.3. the power of one lamp _____

2.2.4. the area of the floor in the class-room _____

- the length of the floor _____

- the width of the floor _____

2.3.Calculation of the artificial lighting by the formula

$$E = \frac{P \times n \times 10}{S \times K}$$

Where

- **E**- is artificial lighting in the room (in luxes)
- **P** -is the power of one lamp
- **n**- is the number of lamps
- **S** -is the area of the floor in the room
- **K** -is the coefficient of stand-by (1.3)
- **10**- is recalculation of Watts into luxes (1 watt is equal 10 luxes)

Conclusion_____

_____

_____

_____

_____

_____

_____

Table 1. Proper power (Wt/м^2) of general illumination

Height of hanging of lamps, м	Square of the apartment $м^2$	Level of illumination, lux								
		30	50	75	100	150	200	300	400	500
Luminescence lamp										
2-3	10-15	-	-	8,6	11,5	17,3	23	35	46	58
	15-25	-	-	7,3	9,7	14,5	19,4	29	39	49
	25-50	-	-	6,0	8,0	12,0	16	24	32	40
	50-150	-	-	5,0	6,7	10,0	13,4	20	27	34
	150-300	-	-	4,4	5,9	8,9	11,8	17,7	24	30
	More 300	-	-	4,1	5,5	8,3	11	16,5	22	27
Incandescent lamp (bulb lamp)										
2-3	10-15	11	17	24,	31	45	61	-	-	-
	15-25	9,2	14	20	25,5	37	50	-	-	-
	25-50	7,8	12	17,3	21,5	31	42	-	-	-
	50-150	6,5	10,3	14,7	18,5	27	36	-	-	-
	150-300	5,6	9,2	12,9	16,3	24	32	-	-	-
	More 300	5,2	8,2	12,3	15,3	22	29,5	-	-	-

Table 2. Hygienically norms of artificial illumination

Room	Minimal illumination, lx	
	Luminescence lamp	Incandescent lamp (bulb lamp)
Operation room	-	200
Doctors room	300 (200)	150 (100)
Room for patient	-	50
Study rooms, laboratory room	300	150
Corridor	100	50

Table 3. Types of premises isolation regimen

Premises insolation regimen	**Orientation of windows**	***The duration of insolation, hours***	***The insolated area of the floor,%***
Maximum	South-East, South-West	5-6	80
Medium	South, East, West	3-5	40-50
Minimum	North-East, North-West, West	*less than 3*	*till 30*

Table 4. The natural lighting norms for different premises

The type of premises	***The daylight factor (DF)***	***The lighting coefficient (LC)***	***The angle of incidence (a)***	***The aperture angle (g)***	***The depth coefficient of premises***
	not less than		**not less than**	**not less than**	**not less than**
1.Classrooms	1.25-1.5%	1:4 – 1:5	27°	5°	2
2.Residential	1.0%	1:5 – 1:6	27°	5°	2
3. Wards	0.5%	1: – 1:8	27°	5°	2
4. Surgeries	2.0%	1:2 – 1:3	27°	5°	2

The indoor and outdoor lighting is measured by luxmeter.

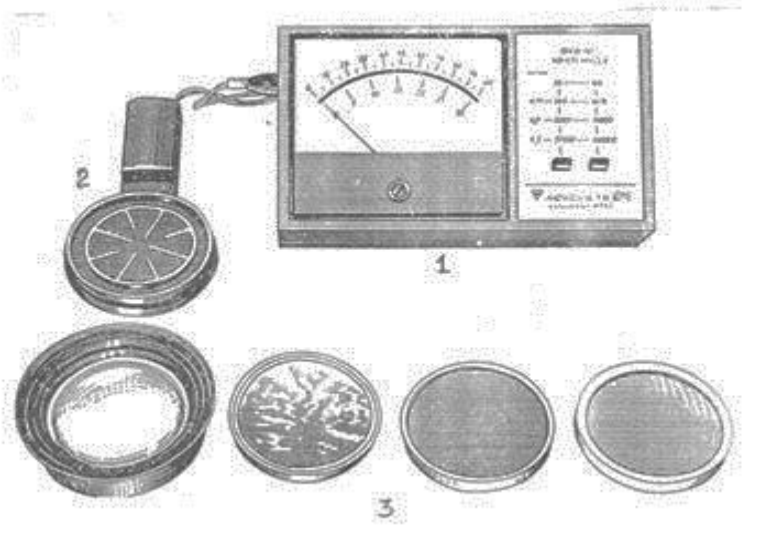


Fig. 1 Luxmeter U-116 (Ю-166)

1. measuring device (galvanometer);
2. light receiver (selenium photo-cell);
3. changing light filters.

The allowable values of dazzling at the workplace are:

- 20 cd/m^2 for types 1 and 2 of the visual work;
- 40 cd/m^2 for the types 3-5 of the visual work;
- 60 cd/m^2 for the types 6 and 7 of the visual work.

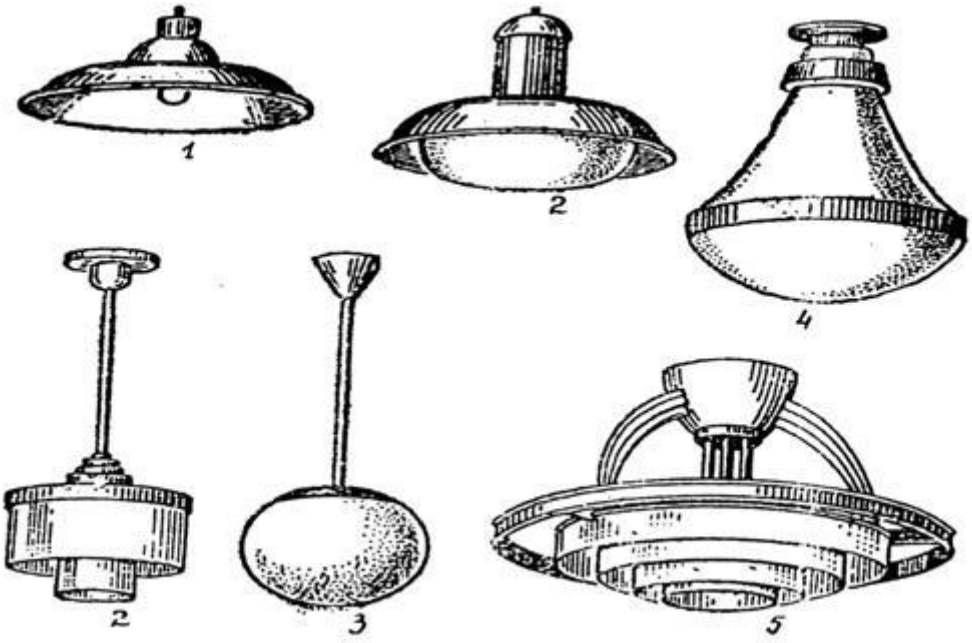


Fig.2. Types of lighting fixtures.

1. direct light type;
2. directed-diffused light type;

3, 4 - evenly-diffused light type;

5 - reflected-diffused light type.

The scheme of the artificial illumination assessment in different premises

Descriptive data:

1. name and function of premises_____
2. system of illumination (local, general and combined)_____
3. number of lights, their types (incandescent, luminescent and other lamps)_____
3. their capacity, Wt_____
4. type of lighting fixture, light flow direction and formation (direct, evenly-diffused, directed-diffused, reflected, diffused-reflected)_____
5. height of the lamps above the floor and the work plane_____
illuminated area_____
6. reflection ability (brightness) of ceiling, walls, windows, floor, furniture and other surfaces._____
_____

Illumination determination using the 'Watt' calculation method:

a) the area of the premises is determined, S, m^2;

b) the total capacity of all the lamps, Wt, is determined;

c) the specific capacity, Wt/m^2, is calculated;

d) the illuminance at the specific capacity of $10Wt/m^2$ can be found from the table 1 of minimum horizontal illuminance values;

e) for the incandescent lamps the illuminance is calculated according to the following formula:

$$E = \frac{P \times E\ tab}{10 \times K},$$

where:

- **P** –is a specific capacity, Wt/m^2;
- $\mathbf{E_{tab}}$- illuminance at $10Wt/m^2$,
- **K** – which equals to 1.3, is the reserve coefficient for residential and public premises.

Test questions

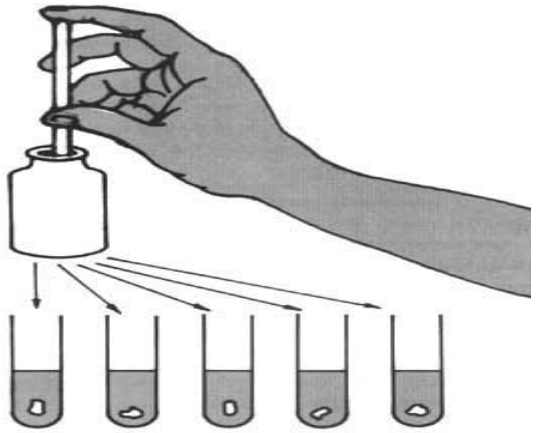
1. Hygienic requirements to natural lighting.
2. Factors influenceing natural lighting.
3. Natural lighting determination methods.
4. Light coefficient and the method of its determination.
5. The angle of incidence, hygienic standard and the method of its determination.
6. The angle of opening, hygienic standards and the method of its determination.
7. The coefficient of natural illumination, method of its determination, hygienic standards for different rooms.
8. Hygienic requirements to artificial lighting.
9. Sources of artificial lighting and their hygienic characteristics.
10. Systems of artificial lighting.
11. Methods of measurement of artificial lighting.
12. Rate setting of artificial lighting for different rooms

Signature of Lecturer_____ Signature of Student _____

Date _____

Practical class

Hygienic assessment of drinking water quality.



The purpose of study:

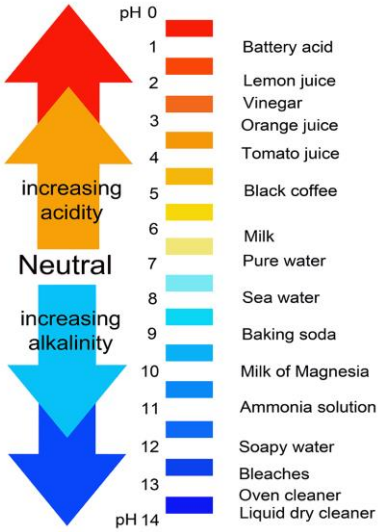
_____
_____
_____
_____
_____
_____
_____
_____
_____

Work report:

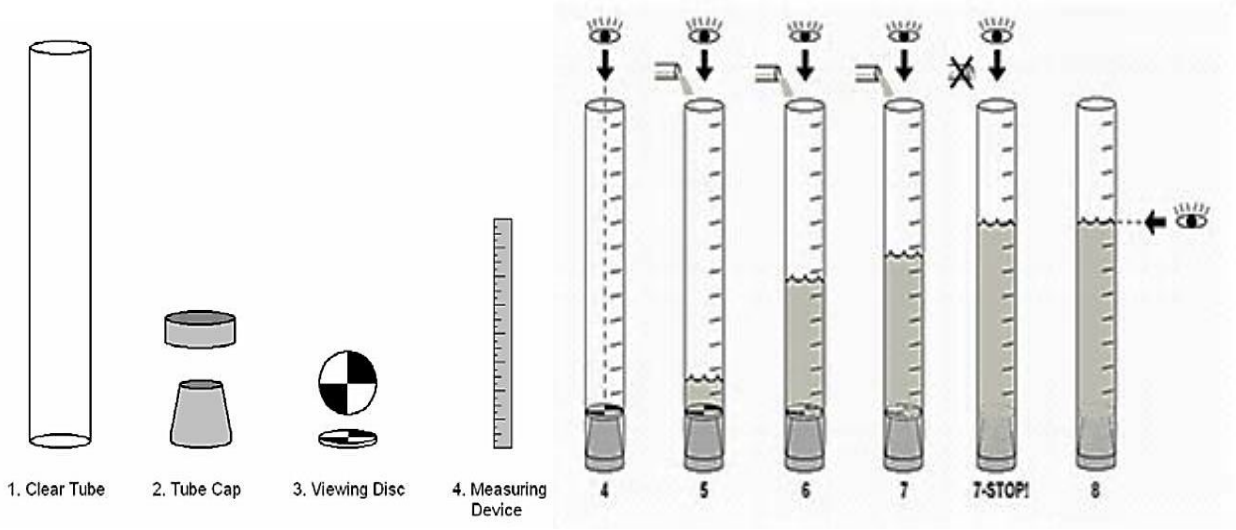
1. **Organoleptic tests:**

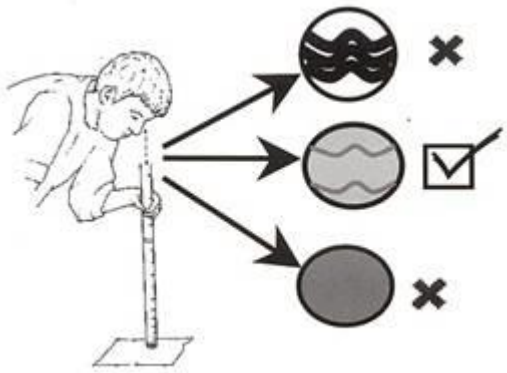
Organoleptic properties	**Tests**				
	1	2	3	4	5
smell					
taste					
color					
transparency					

Chemical indexes	**Tests**				
	1	**2**	**3**	**4**	**5**
1. Ph/phosphorus					
2. Ammonia					
3. Nitrites					
4. Nitrates					
5. General hardness					
6. Iron					
7. chlorides					



Turbidity Tube (Mary Eckel)





Date _____

Practical class

Method of sanitary topographical control of water supply sources and sampling of water for bacteriological and sanitary chimical analisis

Objectives:

1. To master the technique of sanitary control of water supply sources and water sampling for bacteriological and sanitary and chemical analysis.

You should know :

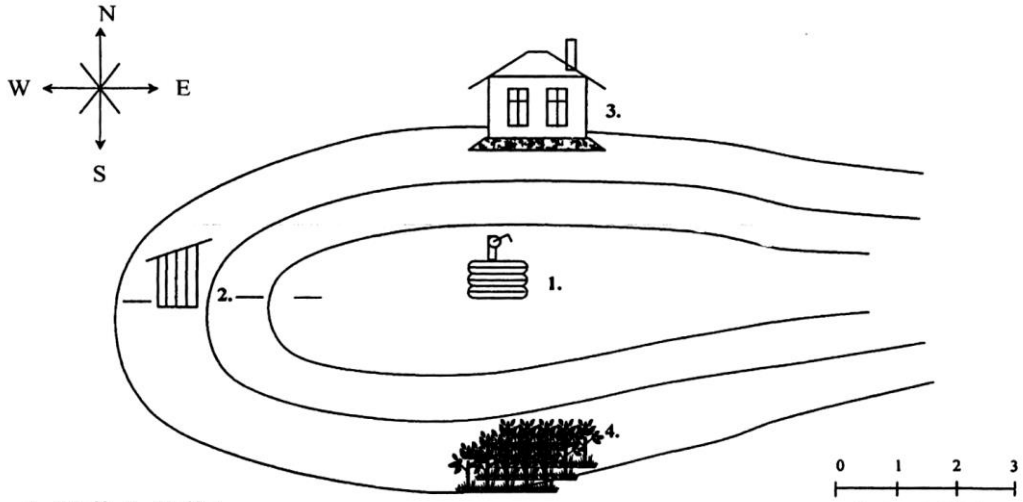
1. Hygienic significance of water (physiologic, endemic, epidemiological, toxicological, balneal, climate and weather-forming, economical and domestic, pertaining to national economy).
2. Classification of water supply sources and their hygienic characteristics.
3. Programme of sanitary control of water supply sources: sanitary and topographic, sanitary and technical, sanitary and-epidemiological.

You should have the following skills:

1. Carrying out sanitary control inspection of water supply sources.
2. Defining sampling places and obtaining water samples for analysis, to know how to fill in an accompanying form.
3. Defining the discharge (output) of water supply sources.

Situational problem:

There is a well in a courtyard of dwelling house in the village of Pavlovka of the Bogodukov District. The contour of the district has a natural bevel from the west to the east. There is an out-of-doors toilet at a distance of 30 meters from the well and on a surface relief. The dwelling house is located at 25 meters to the north from the well. There is a fruit garden whose bed-rock is annually dressed with organic fertilizers at 35 meters from the well to the south. The walls of the well are new, wooden. There is a "clay lock" around the well. The well has a cover, but there is no canopy. The water from the well is taken with a bucket for common use. The depth of the well to the bottom is 15 meters. The depth to the surface of water is 10 meters.



1. Well; 2. Toilet;
3. Dwelling house; 4. Garden

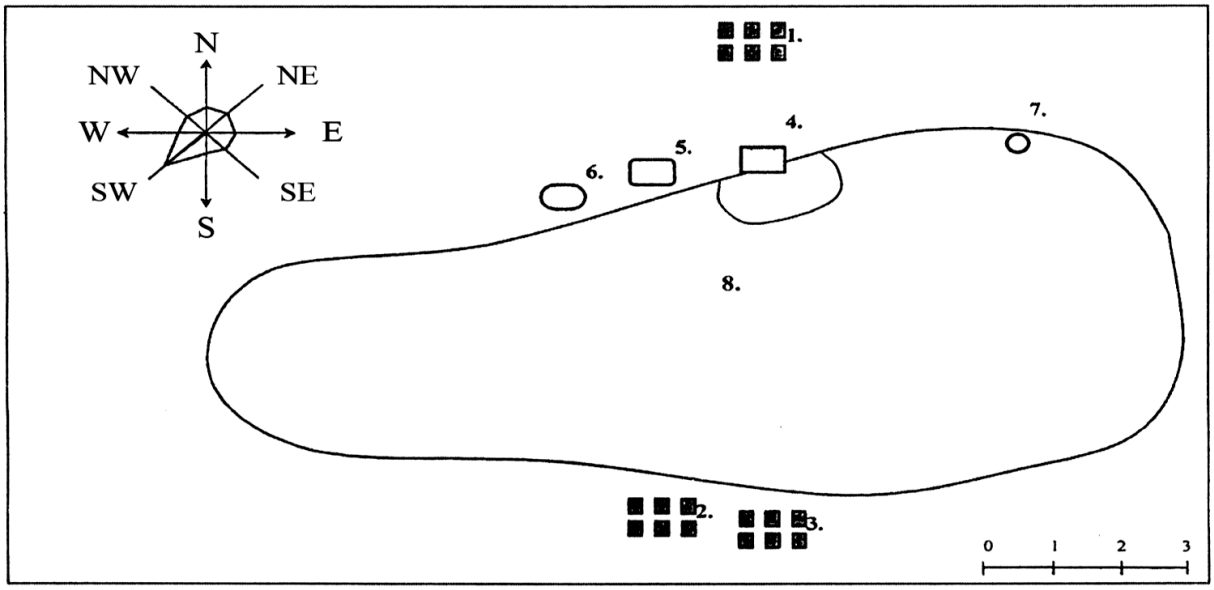
1.Possible sources of water pollution in the well _____
_____
_____
_____

2. Possible paths of pollutants ingress to the well: _____
_____
_____
_____
_____

3. Measures for the improvement of the water source_____
_____
_____
_____
_____

Situational problem.

The village of Ivanovka of Donetsk Region is at the distance of 170 meters from the bank of the Olkovskiy reservoir. On the southern coast of the reservoir in the immediate proximity to it there are two populated areas. At 30 meters from the bank there is a collective poultry farm, that uses a part of the water surface for breeding ducks. At the distance of 50 meters to the west from the poultry farm there is the collective-farm's garage and at 100 meters to the west there is a depot of mineral fertilizers, part of which is stored in the open air. In the given district the southwest wind prevails. The construction of drinking water-pipe for the village of Ivanovka is planned. The water intake will be placed at the distance of 200 meters to the east of the poultry farm and of 3 meters from the bank.



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1.Village Ivanovka. 2. Populated area. 3. Populated area. 4. Poultry farm. 5. Garage. 6. Depot of mineral fertilizers. 7. Place of the water intake. 8. The reservoir.

1. Possible pollutant of water in the reservoir: _____
_____
_____
_____
_____

2. Possible ways of pollutant ingress to the reservoir _____
_____
_____
_____
_____

3. Correctness of the choice of place for the water intake:_____
_____
_____
_____
_____

4. Measures for the improvement of water in the reservoir:

Describe the procedure of water sampling for physicochemical and bacteriological analyses:

1. From an open flowing water source (river):

_____
_____
_____

2. From an open source with stagnant water (lake, reservoir):_____
_____
_____
_____
_____
3.From an artesian well:_____
_____
_____
_____
4. From a mine well:
_____
_____
_____
_____

5.From a water-tap:_____
_____
_____
_____
_____
_____

Test questions

1. Classification of water sources in nature.
2. Hygienic control of open (superficial) sources of water-supply.
3. Hygienic control of underground sources of water-supply.
4. Basic hygienic requirements to good quality drinkable water.
5. The procedure of water sampling for bacteriological and sanitary chemical analysis from an open pool.
6. The procedure of water sampling for analysis from underground sources.
7. The procedure of water sampling for analysis from mine and tubular wells.
8. The procedure of water sampling for analysis from a water-tap.
9. The hygienic value and procedure of sanitary topographical inspection and description of sources of water-supply.

Signature of Lecturer_____ Signature of Student _____

Date _____

Practical class

Methods of drinking water quality improvement. Purification.

Objectives:

1. To learn the classification of conventional and special methods of water quality improvement, technology of their implementation on the main facilities of water supply system.

You should know :

1. Methods of drinking water quality improvement,
2. Methods of drinking water purification.

You should have the following skills:

1. Determining the dose of coagulant for purification of water,
2. Estimating the results of purification.

1.Sampling of water for the assessment of coagulant dose for its purification.

A sample of water (the quantity is 1000 ml) was taken_____

date_____by a laboratory assistant from the reservoir_____

It is located _____

The air temperature is _____, the atmospheric pressure is _____

Precipitation is absent (or there is some precipitation) _____

2. The method of drinking water coagulation by aluminium sulphate

2.1. The principle of the method _____

_____

_____

_____

2.2. Chemical reactions _____

_____

_____

_____

2.3. Chemical reagents and laboratory utensils _____

_____

_____
_____
_____

2.4. The course of the work:

2.4.1. Determination of carbonic water hardness

_____
_____
_____
_____

2.4.2 Calculation of quantity of 1% of aluminium sulphate in solution for the experiment

Experimental coagulation of water				
Test tube	**Carbonic water hardness (degrees)**	**$Al_2(SO_4)_3$**		
		mg/dm^3 of water	**mg/200ml of water**	**ml /200 ml of water**
	1°	40	8	0.8
1				
2				
3				

2.4.3. Experimental coagulation

_____
_____
_____
_____

2.5. **Conclusion** _____

_____
_____
_____

3. The method of coagulation with iron sulphate

3.1. The principle of the method _____

_____
_____

3.2. Chemical reactions _____

_____
_____
_____

3.3. Chemical reagents and laboratory utensils _____

_____
_____
_____

3.4. The course of the work:

3.4.1. Conditions of experimental coagulation with iron sulphate

Test tube	**$FeSO_4$**			**Active chlorine**		**Chloride of lime**
	mg/L of water	mg / 200 ml of water	ml /200 ml of water	mg/L of water	mg / 200 ml of water	ml of 1% solution per 200 ml of water
1	100	20	2	12.5		
2	200	40	4	25.0		
3	300	60	6	37.5		

3.4.2. Experimental coagulation_____

_____
_____

3.5. **Conclusion**

_____
_____
_____

Test questions

1. Methods of drinking water quality improvement and their hygienic characteristics.
2. Methods of drinking water purification and their hygienic characteristics.
3. The principle of coagulation of drinking water with aluminum sulphate.
4. The principle of coagulation of drinking water with iron sulphate.

Date _____

Practical class

Methods of water quality conditioning.

The purpose of study:

_____
_____
_____

Work report:

1. Specified technological processes of cleaning and disinfection of drinking water:
   _____
   _____
   _____
   _____
   _____

2. Water coagulation
   a) Temporary hardness of the water_____
   b) Calculation dose of coagulant, mg/l _____
   c) Experimental dose of coagulant, mg/l _____
   d) Quantity of dry coagulant necessary for $1m^3$ of water_____

3. Water disinfection
   a) Residual chloride, mg/l_____
   b) Chloride dose, mg/l _____
   c) Calculation of chloride dose for $1m^3$ of water_____

Conclusions:_____
_____
_____
_____
_____
_____
_____
_____
_____

Signature of Lecturer_____ **Signature of Student** _____

Date _____

Practical class

Methods of drinking water quality disinfection

Objectives:

1. To learn the methods of water disinfection, their classification, hygienic characteristics.

You should know :

1. The notion and methods of drinking water disinfection.
2. Water chlorination, methods of chlorination and reagents, which are used for this purpose; disadvantages of chlorination.
3. Water disinfection by ozone treatment and treatment with ultraviolet rays, their hygienic characteristics.

You should have the following skills:

Determining the dose of active chlorine and chloride of lime for disinfection of drinking water.

1. Essence of drinking water disinfection _____
_____

The methods of water disinfection:

physical: _____
_____

chemical:_____
_____
_____

the methods of water chlorination:

_____
_____
_____

Experimental work

Determining of chloride of lime doze for water disinfection

1. Sampling of water for experimental disinfection.

A sample of water (quantity is 6000 ml) was taken_____

Date_____ by a laboratory assistant from a mine well_____

It is situated in _____

The air temperature is _____, the atmospheric pressure is _____

Precipitation is absent (or there is some precipitation) _____

2. The method of disinfection of drinking water with normal doses of chlorine

2.1. The principle of the method _____
_____
_____

2.2. The chemical mechanism of disinfection_____
_____
_____

2.3. Chemical reagents and laboratory utensils_____

_____
_____
_____

2.4. Assessment of active chlorine content in chloride of lime _____
2.4.1. Preparation of 1% of chloride of lime in solution for the experiment: _____
_____
_____
_____

2.4.2. Calculation of quantity of 1% chloride of lime in the solution for the experiment
Bottle I – _____
Bottle II –_____
Bottle III –_____
2.4.3. Experimental chlorination of drinking water _____
_____
_____

2.4.4. Assessment of residual chlorine in disinfected water _____
_____
_____

2.5. Calculation of chlorine dose for disinfection

№	Content of active chlorine		Amount of $Na_2S_2O_3$ (for titration)		Residual chlorine	Chlorine absorption	Dose of active chlorine	Dose of chlorine of lime
	mg/L	ml of 1% sol/L	ml/200	ml/L	mg/L	mg/L	mg/L	
1								
2								
3								

3. Conclusion _____
_____
_____
_____
_____
_____

Test questions

1. The notion and methods of disinfection of drinking water and their hygienic characteristics.
2. The notion of a “dose of active chlorine” for disinfection of drinking water, and “chlorine absorption”.
3. The principle of chlorination of water with usual doses of active chlorine. The chemical reaction and reagents.
4. Water disinfection technique with usual doses of active chlorine.
5. Residual chlorine in water, its hygienic significance and the method of determination.

Signature of Lecturer_____ Signature of Student _____

Date _____

Practical class

Method of hygienic estimation of drinking water quality based on the results of laboratory analysis (centralized water supply)

Objectives:

1. To master requirements to drinking water quality and hygienic importance of some of its indices.
2. To master the method of assessment of drinking water quality for centralized water supply.

You should know:

1. Hygienic indices and standards of drinking water quality (physical, organoleptic, chemical composition) and pollution indices (chemical, bacteriological – both direct and indirect), their scientific substantiation.
2. Concept and characteristics of centralized (domestic and drinking water pipeline) water supply system.
3. Set of measures during sanitary inspection of water pipeline main facilities exploitation (individual components of water pipeline and water supply network).

You should have the following skills:

1. To state a hygienic value of drinking water quality according to the results of sanitary inspection of the water supply source and results of the laboratory analysis of water at centralized water supply system.
2. To state a hygienic value of different methods of water quality improvement and exploitation efficiency of individual structures and facilities, used for this purpose.
3. To develop a complex of measures to improve water quality and to prevent diseases caused by poor water quality.

Act
of sanitary and hygienic estimation of drinking water quality
(the scheme of estimation)

1. The general conclusion about the quality of drinking water under study. Is the water drinkable or not?
2. Do all properties of this drinking water conform to the Hygienic State Standard (or Hygienic Norms) or not?
3. Is there any pollution of the drinking water with organic substances?
4. Are there any organic substances of animal or plant origin?
5. When was the drinking water polluted?
6. What are the sources of pollution of the drinking water? Specify general hygienic requirements for the placement of the water supply source.
7. Are there any changes of mineral composition of the drinking water? Show the signs.
8. What hygienic and sanitary measures must be taken for improving quality of drinking water, water-supply source and surrounding territory?

Situational problem.

Sanitary-topographical description of a water supply source: in the town of Kahovka a hospital for 300 beds will be built. There are 200 000 men in this town. The hospital will take the drinking water from a water-pipe. The water-pipe takes water from a borehole. The depth of the borehole is 30 m. For the current sanitary inspection, some water was taken for a sanitary test from the water pipe.

Analysis of water

Organoleptic properties

Color – colourless
Taste – refreshing
Aftertaste – 2 points
Nitrites – 0.01 mg/dm^3
Sediment – absent

Physical properties

Temperature – 7°C
Quantity of color – 20°
Transparency – 50 cm
Feculence – 0.5 NUF

Bacteriological indices

Total microbial number –90
Coli-index – 0

Chemical composition

Permanganate oxidability –5 mg/dm^3
Nitrates – 35 mg/dm^3
Sulfates – 270 mg/dm^3
Chlorides – 300 mg/dm^3
Ammonia – 0.1 mg/ dm^3
Dry residue – 1100 mg/dm^3
General hardness – 8 mmol/dm^3
Iron – 0.3 mg/dm^3
Zinc – 1 mg/dm^3
Fluoride –2 mg/dm^3
Manganese – 0.03 mg/ dm^3
Copper –1 mg/dm^3
Arsenic – 0.0001 mg/ dm^3
Lead – 0.001 mg/dm^3

Make up a hygienic conclusion on the quality analysed drinking water and possibility of its use for drinking purposes

Situational problem.

Sanitary topographical description of water supply source: the settlement of the Kharkov Region takes running water from a borehole. The depth of the borehole is 170 m. The water runs into the tank tower before it gets a water-pipe. The tank tower is covered with rust. For the current sanitary inspection, a sanitary test of the drinking water from the water tap was made.

Analysis of the water

Organoleptic properties

Color – yellow brown
Aftertaste – 3 points
Smell –2 points
Sediment – considerable

Physical properties

Temperature – 9°C
Quantity of color – 30°
Transparency – 20 cm
Feculence – 3.5 NUF

Bacteriological indices

Total microbial number – 120
Coli-index – 3

Chemical composition

Permanganate oxidability – 8 mg/dm^3
Ammonia – 1.3 mg/dm^3
Nitrites – 0.03 mg/dm^3
Nitrates –31 mg/dm^3
Sulfates –150 mg/dm^3
Chlorides – 230 mg/dm^3
Dry residue – 760 mg/dm^3
General hardness –6.7 mmol/dm^3
Iron – 0.8 mg/dm^3
Zinc –1.5 mg/dm^3
Fluoride –1 mg/dm^3

Make up a hygienic conclusion on the quality of analysed drinking water and possibility of its use for drinking purposes

_____
_____
_____
_____
_____
_____
_____
_____

Test questions

1. Sources of water in nature, their hygienic characteristics.
2. Systems of water supply.
3. Hygienic requirements to drinking water quality for the centralized water supply.
4. Chemical indices of water pollution and their hygienic norms.
5. Indices of mineral composition of water and their hygienic standards.
6. Bacteriological indices of drinking water quality.
7. Methods of drinking water quality improvement.

Signature of Lecturer_____ Signature of Student _____

Date _____

Practical class

Method of hygienic estimation of drinkung water quality based on the results of laboratory analysis (decentralized water supply)

Oobjectives:

1. To master knowledge about requirements to drinking water quality and hygienic importance of some of its indices.
2. To master the method of assessment of drinking water quality for decentralized water supply system.

You should know:

1. Hygienic indices and standards of drinking water quality (physical, organoleptic, chemical composition) and pollution indices (chemical, bacteriological – both direct and indirect), their scientific substantiation for decentralized (wells, groundwater intake structures, catchments) water supply.
2. Characteristics of decentralized water supply system.
3. Set of measures during sanitary inspection of exploitation of main facilities of decentralized water supply system.

You should have the following skills:

1. To state a hygienic value of drinking water quality according to the results of sanitary inspection of the source of water supply and the results of the laboratory analysis of water at decentralized water supply system.
2. To state a hygienic value of different methods of water quality improvement and exploitation efficiency of individual structures and facilities, used for this purpose.
3. To develop the complex of measures to improve water quality and to prevent diseases caused by poor water quality.

Act
of sanitary and hygienic estimation of drinking water quality
(the scheme of estimation)

1. The general conclusion about the quality of the drinking water under study. Is the water drinkable or not?
2. Do all properties of this drinking water satisfy the Hygienic State Standard (or Hygienic Norms) or not?
3. Is there any pollution of the drinking water with organic substances?
4. Are there any organic substances of animal or plant origin?
5. When was the drinking water polluted?
6. What are the sources of pollution of the drinking water? Make up a general hygienic characteristic of the placement of the water supply source.
7. Are there any changes of mineral composition of the drinking water? Show the signs.
8. What hygienic and sanitary measures must be taken for improving the quality of the drinking water, of the water-supply source and surrounding territory?

Situational problem

Sanitary topographical description of a water supply source. There is a well on the territory of the cottage in the suburb of Kharkov. The depth of the well is 6 m. Its framework is in good repair. There is a lid and a pail for common use. There is a "clay lock" around the well. There is a compost heap at the distance of 20 meters from the well and public convenience at 40 meters distance from the well.

Analysis of the water

Organoleptic properties

Color – yellow
Taste – 3 points
Smell – 3 points
Nitrites – 12 mg/dm^3
Nitrates – 60 mg/dm^3

Physical properties

Quantity of color – 30°
Feculence – 2.8 NUF
Sediment – plentiful

Bacteriological indices

Total microbial number – 430
Coli-index – 12

Chemical composition

Permanganate oxidability – 7.5 mg/dm^3
Ammonia – 3.0 mg/dm^3
Sulfates – 230 mg/dm^3
Chlorides – 250 mg/dm^3
Dry residue – 780 mg/dm^3
Fluorine – 0.9 mg/dm3
General hardness – 5.5 mmol/dm^3
Iron – 0.3 mg/dm^3

Make up a hygienic conclusion on the drinking water quality under the study and possibility of its use for drinking purposes

_____
_____
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_____

Situational problem

Sanitary and topographical description of a water supply source.

There is a well at the distance of 50 m from the sea. The depth of the well is 10m. The framework of the well is wooden and in good repair. The framework of the well is 0.8 m in height. The ground around the well is sand. There is a lid and a pail for common use. A holiday house takes this water for drinking and domestic purposes. Some drinking water was taken fromth well for the analysis.

Analysis of the water

Organoleptic properties
Taste – salty
Aftertaste – 3 points
Smell – 3 points

Physical properties
Temperature – 12°C
Quantity of color – 25°
Feculence – 1.2 NUF

Bacteriological indices
Total microbial number –200
E.coli and pathogenic bacteria are absent in 1 dm^3

Chemical composition
Oxidation – 6.5 mg/dm^3
Sulfates – 650 mg/dm^3
Ammonia – 1.0 mg/dm^3
Nitrites – 0.01 mg/dm^3
Nitrates – 27 mg/dm^3
Dry residue –1350 mg/dm^3
General hardness – 15 $mgequiv/dm^3$
Manganese – 0.8 mg/dm^3
Chlorides – 400 mg/dm^3
Fluorine – 1.4 mg/dm^3

Make up a hygienic conclusion on the quality of analysed drinking water and possibility of its use for drinking purposes

_____
_____
_____
_____
_____
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_____
_____
_____
_____
_____

Test questions

1. Sources of water in nature.
2. Systems of water supply.
3. Hygienic requirements to drinking water quality for decentralized water supply.
4. Chemical indices of water pollution and their hygienic standards.
5. Bacteriological indices of drinking water.
6. Methods of drinking water quality improvement.
7. Hygienic requirement for the wells.

Signature of Lecturer_____ Signature of Student _____

HYGIENE OF MEDICAL INSTITUTIONS

Date _____

Practical class

Hygienic estimation of the placement and design of hospital department by the project

Objectives:

1. To strengthen the students' knowledge of the hygienic requirements concerning the medical institution location and planning on the basis of assessment and the normative documents;
2. To teach the students to draw the hygienic conclusions, substantiated resolutions and give the recommendations

You should know:

1. Basic hygienic requirements concerning the planning and regime of exploitation of the patient care institutions, the therapeutic, surgical, infectious diseases and other specialized departments.

You should have the following skills:

4. Using the construction drawings of the location and general layout to determine and assess the project patient care institutions location and territory zoning, taking into account objects, adjacent to the plot for construction, "wind rose", correspondence with the site development, percentage of green area and the constructions orientation.
5. Using the construction plans and slits to determine and assess the correspondence of the hospital premises area, cubic capacity and sanitary accomplishment to hygienic standards; their correspondence to the functional purpose.

1. Sanitary estimation of the placement of the hospital (situational plan)

1.1.The scale of the situational plan _____

1.2. Characteristics of "wind rose"_____

1.3. Location of the hospital_____

1.4. The surrounding objects and distance to them

_____

_____

_____

_____

_____

1.5. Presence of sources of pollution of the environment around the hospital and distance to them_____

_____

_____

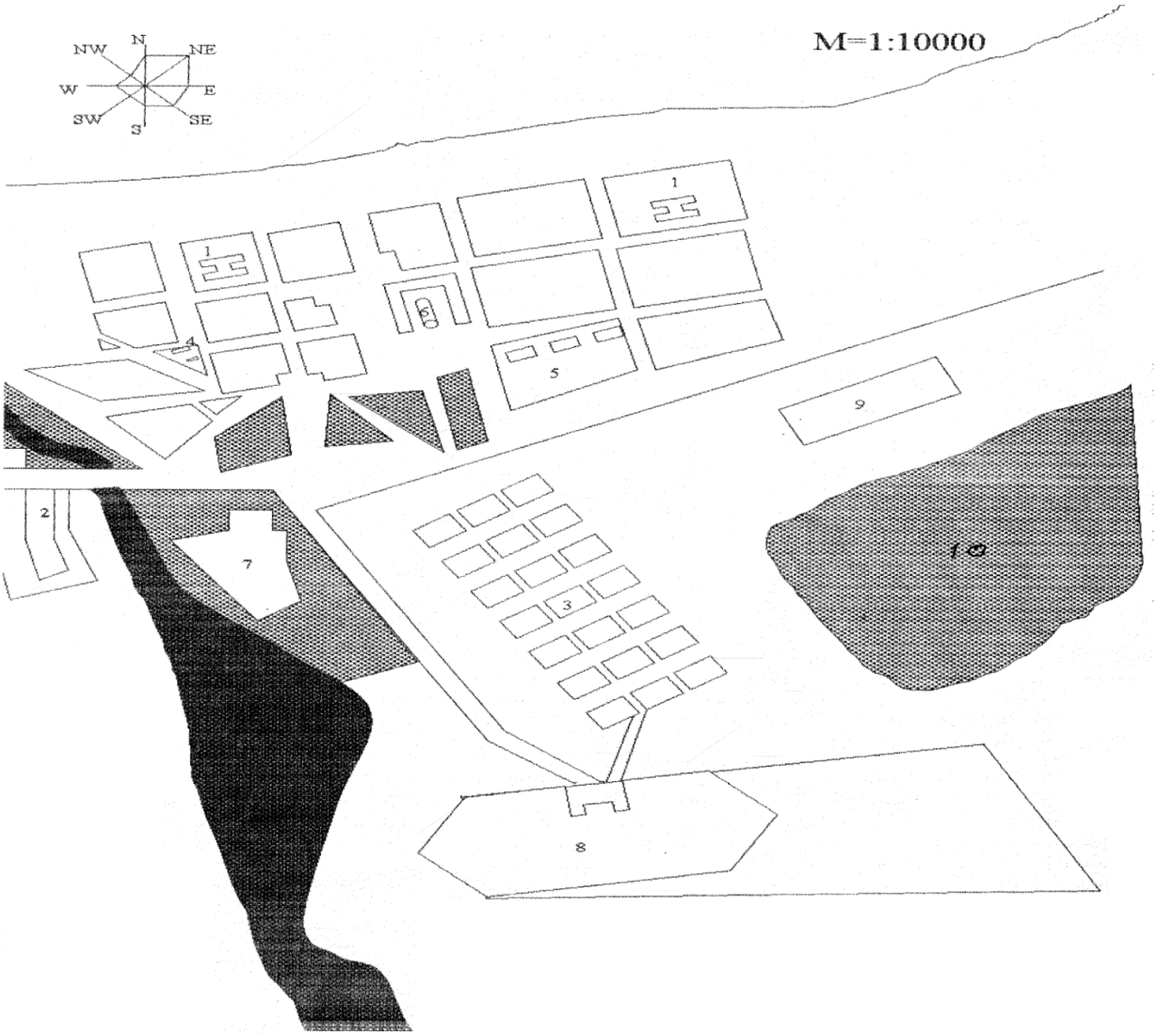
_____

_____

1.6. Conclusion

_____
_____
_____
_____

Example of situational plan of district hospital



1. school
2. village
3. living houses
4. bread bakery
5. garages
6. market
7. clothing factory
8. factory of chemical equipment
9. hospital
10. green space.

2. Sanitary and hygienic estimation of the general plan of the hospital for 320 beds.

2.1. The scale of the general plan: _____

2.2. Shape of the hospital plot _____

2.3. The size of the plot: length _____ ; width _____

2.4. The ratio of width and length of the hospital plot _____

2.5. The area of the hospital plot _____

2.6. The area of the hospital plot for one bed _____

2.7. The presence and number of entrances to the territory of the hospital

_____

_____

2.8 The presence of separate entrances to the morgue zone, to the economic zone and other facilities zone

_____

_____

2.9. The presence of a sufficient number of paths and passages on the hospital plot

_____

_____

2.10. The percentage of buildings on the territory is _____

2.11. The percentage of green spaces on the territory _____

2.12. The list and location of medical buildings and other buildings on the territory of the plot

_____

_____

_____

_____

_____

2.13. Orientation of the medical building front

_____

_____

2.14. The correct location of different zones on the territory of hospital (according to "wind rose")

_____

_____

_____

_____

Conclusion:

_____

_____

_____

_____

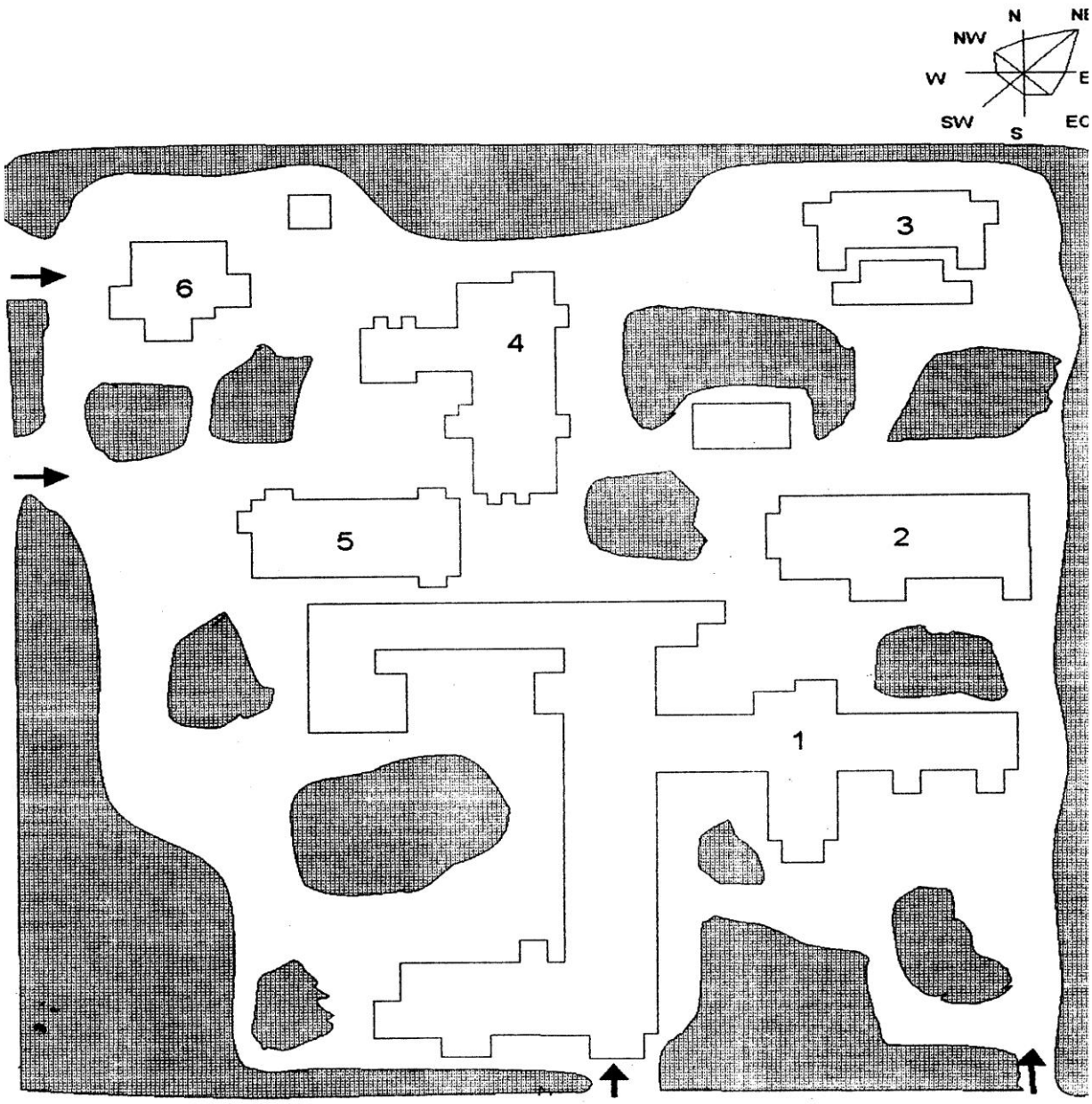
_____

_____

_____

_____

Example of general plan of district hospital



Scale 1 : 1000

1. Main medical building for 240 beds
2. Medical building for 60 beds
3. Infections disease department for 20 beds
4. Administrative building
5. Hospital department of nutrition
6. Morgue

3. Sanitary-hygienic estimation of the internal design of the hospital section

3.1. The scale of the internal design. _____

3.2. Number of beds in the ward _____

3.3. Number of the entrances to the ward _____

3.4. The type of the corridor in the ward _____

3.5. The set of main rooms for medical treatment and other rooms in the section

_____

_____

_____

_____

3.6. Number and percentage of:

3.6.1 one-bed wards in the section _____

3.6.2 two-bed wards _____

3.6.3 four-bed and more wards _____

3.7. The scheme of movement of the patients in the section

_____

_____

3.8. The place of sanitary sections in the hospital

_____

_____

3.9. Types of ventilation and heating systems in the wards and others medical rooms in the ward section

_____

_____

3.10. Dimensions of the corridor

3.10.1 Length of the corridor _____

3.10.2 Width of the corridor_____

3.10.3. Area of the corridor_____

3.10.4 The area of the corridor for one patient_____

4. Hygienic estimation of the ward

4.1. Length of the ward _____width of the ward _____

4.2. Area of the ward _____

4.3. Area of the ward for one patient _____

4.4. Height of the ward - 3,2 m _____

4.5. Volume of the ward _____

4.6. Volume of the ward for one patient _____

4.7. Natural lighting of the ward

4.8.Number of windows in the ward _____

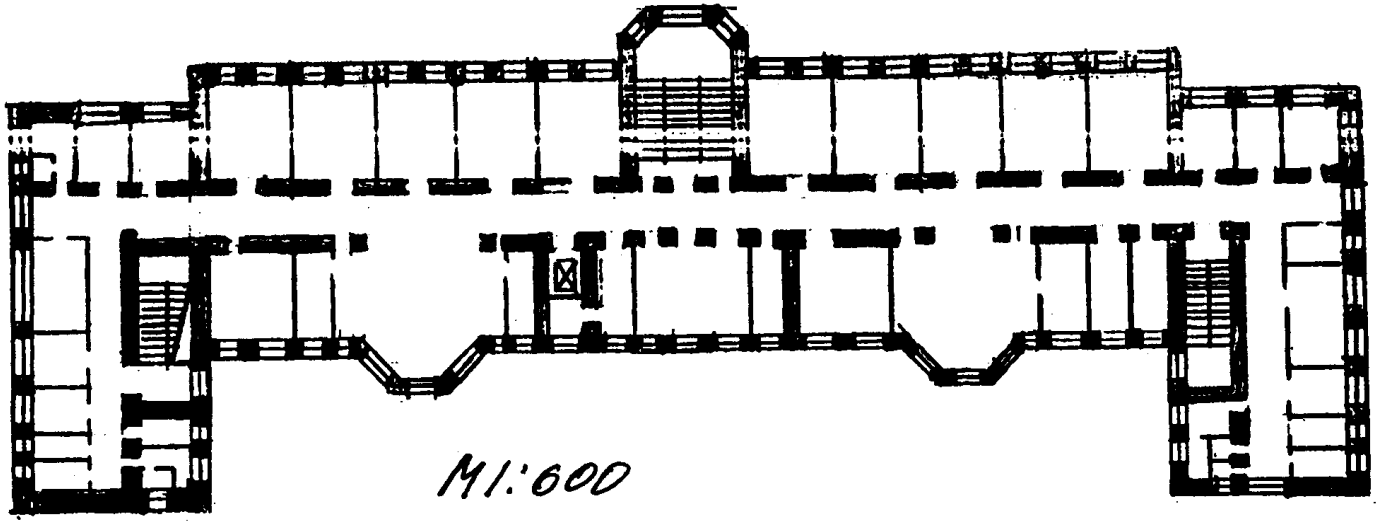
4.8.1.width of the window_____height of the window_____

4.8.2. area of one window _____

4.8.3. total area of windows (without transom) _____

4.9. Lighting coefficient _____

а



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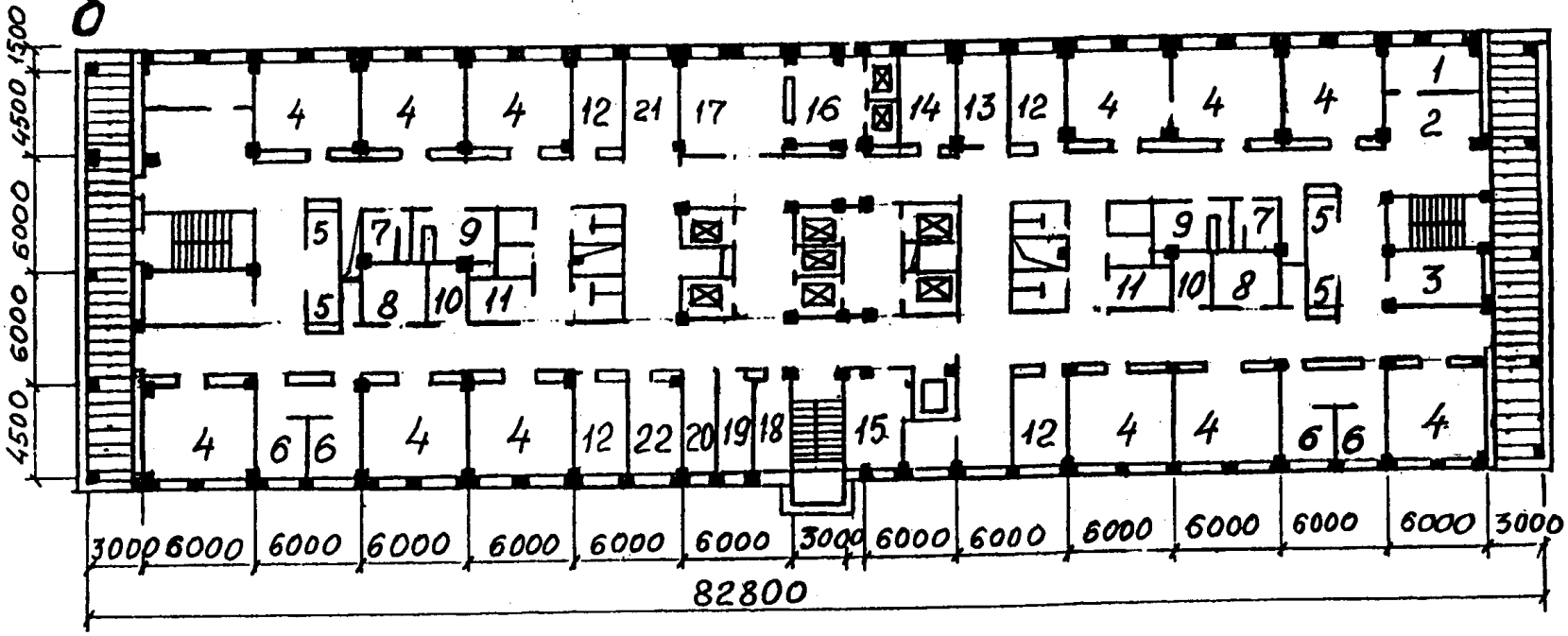
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82800

The internal design of the therapeutic department

a - the ward section with a corridor of two-side building;
b - the ward section with a two-way corridor;

1. sanitary treatment room;
2. room for daily stay of patients;
3. dressing room;
4. wards for 4 beds;
5. post for the nurse on duty;
6. wards for 1 bed;
7. clyster room;
8. room for storage of portable equipment;
9. bathroom;
10. room for dirty linen;
11. sanitary room;
12. two-bed wards;
13. doctor's room;
14. room of head physician;
15. room for endoscopy;
16. refreshment room;
17. dining room;
18. room for personnel;
19. matron's room;
20. nurse-manager's room;
21. room for day stay patients;
22. doctor's room

Conclusion:

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Test questions

1. Hygienic requirements to the location of medical preventive establishments on the territory of city.
2. Hygienic requirements to the general plan of a hospital
3. Hygienic characteristic of the various systems of planning of hospitals,
4. Hygienic requirements to internal design of a hospital.
5. The main principle of the design of a ward section.
6. Hygienic requirements to the hospital wards.

Signature of Lecturer _____ Signature of Student _____

Date _____

Practical class

Method of sanitary hygienic inspection of medical institutions

Objective

23. Master the knowledge of the hygienic conditions and harmful factors influencing the efficacy of patients' treatment and medical workers health.
24. Become familiar with the legislative and organizational measures of the provision of the optimal regime, hygienic conditions for patients of the in patient departments and the medical workers labour protection.
25. Master the general scheme and methods of subjective (sanitary inspection) and objective sanitary control of the conditions of patients stay and the working conditions of medical personnel at the hospital.

You should know :

7. Basic hygienic requirements to the planning, equipment, regime, exploitation of the treatment, diagnostic, departments.
8. Hygienic standards of microclimate, air, ventilation, natural and artificial lighting of different subdivisions of the medical institution, their importance in the patients' treatment efficacy and the working conditions of medical personnel.
9. Harmful and dangerous factors of different subdivisions of the medical institution (diagnostic, physiotherapeutic, balneal etc.), their influence on the patients' and medical personnel health.

You should have the following skills:

1. To carry out the sanitary inspection and determine the objective figures of the hygienic condition of different subdivisions of the medical institution .
2. To determine and assess harmful and dangerous factors of different subdivisions of the medical institution and their influence on the patients and medical personnel health.

Act of sanitary inspection of medical institutions

1. General information.

1.1. Name of the medical preventive establishment

_____

_____

1.2. Address of the hospital _____

1.3. Number of beds in the hospital_____

1.4. Servics provided by the hospital_____

2. Sanitary inspection of the location plan of the hospital.

2.1 Location of the hospital in the city _____

2.2 The surrounding objects and distance to them _____

2.3 Presence of polluted sources of the environment around the hospital and distance to them _____

3. Sanitary inspection of the general plan of the hospital.

3.1. Shape of the plot of the hospital _____

3.2. Length of the plot _____

3.3. Width of the plot _____

3.4. Ratio of the width and length of the plot _____

3.5. The area of the hospital plot _____

3.6. The area of the plot for one bed _____

3.7.Number of entrances to the territory _____

3.8.Presence and names of zones on the territory of the hospital

_____

_____

_____

_____

_____

3.9. Presence of sufficient number of paths and passages on the hospital plot

_____

_____

_____

_____

_____

3.10. Presence of separate entrances to the morgue and economic zone

_____

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3.11. The hospital building occupy…..% of the teritory

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3.12. The green spases of the hospital occupy…..% of the teritory

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3.13. The list of medical buildings, their location on the territory

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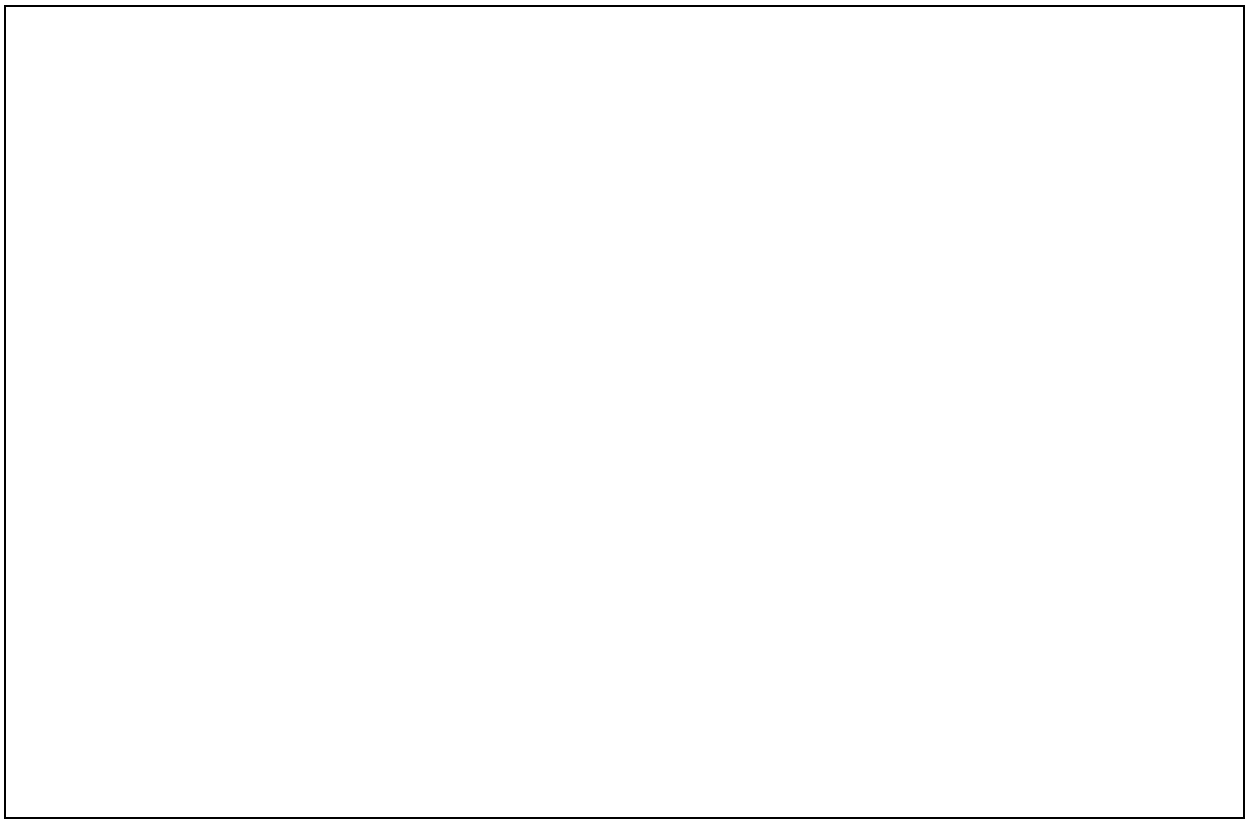
Scheme of general plan of hospital



Scale (1:1000)

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4. Hygienic inspection of the main building of the hospital.

4.1. The system of construction of the hospital _____

4.2. Orientation of the medical building front of the medical building

_____

4.3. Number of floors in the main building _____

4.4. Location of departments on the floors of the hospital

4.4.1 on the floor_____

4.4.2 on the floor _____

4.4.3_____

4.4.4 _____

4.4.5 _____

4.4.6 _____

4.4.7_____

4.4.8_____

4.4.9_____

5. Sanitary inspection of the section

5.1. Number of beds in the department_____

5.2. Number of the entrances to the department_____

5.3. Type of the corridor in the department _____

5.4. The set of main rooms for medical treatment and other rooms in the department.

_____

_____

5.5. Presence and number of one-bed wards, two-beds wards, four-beds wards and more in the ward hospital department

_____

_____

5.6. The scheme of movement of the patients in the ward department

_____

_____

5.7. The place of sanitary sections in the ward department

_____

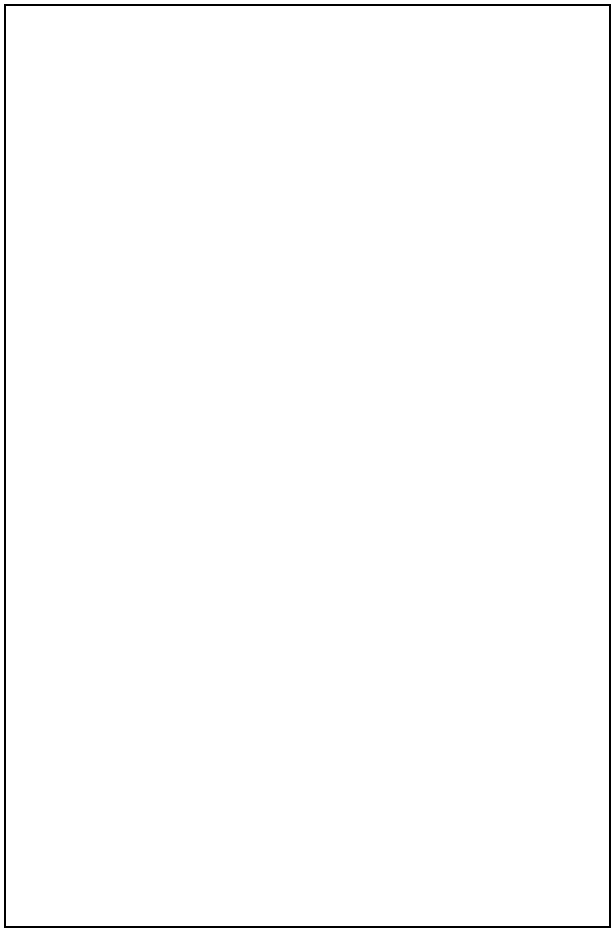
_____

1.8. Types of ventilaion and heating systems in the wards and other medical rooms

_____

_____

Scheme of internal design of the department



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5.9.Scale (1:1000)

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6. Hygienic inspection of the ward:

6.1. Length of the ward _____
6.2. Width of the ward _____
6.3. Area of the ward _____
6.4. Number of beds in the ward _____
6.5. Area of the ward for one patient_____
6.6. Height of the ward _____
6.7. Volume of the ward _____
6.8. Volume of the ward for one patient _____
6.9. Natural lighting of the ward - the number of windows _____
- the width of the window _____
- the height of the window _____
- the area of one window_____
- the area of all windows (without transom) _____
- the lightning coefficient in the ward _____

7.Conclusions

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Test questions

1. Hygienic requirements for the placement of a medical preventive establishments on territory of city. The method of inspection.
2. Hygienic requirements for the general plan of a hospital. The method of inspection.
3. Hygienic characteristics of various heating systems in hospitals.
4. Hygienic requirements for internal design of a hospital. The method of inspection.
5. The main principle of the planning of ward section.
6. Hygienic requirements for the ward of a hospital.
7. Hygienic requirements for the microclimate in a hospital.
8. Hygienic requirements for natural and artificial lighting in hospital wards and other medical rooms. The method of inspection.
9. Hygienic characteristics of the treatment regimen in a hospital.
10.Prophylaxis of hospital infections.

Signature of Lecturer_____ Signature of Student_____

Date _____

Practical class

Features of hygienic requirements to planning and maintenance of medical-preventive establishments.

Objective:

1. To strengthen the students' knowledge of the hygienic requirements concerning the patient care institutions' location and planning on the basis of assessment and analysis of the study project materials and the normative documents; to teach the students to draw the hygienic conclusions, substantiated resolutions and give the recommendations.

You should know :

1. Basic hygienic requirements concerning the planning and regime of exploitation of the patient care institutions, the therapeutic, surgical, infectious diseases and other specialized departments.

You should have the following skills :

1. Using the construction drawings of the situational and general layout to determine and assess the project patient care institutions' location and territory zoning, taking into account objects, adjacent to the land parcel, "wind rose", correspondence with the site development, percentage of green area and the constructions' orientation.
2. Using the constructions' plans and slits to determine and assess the correspondence of the hospital premises' area, cubic capacity and sanitary accomplishment to hygienic standards; their correspondence to the functional purpose.

Tasks for self-training:

At home, the student should give definitions to the following terms:

Term	Definition
Hospital	
Medical-preventive establishments (MPE)	
Systems of hospital construction	
Architectural and planning measures	
Zones of the hospital site	
Hygienic requirements to the composition of hospital ward units	
Hygienic requirements to the indices of microclimate and illumination of operating rooms	

Class work – solve situational problem No.___ and make the record:

Situational problem

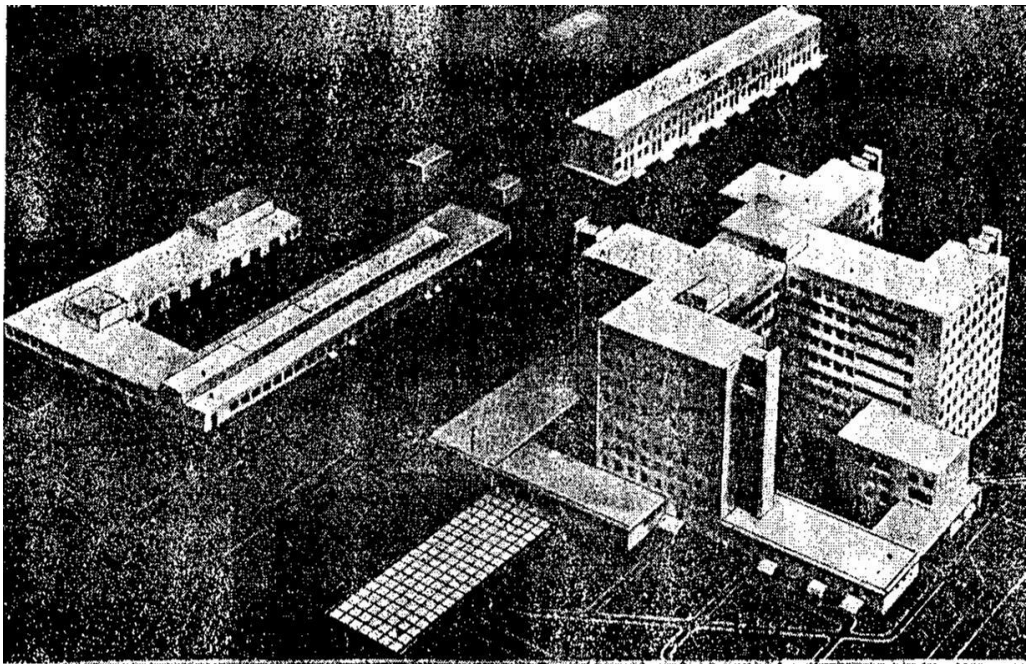
District Hospital for 510 beds with a polyclinic 1,000 visits per shift
* (Training project is prepared at the Department)

Explanatory Note.

1. The complex of Regional Hospital for 510 beds with an out-patient department for 1,000 visits per shift is a center for provision of high quality health care to the population, and is designed to serve the district town and the district with population of 100,000, taking into account existing local hospitals.
2. The complex includes the main building with 450 beds (nine-storeyed), infectious building with 60 beds, an outpatient clinic (two-storeyed) and a block of additional facilities (1 floor).
3. The out-patient clinic for 1000 visits per shift is designed to provide medical care to the population (to 40,000) who lives in the area, and rendering an advisory care. The hospital is an organizational-methodical and advisory center for the medical-preventive establishments of the district.In its structure, the hospital has ten departments listed below.
4. There are such medical-supporting departments of the main building: intensive care unit, departments of rehabilitation, radiology, admission department, administrative, operating unit and clinical diagnostic laboratory.
5. The area of project application: I - B, II, III climatic areas.
6. For hospital complex construction, the area of 7.3 hectares should be assigned.
7. The territory is divided into zones: a hospital zone, a zone of out-patient department, infectious building zone, economic and auxiliary services, and garden-park zone.
8. The placement of departments per floor of the main building is as follows:
9. 1st floor - obstetrical department, pediatric department with 30 beds for children up to 1 year, the admission department, and the main entrance of the hospital;
10. 2nd floor- department of rehabilitation, obstetrical department and pediatric department with 30 beds for children up to 6 years;
11. 3rd floor - rehabilitation department, intensive care unit, pediatric department with 30 beds for children older than 6 years old;
12. 4th floor - therapeutic department of two sections with 30 beds and rehabilitation;
13. 5th floor - neurological department with 30 beds, therapeutic section with 30 beds and radiological section; 6th floor - department of functional diagnostics and gynecology department of two ward sections with 30 beds; 7th floor - pharmacy, ENT department with 30 beds, ophthalmology department with 30 beds;
14. 8th floor - the surgical department of two ward sections with 30 beds and clinical diagnostic laboratory; 9th floor - trauma section with 30 beds and an operating unit.
15. Therapeutic and diagnostic departments are located next to every floor of the hospital and have a comfortable relationship with them.
16. Ward sections have short main corridor lit from two ends. On the border of the corridors the halls of the day stay and posts of nurses on duty are designed.

17. Infectious building for 60 beds is designed in a П- shaped one-story building, which houses the section of cubicles with 30 beds (one wing) and section of semi-cubicles with 30 beds (second wing). Pathologic anatomy department is designed in a separate isolated building.
18. Block of economic services is designed in a separate insulated building and at the economic yard, where there are: the central heating unit, boiler room, garage, workshop, laundry and catering department.
19. The hospital is designed using frame-panel constructions of II-04 series.

The hospital complex is provided with water heating and mechanical input-exhaust ventilation, hot water from the boiler, electricity from the transformer substation and weak currents from the district telephone station and PBX.



District Hospital to 510 beds with a polyclinic 1,000 visits per shift, (project branch, architect A. Zagniboroda, constructor L.Vaymisheva, 1975, Model)

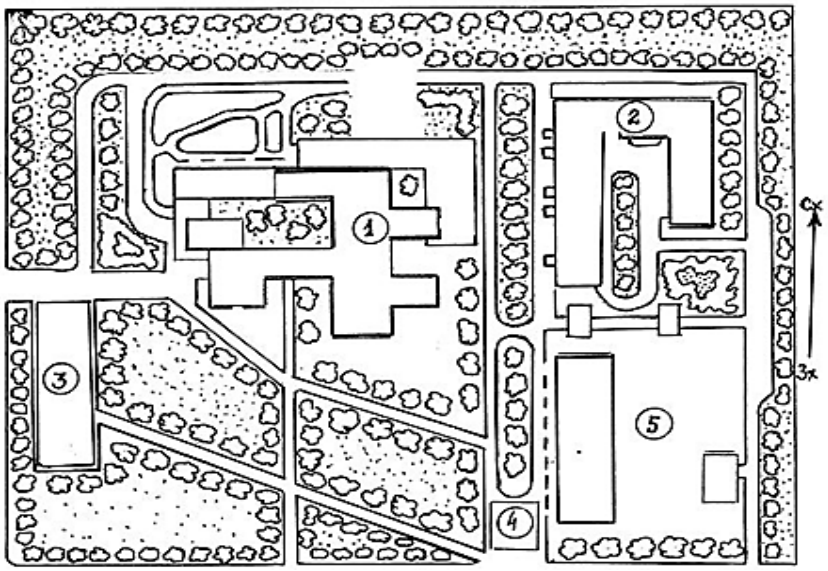


Fig. 1.Scheme (general plan).

Legend:

1. 9-storey main building with diagnostic and medical departments and a 450-bed hospital.
2. One-storey infectious building with 60 beds.
3. Two-storey out-patient department.
4. Pathologoanatomic building.
5. Economic zone.

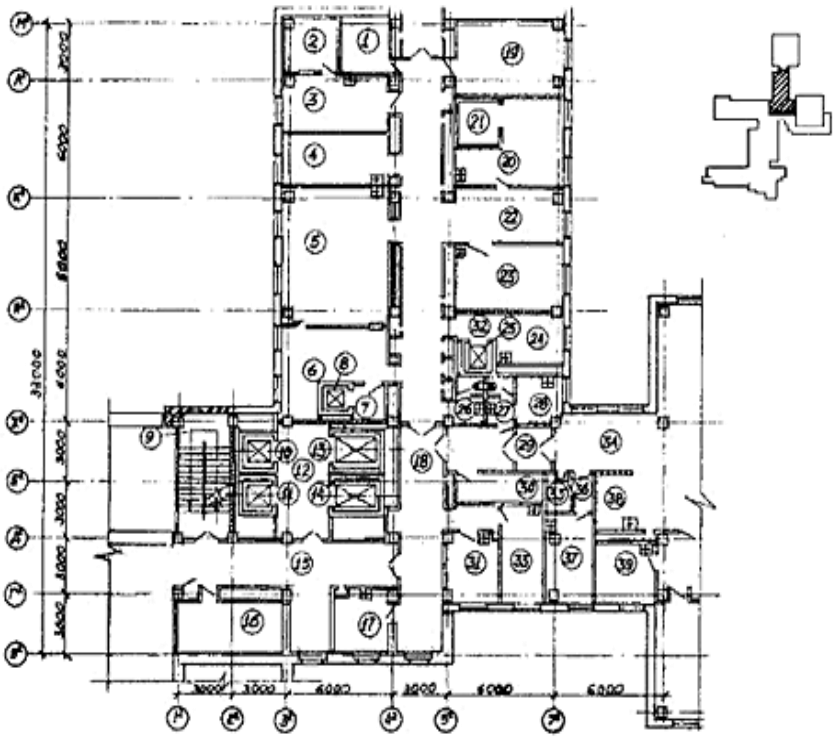


Fig. 2. Detail of a typical plan of the operating unit

Legend:

1.
2.

Fig. 3. Fragment of a typical plan of the therapeutic department
Legend:
1.

2.

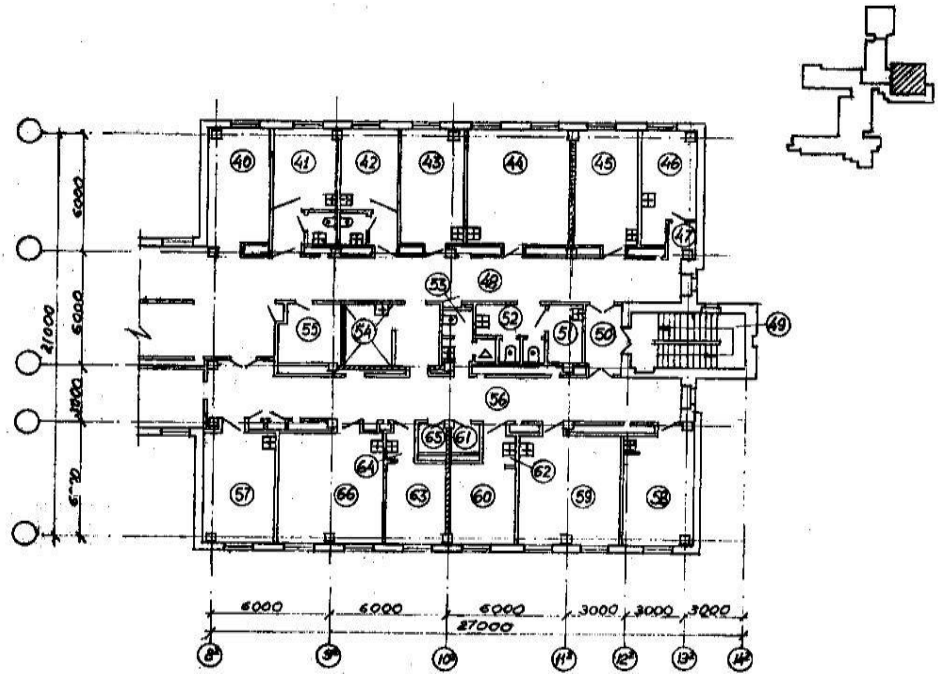


Fig. 4 Typical ward section of children's department
Legend:

1.
2.

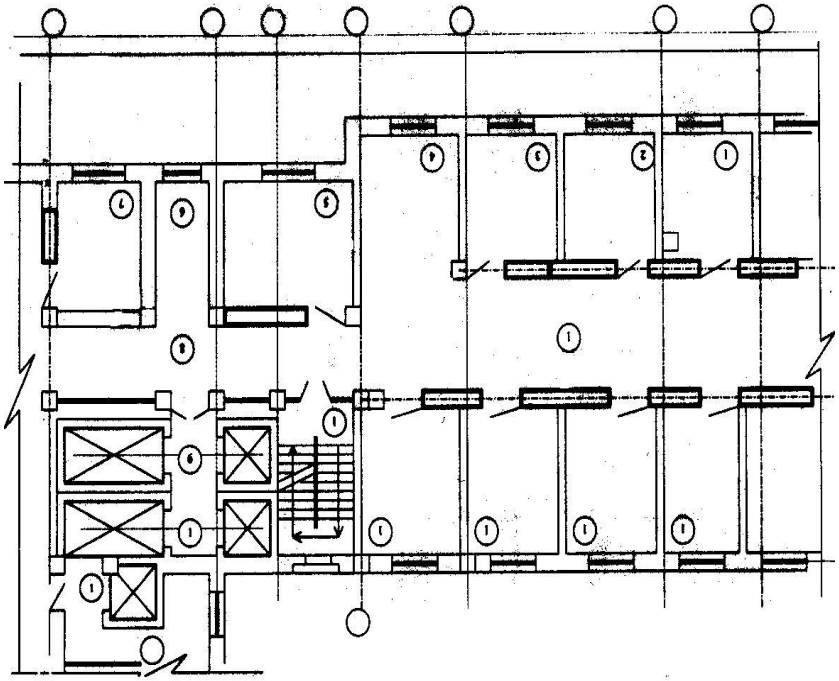


Fig. 5 Typical ward section of infectious department

Legend:

1.

2.

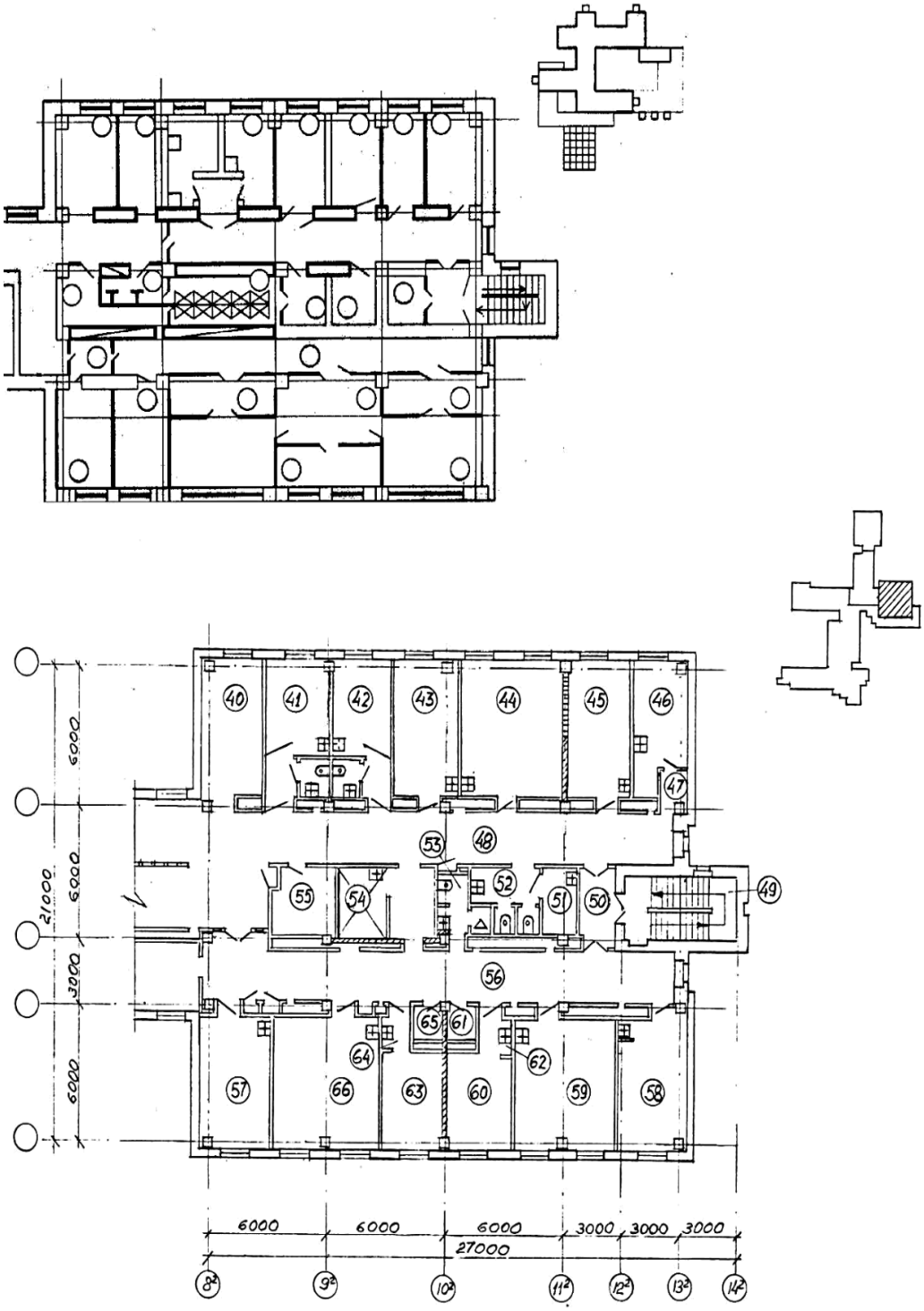


Fig. 6. Detail of a typical ward section

Legend:

1.

2.

Stages of solving of situational task:

1. Examination of the explanatory note.
2. Reading the drawings of a typical plan of one of the departments of medical-preventive establishment.
3. Conclusion:

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Theoretical questions:

1. Preliminary sanitary supervision over designing and construction of medical-preventive establishments, its stages. Components of the project.
2. Hygienic requirements to accommodation of the hospital in the settlement, taking into account existing objects and“wind rose”. The situational plan.
3. Hygienic requirements to the general plan of building of the hospital site, functional zoning of the territory, accomplishment, constructed area and gardening.
4. Modern systems of hospital construction (centralized, block, decentralized-pavillion, mixed), their comparative characteristic, influence on conditions of exploitation, equipment.
5. Hygienic requirements to planning of admission departments of the hospital, its importance for the regimen of exploitation and prophylaxis of nosocomial infections.
6. Hygienic requirements to planning and regimen of work for therapeutic, surgical, infectious and other departments.
7. Hygienic characteristic of ward sections, requirements to the set of premises of these sections in different departments.
8. Hygienic requirements to planning and equipment of wards of different departments. Features of planning and equipment of infectious departments, intensive care units and rehabilitation departments.
9. Hygienic requirements to planning, equipment and regimen of exploitation of operational units.
10. Hygienic requirements to sanitary-engineering equipment of hospitals

Signature of Lecturer_____ Signature of Student _____

Date _____

Practical lesson

Physical and intellectual work. Functional chages in the organism during the work.

The purpose of study:

_____

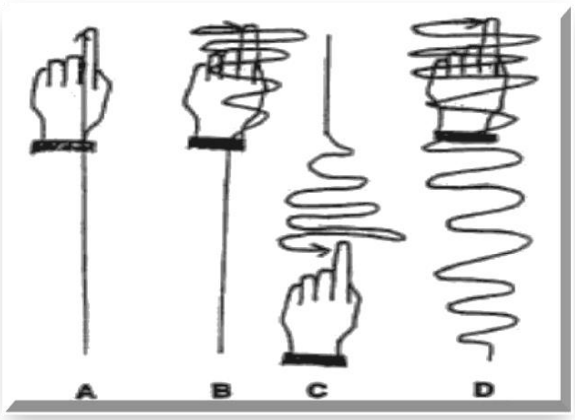
_____

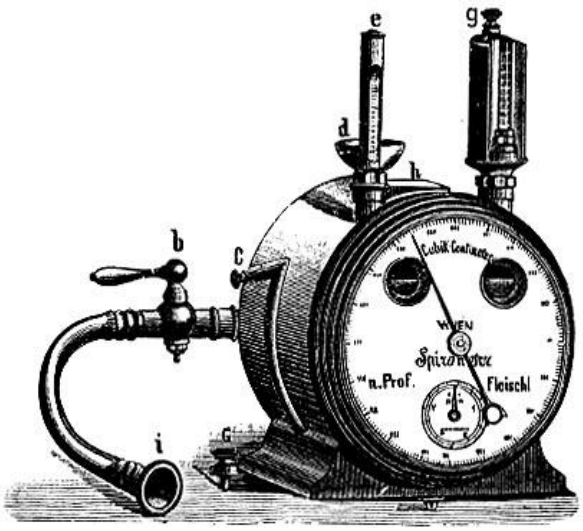
_____

Work report:

The central nervous system			
latent period of visual motor reaction, s		after effort	
latent period of acoustical motor reaction, s		after effort	
operative memory, %		after effort	
focusing attention, s		after effort	
percentage of correctness, %		after effort	
The cardiovascular system			
pulse rate before effort		after effort	
arterial tension before effort		after effort	
pulse pressure beforeeffort		after effort	
The respiratory sistem			
respiration rate before effort		after effort	
respiration volume before effort		after effort	
The neuromuscular system			
dynamometry of muscular force		after effort	
dynamometry of muscular resistance		after effort	
tremometry before effort		after effort	

Name the devices in the picture and indicate the scope of aplication

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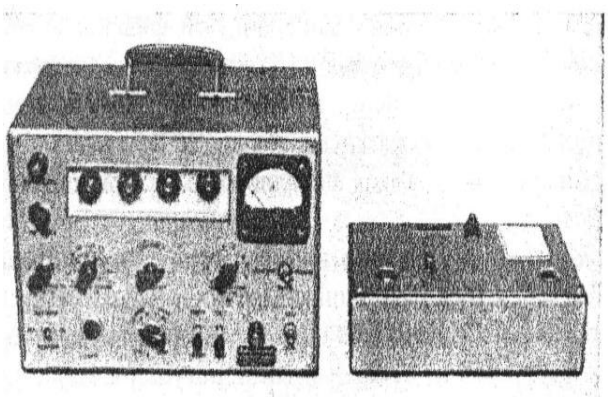

Conclusion: _____
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Professional groups of workers

1st group	**Workers occupied with mental work** Engineers, teachers, physicians (except surgeons), chiefs of enterprises, scientific workers, secretaries, students, managers of industrial enterprises, literature workers, businessmen, controllers, laboratory assistants.
2nd group	**Workers occupied with light physical work** Coaches, workers of automatic industrial process, clothing industry workers, agronomists, salespeople, stockbreeders, junior nurses, trainers, nurses.
3rd group	**Workers occupied with not hard work** Drivers, cooks, shoemakers, surgeons, fitters, adjusters, chemists, textile workers, workers of public nutrition, salespeople in food shops, water transport workers, railway men.
4th group	**Workers occupied with hard physical work** Dockers, builders, metallurgists, riggers, miners, steelmakers, foundry men.

Signature of Lecturer_____ Signature of Student _____

Date _____

Practical lesson

Sanitary investigation of an occupational polsoning

Objectives:

1. To acquire knowledge about the effect of occupational hazards on workers' health as well as regulations and procedure of investigation concerning occupational diseases and poisonings, proper paperwork.
2. To substantiate and take the indispensable therapeutic and prophylactic measures.

You should kno:

1. Fundamentals of toxicology of chemical compounds – routes of penetration into organism, their transformation, mechanism of action, excretion.
2. Methods and techniques of intoxication prophylaxis, basic criteria of hygienic standardization of chemical compounds in the working zone air, in the other environments.

You should have the following skills:

1. Recognizing and investigateing cases of poisonings and diseases having chemical character, using appropriate normative and directive documentation.
2. Recommending and taking prophylactic measures regarding occupational diseases and poisonings, assessing their effectiveness.
3. Drawing up the documents concerning investigation of cases of occupational poisonings and diseases properly.

Situational problem

Four workers of a machine-building shop of an engineering plant referred to the plant polyclinic one hour before the end of their work shift complaining of heaviness in the head, headache in the regions of the temples and forehead, tinnitus, a sense of weakness, rapid pulse, nausea. Before seeking medical advice, two workers vomited. On examination, a factory sectorial doctor objectively revealed that the mucosa and skin integuments of the sick workers were markedly pink, the pulse rate was 110-120 beats per minute, the respiratory rate was 30-35 respirations per minute. A neurologist, invited for consultation, revealed an increase of tendon reflexes and tremor of fingers of stretched arms in all the patients. All sick workers were released from their work, two persons with the most expressed signs were admitted to the plant hospital.

As a result of an investigation of this case of a mass acute disease carried on by a sanitation physician for occupational hygiene in the presence of the motor-testing shop manager and the chief of the safety engineering section of the plant before the beginning of the second shift, the following facts were revealed:

- All workers started their work in time at the beginning of the first shift.

- The workers were testers of tractor engines and operated engine-test beds, on which ready engines were tested in different modes of operation. Simultaneously, 10 engines are tested at the shop. One bed is operated by two workers.
- Usually the course of an operational check consists of the following stages: the engines are filled up with diesel fuel, started and work according to the program of testing in different modes (unloaded, usual and forced). The workers are directly near the test beds and with the help of special devices register the course of engine testing.
- The main unfavorable factors in this work are industrial noise (up to 95 dBA) and air pollution in the work area with exhaust fumes of engines in operation.
- The shop is equipped with plenum-exhaust ventilation. Besides, each bed has local ventilation for removing exhaust fumes from the air of the work area. In order to protect the organ of hearing, the workers use anti-noise earphones.
- On the day when there was the case of a mass disease of the employees, 30 minutes after the end of the dinner break the local ventilation on one of the beds went out of service. The work was not stopped though the employees were informed that it was inadmissible to carry out engine testing with faulty ventilation.
- The foreman of the test section did not inform the shop manager about the malfunction of the ventilation on one of the work places and allowed to go on with the testing.
- The work was stopped only one hour before the end of the shift when two workers who operated the engine-test bed with faulty ventilation and two workers who were engaged the nearby bed state of health had to leave their places of work and turn to the doctor of their plant outpatient clinic.

Task:

1. On the basis of the information given in the situational problem draw a record of investigation of the occupational poisoning according to the suggested form.
2. Make the initial diagnosis of the occupational poisoning of the workers.
3. List the laboratory tests which should be done in order to specify the diagnosis of the given occupational poisoning. Ministry of Public Health of Republic Moldova_____
   City _____
4. District _____

The act of sanitary investigation of occupational poisoning

This act was made the …….20 ……... by doctor in hygiene of

_____

_____

The investigation was carried out by

_____

_____

1.Name of the enterprise

_____

_____

2.Address of the enterprise

3.Name of the shop

4.Date of the onset the disease ……..20 ……

5.The circumstances of the occupational poisoning incidence

6. The causes of the disease

7. The list of persons who fell ill

8. The measures of liquidation of the disease and terms of their fulfillment

Signatures of the participants of the investigation:

Industrial physician/occupational hygienist

Trade union representative

Draw up a conclusion by results on the resuits of the solution of situational task. It is necessary to take into account

1. The beginning of the work

2. The character of the work and equipment

3. The character of the technological process

4. The main unfavorable factors of the technological process

5. Sanitary measures taken at the work place.

6. Organization of labor at the industrial enterprise

7. The order of the administrative control

8.Data on the breakdown in technological process

9. Data about breakage of sanitary and technological equipment

10. Conclussion

Test questions

1. Classification of industrial poisons .
2. Basic ways how industrial poisons enter human organism.
3. The basic mechanism, which determines a toxic transformation of the human organism.
4. Destiny of industrial poisons in a human organism.
5. Accumulation of industrial poisons in a human organism and its significance in the development of occupational poisoning.
6. The ways of industrial poison elimination from a human organism.
7. Definition of marginal concentrations of industrial poison in the working area air.
8. The procedure of hygienic investigation of cases of occupational poisonings.
9. The documents filled in in the case of the occupational poisoning.

Signature of Lecturer_____ Signature of Student _____

HYGIENE OF CHILDREN AND TEENAGERS

Date _____

Practical lesson

Methods of study of childrens' health under influence of environmental factors. The methods of study.

Objective

1. To strengthen the theoretical knowledge about environmental factors and conditions rhat influence the formation of children's health.
2. To master the methods of study of the children's and teenagers' health and physical development.

You should know :

1. Principal factors of environmental and social conditions of life, which influence the health of childern and adolescents.
2. Main patterns of growth, development and peculiarities of morphological and functional state of the child's and teenager's organism.
3. Methods of studying of physical development of children and teenagers.

You should have the following skills:

1. Determining the health groups, somatometric, somatoscopic and physiometric indices of the children's and adolescents' physical development.

2. Measuring main parameters of physical development of a child and a teenager

The purpose of study:

Work report:

To appreciate the individual physical development of 3 children through the method:

a) deviations from Sigma

Parameters of physical development of three children

Indicies	**Individual data**	**Arithmetic average, *M***	**Deviation from square average *σ***	**Deviation from average**	**Deviation from sigma**
	a	***b***	***c***	***d***	$e = \frac{d}{c}$
Height					
bodyweight					
Chest perimeter					

Graphical representation of the profile of physical development of children

-3 σ -2 σ -1 σ M +1 σ + 2 σ +3 σ

Height						
bodyweight						
Chest perimeter						

Health group determinations:

Group I :

_____
_____
_____
_____

Group II :

_____
_____
_____
_____

Group III :

_____
_____
_____
_____

Group IV

_____
_____
_____
_____

Theme problem

Conclusion:_____
_____
_____
_____
_____
_____
_____
_____

Signature of Lecturer_____ **Signature of Student** _____

Record of physical development of a child and a teenager (student)

1. General data

1. First and second name _____
2. Sex _____
3. Age (date of birth) _____
4. Nationality_____
5. Address_____
6. Place of studying _____
7. Data about the parents: Mother's profession and place of mother's work_____ Father's profession and father's place of work_____
8. Living conditions (presence of a separate room, a separate bed, a desk for study _____ _____ _____
9. Character of nourishment (good, bad, satisfactory) _____
10. Diseases at past time_____
11. Presence of chronic diseases at present _____

2.Somatoscopic data

1. Constitutional type_____
2. Skeleton_____
3. Development of the musculature_____
4. Fat deposit_____
5. Color of mucosa and skin, elasticity of skin_____
6. Posture_____
7. The form of the legs_____
8. Foot-print_____
9. Sexual development_____

3. Somatometric data

1. stature upright_____ in sitting position_____
2. weight_____
3. circumference of thorax
   3.3.1 at maximum inspiration _____
   3.3.2. at maximum expiration _____
4. at rest_____
5. circumference of the head_____

4. Physiometric data

1.vital capacity of lungs_____
2. muscular force of hands: right _____ left _____
3. muscular force of the trunk_____
4. Pulse _____
5. Blood pressure_____
6. Respiration (number in 1 min) _____

Conclusion_____
_____
_____
_____
_____
_____
_____
_____
_____
_____

Test questions

1. The methods of studying of physical development of children and teenagers and their essence.
2. The methods of measurement of stature in children and teenagers (upright and sitting); the instruments used for these measurements.
3. The methods of measurement of circumference of the thorax, head, abdomen, etc; the instruments used for these purposes.
4. The methods of measurement of weight in children and teenagers; the instruments used for this purpose.
5. The methods of measurement of muscular force in the hands and trunk.
6. The methods of determination of somatoscopic parameters of the body (posture, development of muscles, the thorax form, development of fatty tissues, degree of sexual development)

Signature of Lecturer_____ **Signature of Student** _____

Date _____

Practical lesson

Metods of estimation of physical development of children and teenagers.

Objective

1. To consolidate theoretical knowledge about the main criteria and indices of the children and adolescents health and development.
2. To master methods of complex assessment of the children and adolescents health and physical development.

You should know :

1. Methods of estimation of physical development of children and teenagers.

You should have the following skills:

1. Estimating the physical development of a child and a group of children using different methods.

Situational task 1

To estimate the physical development of a 12 -year-old girl using the method of "sigmal deviation". The stature of the girl is 138 cm, the weight is 40.6 kg, the circumference of the thorax is 61.89 cm

Parameters of physical development	**Value for the child A**	**Standard value of parameter M**	**Difference Δ**	**σ**	**Sigmal deviation Δ / σ**	**Estimation**
stature						
weight						
circumference of the thorax						

Conclusion_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

Situational task 2

Draw a profile of physical development for a nine year-old boy if it is known that he has: deviation in stature + 1.3σ, in weight - 0.9σ, in circumference of the thorax

	-3σ	**-2σ**	**-1σ**	**M**	**+1σ**	**+2σ**	**+3σ**
Stature							
Weight							
Circumference of the thorax							

Conclusion _____

_____

_____

_____

_____

_____

Situational task 3

To give the hygienic estimations of physical development of a seven - year-old girl with using the " Stature regression scale". Stature of the girl is 128 cm, weight is 24 kg, circumference of the thorax is 59 cm

Parameter of physical development	**Value for the child A**	**Standard value of parameter M**	**Difference Δ**	**σ**	**Sigmal deviation Δ / σ**	**Estimation**
stature						
weight						
circumference of the thorax						

Conclusion_____

_____

_____

_____

_____

_____

_____

_____

Test questions

1. The methods of estimation of children's' and teenagers' physical development.
2. The essence of the "sigmal deviation" method.
3. The essence of the graphical method.
4. The essence of "regression scale" method by stature.
5. The essence of the complex method of estimation of physical development.
6. Groups of physical development of children and teenagers.
7. When you estimate them by the method of "sigmal deviation", by the method of "regression scale by stature", by the complex method

Signature of Lecturer _____ Signature of Student _____

Date _____

Practical lesson

The method of hygienic estimation of the secondary school design.

Objective

1. To strengthen the theoretical knowledge about the significance of optimal hygienic conditions maintenance during organization the educational process for preservation and strengthening of schoolchildren health, prevention of "school diseases".
2. To become familiar with methods of hygienic assessment of the land plot and the building of educational establishment, its main premises (school class), inspection of conditions for schoolchildren, the implementation and substantiation of hygienic recommendations for the improvement of training and education quality.
3. To master the method of hygienic assessment of school furniture.

You should know :

1. Peculiarities of the main environmental factors and conditions of training and education, which influence the children and adolescents health.
2. Health disorders and diseases caused by the influence of environmental conditions, training and education.
3. Hygienic requirements to the land plot and the building, planning, sanitary and technical infrastructure (microclimate parameters, illumination, ventilation, water-supply etc.) of main premises of training and educational establishments.

***You should have the following skills*:**

1. Drawing up the plan of inspection of training premise and filling in appropriate papers (sanitary description, sanitary inspection act, hygienic conclusion).
2. Researching the temperature regimen, humidity and air movement, illumination, calculating the required and actual ventilation volume and rate (air exchange rate).
3. Determining main parameters of school furniture, carrying out the school desk marking.
4. Developing and substantiating preventive recommendations concerning improvement of sanitary and hygienic conditions of the pupils.

Act of sanitary and hygienic inspection of secondary school

I, student (children and teenager hygiene phsician)

_____

conducted sanitary hygienic inspection of secondary school №

_____

1. General information

1.The name of secondary school_____

2 Address of secondary school_____

3 Number of pupils in the school_____

4 Type of the school_____

2. Sanitary inspection of the location plan of the school on a scale 1.5

1. Location of the school in the city

_____

2. The surrounding objects and distance to them_____

3. Sources of the environmental pollution and distance to them

_____

3. Sanitary inspection of the general plan of the school

1. The shape of the plot of the school_____
2. Length of the plot_____
3. Width of the plot_____
4. The area of the plot_____
5. Presence and names of zones on the territory of school plot_____
6. Number of entrances to the territory of the school_____
7. Percentage of building of the territory_____
8. Persentage and location of green plantation _____

4. Hygienic character of school building

4. 1. Distance of school building from the road _____
"red line"_____

4.2. Orientation of the school building front_____

4.3. Number of floors_____

4.4. Location of class rooms on the floors_____

4.4.1 On the ground floor there are_____

4.4.2 on the first floor there are

_____

_____

4.4.3 on the second floor there are

_____

_____

4.5. Water supply and sewerage system at the school_____

4.6. Heating system of the school building_____

4.7. Character of the corridor_____

4.7.1 type of the corridor ._____

4.7.2 length of the corridor

_____

4.7.3 width of the corridor_____

4.7.4 the corridor area

_____

4.7.5 the corridor area per one pupil

_____

4.7.6 The characteristic of natural lighting of the corridor

- number of windows_____
- height of the window_____

- width of the window_____
- the window area _____
- area of all windows (without the frame) _____
- lighting coefficient in the corridor_____

4.8. Dimensions of the class-room

4.8.1 length of the class-room_____

4.8.2 width of the class-room _____

4.8.3 the class-room area _____

4.8.4 the class-room area per one pupil_____

4.8.5 natural lighting in the class-room:

- number of windows_____
- height of the window_____
- width of the window_____
- window area _____
- area of all windows (without the frame) _____
- lighting coefficient _____

4.8.6 microclimate in the class- room:

- air temperature_____
- air humidity _____
- velocity of air movement_____

4.9. Characteristics of the gymnasium:

4.9.1 gymnasium is situated on_____

4.9.2 length the gymnasium _____

4.9.3 width the gymnasium _____

4.9.4 floor area _____

4.9.5 floor area per one pupil _____

4.9.6 lighting coefficient_____

4.9.7 artificial lighting_____

4.9.8 microclimate in the gymnasium:

- air temperature_____
- relative humidity_____
- velocity of air movement_____

4.9.9 cloak-room for the gymnasium _____

4.9.10 shower-bath for the gymnasium_____

4.10. Characteristics of the workshop_____

4.10.1 length_____

4.10.2 width_____

4.10.3 floor area _____

4.10.4 floor area per one pupil_____

4.10.5 microclimate in the workshop:

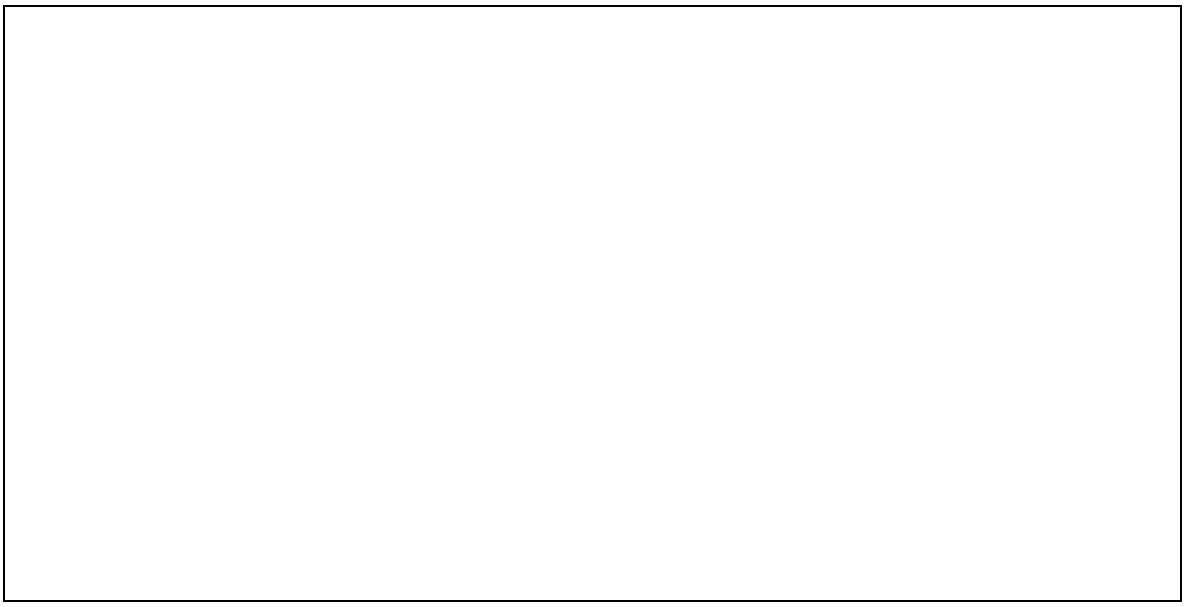
- air temperature_____
- air humidity_____
- velocity of air movement_____

5. **Additional information**

_____
_____
_____
_____

Conclusion _____
_____
_____
_____
_____

Scheme of internal design of the school building



Test questions

1. Hygienic requirements to the placement of schools in the city.
2. Hygienic requirements to the plot area.
3. Hygienic requirements to a school building.
4. Set of rooms in a school and their location on the stories.
5. Hygienic requirements to a class-room and its equipment.
6. Hygienic requirements to a gymnasium and its equipment.
7. Hygienic requirements to a workshop and its equipment.
8. Organization of physical training in school.
9. Organization of pupils' work in a workshop.

Signature of Lecturer_____ Signature of Student _____

Date _____

Practical class

Methods of studyng age psychical and physiological peculiarities in children and teenagers. Hygienic estimation of the educational and upbringing regimen of different children's groups.

Objective:

1. To become familiar with methods of studying age psychological and physiological peculairities of the organism of children and adolescents.
2. To master the method of examination of children's functional preparedness to studying at school.
3. To master methods of making hygienic assessment of day regimen and time-table for different age pupils.
4. To become acquainted with the method of hygienic assessment of organization of the pupils' extra-curricular activities and free time.

You should know:

1. Anatomical and physiological, psychological and physiological peculiarities of the child and adolescent organism of different age and sex.
2. Medical, physiological, psychological and pedagogic assessment criteria of the child development level.
3. Methods of studying of fucntional state of the child and adolescent organism.
4. Health disorders and diseases caused by irrational organization of training and education.
5. Hygienic requirements to organization of training and education, drawing up a time table, organization and conducting classes, organization of the pupils' extra-curricular activities and free time.

You should have the following skills:

1. Identifying psychological and physiological peculiarities of the child's and adolescent's organism depending on age.
2. Carrying out the hygienic assessment of functional preparedness of children to training at school.
3. Performing the hygienic assessment of day regimen, time-table, school textbooks and manuals, organization and conducting classes and pupils' extra-curricular activities and free time.

The scheme of hygienic estimation of the school time-table

1. The number of school shifts_____
2. The beginning of classes of the first shift_____
3. The end of classes of the first shift _____
4. The beginning of classes of the second shift_____
5. The end of classes of the second shift_____

(You should calculate the end of the classes by yourself. For this purpose, you should sum up the time of all classes and all breaks.)

6. The number of breaks and their duration_____
7. The number ofclasses a day: minimal _____ maximal _____
8. The number of classes a week_____
9. Study time a day: minimal _____ maximal _____
10. Study time a week_____
11. The number of classes of physical training a week_____

What days and at what time are there the classes of physical training?_____

_____

12. The number of industrial arts classes a week_____
13. What days and at what time are there the classes of labor?_____

_____

14. The number of double lessons_____

What day of the week, at what time and in what subjects are there double classes?

_____

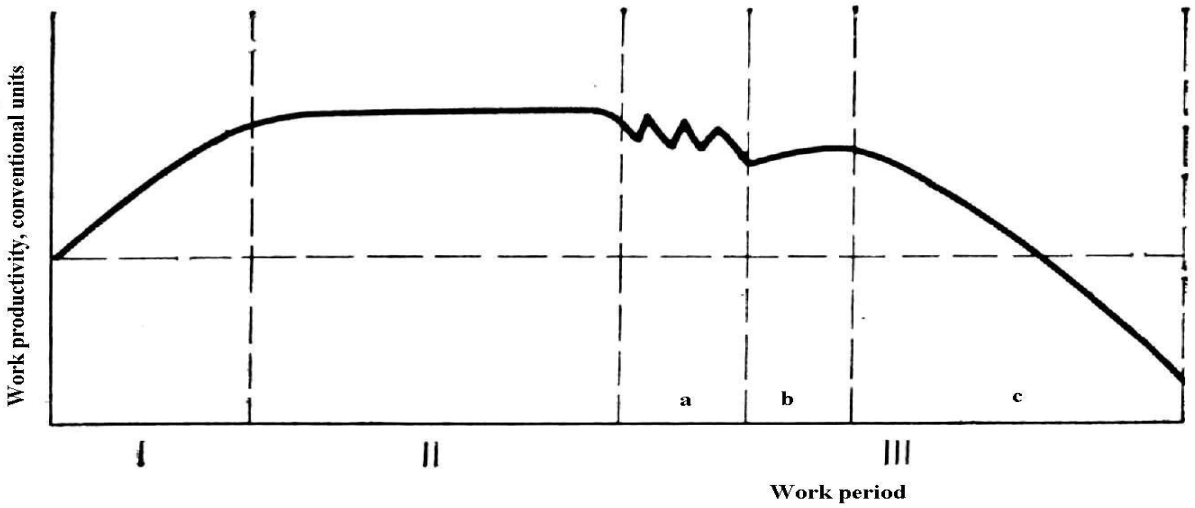
School time-table

Monday		**Tuesday**	
1		1	
2		2	
3		3	
4		4	
5		5	
6		6	
Wednesday		**Thursday**	
1		1	
2		2	
3		3	
4		4	
5		5	
6		6	

Friday			
1			
2			
3			
4			
5			
6			

Physiological curve of working capacity

(I – period of work initialization; II – period of high constant working capacity, III – period of decrease of working capacity; a –zone of partial compensation; b – zone of final out break; c – zone of progressive fall of working capacity)



Test questions

1. The physiological curve of the working ability and its substantiation.
2. The main peculiarities of educational process at school.
3. Regimen of a day. Principles of the day regimen construction.
4. Hygienic requirements to the day regimen.
5. Hygienic requirements to the school timetable.

Signature of Lecturer_____ Signature of Student _____

INFORMATION AND REFERENCE MATERIALS

Determination of the relative humidity based on the Assmann psychrometer data, %

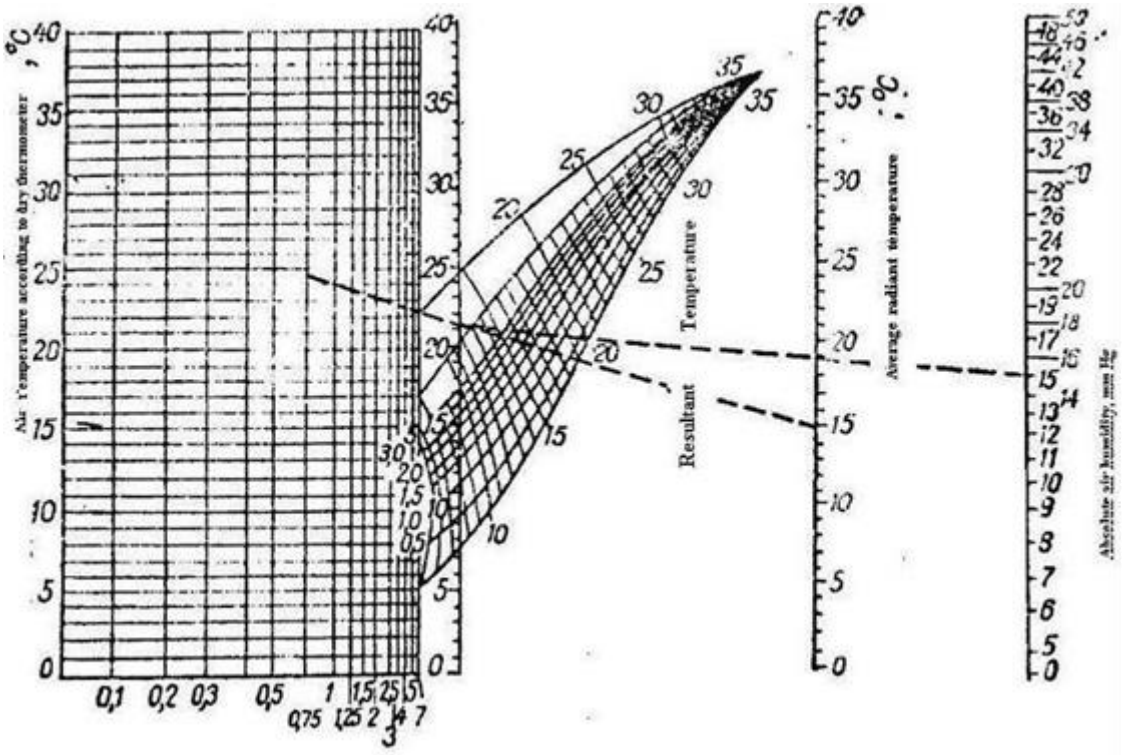
Dry thermometer reading, ° C	Wet thermometer reading, ° C													
	10.0	11.0	12.0	13.0	14.0	15.0	16.0	17.0	18.0	19.0	20.0	21.0	22.0	23.0
16.0	**46**	**54**	**63**	**71**	**81**	**90**	**100**							
17.0	**39**	**47**	**55**	**64**	**72**	**81**	**90**	**100**						
18.0	**34**	**41**	**49**	**56**	**65**	**73**	**82**	**91**	**100**					
19.0	**29**	**36**	**43**	**50**	**58**	**66**	**74**	**82**	**91**	**100**				
20.0	**24**	**30**	**37**	**44**	**52**	**59**	**66**	**74**	**83**	**91**	**100**			
21.0	**20**	**26**	**32**	**39**	**46**	**53**	**60**	**67**	**75**	**83**	**91**	**100**		
22.0	**16**	**22**	**28**	**34**	**40**	**47**	**57**	**64**	**72**	**80**	**84**	**91**	**100**	
23.0	**13**	**18**	**24**	**30**	**36**	**42**	**48**	**55**	**62**	**69**	**76**	**84**	**92**	**100**
24.0		**15**	**20**	**26**	**31**	**37**	**43**	**49**	**56**	**63**	**70**	**77**	**84**	**92**
25.0			**17**	**22**	**27**	**33**	**38**	**44**	**50**	**57**	**63**	**70**	**77**	**84**
26.0			**14**	**19**	**24**	**29**	**34**	**40**	**46**	**52**	**58**	**64**	**71**	**77**
27.0				**16**	**21**	**25**	**30**	**36**	**41**	**47**	**52**	**58**	**65**	**71**
28.0				**13**	**17**	**22**	**26**	**31**	**36**	**42**	**46**	**52**	**58**	**65**
29.0					**14**	**18**	**22**	**27**	**33**	**37**	**42**	**46**	**52**	**58**
30.0						**15**	**19**	**24**	**29**	**33**	**37**	**40**	**46**	**52**
31.0							**16**	**21**	**25**	**29**	**33**	**36**	**40**	**46**

Table of tangents

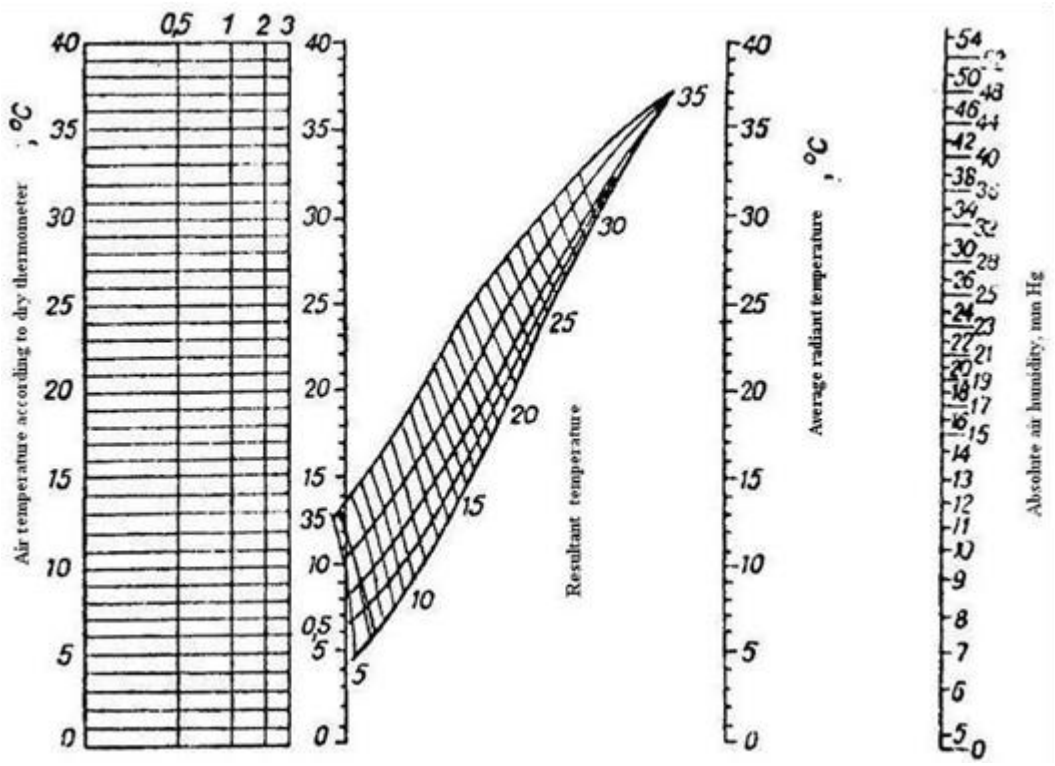
$tg\alpha$	$\angle \alpha^0$	$tg\alpha$	$\angle \alpha^0$	$tg\alpha$	$\angle \alpha^0$	$tg\alpha$	$\angle \alpha^0$
0.0175	1	0.2867	16	0.6009	31	1.0355	46
0.0349	2	0.3057	17	0.6249	32	1.1106	48
0.0524	3	0.3249	18	0.6494	33	1.1918	50
0.0699	4	0.3443	19	0.6745	34	1.2799	52
0.0875	5	0.3640	20	0.7002	35	1.3764	54
0.1051	6	0.3839	21	0.7265	36	1.4826	56
0.1228	7	0.4040	22	0.7536	37	1.6003	58
0.1405	8	0.4245	23	0.7813	38	1.732	60
0.1584	9	0.4452	24	0.8098	39	1.881	62
0.1763	10	0.4663	25	0.8391	40	2.050	64
0.1944	11	0.4877	26	0.8693	41	2.246	66
0.2126	12	0.5095	27	0.9004	42	2.475	68
0.2309	13	0.5317	28	0.9325	43	2.747	70
0.2493	14	0.5543	29	0.9657	44	3.078	72
0.2679	15	0.5774	30	1.0000	45	3.487	74

Calculations for the formula of air movement speed less than 1 m/sec considering the temperature allowance

	Air movement speed in m/sec. at the temperature in °C							
	10	12.5	15	17.5	20	22,5	25	26
0.27	-	-	-	-	0.044	0.047	0.051	0.059
0.28	-	-	-	0.049	0.051	0.061	0.070	0.074
0.29	0.041	0.050	0.051	0.060	0.067	0.076	0.085	0.089
0.30	0.051	0.060	0.065	0.073	0.082	0.091	0.101	0.104
0.31	0.061	0.070	0.079	0.088	0.098	0.107	0.116	0.119
0.32	0.076	0.085	0.094	0.104	0.113	0.124	0.136	0.140
0.33	0.091	0.101	0.110	0.119	0.128	0.140	0.153	0.159
0.34	0.107	0.115	0.129	0.139	0.148	0.160	0.174	0.179
0.35	0.127	0.136	0.145	0.154	0.167	0.180	0.196	0.203
0.36	0.142	0.151	0.165	0.19	0.192	0.206	0.220	0.225
0.37	0.163	0.172	0.185	0.198	0.212	0.226	0.266	0.245
0.38	0.183	0.197	0.210	0.222	0.239	0.249	0.240	0.273
0.39	0.208	0.222	0.232	0.244	0.257	0.274	0.266	0.301
0.40	0.229	0.242	0.256	0.269	0.287	0.305	0.293	0.330
0.41	0.254	0.267	0.282	0.299	0.314	0.330	0.323	0.364
0.42	0.280	0.293	0.311	0.325	0.343	0.361	0.349	0.386
0.43	0.310	0.324	0.342	0.356	0.373	0.392	0.379	0.417
0.44	0.340	0.354	0.368	0.385	0.401	0.417	0.410	0.449
0.45	0.366	0.381	0.398	0.412	0.429	0.449	0.445	0.478
0.46	0.396	0.415	0.429	0.446	0.465	0.483	0.471	0.508
0.47	0.427	0.445	0.464	0.482	0.500	0.518	0.501	0.544
0.48	0.468	0.480	0.499	0.513	0.531	0.551	0.537	0.579
0.49	0.503	0.516	0.535	0.556	0.571	0.590	0.572	0.615
0.50	0.539	0.557	0.571	0.589	0.604	0.622	0.608	0.651
0.51	0.574	0.593	0.607	0.628	0.648	0.666	0.640	0.691
0.52	0.615	0.633	0.644	0.665	0.683	0.701	0.684	0.727
0.53	0.656	0.674	0.688	0.705	0.724	0.742	0.720	0.768
0.54	0.696	0.715	0.729	0.746	0.764	0.783	0.760	0.808
0.55	0.737	0.755	0.770	0.790	0.827	0.827	0.801	0.851
0.56	0.788	0.801	0.815	0.833	0.851	0.867	0.844	0.894
0.57	0.834	0.852	0.867	0.882	0.898	0.915	0.933	0.940
0.58	0.879	0.898	0.912	0.929	0.941	0.959	0.972	0.977
0.59	0.930	0.943	0.957	0.971	0.985	1.001	1.018	1.023
0.60	0.981	0.994	1.008	1.022	1.033	1.044	1.056	1.060



air movement, m/s a



air movement, m/s b

Nomogram of resultant temperature determination

(a – during light work; b – during hard work)

Coefficients for conversion the air volumes to their values in standard conditions

Tempe-rature, °C	*1 + αt*	*Tempe-rature, °C*	*1 + αt*
- 4	0.98535	16	1.0586
- 3	0.9890	17	1.0623
- 2	0.9927	18	1.0660
-1	0.9963	19	1.0696
0	1.000	20	1.0733
1	1.0037	21	1.0770
2	1.0073	22	1.0806
3	1.0010	23	1.0843
4	1.0147	24	1.0880
5	1.0183	25	1.0917
6	1.0220	26	1.0953
7	1.0257	27	1.0990
8	1.0293	28	1.1027
9	1.0330	29	1.1063
10	1.0367	30	1.1100
11	1.0403	31	1.1137
12	1.0440	32	1.1173
13	1.0476	33	1.1210
14	10513	34	1.1247
15	10550	35	1.1283

Atmospheric pressure, Hg mm.	$\frac{B}{}$	*Atmospheric pressure, Hg mm.*	$\frac{B}{}$
741	0.975	761	1.0013
742	0.976	762	1.0026
743	0.978	763	1.0039
744	0.979	764	1.0053
745	0.980	765	1.0066
746	0.982	766	1.0079
747	0.983	767	1.0092
748	0.984	768	1.0105
749	0.986	769	1.0118
750	0.987	770	1.0132
751	0.988	771	1.0145
752	0.989	772	1.0158
753	0.991	773	1.0171
754	0.992	774	1.0184
755	0.993	775	1.0197
756	0.995	776	1.0211
757	0.996	777	1.0224
758	0.997	778	1.0237
759	0.999	779	1.0250
760	1.000	780	1.0263

Air temperature in dwelling
(for cold period of year)

Premises	Air temperature, ºC
Living room (in flat and hostel)	18-20
Kitchen	18
Bath-room and shower-stall	25
Cloak-room	16-18
Toilet with bath-room	25
Wash-room	18
Hall, corridor	16
Premises for rest and study in a hostel	18
Isolation ward in a hostel	20
Administrative room in a hostel	18

Hygienic Standards of drinking water quality according the State Sanitary Rules and Norms 2.2.4-171-10
"Hygienic Requirements of Drinking water destined for person' consumption"
Sanitary-chemical indices Organoleptic and physical properties

Index	Hygienic norm	
	for water-pipe	for wells and captation of springs
Smell (at 20^{o} C and 60^{o} C)	not more than **2** points	not more than **3** points
Taste and aftertaste (at 20^{o} C)	not more than **2** points	not more than **3** points
Color quantity	not more than **20º**	not more than **35º**
Feculence	not more than **1.0** NUF (not more than **2.6** NUF for underground water)	not more than **3.5** NUF

Physico-chemical indices

Index	Hygienic norm	
	for water-pipe	for wells and captation of springs
pH	**6.5-8.5**	**6.5-8.5**
Iron (Fe)	not more than **0.2** mg/dm^{3}	not more than **1.0** mg/dm^{3}
General hardness	not more than **7.0** mmol/ dm^{3}	not more than **10.0** mmol/ dm^{3}
Manganese (Mn)	not more than **0.05** mg/dm^{3}	not more than **0.5** mg/dm^{3}
Copper (Cu^{2+})	not more than **1.0** mg/dm^{3}	not determined

Polyphosphates (by PO_4)	not more than **3.5** mg/dm^3	not determined
Sulphates (SO_4)	not more than **250** mg/dm^3	not more than **500** mg/dm^3
Dry residue	not more than **1000** mg/dm^3	not more than **1500** mg/dm^3
Residual uncombined chlorine	not more than **0.5** mg/dm^3	not more than **0.5** mg/dm^3
Chlorides (Cl^-)	not more than **250** mg/dm^3	not more than **350** mg/dm^3
Zinc (Zn^{2+})	not more than **1.0** mg/dm^3	not determined

Microbiological indices

Index	Hygienic norm	
	for water-pipe	for wells and captation of springs
Total microbial number	not more than **100** CFU/cm^3	not determined
E.coli	absence in **100** cm^3	absence in **100** cm^3
Entherococci	absence in **100** cm^3	not determined
Pseudomonas aeruginosa	absence in **100** cm^3	not determined
Pathogenic entherobacteria	absence in **1** dm^3	absence in **1** dm^3
Coliphage	absence in **100** cm^3	absence in **100** cm^3
Entheroviruses, adenoviruses and so on	absence in **100** cm^3	absence in **100** cm^3
Pathogenic intestinal protozoa, intestinal helmints	absence in **50** dm^3	absence in **50** dm^3

Toxicological indices

Index	Hygienic norm	
	for water-pipe	for wells and captation of springs
Aluminum (Al)	not more than **0.2** mg/dm^3	not determined
Ammonia	not more than **0.5** mg/dm^3	not more than **2.6** mg/dm^3
Cadmium (Cd)	not more than **0.001** mg/dm^3	not determined
Silicon (Si)	not more than **10** mg/dm^3	not determined
Arsenic (As)	not more than **0.01** mg/dm^3	not determined
Molybdenum (Mo)	not more than **0.07** mg/dm^3	not determined
Nitrates (by NO_3^-)	not more than **50** mg/dm^3	not more than **50** mg/dm^3

Nitrites (NO_2^-)	not more than **0.5** mg/dm^3	not more than **3.3** mg/dm^3
Residual ozone (O_3)	**0.1-0.3** mg/dm^3	not determined
Mercury (Hg)	not more than **0.0005** mg/dm^3	not determined
Lead (Pb)	not more than **0.01** mg/dm^3	not determined
Fluoride (F^-)	I and II climatic zone - not more than **1.5** mg/dm^3 III climatic zone - not more than **1.2** mg/dm^3 IV climatic zone - not more than **0.7** mg/dm^3	not more than **1.5** mg/dm^3
Residual polyacrylamide	not more than **2.0** mg/dm^3	not determined
Formaldehyde	not more than **0.05** mg/dm^3	not determined
Chloroform	not more than **60** mg/dm^3	not determined
Permanganate oxidability	not more than **5.0** mg/dm^3	not more than **5.0** mg/dm^3

Daily caloric value and quantity of proteins, fats and carbohydrates for different professional groups of population (males)

Professional groups	Coefficient of physical activity	Age (years)	Caloricity Kcal	Proteins (g)		Fats(g)	Carbo hydrates (g)
				Total	Animal origin		
I	1.4	18-29	2450	67	37	68	392
		30-39	2300	63	35	64	368
		40-59	2100	58	32	58	336
II	1.6	18-29	2800	77	42	78	448
		30-39	2650	73	40	74	424
		40-59	2500	69	38	69	400
III	1.9	18-29	3300	91	50	92	528
		30-39	3150	87	48	88	504
		40-59	2950	81	45	82	472
IV	2.3	18-29	3900	107	59	100	624
		30-39	3700	102	56	100	592
		40-59	3500	96	53	97	560

Daily caloric value and quantity of proteins, fats and carbohydrates for different professional groups of population (females)

Professional groups	Coefficient of physical activity	Age (years)	Caloricity Kcal	Proteins (g)		Fats(g)	Carbohydrates(g)
				Total	Animal origin		
I	1.4	18-29	2000	55	30	56	320
		30-39	1900	52	29	53	304
		40-59	1800	50	28	51	288
II	1.6	18-29	2200	61	34	62	362
		30-39	2150	59	32	60	344
		40-59	2100	58	32	59	336
III	1.9	18-29	2600	72	40	73	416
		30-39	2550	72	39	71	408
		40-59	2500	69	38	70	400
IV	2.2	18-29	3050	84	46	85	488
		30-39	2950	81	45	82	472
		40-59	2850	78	43	79	456

Daily need for vitamins for different professional groups of population (males)

Professional groups	Coefficient of physical activity	Vitamins									
		E	**D**	**A**	**B_1**	**B_2**	**B_6**	**PP**	***Folat***	**B_{12}**	**C**
		mg	mcg	mcg	mg	mg	mg	mg	mcg	mcg	mg
I	1.4	15	2.5	1000	1.6	2.0	2.0	22	250	3	80
		15	2.5	1000	1.6	2.0	2.0	22	250	3	80
		15	2.5	1000	1.6	2.0	2.0	22	250	3	80
II	1.6	15	2.5	1000	1.6	2.0	2.0	22	250	3	80
		15	2.5	1000	1.6	2.0	2.0	22	250	3	80
		15	2.5	1000	1.6	2.0	2.0	22	250	3	80
III	1.9	15	2.5	1000	1.6	2.0	2.0	22	250	3	80
		15	2.5	1000	1.6	2.0	2.0	22	250	3	80
		15	2.5	1000	1.6	2.0	2.0	22	250	3	80
IV	2.3	15	2.5	1000	1.6	2.0	2.0	22	250	3	80

Daily need for vitamins for different professional groups of population (females)

Professional groups	Coefficient of physical activity	Vitamins									
		E	**D**	**A**	**B_1**	**B_2**	**B_6**	**PP**	***Folat***	**B_{12}**	**C**
		mg	Mcg	mcg	mg	mg	mg	mg	mcg	mcg	mg
I	1.4	15	2.5	1000	1.3	1.6	1.8	16	200	3	70
		15	2.5	1000	1.3	1.6	1.8	16	200	3	70
		15	2.5	1000	1.3	1.6	1.8	16	200	3	70
II	1.6	15	2.5	1000	1.3	1.6	1.8	16	200	3	70
		15	2.5	1000	1.3	1.6	1.8	16	200	3	70
		15	2.5	1000	1.3	1.6	1.8	16	200	3	70
III	1.9	15	2.5	1000	1.3	1.6	1.8	16	200	3	70
		15	2.5	1000	1.3	1.6	1.8	16	200	3	70
		15	2.5	1000	1.3	1.6	1.8	16	200	3	70
IV	2.2	15	2.5	1000	1.3	1.6	1.8	16	200	3	70

Daily need for mineral substances for different professional groups of population (males)

Professional groups	Coefficient of physical activity	Mineral substances							
		Ca	P	Mg	Fe	F	Zn	I	Se
		mg	mg	mg	mg	mg	mg	mg	mcg
I	1.4	1200	1200	400	15	0.75	15	0.15	70
		1200	1200	400	15	0.75	15	0.15	70
		1200	1200	400	15	0.75	15	0.15	70
II	1.6	1200	1200	400	15	0.75	15	0.15	70
		1200	1200	400	15	0.75	15	0.15	70
		1200	1200	400	15	0.75	15	0.15	70
III	1.9	1200	1200	400	15	0.75	15	0.15	70
		1200	1200	400	15	0.75	15	0.15	70
		1200	1200	400	15	0.75	15	0.15	70
IV	2.3	1200	1200	400	15	0.75	15	0.15	70
		1200	1200	400	15	0.75	15	0.15	70

Daily need for mineral substances for different professional groups of population (females)

Professional groups	Coefficient of physical activity	Mineral substances							
		Ca	P	Mg	Fe	F	Zn	1	Se
		mg	mg	mg	mg	mg	mg	mg	mcg
I	1.4	1100	1200	350	17	0.75	12	0.15	50
		1100	1200	350	17	0.75	12	0.15	50
		1100	1200	350	17	0.75	12	0.15	50
II	1.6	1100	1200	350	17	0.75	12	0.15	50
		1100	1200	350	17	0.75	12	0.15.	50
		1100	1200	350	17	0.75	12	0.15	50
III	1.9	1100	1200	350	17	0.75	12	0.15	50
		1100	1200	350	17	0.75	12	0.15	50
		1100	1200	350	17	0.75	12	0.15	50
IV	2.2	1100	1200	350	17	0.75	12	0.15	50
		1100	1200	350	17	0.75	12	0.15	50
		1100	1200	350	17	0.75	12	0.15	50

Caloric value of different nutritious substances

Name of nutritious substances		Caloric value of 1 g of nutritious substances during its oxidation in the organism
1	Proteins	4.1 Kcal
2	Fats	9.3 Kcal
3	Carbohydrates	4.1 Kcal

Share of nutritious substances in daily ration

Name of nutritious substances		Share
1	Proteins	11-13
2	Fats	25-30
3	Carbohydrates	56-61
Total sum		100

Hygienic standard for milk

	Kind of milk	Acidity in %	Dry residue	Fatness
1	Whole	21	8.1	3.2
2	High fatness	20	7.8	6.0
3	Proteinized	25	10.5	2.5
4	Skim milk	21	8.1	-
5	Vitaminized, whole	21	8.1	3.2
6	Vitaminized, skim	21	8.1	-

The specification of quality of bread

Name of bread	Porosity (%),not less	Humidity (%) of crumb, not more	Acidity (^{0}), not more
Wheat bread (I class)	**72-74**	**43-44**	**3**
Wheat bread (II class)	**67-70**	**44-45**	**3**
Rye bread	**48**	**51**	**12**

Contents of essential amino acids in the meat of different animals

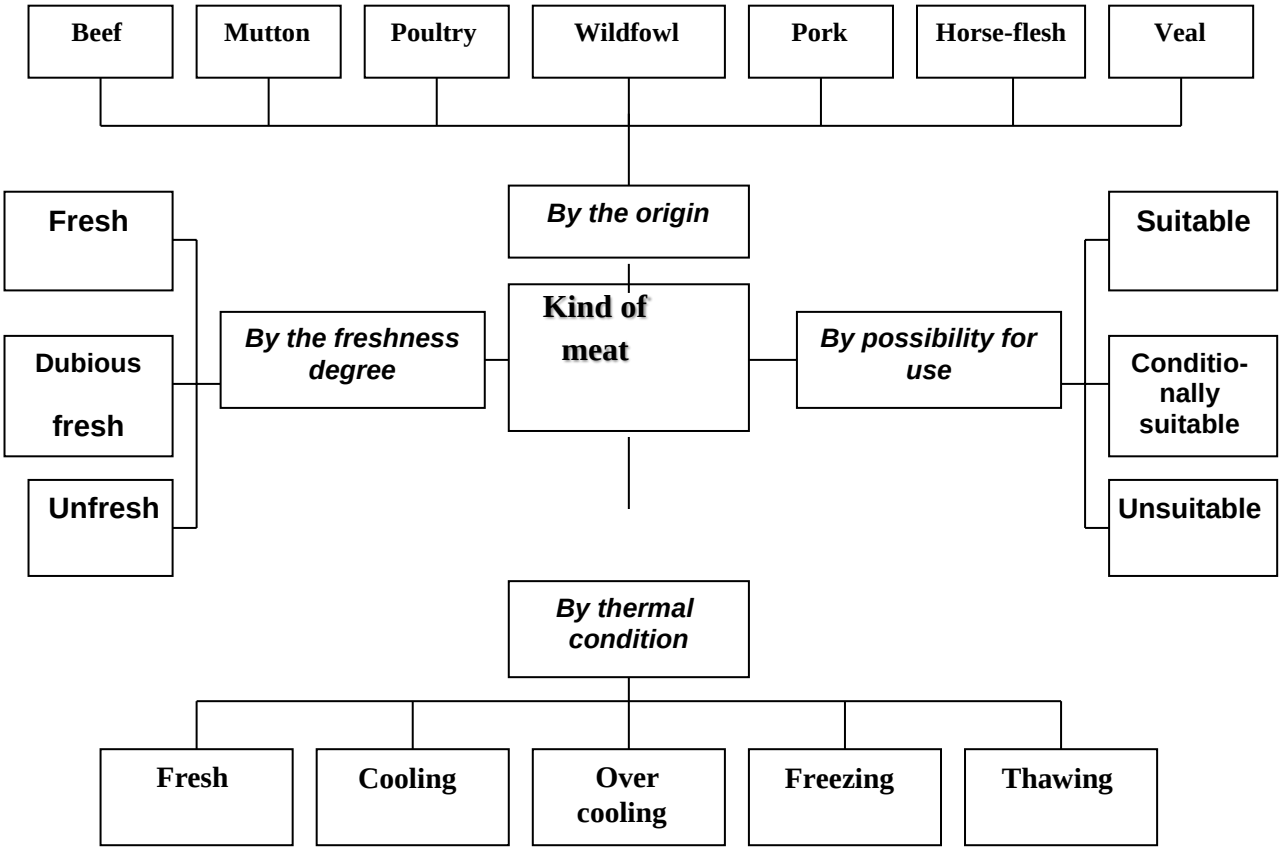
Amino acids	Contents of amino acids (% to proteins)		
	Beef	Pork	Mutton
Leucine	7.6	7.2	8.1
Isoleucine	5.7	5.7	5.4
Valine	5.3	5.5	5.4
Lysine	8.9	8.7	8.8
Methionine	2.5	2.4	2.4
Tryptophan	1.4	1.4	1.4
Phenylalanine	4.2	4.2	4.3
Threonine	4.5	4.5	4.8
Arginine	6.4	6.4	6.2
Histidine	3.9	3.8	3.2

Zavialov's table for determination of bread porosity

Rye bread		Wheaten bread	
Weight of 4 cylinders of bread (27 cm^3 each)	Porosity, %	Weight of 3 cylinders of bread (27 cm^3 each)	Porosity, %
4.9-83.6	35	51.0-50.1	50
83.5-82.3	36	50.0-49.1	51
82.2-81.0	37	49.0-48.1	52
81.0-79.8	38	48.0-47.1	53
79.7-78.5	39	47.0-46.1	54
78.4-77.2	40	46.0-45.1	55
77.1-75.9	41	45.0-44.1	56
75.8-74.6	42	44.0-43.1	57
74.5-73.3	43	43.0-42.1	58
73.2-72.0	44	42.0-41.1	59
71.9-70.7	45	41.0-40.4	60
70.6-69.4	46	39.3-39.0	61
69.3-68.1	47	38.8-38.0	62
68.0-66.8	48	37.9-36.8	63
66.7-65.5	49	36.7-35.8	64
65.4-64.2	50	37.5-34.9	65
64.1-62.9	51	34.8-33.9	66
62.8-61.6	52	33.8-32.9	67
61.5-60.5	53	32.8-31.9	68
60.4-59.2	54	31.8-30.9	69
59.1-57.9	55	30.8-29.9	70
57.8-56.6	56	29.8-28.9	71
56.5-55.3	57	28.8-27.9	72
55.2-54.0	58	27.8-26.9	73
53.9-52.7	59	26.8-25.8	74

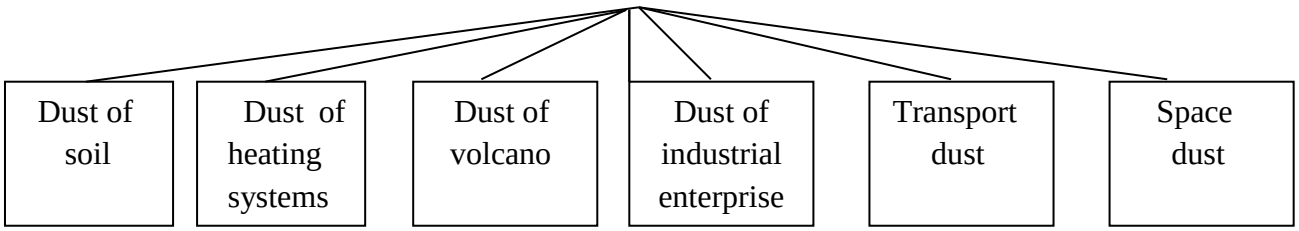
Zavialov's formula : $P = 100 - 3.086 \cdot d$,
where P is required porosity; d is weight of one slice (27 cm^3) of bread

Classification of meat

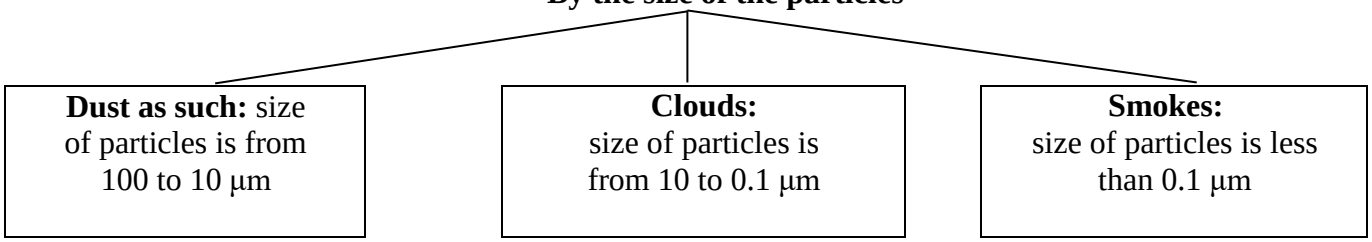


CLASSIFICATION OF DUST

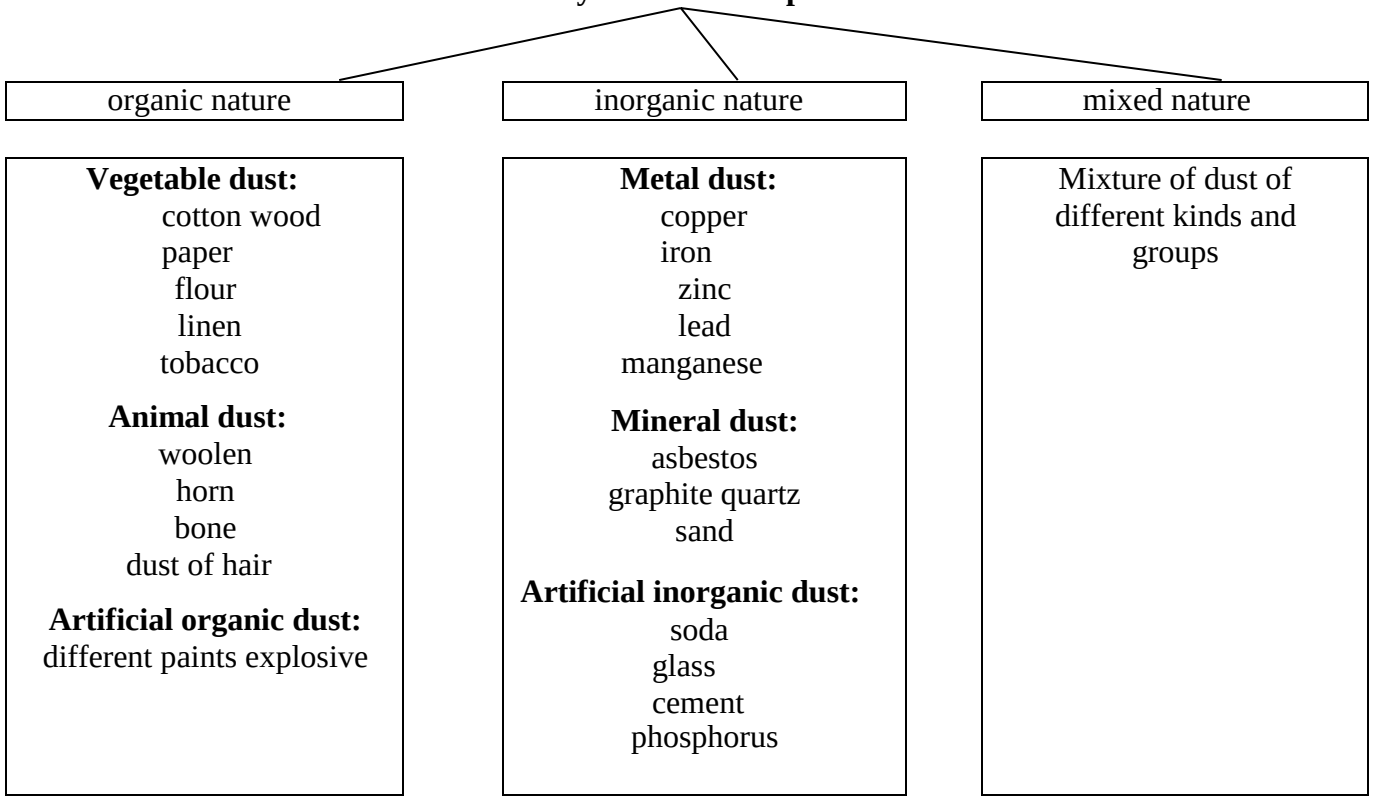
By the origin



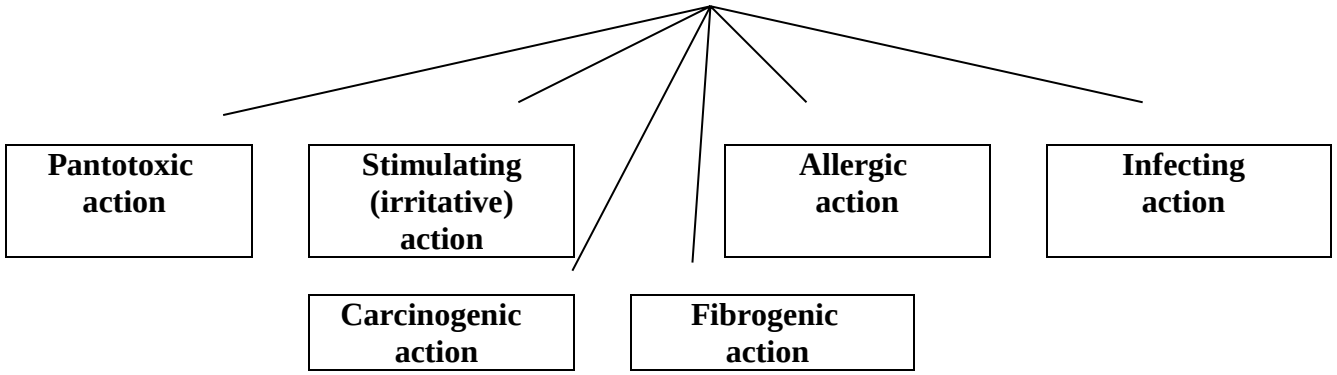
By the size of the particles



By chemical composition



By the character of effect



Maximum permissible concentration of dust and chemical substances in air of working zone

No	Substances	MPC (mg/m^3)
1	Nitrogen monoxide	5.0
2	Ammonia	20.0
3	Benzene	300.0
4	Manganese	0.3
5	Carbon monoxide (CO)	20.0
6	Lead	0.01
7	Mercury	0.01
8	Chlorine	1.0
9	Sulfureous gas (SO_2)	10.0
10	Dust, containing from 10% to 70% of SiO_2	2.0
11	Dust, containing more than 70% of SiO_2	1.0
12	Dust, containing from 2% to 10% of SiO_2	4.0
13	Cement dust	2.0

Permissible concentration of harmful substances in atmospheric air of cities

Substances	Permissible concentration		Classes of danger
	max	average/day	
Nitrogen dioxide (NO_2)	0.085	0.04	II
Nitrogen monoxide (NO)	0.4	0.06	III
Sulphureous gas (SO_2)	0.5	0.05	III
Ammonia (NH_3)	0.2	0.04	IV
Benzene	5	1.5	IV
Carbon monoxide	5.0	3.0	IV
Ozone (O_3)	0.16	0.03	I
Dust with more than 70% of SiO_2	0.15	0.05	III
Dust with 20-70% of SiO_2	0.3	0.1	III
Dust with less than 20% of SiO_2	0.5	0.15	III
Mercury	-	0.0003	I
Lead	0.001	0.0003	I
Chlorine	0.1	0.03	II

Areas of school rooms

Name of the room	Minimal area (m^2)	
	total	Per pupil
Class-rooms	50	1.25
Educational studies	50-66	1.25-1.65
Laboratory	66	1.65
Workshop for boys	66+16	3.3
Study of work for girls	50	2.5
Doctor's consulting room	12-15	-
Gymnasium	144-288	3.6-7.2
Premises for pupil rest	164-1176	0.42-0.46
Hall with cloak-room	98-490	0.25
Toilet with washing room for pupil	39-196	0.1
Toilet for teachers	4-6	-
Room for dinner (for 80-490 places)	52-319	0.65
Kitchen (all rooms)	94-171	-
Library	32-80	0.05-0.08
Assembly hall (80-400 places)	66-240	0.6
Office of the head	15	-
Office of the head	8	-
Office	8-15	-
Room teachers	24-70	2-2.5 per for 1

Hygienic norms of natural and artificial lighting (illumination) in school premises

Premises	Natural lighting, not less than		Artificial lighting (luxes) not less than	
	Daylight factor, %	Light coefficient	Incandescent lamps	Luminescent lamps
Class-rooms, studies, laboratories, workshops, room for laboratory assistants, library	1,5	1:4 – 1:6	150	300
Class room for drawing	2	1:3 – 1:5	300	500
Gymnasium, doctor’s consulting room, headmaster’s study, food department, assembly room	1	1:4 – 1:6	100	200
Support space	0,5	1:7 – 1:8	30	50
Gymlocker room	0,5	1:6 – 1:8	75	150

Rules for recoveries

Practical class

- dean's permission with valid term for recovery
- report for necessary theme 10 A4 sheets , handwriting. Answering questions.
- to recover the time of was absent (working 3 hours)
- practical work on the subject of the mise of class;
- to be ready to answer the lecturer's questions.

Lecture:

- to present the copybook for lectures with notes of the missed lecture;
- report for necessary theme A4 paper (20 typed pages), contains some material on the theme of the missed lecture;
- to be ready to answer the lecturer's questions .

Negative marks

- report for necessary theme 10 pages on A4 sheets , handwriting. Answering questions must be completed.
- to be ready to answer the teachers' questions.

Absences and negative marks must be recovered no later than two weeks from the date of the missed class or failure.

Admission to the exam

1. to recover missed practical classes;
2. to recover missed practical lectures;
3. to recover negative notes (in case if the semester average score is less than 5);
4. laboratory notebook - completed;
5. 10 A4 sheets of paper for the exam for each student.

CONTENTS