DANYLO HALYTSKY LVIV NATIONAL MEDICAL UNIVERSITY
DEPARTMENT OF HYGIENE AND PROPHYLACTIC TOXICOLOGY

H Y G I E N E A N D E C O L O G Y

MANUAL OF TYPICAL TASKS OF ACTIVITY, PRACTICAL SKILLS AND ABILITIES

FOR FOREIGN VI-YEAR STUDENTS OF MEDICAL FACULTIES OF HIGHER MEDICAL EDUCATIONAL INSTITUTIONS

Lviv – 2018

ББК 51.2я73
УДК 613.1 (076)

Л 804

Hygiene and Ecology: The manual of tipical tasks of activity, skills and practical abilities for foreign VI-year students of Medical Faculties of higher medical educational institutions / Edited by Associate prof. Ulyana B. Lototska-Dudyk (MD, PhD), Associate prof. Oleksandr M. Kolinkovskyy (MD, PhD). – Lviv. – 2018. – 44 p.

Reviewers:

Lilya P. Kozak, associate professor of department of general hygiene with ecology of the Danylo Halytskyi Lviv National Medical University.

The manual has been considered and approved by the Methodical Commission of the Prophylactic Medicine (protocol № «___ « _____2018).

The supervisor of the issue is 1st Vice-Rector for scientific-pedagogical work of Danylo Halytsky Lviv National Medical University, Doctor of Medical Sciences, Professor Miechyslaw R. Gzhegotsky.

P R E F A C E

The collection contains a list of situational tasks, skills and practical abilities in hygiene and ecology, which are envisaged by the educational-professional program of training specialists of the Faculty of General Medicine and a typical curriculum of discipline for VI-year students.

It is compiled in accordance with the requirements of the "Regulation on the state certification of graduates of higher medical educational institutions of the III-IV accreditation levels" and is intended to prepare students for state examinations.

Every situational task contains five standard questions of hygienic assessment of the situation, given in the condition of the task (1), the identification of possible risk factors (2) and their negative health effects (3), justification of hygienic measures to improve the situation (4) and solving the individual problem associated with the condition of the problem (5).

Each practical skill involves drawing up a hygienic conclusion based on the results of research of a particular object and allows objectively (on the sum of the points scored) evaluate the level of students' preparation during state examinations.

The materials of the collection are divided by sections and themes of the curriculum, which allows its use by students in preparation for practical classes, and the conducting knowledge of control, skills and abilities of students and discussion of mistakes made in solving problems.

GENERAL HYGIENE AND TOXICOLOGY
SITUATIONAL TASKS

1. The city is provided by drinking water from two water pipes. The iodine content is 0.1-0.3 μg/l in the first water pipe (F) and 2-3 μg/l in the second (S) one. The experimental group in number of 750 persons is formed by inhabitants who has diffuse nontoxic goiter of I-II degrees, 550 persons of this group use water from pipe F, 200 persons – from pipe S. The control group consists of 750 healthy inhabitants of this city who are the same age and sex with the people of experimental group. 250 persons of control group use water from the pipe F and 500 persons – from pipe S. It was carried out a survey of people with experimental and control groups for the use of seafood or iodine-containing drugs during the year. It was established that 100 people from 750 of experimental group applied regular iodine deficiency prevention and 650 of them applied the irregular iodine deficiency prevention measures or even neglected them. 270 individuals from the control group did not carried iodine deficiency prevention, while 480 people followed it.

Define the form of the method of epidemiological research (1),

Calculate the relation of chances of pathology occurrence depending from use of water, nutrition and the apply of iodine content medications (2),

Estimate the received result (3),

Propose the preventive measures (4),

Specify the criterion of definition of probability of the connection between the risk factor and appearance of the disease (5).

2. A 5 year old child (weight 20 kg) has received 200 mg of nitrates with his daily nutrition.

Determine daily dose of nitrates (1),

Give hygienic valuation (2),

Determine factor of risk (3) and possible negative effect for health (4),

Propose hygienic measures (5).

3. Acceptable daily intake of pesticide phosphamide with food in human organism is 0.42 mg. Phosphamide content in vegetables of industrial area is following: tomatoes – 20 mg/kg, potatoes – 10 mg/kg, carrot – 30 mg/kg, lettuce – 30 mg/kg, and others – 100 mg/kg. Food ration of human includes: tomatoes – 50 g, potatoes – 300 g, carrot – 50 g, lettuce – 100 g and other vegetables – 200 g.

Determine real daily intake of phosphamide with food allowance (5),
Give hygienic valuation (1),
Determine factor of risk (2) and possible negative effect for health (3),
Propose hygienic measures (4).

4. In the laboratory the new chemical substance is analysed. There were determined the following:

Character of influence	Concentration mg/dm^3	Toxicity	mg/kg
Threshold concentration by perceptive criterion, t – 20 °C	20,2	DL_{50} (white rats)	1050
Threshold concentration by perceptive criterion, t – 60 °C	10,0	DL_{50} (white mouse)	1076
Threshold concentration by general sanitary criterion (biological oxygen demand stimulation)	0,5	Coefficient of accumulation	3,5
Ammoniacal nitrogen	1,0	Threshold dose by general toxic effect	5,44
Nitrate nitrogen	0,5	Maximum non-effective concentration by general toxic effect	0,68
Nitrite nitrogen	0,5	Threshold dose by allergenic effect	10,5
Saprophytic microflora development	5,0	Maximum non-effective concentration by allergenic effect	1,05
		Threshold dose by embryotoxic effect	10,5
		Maximum non-effective concentration by embryotoxic effect	1,05
		Cutaneous - resorptive effect	Absent
		Mutagenous effect	Absent

Give hygienic valuation this chemical substance by degree of toxicity and accumulation (1),

Determinate possible negative effects for health (3),

Determinate the critical indicator of harm (2),

Determinate MAC of this substance (4),

Calculate of species sensitivity coefficient (5).

5. According to FAO/WHO recommendation acceptable daily intake of lead with food, water and air for human (body- mass – 60 kg) is 0,21 mg. MAC of lead in atmosphere is 0,0003 mg/m^3, MAC in water – 0,01 mg/L. Pulmonary ventilation volume is 20 m^3/daily, daily necessity of water is 3L. Food ration of man includes: 65 g tomatoes, 150 g potatoes, 65 g carrot, 70 g lettuce. Lead concentration is 15 mg/kg in tomatoes, 35 mg/kg in potatoes, 15 mg/kg in carrot, 30 mg/kg in lettuce.

Determine real daily intake of lead with food allowance (5),

Give hygienic valuation (1),

Determine factor of risk (2) and possible negative effect for health (3),

Propose hygienic measures (4).

6. In a toxicological laboratory the hygienic evaluation of 5 new pesticides in soil (liquid forms of preparations) was conducted. There were determined the following:

Pesticide Indication	1	2	3	4	5
DL_{50} (white rats), mg/kg	45	2100	800	150	450
DL_{50} (white mouse), mg/kg	42	2280	650	200	500
Coefficient of accumulation	5	6	3	2	0,5
Threshold concentration by perceptive criterion, mg/kg of soil	0,15	0,2	0,25	0,5	0,3
Threshold concentration by general sanitary criterion, mg/kg of soil	0,2	0,6	0,03	0,1	0,03
Threshold concentration by phytoaccumulation criterion, mg/kg of soil	0,01	0,35	0,4	0,02	0,018
Threshold concentration by migratory-aquatics criterion, mg/kg of soil	0,015	0,4	0,5	0,12	0,012
Threshold concentration by migratory-air criterion, mg/kg of soil	0,2	0,45	0,35	0,42	0,025
Threshold concentration by toxicological	0,05	0,3	0,4	0,025	0,02

criterion, mg/kg of soil					

Estimate the degrees of toxicity and accumulation of pesticides (1),

To define the possible differences in species sensitivity (2)

To make a hygienic conclusion (3)

Define the critical indicators (4) and ground the MAC (5).

7. In the laboratory a new pesticide is studied. There were determined the following: median lethal doses are 861,5 mg/kg (white rats) and 1050 mg/kg (white mouse), accumulation coefficient is 2,0 mean effective time of lethal outcome is 28,5 hours, threshold concentration by perceptive criterion (odor in water) is 2,9 mg/l, threshold concentration by general sanitary criterion is 0,5 mg/l (biological oxygen demand stimulation), maximum non-effective dose is 0,09 mg/kg (in chronic experiment on the white rats by intragastric administration), maximum non-effective concentration is 0,16 mg/l (cutaneous - resorptive effect with water penetrating).

Give hygienic valuation this chemical substance by degree of toxicity and accumulation (1),

Invert maximum non-effective dose in chronic experiment on maximum non-effective concentration, to determinate the critical indicator of harm (2),

Determinate possible negative effect for health (3),

Determinate MAC of this substance (4),

Calculate of species sensitivity coefficient (5).

PRACTICAL SCILLS

8. For the study of impact of the industrial factors on the health of workers the analysis of cases of occupational diseases among the workers in the coal industry is produced. In 2004 the number of occupational diseases was 16 and in 2014 - 30 cases. In harmful conditions of the working environment and labour process were employed 190 and 195 workers according to years

2004 and 2014. To calculate the relative risk of occupational diseases in the enterprise, assess the obtained results.

9. The laboratory monitoring of water quality in the river K., in connection with its industrial wastewater pollution by metallurgical plant revealed the following concentrations of pollutants: lead - 0.03 mg / dm^3 (MAC - 0.03 mg / dm^3, hazard class II), sodium silicate - 15.0 mg / dm^3 (MAC - 30.0 mg / dm^3 hazard class II). Calculate the value of the summation effect of those hazards.

10. The toxicological laboratory received a new synthesized substance. The toxicological studies obtained the following results: CL_{50} - 650 mg / m^3 (2nd hazard class) DL_{50} - 250 mg / kg (3rd class), index of potentional ingalation toxicity - 2 (4th class), a zone of acute action - 5 (1st class), PSLA (probable safe level of action) - 2 mg / m^3 (3^{rd} class). Identify the limiting toxicological indicator for assessing the hazard class for the substance.

11. During the toxicological studies of new synthesized substance tris [N-(2,3-dimethylphenyl) antranilat] aluminum hydrate obtained the following results: LD_{50} for white mice males - 687 mg / kg; LD_{50} for male albino rats - 1255 mg / kg; Average time of death of animals $ET_{50\ (n)}$ - 24 hours. Identify the class of toxicity, coefficient of accumulation (by Yu.S. Kagan) and calculate the species sensitivity coefficient.

HYGIENE OF WATER AND SOIL

SITUATIONAL TASKS

12. Laboratory testing of the well water sample showed the following results: colour – 20 degrees, smell and taste – 2 points, nitrite nitrogen – absent, nitrate nitrogen – 43 mg/dm^3, microbial number – 200 CFU/cm^3, E. coli – 8 CFU/100 cm^3.

Determine daily dose of nitrates (1),
Give hygienic valuation of water quality (2),
Determine factor of risk (3) and possible negative effect for health (4),
Propose hygienic measures (5).

13. Water that is used for supply of the city, contains fluoride 2,2 mg/dm^3, nitrates 40 mg/dm^3, chlorides 250 mg/dm^3, iron 0,01 mg/dm^3, lead 0,001 mg/dm^3.

Estimate the water quality (1),
Determine factor of risk (2) and possible negative effect for health (3),
Give the recommendation to regard of the water quality improving (4),
Calculate fluoride intake in human organism and compare results with daily requirement, biological and optimal indications (5).

14. The river's water is planning to use for water supply town A. This river is polluted by wastewater from industry factory. Concentration of chemicals in water samples are: iron 1,0 mg/dm^3 (III class, MAC – 0,3 mg/dm^3), cadmium – 0,002 mg/dm^3 (II class, MAC – 0,001 mg/dm^3), arsenic – 0,1 mg/dm^3 (II class, MAC – 0,05 mg/dm^3), lead – 0,06 mg/dm^3 (II class, MAC – 0,03 mg/dm^3).

Estimate the water quality according to chemicals contains (1),
Determine factor of risk (2) and possible negative effect for health (3),
Determine the possibility of using this water for water supply (4),
Give valuation of combined action of chemicals (5).

15. River C is used for water supply town K. After spring flood the sanitary doctor have researched water quality from river. Laboratory testing showed the following results: smell and taste – 2 points, colour – 40 degrees, turbidity – 5,5 NU, nitrate nitrogen – 1,5 mg/dm^3, nitrite nitrogen – 0,01 mg/dm^3, ammonic nitrogen – 1,5 mg/dm^3, microbial number – 300 CFU/cm^3, E. coli – 5 CFU/100 cm^3, oxidation – 12 mg/dm^3, residual free chorine – 0,1 mg/dm^3.

Give hygienic valuation of the water quality (1),

Determine factor of risk (2) and possible negative effect for health (3),

Give the recommendation to regard of the water quality improving (4) and towards emergency situation, separately (5).

16. In baby house food mixes are diluted by water from well. The farm private stock with nitrite pesticides is on 20 m from the well. The laboratory testing of the water sample showed the following results: smell and taste 2 points, colour 10 degrees, turbidity 0,1 NU, hardness – 5 mmol /dm^3, iron – 0.05 mg/dm^3, lead – 0.001 mg/dm^3, fluoride – 1,0 mg/dm^3, nitrate – 160 mg/dm^3, microbial number – 30 CFU/cm^3, E. coli – absent in 100 cm^3 of water.

Give the hygienic assessment of water quality (1),

Determine the risk factors (2) and their possible negative effects for health (3),

Propose the measures of improvement of the drinking water quality (4),

Calculate the actual daily income of nitrates in the child's daily water use of 2 l and compare with ADI (5).

17. Among the inhabitants of settlement the yellow-brown pigmentation of teeth enamel was discovered. The origins of these symptoms are connected with the use of water from an artesian well. Laboratory tests of water showed the following results: smell and taste are 2 points, colour – 30 degrees, turbidity – 1.0 nephelometric units, hardness, – 5.5 mmol/dm^3, iron – 1.0 mg/dm^3, lead – 0,005 mg/dm^3, fluorine – 2.5 mg/dm^3, nitrates – 40.0 mg/dm^3, total microbial number – 50 CFU/ cm^3, E. coli – absent in 100 cm^3.

Estimate the water quality (1),

Define risk factors (2) and their possible negative consequences for a health (3),

Ground the measures of improvement of water quality (4),

Expect the real intake of fluorine in human organism at the day's water necessity 3 l, to compare the results with the daily requirement of fluorine (5).

18. For the purpose of certification of wells in village N. the water quality was studied. The results of laboratory tests: colour – 10 degrees, smell and taste – absent, turbidity – 1.0 nephelometric units, iron – 0.05 mg/dm^3, hardness – 3.5 mmol/dm^3, total mineralisation – 520 mg/dm^3, E. coli – absent in 100 cm^3, coli-phages – 12 units/dm^3, simplest – 0 cysts/50 dm^3.

Estimate the water quality (1),

Define risk factors (2) and their possible negative consequences for a health (3),

Ground the measures of improvement of water quality (4),

Specify the criteria for assessing the effectiveness of wells sanitation (5).

PRACTICAL SCILLS

19. During the laboratory testing of drinking water from the pit mine, located in the urban village, set the following parameters of salt and trace element composition of water: chlorides - 140 mg/dm^3, sulphates - 246 mg/dm^3, fluorine - 1.1 mg/dm^3, nitrates - 90 mg/dm^3, iodine - 20 mg/dm^3. Rate the chemical composition of water from the well.

20. The results of the analysis of water samples from the well, which is located in the livestock complex: colour - 30 degrees, smell and taste - 2 points, nitrates - 40 mg/dm^3, E. coli - 2 CFU/100 cm^3. Evaluate the quality of water in the well.

21. The test results of the water from the well: colour - 15 degrees, smell - 3 points, total hardness- 12 mmol/dm^3, oxidation - 4 mg / dm^3, chlorides - 80 mg/dm^3, E. coli - 5 CFU/ 100 cm^3. Evaluate the quality of water in the well.

22. The laboratory testing of water samples taken from reservoirs of pure water in the purification station for the centralized drinking water supply revealed the following results: the smell and taste - 2 points, colour - 19

degrees, turbidity - 0.5 nephelometric units, E. coli absent in 100 cm^3 of water, the total number of bacteria - 80 CFU/cm^3, residual free chlorine - 0.5 mg/dm^3. Evaluate the quality of drinking water.

23. A laboratory study of water from the well revealed the next results: the smell - 2 points, colour - 20 degrees, total mineralisation - 900 mg/dm^3, sulphates - 250 mg/dm^3, chlorides - 250 mg/dm^3 , oxidation - 4 mg/dm^3, fluorine - 1.5 mg/dm^3, nitrates - 10 mg/dm^3, E. coli - absent in 100 cm^3, helminthic eggs - 8 in 50 dm^3 of water. Evaluate the quality of water in the well.

24. The sanitary and hygienic laboratory study of the quality of drinking water in municipal water supply distribution network of the town C. was conducted quarterly. The water supply is fed from an underground source. The results are present in the table. Strict regime zone around water sources available. Water supply is equipped with a set treatment plants and chlorination.

Result \ Samlple	1	2	3	4
Smell, points	1	2	2	1
Taste, points	1	1	2	1
Coloration, degrees	15	15	20	15
Turbidity, nephelometric units	0,25	0,2	0,3	0,25
pH	6	6	6,5	6,5
Total mineralisation mg / dm^3	800	820	900	850
General hardness, mmol / dm^3	5,5	6,0	6,0	5,5
Sulfates, mg / dm^3	140	135	140	145
Chlorides, mg / dm^3	150	150	200	140
Iron, mg / dm^3	0,01	0,015	0,02	0,02
Nitrates mg / dm^3	20	40	60	23
Fluoride mg / dm^3	0,3	0,4	0,3	0,4
General number of bacteria, CFU / cm^3	90	110	150	70
E. coli, CFU / 100 cm^3	0	1	4	0
Free residual chlorine, mg / dm^3	0,3	0,2	0,15	0,4

Using the results of the study make hygienic conclusion and argue measures of improvement of the quality of drinking water.

25. Sanitation Laboratory studies conducted selectively quality of drinking water from wells in the village C. The results are shown in the table.

Result \ wells	1	2	3	4
Smell, points	2	1	2	4
Taste, points	2	2	2	3
Coloration, degrees	20	15	10	35
Turbidity, nephelometric units	0,3	0,25	0,4	2,0
pH	7,0	7,5	8,0	9,0
Total mineralisation mg / dm^3	250	300	200	600
General hardness, mmol / dm^3	5	4	6	7,5
Sulfates, mg / dm^3	30	50	90	100
Chlorides, mg / dm^3	80	120	130	140
Iron, mg / dm^3	0,02	0,1	0,05	0,4
Nitrates mg / dm^3	24	45	90	62
Nitrites mg / dm^3	3,9	1,2	0,7	4,0
Ammonium, mg/dm^3	2,7	0,5	1,1	2,9
Fluoride mg / dm^3	1,2	0,9	1,0	1,1
E. coli, CFU/100 cm^3	2	0	1	4
Oxidation, mg/dm^3	6	3	4	15

Using the results of the study make hygienic conclusion and argue measures of improvement of the quality of drinking water.

26. Laboratory testing of the drinking water sample showed the following results: colour – 20 degrees, smell and taste – 2 points, nitrite nitrogen – absent, nitrate nitrogen – 70 mg/dm^3, microbial number – 80 CFU/cm^3, E. coli – absent in 100 cm^3. Evaluate water quality.

27. Water that is used for supply of the city, contains fluoride 0.5 mg/L, nitrates 40 mg/L, chlorides 250 mg/L, iron 0,1 mg/L, residual nitrogen 0,05 mg/L. What medical condition is the most likely to occur in inhabitants of this city?

28. In drinking water samples selected after purification and disinfested by gaseous chlorine the following was revealed: chloroform and threechloracetic acid in concentration three times more than their MAC.

What disease may probably develops as a result of prolonged intake of this water?

HYGIENE OF ATMOSPERIC AIR
SITUATIONAL TASKS

29. A town is situated in 500 m to the south from chemical factory (I class of harmfulness), which polluted atmospheric air by sulfur oxide. "Wind rose": north – 35%, northeast – 16%, east – 10 %, southeast – 5%, south – 7%, southwest – 8%, west – 7%, northwest – 12%.

Give the valence of correct situation of chemical factory relatively town (1),

Determine dominate wind direction (2),

Determine factor of risk (3) and possible negative effect for health (4),

Correct sanitary-protection zone size (5).

30. Among the children population in one of city district increasing of respiratory diseases frequency is registered, especially chronic bronchitis and bronchial asthma. In 100 m from residential building industrial factory (III level harmfulness) is located. According to laboratory results the actual concentrations of chemicals (mg/m^3) in atmosphere air are: sulphur oxide – 1.5 (MAC – 0.5), carbon oxide – 0.05 (MAC – 5.0), nitrite dioxide – 0.17 (MAC – 0.085), phenol – 0.01 (MAC – 0.01).

Give hygienic valuation of atmospheric pollution according to combined action (5),

Make conclusion about hygienic condition of atmospheric air in the border of sanitary protection zone (1),

Determine factor of risk (2) and possible negative effect for health (3),

Prove measures regard to atmospheric air improving (5).

31. A town is situated in 400 m to the north from chemical factory (II class of harmfulness), which polluted atmospheric air by manganese. "Wind rose": north – 10%, northeast – 10%, east – 5 %, southeast – 20%, south – 25%, southwest – 10%, west – 10%, northwest – 10%.

Give the valence of right situation of chemical factory conserving to town (1),

Determine dominate wind direction (2),

Determine factor of risk (3) and possible negative effect for health (4),

Corrective the sanitary-protection zone size (5).

32. In the village A., located at a distance of 500 m from the chemical plant of the first class of danger, the average concentration of sulphur dioxide at 3-4 times higher than MAC, carbon monoxide and dust are at MAC level. In the village B., located 2.5 km from the same plant, the average concentration of these substances are determined at and below the MAC. The number of residents in towns A. is 20.0 and 27.5 thousands in B. The number of registered appeals for medical aid at the year was 22.0 and 22.5 thousands accordingly.

Calculate the primary indicators of morbidity in both towns (5),

Give the hygienic assessment of the impact of air pollution on public health (1)

Determine the risk factor (2) and possible negative health effects (3),

Argue the preventive measures (4).

PRACTICAL SCILLS

33. There is a plan to build a hospital with 120 beds in the village. Commission consisting of representatives of the customer and the project organization observed an area with the size of 120×80 m. The long side is oriented towards the SW-NE and is located at a distance of 80 meters from the nearest houses. Hospital service is round 2 km. The motorway off-site of regional importance is situated at a 40 m distance. The relief of the area is

plain, soil is sandy, groundwater level standing over 2 m from the surface. Green plants - rare young pines. “Wind rose” in this area: S - 20%, SW - 25%, W - 10% NW - 6%, N - 5%, NE - 7%, E - 8%, SE - 14%, calm - 5%. According to the observation determine the choice of land for the building of the hospital.

34. Air contains 200 mg/m^3 of ethanol, (MAC 400 mg/m^3), chlordane – 0.1 mg/m^3 (MAC 0.5 mg/m^3) dimethylphatalate – 0.05 mg/m^3 (MAC 5.0 mg/m^3). Evaluate concentration of mixture in atmospheric air

35. In a settlement, where north and north-western winds (70 % days during a year) prevail, and southern winds are almost absent, a lot land is elected for building of cement plant of 2-nd class of harmfulness. According to project document that plant will contaminate atmospheric air by a dust.

Which part of the settlement fits better for disposition of the enterprise?

From which side and at what distance from settlement is the most suitable location for an enterprise?

HYGIENE OF TREATMENT AND PREVENTIVE ESTABLISHMENTS AND LIVING BUILDINGS

SITUATIONAL TASKS

36. City hospital consists of main building with surgical and therapeutic departments, and several small buildings with infection, obstetric and pediatric departments. Therapeutic department consists of 2 ward sections; the capacity each of them is 40 beds. Area per one bed averages 6 m^2. Each ward section contains 10 four-bed wards.

Estimate type of the hospital building up (5),

Make the hygienic evaluation of ward section planning (1),

Estimate risk factors (2) and possible consequences for the health (3),

Suggest prophylaxis measures (4).

37. At in-hospital control after the observance of the hygienic regimen operating-room the instrumental-laboratory researches of quality of air environment are conducted. The followings results are: temperature of air – 24°C, rate of air movement – 0,15 m/c, relative humidity – 60 %, DLF – 2%, general artificial luminosity– 250 lx, artificial luminosity of the operation field – 1000 lx, concentration of ftorotan – 2 mg/m^3, inhalan – 20 mg/m^3, chlorethyl – 5 mg/m^3, diethylated ether – 30 mg/m^3, mercury – 0.0003 mg/m^3 (MAC accordingly is 20, 200, 50, 300 and 0.01 mg/m^3), content of CO_2 – 0,1%, incurrence of bacteria – 300 unit/m^3.

Give the hygienic estimation of labour results in an operating-room (1),
Define risk factors (2) and possible negative effect for health (3),
Propose of preventive measures (4),
Estimate combined action on the organism of these substances (5).

38. Gastroenterological department of the district hospital is situated on the second floor of the four-storeid building. In the wards section there are 2 one-bed wards, 2 two-bed wards and 6 four-bed wards. The one-bed ward length is 5 m and a width of 2 meters and there is one window. The 2-bed wards have the length of 5 m and a width of 3 m and two windows. The 4-bed wards have the length of 5 m and a width of 4 meters and two windows. The sizes of windows are the height - 1.5 m, width - 1 m.

Rate daylight factor in wards compartment (5)
Give hygienic evaluation of planning of wards section (1)
Determine risk factors (2) and their possible negative health effects (3)
Argue the measures of improvement of the wards conditions (4).

39. Instrumental-laboratory research of air is conducted on bacteriological indexes (general microbal semination, Staphylococcus aureus) in a ward for new-borns maternity department. Inoculation of air is conducted by sediment-aspiration method, sampling duration – 5 min., speed of aspiration of air is 20 l/min. After incubation in a thermostat 500 colonies, including 2 colonies – Staphylococcus aureus, grew on Petri dishes.

Estimate concentration of the microorganisms in air (5),

Give hygienic evaluation of present situation (1)

Determine risk factors (2) and their possible negative health effects (3)

Estimate the proper sanitary-and-hygienic regime of wards and ground other prophylactic measures (4).

PRACTICAL SCILLS

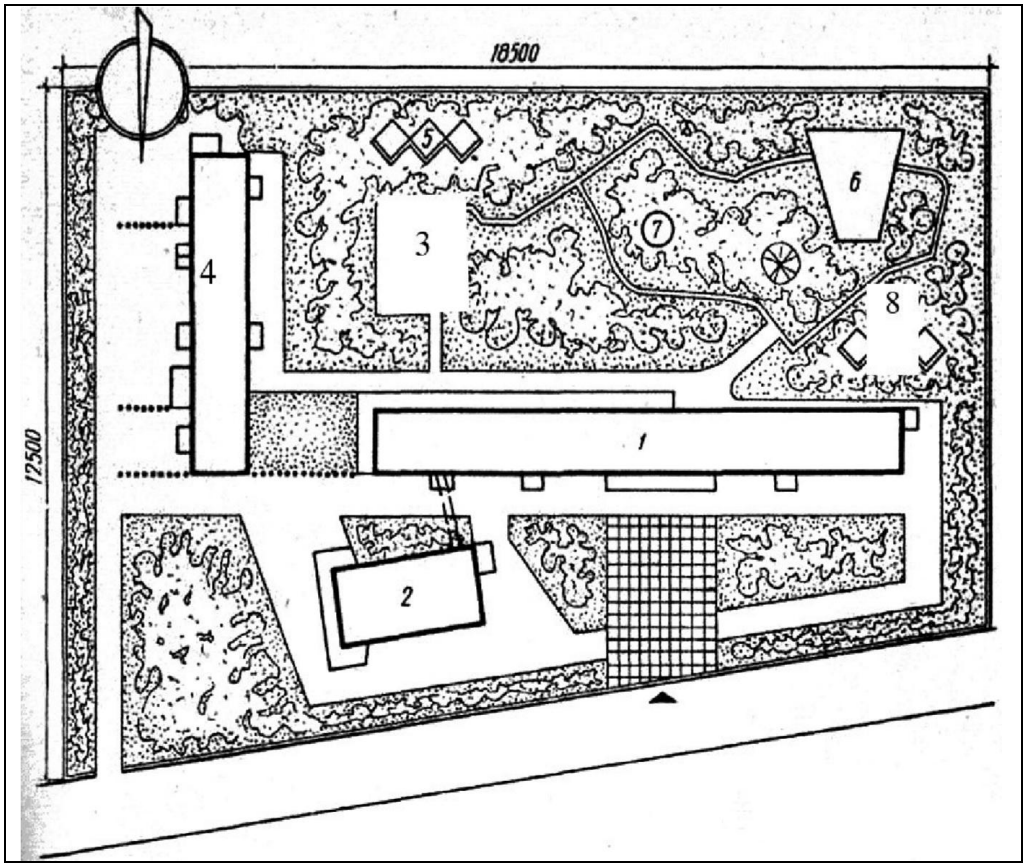
40. The total size of the area of the 50 beds hospital is 1.5 hectares (15 000 m^2). There was chosen a mixed type system of building, there are separate areas of the main building, policlinics, obstetric and gynaecological department, infection disease department, catering, technical buildings, morbid anatomy department and a hospital garden with a strip of green space land round the total hospital area about 15 meters wide. The percentage of hospital buildings area is 25%, the percentage of planting - 55%. Evaluate the planning of the hospital area.

41. The land area for the hospital buildings has such a planning: the territory under the buildings is 19%, the area of planting (green zone) - 62%, garden-park area size is 30 m^2 per one hospital bed. Green areas are located along the perimeter area 15 meters width. The distance from morbid anatomy department to the wards buildings - 32 m. Evaluate the planning of the hospital area.

42. There is a plan to build a hospital with 120 beds in the village. Commission consisting of representatives of the customer and the project organization observed an area with the size of 120×80 m. The long side is oriented towards the SW-NE and is located at a distance of 80 meters from the nearest houses. Hospital service is round 2 km. The motorway off-site of regional importance is situated at a 40 m distance. The relief of the area is plain, soil is sandy, groundwater level standing over 2 m from the surface. Green plants - rare young pines. Wind rose in this area: S - 20%, SW - 25%, W - 10% NW - 6%, N - 5%, NE - 7%, E - 8%, SE - 14%, calm - 5%.

According to the observation determine the choice of land for the building of the hospital.

43. The plan of the 200 beds adults' hospital (Fig. 1) submitted for the consideration.



1 - therapeutic department with 100 beds; 2 - surgical department with 50 beds; 3 – infectious disease department building with 10 beds; 4 - economic building; 5 - morbid anatomy department; 6 – obstetrics and gynaecology hospital building with 40 beds; 7 - garden house; 8 - clinical laboratory.

The percentage of the area under the buildings is 21%, green zone is 55% of the total land size. Using the project materials determine the type of building and make hygienic conclusion on the quality of the hospital area planning.

44. Make conclusion about accordance to the hygienic requirements of location and planning of hospital area (Fig. 2), define the type of building of hospital. A building percent is 16%, planting of greenery – 65%.

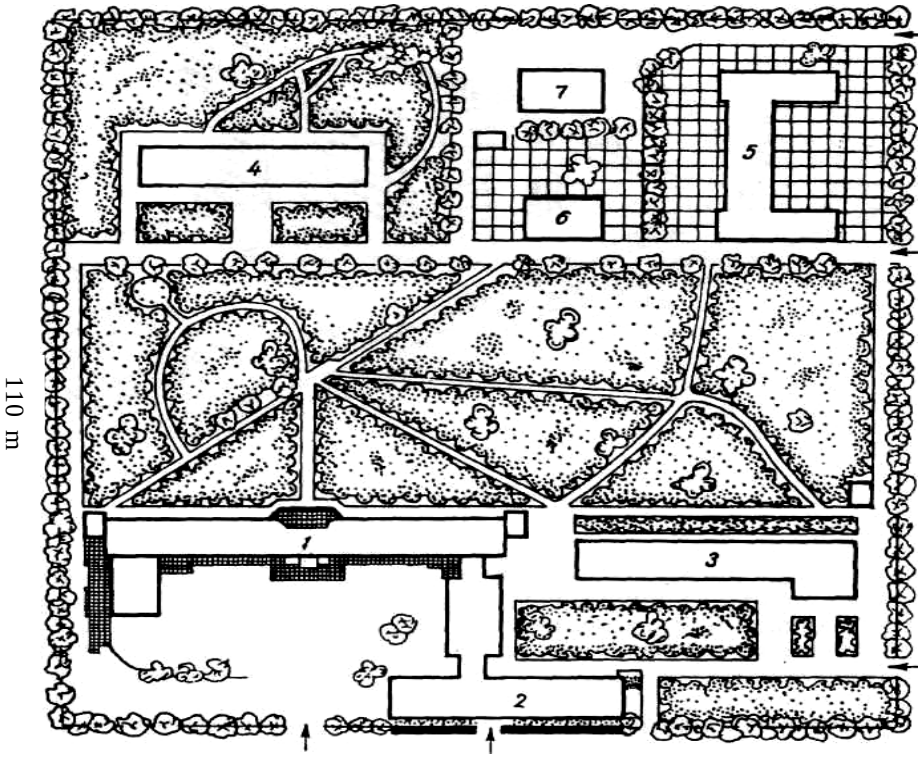


Fig. 2. General plan of hospital on 150 beds. *1 – main building (therapeutic and surgical departments) 70 beds; 2 – out-patient clinic; 3 – obstetric-gynaecological building on 50 beds; 4 – an infectious building is on 30 beds; 5 – kitchen; 6 – economic building; 7 – morbid anatomical building*.

45. A patient is in the two-place hospital ward of therapeutic department. The area of the ward is 18 m^2, height is 3 m, ventilation rate is 2.5/h. Air temperature is 18^oC, relative humidity is 45%, air movement velocity is 0.4 m/sec, light coefficient is 1/6, noise level constitutes 30 dB. Make a hygienic assessment of these conditions.

46. Air temperature of therapeutic ward is 22 °C, relative humidity is 60 %, air movement velocity is 0,05 m/sec, microbial number is 7000 unit/m^3, carbon dioxide concentration is 0,14 %, total illumination is 100 lx, level of noise is 45 dB A at day, and 35 dB A at night. Make a hygienic assessment of these conditions.

47. The area of the four-place hospital ward of cardiologic department is 24 m^2. Air temperature is 16 °C, relative humidity is 72 %, air movement velocity is 0.35 m/sec, and DLF is 0.88 %. Make a hygienic assessment of these conditions.

48. The operation room area for one operating table is 40 m^2. Average air temperature – 20 °C, relative humidity – 50%, rate of air movement – 0.15 m/sec, horizontal temperature drop – 2.5 °C, CO_2 content – 0,07%, LC – 1:3,

general artificial lighting with luminescent lamps – 200 lx, CNL – 3.5%. Non-shadow lamp gives the lighting of 1 000 lx. Make the hygienic evaluation of the conditions of work of medical staff.

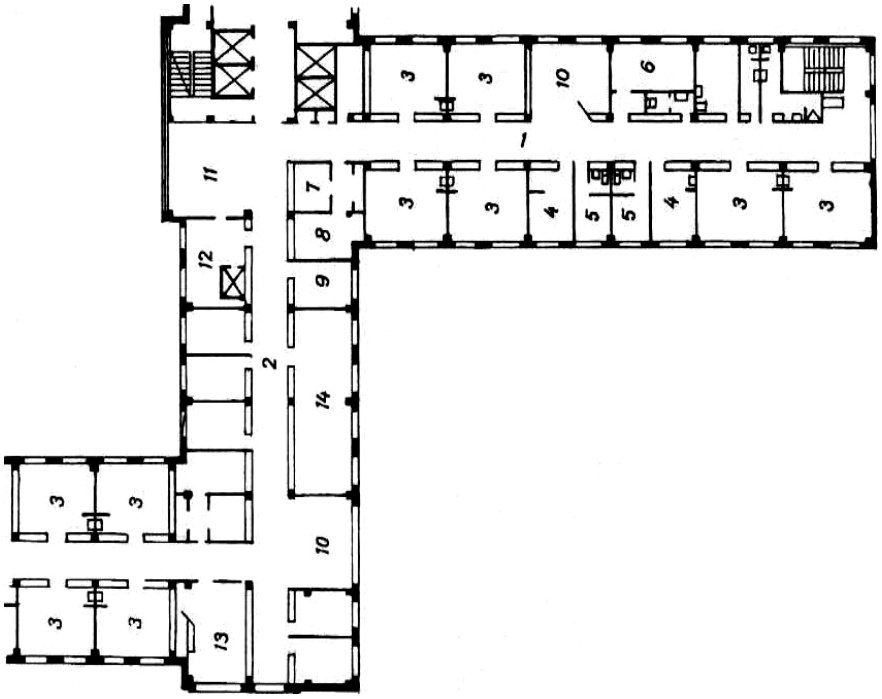
49. Air temperature in the operation room is 20 °C, humidity 50%, air movement velocity is 0.3 m/sec, level of noise 25 dB, carbon dioxide concentration is 0.15%. Make a hygienic assessment of these conditions.

50. The temperature of air in an operating-room is 18°C, rate of air movement is 0,4 m/c, the relative humidity is 75%, content of carbon dioxide is 0,4%, total artificial luminosity by luminescent lamps is 400 lx, luminosity of the operation field is 7000 lx. Estimate the work conditions of medical staff. To list devices those were used at the researches.

51. Humid cleaning of wards in the postoperative department carried out one time per days with application of a 1% solution of chloramine, ventilation to ward – four times per days, change of linen – once for a week, and in the case of contamination its pus – immediately, patients accept a hygienic shower one time per a week. Estimate the sanitary and hygienic regimen in the department.

52. The temperature of air in wards and corridors of therapeutic department is 22 °C, relative humidity is 60%, rate of air movement is 0.1 m/sec, microbial number is 7000 units/m^3, concentrations of carbon dioxide in most wards is 0.14%, total artificial luminosity of wards by luminescent lamps is 100 lx, noise-level in the day-time is 45 dB A, at night – 35 dB A. Estimate conditions in the department. Which devices were used for researches?

53. The plan of ward department on 60 beds (Fig. 3). Give the hygienic conclusion about a department planning. Analyse the planning of the ward section.



1 – plan of ward section is on 30 beds; 2 – general apartments; 3 – 4-beds wards (area is 28 m^2); 4 – 2-beds wards (area is 10 m^2); 5 – 1-bed wards (area is 7 m^2); 6 – medical treatment room; 7 – shower cubicle; 8 – bathroom; 9 – doctor's consulting room; 10 – entrance-hall for waiting; 11 – dining room; 12 – pantry; 13 – special care ward; 14 – technical room.

54. By a sanitary doctor inspected the apartments of infectious department at hospital and investigated parameters of microclimate, illumination and noise in these apartments. There determined the following:

Name of apartment	Area, m^2	T, °C	Relative humidity, %	Rate of air movement, m/sec	Content of CO_2, %	Luminosity, lx	Noise-level (in a day-time), dB A
Box for adults on 1 bed	20	22	55	0,15	0,1	120	30
Box for adults on 2 beds	23	23	60	0,215	0,08	150	45
Box for adults on 3 beds	25	24	70	0,05	0,2	150	45
Semi box on 1 bed	22	20	55	0,3	0,7	200	40
Semi box on 2 beds	27	20	65	0,2	0,1	200	35
Boxing chamber	20	18	65	0,4	0,15	250	35
Consulting room	5	18	55	0,3	0,06	100	40

As a result of the conducted researches to make a hygienic conclusion, ground measures on the improvement of the sanitary-hygienic regimen in the infectious separation.

55. The land area for the hospital buildings has such a planning: the territory under the buildings is 19%, the area of planting (green zone) - 62%, garden-park area size is 30 m^2 per one hospital bed. Green areas are located along the perimeter area 15 meters width. The distance from morbid anatomical department to the wards buildings - 32 m. Evaluate the planning of the hospital area.

56. Analyse the planning of infectious department (Fig. 4) after project materials and make a hygienic conclusion.
Waste water of infectious department going to the separate storage, from where after the mechanical and biological cleaning are dropped in a reservoir.

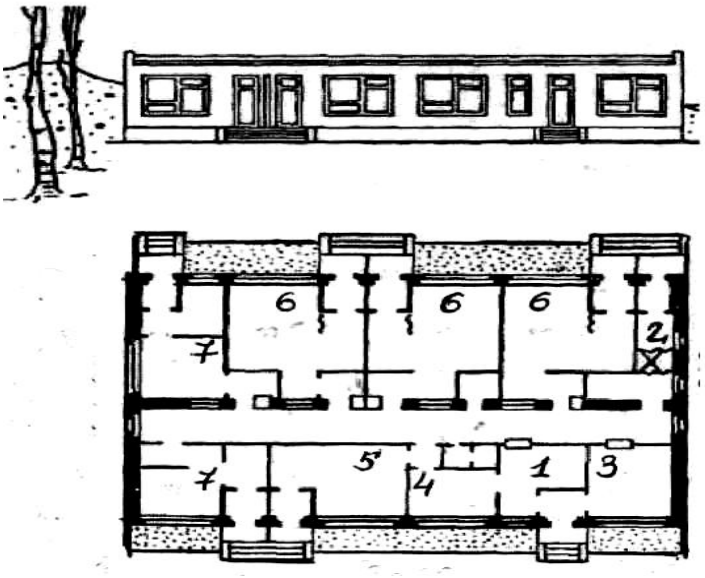


Fig. 4. Plan of infectious department on 8 beds.

1 – entrance-hall for waiting; 2 – sanitary inspection room; 3 – pantry; 4 – doctor's consulting room; 5 – admitting box (area is 17 m^2); 6 – 2-beds box (area is 27 m^2); 7 – 1-bed box (area is 20 m^2).

58. The noise level in the doctors' rooms of sanatorium, located in a resort area was studied. The windows of cabinets go out on the pumping station, which is located in the distance 10 m from a building. The results of instrumental researches, conducted in daily time, are resulted in a table. Noise is permanent, wideband.

Octave-frequency band, Hz	63	125	250	500	1000	2000	4000	8000
Sound pressure level, dB	62	60	55	48	42	33	30	24

Estimate levels of noise, define possible negative consequences for a

health, and propose preventive measures.

57. A content of CO_2 in air of living apartment is 0,07%, general amount of microorganisms – 4000 in 1 m^3, streptococci and staphylococcuss – 40 and 100 accordingly, the angle of incidence – 29°, the aperture angle – 3°, light coefficient – 1:7, DLF – 1,5%, coefficient of deepening – 1:2.

Estimate the state of air environment and light regimen of housing apartment from data of situational task.

HYGIENE OF NUTRITION
SITUATIONAL TASKS

59. Daily nutrition of a 33 year old surgeon contains 60 g of proteins (including 20 g of animal proteins), 90 g of fats and 400 g of carbohydrates. Energetic capacity of the nutrition is 2650 kcal.

Calculate contents of proteins, fats and carbohydrates in nutrition (1),

Estimate adequateness of nutrition (2), Determine factor of risk and possible negative effect for health (3),

Give the recommendations to regard of the nutrition improving (4).

60. A boy, aged 10, came to the doctor with the complaints about general weakness, quick exhaustion, irritability, reduced capacity for work, gum bleeding petechiae on the legs.

Evaluate boy's status (2),

Determine factor of risk (3) and possible negative effect for health (4), Propose hygienic measures (5),

Specify the conditions of conservation vitamin in the foodstuff at the culinary processing (1).

61. The 28 pupils of the rural school got sick a nutrition poisoning characterized by subfibrile temperature, nausea, vomiting, aching attacks with epigastric location. These symptoms appeared 1-3 hours after breakfast

(pancakes with sour cream). The hand-made sour cream that brought from local resident has been the cause of the illness.

What is the most likely diagnosis (3),

Determine factor of risk (2),

Give hygienic evaluation of situation (1),

Elaborate preventive measures (4),

Determine dates, list of specialists and laboratory researches, with are necessary for periodic medical check up (5).

62. A 25-year-old woman works as a nurse. Her diet contains 28% fats and 68% carbohydrates. Energy capacity is 3500 kcal.

Calculate contents of proteins in food allowance (5),

Estimate adequateness of nutrition (1),

Determine factor of risk (2) and possible negative effect for health (3),

Give the recommendations to regard of the nutrition improving (4).

63. A woman aged 30, 162 cm, weight 48 kg, vegetarian. On examination: xeroderma, paleness of mucous membranes, fragility of nails, hair shedding; red tip of the tongue with fissures and aphtae; optic neuritis.

Determine body-mass index (5),

Valuate of nutritional status (1),

Determine factor of risk (2) and possible negative effect for health (3), Give the recommendations to regard of the nutritional status improving (4).

64. Daily nutrition of a 19 year old student contains 60 g of proteins (including 23 g of animal proteins), 70 g of fats and 400 g of carbohydrates. Energetic capacity of the nutrition is 2470 kcal.

Calculate contents of proteins, fats and carbohydrates (%) in food allowance (1),

Estimate adequateness of nutrition (2),

Determine factor of risk (3) and possible negative effect for health (4),

Give the recommendations to regard of the nutrition improving (5).

65. At the studying of the actual nutrition of 20 years old student (girl) next parameters were revealed: caloric value of daily ration is 2600 kcal, proteins content – 72 g (animal proteins – 40 g), carbohydrates – 416 g, ascorbic acid – 40 mg, calcium – 1100 mg, phosphorus – 1200 mg, iron – 10 mg.

Calculate contents of proteins, fats and carbohydrates (%) in food allowance (1),

Estimate adequateness of nutrition (2),

Determine factor of risk (3) and possible negative effect for health (4),

Give the recommendations to regard of the nutrition improving (5).

66. At the examination of the actual nutrition of the 7 years old child next parameters were revealed: daily energy consumption – 2190 kcal, protein content – 65 g (animal proteins – 30 g), fats – 70 g (plant fats – 21 g), ascorbic acid – 30 mg, calcium – 1000 mg, phosphorus – 1000 mg, iron – 5 mg.

Calculate content of carbohydrates in the daily ration (5),

Make the hygienic evaluation of the actual nutrition taking to the consideration physiologic need of the child (1),

Estimate risk factors (2) and possible consequences for the health (3),

Propose prevention measures (4).

67. At the examination of the actual nutrition of the 6 years old child next parameters were revealed: daily energy consumption – 2000 kcal, content of proteins 10 %, fats – 31.5 % and carbohydrates – 58.5 %.

Calculate content of proteins, fats and carbohydrates (g) in the daily ration (5),

Make the hygienic evaluation of the actual nutrition taking to the consideration physiologic need of the child (1),

Estimate risk factors (2) and possible consequences for the health (3),

Propose prevention measures (4).

68. At the hospital treatment in regional hospital in June a 3-month boy entered, body weight 5 kg, previous diagnose was heart defect. Growth and

development was good. Starting from the 2 months of age was on bottle-feeding with infant formula, diluted with water (from a well) in an amount of 1 L/day. The nutrition included the carrot juice 30 ml/day. The general condition of the child moderate, the cyanosis of the skin is present on hands, feet and face. Pulse - 120 beats / min, tachypnea - 80 breaths / min; haemoglobin - 106 g/ L, red blood cells - 3,1 $\times 10^{12}$ / L, white blood cells - 7 $\times 10^{9}$ / L, blood has a chocolate colour. Heart defects were not found. After 2 weeks of appropriate treatment, the boy was discharged home in satisfactory condition. The nitrates level in well water found in concentrations of 225-275 mg/dm^3, nitrates in carrot were 1000 mg/kg.

Prove the diagnosis (1)

Determine the risk factors of the disease (2),

Give the hygienic assessment of the situation (3),

Develop measures for prevention of further cases of the disease (4),

Calculate the average actual daily dose of nitrates, which received the baby, and compare to the ADD (5).

69. Three tourists from the private pension applied for the medical help in the regional hospital. They had complains on burning in the mouth and throat, difficulty during swallowing, headache, weakness, runny nose, itchy skin. At the examination physician revealed, that all patients had redness of the face, neck, eyes and constriction of visual fields, swelling of the mucous membranes of the nose, two of them had a skin rashes on the neck locations. The anamnesis of the disease: before the case tourists ate seafood (shrimp).

Prove the diagnosis (1),

Determine the risk factors of the disease (2),

Give the hygienic assessment of the situation (3),

Develop preventive measures to prevent further cases of the disease (4),

Specify the laboratory tests needed to clarify the diagnosis (5).

70. A pregnant woman at 10 weeks of pregnancy was hospitalized in the department of obstetrics pathology. The previous diagnose chronic glomerulonephritis, acute stage. At the time of examination, weight of

pregnant woman was 70 kg, height - 172 cm. During the examination of the woman found symptoms of edema, hypertension and urinary syndromes, as well as complaints of wakefulness and irritability during the last week, pale skin and mucous membranes. The results of laboratory tests revealed hyperchromic anemia. The average weekly diet of pregnant women contains 96 g of proteins, 90 g of fats, 340 g carbohydrates, 200 mg of iodine and 300 μg of folic acid.

Calculate body mass index of pregnant woman and determine the group of patients (5),

Evaluate the diet according the content of nutrients and energy (1)

Determine factors of risk (2) and possible negative consequences for the health (3),

Give the recommendations for improving the nutrition of pregnant women (4).

71. The study of pasteurized milk from the flask revealed the following results: the appearance and texture - homogeneous liquid without sediment; taste and smell - without extra unusual for fresh milk tastes and smells; colour - white with a yellowish tinge; fat - 2.5%; density - 1.027 g / cm3; acidity - 20 ° T; the total number of bacteria in 1 ml - 200000; titer E. coli ml - 0.3; pathogens - none; availability phosphatase - not detected. Reactions for starch, baking soda, hydrogen peroxide are negative; nitrates - 5.0 mg /L; content of strontium-90 - 10 Bq / L.

Give the hygienic estimation of the milk quality (1),

Determine factors of risk (2) and possible negative consequences for the health (3),

Evaluate the possibility of selling milk (4),

Calculate the actual daily intake and the actual daily dose of nitrate for a person, who drinks 0.5 L of milk a day, compare with ADD (5).

72. The study of the meat revealed the following results: appearance and colour of the surface of the carcass - crust drying pale red colour; consistency - on the cut of meat tight and elastic generated when pressing a

finger hole quickly aligned; smell - specific, inherent in this type of meat; state of fat - white, firm consistency, with crushing crumbles; state of tendons - elastic, dense; bone marrow - yellow, completely fills the hole tubular bones; broth - clear, fragrant; test with copper sulphate - clear broth; Trichinellas were not found; 2 helminth finns present in 40 cm^2; lead content - 0.3 mg / kg; cadmium content - 0.05 mg / kg; aflatoxin B1 - 0.005 mg / kg.

Give the hygienic assessment of the meat quality (1),

Determine factors of risk (2) and possible negative consequences for the health (3),

Evaluate the possibility of selling meat (4),

Indicate the possible ways of using the meat (5).

PRACTICAL SCILLS

73. The value of basal metabolism of adult woman is 65 kcal/hour, the daily energy need for mental and physical activity is 600 kcal. Determine the daily necessity in fats and fats of vegetable origin for the woman.

74. Average coefficient of physical activity of a man is 1.9. Basal metabolism is 2050 kcal/day. Determine the daily requirement of man in proteins and proteins of animal origin.

75. Fundamental metabolism of the student is 1400 kcal. Find energetic capacity of student's nutrition.

76. Fundamental metabolism of the student is 900 kcal. Energetic expenditure for all kinds of daily work is 2100 kcal. Find energetic capacity of student's nutrition.

77. A woman aged 30, 160 cm high, weight – 68 kg, works as a teacher. Evaluate nutritional status according body-mass index value. Determine optimal weight.

78. At the assessing the nutritional status of a man (25 y.o.), body mass index was 18.0. Chronic disease and complaints are absent. Define the notion of body mass index and assess the nutritional status of man using this index.

79. The patient applied for medical help with the following symptoms: driness and bitter taste in the mouth, feeling of heat, redness of the face and neck, severe headache, eye pain with lacrimation and redness, swelling of the mucous membranes of the nose. One hour passed after the eating of salted salmon. Allergic anamnesis is complicated. During laboratory testing of the salmon histamine level was 50 mg / 100 g (10 to 100 mg / 100 g potentially dangerous).
Set the previous diagnosis. Indicate the factors that contribute to the accumulation of histamine in fish.

80. The ambulance doctor revealed the following symptoms in the 14-year-old girl: abrupt muscle weakness, headache, difficulty breathing, dilated pupils, decreased reaction to light, voice hoarse, dry mucous membrane of the mouth, difficulty swallowing, two days there was faeces. The body temperature – 36.0°C, heart rate - 100 beats/min, skin and mucous membranes clean, girl is adynamic, answered questions sluggishly. According to family members found that over the past two days the girl ate dumplings, soup, buckwheat porridge, scrambled eggs, smoked sausage, home canning cucumbers, dairy products. The doctor suspected food poisoning.
Set preliminary diagnosis, identify measures emergency, fill out an urgent report about food poisoning.

81. In laboratory a sample of milk is analysed. There determined the following: colour – whitish, smell – without peculiarities, taste – specific for milk, density – 1,038, acidity – 35^{o} Turner, fats – 1,2%, reductase probe – weak positive. Evaluate the degree of milk quality?

82. In laboratory a sample of milk is analysed. There determined the following: colour – whitish, smell, taste – specific for milk, density – 1,014, acidity – 18 °Turner, fats – 2 %,. Evaluate the degree of milk quality?

83. At the control after activity of department laboratory of milk processing enterprise by the sanitary and hygienic laboratory research of quality of milk which treats from the different purveying stations of region is conducted. There determined the following:

Purveying stations Indication	1	2	3	4
Color	white	white	white with a slightly blue tint	white with a yellow tint
Taste	usual	sourish	sourish	usual
Consistency	watery	watery	homogeneous	homogeneous
Density	1,015 g/cm^3	1,020 g/cm^3	1,040 g/cm^3	1,029 g/cm^3
Content of fat	1,8 %	2,0 %	1,0 %	3,5 %
Acidity	15°T	18°T	22°T	18°T
Reaction on a soda	negative	positive	negative	negative
Reaction on starch	negative	negative	positive	negative

As a result of the conducted researches to make a hygienic conclusion, define the suitability of milk for the consumption.

84. The patient applied for medical help with the following symptoms: dryness and bitter taste in the mouth, feeling of heat, redness of the face and neck, severe headache, eye pain with lacrimation and redness, swelling of the mucous membranes of the nose. One hour passed after the eating of salted salmon. Allergic anamnesis is complicated. At the laboratory testing of the salmon histamine level was 50 mg / 100 g (10 to 100 mg / 100 g potentially dangerous).

Set the diagnosis. Indicate the factors that contribute to the accumulation of histamine in fish.

85. By the specialists of district sanitary-epidemiology service during the first half-year of cy it is registered 45 accidents of the food poisonings and during their investigation found out objects, which made or realized food products which entailed these poisonings.

Diagnosis	Quantity of accidents	Products and objects
Botulism	2	mushrooms of the home canning
Escherichiosis	11	market sour cream
Aphlotoxicosis	2	a peanut is in packets
Poisoning by a death-cup	3	mushrooms of the home canning
Poisoning by the apricot cooking	1	cooking of home preparation
Staphylococcus toxicosis	16	story scalded pastry
Trichinosis	3	market meat
Poisoning of solanin	2	mashed potatoes in a cafe
Chronic poisoning by lead	2	cooking of home preparation, which was saved in the glazed tableware
Food methglobinemia	3	market ham

Distribute found out poisonings on groups according to classification of the food poisonings, to analyse their structure.

86. A 49 year old man complains for weakness ache in heart area and epigastria, lack of breathing, heart beating, and heartburn after eating spicy and soul food. He is ill over a year, having exacerbation in autumn and spring. Status presents: skin is pale with lemon shade and singular haemorrhages, tongue is increasingly, moist, “varnished”, liver is near rib arc. What is the most probable diagnosis?

87. Daily nutrition of a 29 year old surgeon contains 83 g of protein (including 30 g of animal protein), 83 g of fat and 480 g of carbohydrates. Energetic capacity of the nutrition is 2990 kcal. In what way nutrition ration should be corrected?

88. Laboratory determination content of nitrates is conducted in the daily allowances rations of nourishment students at different classes of Lviv boarding-schools. The followings levels of real daily intake of nitrates are set in the organism of children:

class	average weight, kg	real daily intake of nitrates, mg/kg
1st	20	70
3rd	30	75
5th	37	80
8th	45	85

As a result of the conducted researches and calculations of actual daily dose of nitrates make a hygienic conclusion about safety nourishment students of boarding-schools.

89. A 5 year old child (weight 20 kg) has received 140 mg of nitrates with his daily nutrition. Determine actual daily dose of nitrates for this child and make a hygienic conclusion.

OCCUPATIONAL HYGIENE

SITUATIONAL TASKS

90. In blacksmith's-press's shop physical work is connected with unfavourable meteoconditions (air t° 40-50 °C, intensive infra-red radiation, humidity 25%, air movement velocity is 0.1 m/sec), one worker lost consciousness. Doctor of medical room testified the following: face pallor, wet skin, intensive perspiration, surface respiration with BR of 50/min, HR of 100/min, delicate filling, body t° – 39.9 °C.

Which diagnosis is the most possible? (1),

Give hygienic valuation (2),

Estimate risk factors (3) and possible consequences for the health (4),

Offer hygienic measures (5).

91. In the production of asbestos goods mixture of the asbestos with the cotton is used. This process is carried in special underground shelter with

air-exhauster ventilation. At the reach of the air through the filter (time 10 minutes) with the speed of 20 litres per minute, filter mass is increased on 2 mg. Laboratory examination of the qualitative content of the dust revealed 50% of the asbestos content.

Calculate concentration of the dust in the air (5),

Make the hygienic evaluation of the conditions of work (1),

Estimate risk factors (2) and possible consequences for the health (3),

Suggest prophylaxis measures (4).

92. The workers of the laboratory complained about high fatigue, weakness, sleepiness, timidity during the medical review. The objective examination revealed shallow and frequent tremor of fingers of hands, eyelids, and some workers had gingivitis. The devices filled with mercury are used in a laboratory. The content of mercury in mid air was from 0.01 to 0.05 mg/m^3 (MAC is 0.005 mg/m^3), the carbon oxide concentration was from 2 to 8 mg/m^3 (MAC is 20.0 mg/m^3). In the plaster of walls and in a parquet floor traces of mercury were found. The laboratory devices are set on laboratory tables with plastic covering. Shop ventilation is general type.

Give the hygienic evaluation of the working conditions in the laboratory (1),

Estimate the risk factors (2), and possible negative consequences for the health of workers (3),

Suggest prophylaxis measures (4),

Offer the methods of demercurization in the laboratory (5).

92. Workers clean the facade of the building by sand-jet method. During the sampling of air on the AFA filter for 15 min. at a rate of 10 l / min, the filter mass was increased by 3 mg. A qualitative analysis found that 80% of dust consists of free silicon dioxide.

Calculate the dust concentration in the air (5),

Give the hygienic evaluation of the working conditions (1),

Estimate the risk factors (2), and possible negative consequences for the health of workers (3),

Offer measures to improve the working conditions of builders (4).

PRACTICAL SCILLS

93. A worker of a textile factory aged 33 years is working at the bleaching station. She appealed to the clinic with complaints of irritation of the mucous membranes of the upper airways, swelling of eyelids, pain in the eyes, tearing, headache and shortness of breath with a sense of suffocation, pain in the retrosternal area and right quadrant. These symptoms appeared at the end of the day. During the work shift she was working with a fresh solution of sodium hypochlorite.

Put the previous diagnosis; fill out an urgent notification about the diagnosed case of acute occupational poisoning.

94. A worker of the chemical plant complains of fatigue, insomnia and headache. He works at the amalgam production. On examination: tremor, asymmetry of reflexes, labile pulse, stable red dermographism, excretory gingivitis. Which diagnosis is the most possible? What is the cause of the illness?

95. In blacksmith's-press's shop physical work connected with unfavourable meteoconditions (air t° - 40-50 °C, intensive infra-red radiation, humidity 25%, air movement velocity is 0,1 m/sec), one worker lost consciousness. Doctor of medical room testified the following: face pallor, wet skin, intensive perspiration, surface respiration with BR of 50/min, HR of 100/min, delicate filling, body t° – 39.9 °C. Evaluate of the working conditions in the laboratory. Which diagnosis is the most possible?

96. Give a hygienic assessment of the dustiness of the production premises, if at the sampling of the air on the filter for 10 minutes at a speed of 35 l / min the filter mass was increased by 1.68 mg. Qualitative analysis found that 50% dust consists of free silicon dioxide, 75% of particles with a size of 0.8-

2 microns. Determine the concentration of dust in the air. What method was used to sample the air?

97. The working conditions in hotbed plant are characterized by the followings parameters of microclimate: temperature of air is 35°C, relative humidity is 85 %, rate of air movement is 0.1 m/c. Estimate the working environment at the plant and the state of the thermoregulation system of workers. Which devices were used for researches?

98. By the sanitary and hygienic laboratory research of dustiness of air of three areas of reinforced-concrete constructions plant is conducted. There determined the following:

Area Indication	1	2	3
Speed of selection of test of air	20 l/min	20 l/min	20 l/min
Time of selection of test of air	20 min	10 min	30 min
Mass of filter before the selection of test of air	0.8 mg	0.8 mg	0.8 mg
Mass of filter after the selection of test of air	1.4 mg	1.8 mg	2.0 mg
Content of free SiO_2 in air	50 %	80 %	5 %
MAC, class of danger of dust	2 mg/m^3, 4	1 mg/m^3, 3	4 mg/m^3, 4

As a result of the conducted researches make a hygienic conclusion about the state of dustiness of air, determine areas that need primary realization of measures of dustiness diminishing.

HYGIENE OF CHILDREN AND ADOLESCENTS
SITUATIONAL TASKS

99. A boy, aged 9, is examined: height – 127 cm (-0.36 δ), weight – 28.2 kg (+0.96 δ), chest circumference – 64,9 cm (+0.66 δ). He has diagnoses “compensation chronic hyperacid gastritis” and “hyperplasia thyroid of II degree”.

Valuate of child's physical development (1),

Determine factor of risk (2) and possible negative consequences for the health (3),

Offer the preventive measures (4),

Define the group for health (5).

100. A boy, aged 11, is examined: height – 132 cm, weight – 36 kg, chest circumference – 69.5 cm. Standards indicators of weight and chest circumference according to height are 26.6 kg and 63.3 cm, regress sigma accordingly are 4.4 and 4.0.

Valuate of child's physical development (1),

Determine factor of risk (2) and possible negative consequences for the health (3),

Offer the preventive measures (4),

Define the group for health (5).

101. A 9 years old girl is 135 cm height, weight – 23.4 kg, thorax circumference – 58 cm. According to this height, standard parameters of weight and thorax circumference are 30.4 kg and 63.3 cm, regress sigma – 3.2 and 3.6 correspondingly.

Valuate of child's physical development (1),

Determine factor of risk (2) and possible negative consequences for the health (3),

Offer the preventive measures (4),

Define the group for health (5).

102. A 12 year old boy is 145 cm height, weight is 33 kg, thorax circumference is 68 cm. According to this height, standard parameters of weight and thorax circumference are 38.5 kg and 70.9 cm; σ_r are 4.5 and 3.8 correspondingly. Hyperacidic gastritis in the compensation stage and hyperplasia of the thyroid gland of the II stage were revealed at the examination.

Valuate of child's physical development (1),

Determine factors of risk (2) and possible negative consequences for the health (3),

Offer the preventive measures (4),

Define the group for health (5).

103. According to lessons timetable in 6-th class of school the sum of points by class scale is: in Monday – 21.8, Tuesday – 16.1, Wednesday – 20.9, Thursday – 18.0, Friday – 16.5. The interval between lessons is 10 min, after 2-nd lesson – 30 min. Week loading is 33 hours.

Evaluate lessons timetable (1),

Determine factor of risk (2) and possible negative consequences for the health (3),

Give the recommendations with regard to the lessons timetable improving (4),

Evaluate week loading at the school (5).

104. The area of mathematics cabinet of secondary school is 40 m^2. On the workplace of pupils a light coefficient is 1:8, DLF is 1.0%, angle of incidence – 24°, opening angle – 3°. Artificial lighting is provided by 6-th incandescent lamps with power 100 Vat each.

Calculate specific power of artificial lighting in the cabinet (5),

Give the hygienic estimation of terms of stay of pupils (1),

Define risk factors (2) and possible negative consequences for the health (3),

Offer the preventive measures (4).

105. The examination of nursery kindergarten in autumn-winter period found that occupancy is 28 children. The group block is situated on the first floor. The composition includes a games room, bedroom, sanitary units. The heating of the rooms is provided by central water heating system. The temperature in the playroom at a height of 1.5 meters from the floor is 18 °C, at floor level 15°C, humidity 82%, air velocity of 0.1 m/s. In order to keep warm through-ventilation of rooms is not performed.

Give the hygienic evaluation of the present conditions in the kindergarten (1)

Determine risk factors (2) and their possible negative consequences for the health (3),

Offer the preventive measures, that can improve conditions for children in kindergarten (4),

Specify the necessary devices for measurement of microclimate in the group of kindergarten block (5).

106. The sanitary inspection of the classroom for the first-year pupils of the secondary school revealed: 34 students study in the classroom. The students' average height varies 110-120 cm. The classroom area is 63 m^2, t ° + 23 ° C, relative humidity - 55% air velocity - 0.1 m/s, content of CO_2 is 0.2%, DLF is 2.5%, LC from 1:4 to 1:5, lighting by fluorescent lamps - 400 lux. Evaluation of the educational process: week loading is 20 hours, the duration of the lesson is 35 min, homework is not set, the duration of breaks is 15 minutes, and long break is 30 minutes.

Give the hygienic assessment of conditions in the classroom and education of students in the class (1),

Determine risk factors (2) and their possible negative consequences for the health (3),

Argue the measures of improvement of the conditions for students (4),

Determine the number and the size group of desks and the relevant colour marking (5).

PRACTICAL SCILLS

107. A boy, aged 11, is examined: 148 cm (+ 1,5σ), weight 42 kg (+ 1,9σ), the chest circumference is 70 cm (+ 1σ). He usually has acute respiratory infections 4-5 times a year. Chronic diseases have been not identified. Assess the physical development of boy and define a group of health. What methods were used for study and evaluation of the physical development?

108. A 9-year-old child with diagnosis “chronic tonsillitis” stands on a dispanserization control. For 1st year of observation the exacerbation of disease was twice. Physical condition is satisfactory. The general state is not infringed. Define group of health.

109. Evaluate physical status of 11 years old boy which height is +2σ, weight -0,2σ, thorax circumference +0,9σ. Which methods were used for the physical status studying and evaluation?

110. 12 years old girl is 143 cm height, weight – 29 kg (-1.35 σ_r), chest circumference – 63 cm (-1.20 σ_r). Biological status corresponds with calendar age. Functional parameters are M±σ for this age. Evaluate physical status. Which methods were used for the physical status estimation?

111. 5 years old girl has a middle physical development, body weight – M+1,9 σ_r, thorax circumference – M+1,6 σ_r, subcutaneous adipose tissue – 1,2 cm, thin skeleton, medium muscle development, LLC and force in left and right arms are average for the child’s age – M+0,9σ. During the last year girl was ill with flue, acute bronchitis, measles and pneumonia. Evaluate physical status and health group. Which methods were used for the physical status estimation?

112. The pupils study in the 5^{th} class of secondary school. During the cy 4 pupils did not get sick, 8 pupils were sick once, 11 pupils – twice, 6 pupils – three times, 5 pupils – four times, 1 pupil – six times, 1 pupil – eight times. How many pupils should be included to the group those children, which are frequently ill.

113. The boy of 11 years 148 cm (+ 1,5σ), weight 42 kg (+ 1,9σ), the chest circumference is 70 cm (+ 1σ). He has acute respiratory infections 2-3 times a year. Chronic diseases haven’t been identified. Assess the physical

development of boy and define a group of health. Which methods were used for study and evaluation of the physical development?

114. The girl of 6 years old, medium height, harmonious physical development; dental formula corresponds to the age. Last year she was sick be epidemic parotitis and twice acute respiratory diseases. There are no defects of sound pronouncing. The result of cutting circle test is 2 points, Kern-Irasek test - 7 points. Evaluate the readiness of the child to study in school.

114. To prepare an annual report, the doctor summarized the results of the morbidity of children by referrals and the results of medical examinations. The results of the examination of pupils of the IX classes showed that:

- 5 children don't have the rejections in the state of health;
- 2 children for a previous year were ill on acute respiratory disease once;
- 5 children were ill acute respiratory infections twice;
- 3 children were ill acute respiratory infections five times;
- at 4th children found out a flat foot;
- 3 children are had surplus weight within the limits of 12-17 %;
- at one child found out obesity of a 3-ed degree;
- at one child myopia is set 3,5 D;
- at 3rd children found out the teeth decay of high activity;
- at 2nd children found out hyperplasia of thyroid gland of 1st degree.

Distribute pupils on the groups of health.

115. At planned test of general school a sanitary doctor conducted instrumental researches of parameters of microclimate and luminosity in the educational apartments. There determined the following:

Indication	Educational apartments		
	cabinet of mathematics	chemical laboratory	gym
Temperature of air, °C	20	22	19
Relative humidity, %	60	54	68

Rate of air movement, m/sec	0,15	0,24	0,08
DLF, %	1,9	1,2	1,6
Luminosity by incandescent lamps, lx	150	150	–
Luminosity by luminescent lamps, lx	–	–	200

To make a hygienic conclusion as a result of the conducted researches and to ground measures on the improvement of the sanitary and hygienic regimen at school.

116. At the complex inspection of general school by a doctor-hygienist the study of the sanitary-hygienic regimenof educational apartments was conducted. There determined the following:

Apartment	Area, m^2	Filing of class	T, °C	Relative humidity, %	Rate of air movement, m/sec	Content of CO_2, %	DLF, %	Artificial luminosity, luminescent lamps, lx
Class for the students of I of class	46	35	23	75	0,05	0,2	1,0	300
Physics laboratory	72	25	20	50	0,1	0,07	1,5	400
Cabinet of chemistry	60	25	24	68	0,0	0,13	1,0	250
Computer class	40	15	22	60	0,1	0,11	1,0	200

As a result of the conducted researches make a hygienic conclusion ground measures on the improvement of the sanitary-hygienic regimen at school.

RADIOLOGICAL HYGIENE
SITUATIONAL TASKS

117. The radiologist from radiotherapy department works with the source of ionizing radiation (gamma-therapeutic apparatus). He applied to a family doctor complaining of general weakness, fatigue, frequent headaches, subfebrile body temperature. The results of laboratory tests revealed moderate decrease of platelets and white blood cells. The total duration of his work is 10 years, the average power of effective dose of 20-25 mSv / year.

What type of radiation generates a specified unit (1),

Determine the risk factors (2) and its possible negative consequences for the health (3),

Propose the measures of prevention of the harmful effects of ionizing radiation (4),

Specify the timing of periodic medical examinations of workers in this category, the list of experts and laboratory tests required for medical examinations (5).

118. Radiometric studies were conducted for the estimation of the main dose forming food products. Mean values of activity of Cs^{137} and Sr^{90} (Bq / kg, Bq / l) were: milk 100 and 40; meat 100 and 5; bread - 5 and 2.5; potatoes 30 and 10; mushrooms 1000 and 100 respectively. Acceptable levels of Cs^{137} and Sr^{90} are: 100 and 20 for milk, 200 and 20 for meat; 20 and 5 for bread; 60 and 20 for potatoes; 500 and 50 for mushrooms respectively.

Assess the degree of contamination of food with radionuclides Cs^{137} and Sr^{90} (1),

Identify the main dose forming food products (2),

Give qualitative characteristics of the biological effects of Cs^{137} and Sr^{90} (5) and indicate their possible adverse health effects (3),

Propose the measures for the reduction of radionuclides in the human body (4).

PRACTICAL SCILLS

119. The average dose of external radiation for radiologist is 1.5 mSv / month. Calculate and estimate the annual effective dose for the physician.

120. The medical staff of radiology departments is constantly working with closed sources of ionizing radiation while performing radiotherapy. They apply all the preventive measures according to the principles of the protection by time, distance and screens. Determine the category of persons for the workers of radiology department according to the Norms of Radiation Safety of Ukraine.

121. In the health care setting is a therapeutic massage, along with X-ray. As a result of imperfect screening practitioner during the year received a radiation dose of 10 mSv. Determine the category of persons according to Norms of Radiational Safety of Ukraine which therapist belongs and the acceptable limit of effective dose for this category of medical staff?