

Republic Uzbekistan Ministry of Health

Tashkent medical academy

**THE COLLECTION OF
SITUATIONAL PROBLEMS FOR
THE PRACTICAL TRAINING ON
HYGIENE OF LABOR**



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I "APPROVE"

The prorector on study TMA
professor TESHAEV O.R.

«_____» _____ 2013 y.

The report № _____

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FOR THE PRACTICAL TRAINING ON HYGIENE
OF LABOR**

*for students of magistracy on a speciality 5A 510301 –
Hygiene (Hygiene of labor)*

Tashkent

COMPOSERS:

- d.M.S., the professor Iskandarova G. T.
- k.M.S., senior lecturer Samigova N.R.
- k.M.S., the senior teacher Hashirbaeva D.M.

Reviewers:

d.M.S., the professor of chair «Hygiene of children,
teenagers and hygiene of a food » TMA

SHAYHOVA G.I.

k.M.S., the senior teacher
chairs "Hygiene" of Tashkent
Institute of improvement of doctors

ISROILOVA G.M.

In the collection of situational problems on various sections of the hygiene which decision will help to solve to students various situations at carrying out of the State sanitary inspection on industrial objects are presented.

Materials are considered (examined) and approved by session by Cycle objective of section of medikal-preventive faculty of the Tashkent medical academy.

The report № 8 , from « 2 » april 2013 y.

Materials are considered and recommended for the statement on by session by the Central methodical commission of the Tashkent medical academy.

The report № from « » 2013 y.

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I. PHYSIOLOGICAL METHODS OF RESEARCH OF THE FUNCTIONAL CONDITION OF THE ORGANISM WORKING IN DYNAMICS OF THE WORKING DAY

Situational task

Weather conditions work of drivers on pouring cranes of martin shop during the summer period of year (temperature of external air 23-25°C) were studied. A work category on severity level – II a. It is established that air temperature in cabins 38-40°C, relative humidity of 40-45%, speed of movement of air of 0,1-0,3 m/s, intensity of infra-red radiation during time casting, metal - to 600 kcal/m³ hour (through glasses and from walls). The temperature of internal surfaces of protections during the separate moments reached 40-50°C. Results of an estimation of a functional condition of an organism are presented in the table.

Body temperature and integuments at machinists

Research time	Indicators in °C			
	t bodies, °C	t skin, °C		
		forehead	brushes	breasts
Before work	36,6±0,07	33,9±0,29	32,7±0,41	33,01±0,29
In an operating time	37,22±0,09	35,28±0,34	35,21±0,27	35,19±0,18
After the work termination	36,8±0,19	33,8±0,25	34,17±0,23	33,42±0,25

Give answers to following questions:

1. Estimate weather conditions of machinists pouring cranes.
2. What devices it is possible to take skin and body temperature?
3. Explain the found physiological shifts at the working.
4. What actions are necessary for offering for improvement of working conditions of machinists of the crane?

Situational task

The neurosurgeon makes operation within two hours. A working pose during 60% of time standing, in inclined position 35° and more. By the gas-analysis data it is established that power expenditure have made 5,5 kcal/minutes number of objects of simultaneous supervision – 6-8, time of visually-motor reaction is extended after operation on 40,6% from initial level.

Give answers to following questions:

1. On what bodies of the neurosurgeon the maximum loading falls, and what methods study their functional condition?
2. Define a class of working conditions on indicators of weight and intensity of work of the surgeon during operation according to classification of work by weight and intensity?

Situational task

Labour activity of the dispatcher of the airport the message of pilots and visual supervision consist in adjustment of departures and landings of trip planes on the basis of the schedule. Work differs huge responsibility for accuracy and safety of departures and plane landing. It is established that the number of objects of simultaneous supervision makes 15-20, duration of concentrated time of 40% from change time – 87, density of the signals arriving on the average in hour, - 320. Time of visually-motor reaction at the dispatcher before work makes 0,24 sec, after work - 0,35 sec, and acoustical-motor reaction, accordingly, 0,175 and 0,250 sec, power expenditure have made 135 kcal/hour.

Give answers to following questions:

1. Define weight and intensity of work of the dispatcher, what bodies and its systems tests the greatest loading.
2. With what help of methods of research the data, which characterise labour activity of the dispatcher is obtained.
3. Make recommendations about optimisation of labour activity of the dispatcher of the airport.

Situational task

At repair of tractors the machineman performs work as capacity of 40-45 Vt. The stationary workplace is not present. At operation performance muscles of a humeral belt participate mainly. Periodically (to 50% of time) the mechanic is in the compelled pose (in a lap, in the squatting position, lying). In an operating time pulse to 110-120 blows in a minute. Endurance of muscles of hands to static conditions decreases on 35% from initial level.

Give answers to following questions:

1. State an estimation of weight of the given kind of work according to classification of work by weight and intensity.
2. List methods of researches and devices with which help the data characterising work of the machineman is obtained.

Situational task

Work of operators on a site on manufacture of electric devices demands from them supervision over technological processes from the board panel on the average during 45% of time of change. Thus the operator in an hour accepts and analyzes over 300 signals and messages, during change it is necessary for it to remember more than 5 indicators (operative memory). Work on a category of visual works can be carried to exact operations.

Give answers to following questions:

1. Define intensity of work of the operator.
2. Make recommendations about rational construction of the working day.

Situational task

At factory general mechanical rubber goods in shop forming at simultaneous vulcanization make linings. For the basic work at the worker 72,5% of time are necessary, a lunch break – 30 minutes. Results of physical researches of formers have shown that power expenditure make 5,5 kcal/mines, pulse rate on the average for change of 115 blows in mines, muscular endurance decreases on 35% from initial level.

Give answers to following questions:

1. State an estimation of weight of work according to classification of work by weight and intensity.
2. Make recommendations about rational construction of the working day.

Situational task

Work of sorters of preparatory shop of sewing manufacture is characterised by weight of lifted cargo, considerable for women (9-10 kg), stereotypic working-class movements at regional loading, with primary participation of muscles of hands and a humeral belt (to 15000 for change), the compelled working pose "sitting" (to 25% of working hours), with an inclination of a belt to 100 times for change and moving to space to 3 km. Intensity of labour process is caused by duration of the concentrated supervision (to 55% of working hours), the size of object of distinction (5–1,1 mm more than 50% of time of change), degree of responsibility for quality of the basic work, monotonia, an operating mode with the regulated breaks, on insufficient duration.

Give answers to following questions:

1. State an estimation of weight and intensity of labour process of the sorter according to Hygienic classification of work.
2. Make recommendations about rational construction of the working day.

Situational task

Professional duties of drivers of buses of mark "Mercedes" and "Otajol" include performance of works on driving by buses, maintenance of transportations of passengers and maintenance service with their small repair. Drivers in the course of work on maintenance service and bus repair lift and move weights in weight to 18 kg, making inclinations the case more than 30⁰ to 50 times in change, are in compelled (in a lap, in the squatting position) a working pose of 0,9% of working hours. Intensity of labour process is caused by duration of a concentration of attention to 90 % of time of change; responsibility for functional quality of the basic work, errors which can lead to road and transport incidents; the decision of challenges with a choice on an instruction series; comparison of actual parametres to their nominal; check and control over task performance; risk degree for safety of own life and other persons. The operating mode of drivers 2 replaceable, makes duration of the working day of 12 hours, congestion of 85% of time of change.

Give answers to following questions:

1. State an estimation of weight and intensity of labour process of the sorter according to Hygienic classification of work.
2. Make recommendations about rational construction of the working day.

Situational task

In the course of labour activity workers of the polygraphic enterprise had changes of functional condition CVS within the working day which increased by the end of the first and second semichange. Changes CVS have been more expressed at printers and machinists of printing shop who were characterised: increase of pulse to 82±1,62 (printers) and 83±1,51 (machinists) of blows in a minute, increase pulse pressure (on the average from 42±0,54 to 50±1,08 mm hg) and the maximum pressure, decrease minimum the arterial blood pressure throughout the working day. Stroke volume (before work 66±1,42 ml) and the cardiac output (before work 5265,6±101,0 l a minute) after 4 business hours raised at workers master

cylinder a site and stroke volume to 65 ± 121 ml, the cardiac output to $5388,5 \pm 109,6$ l a minute – at workers of printing shop, and by the labour shift end came back to initial sizes.

Give answers to following questions:

1. List methods of researches and devices with which help the data characterising work of workers of the polygraphic enterprise is obtained.
2. How it is possible to define decrease in working capacity and development of industrial exhaustion on the basis of the received data?

II. THE HYGIENIC ESTIMATION OF THE INDUSTRIAL MICROCLIMATE AND ITS INFLUENCE ON THE ORGANISM OF THE WORKING

Situational task

In forge shop of machine-building factory the production technology develops of the following: metal ingots, it is powerful 10-130 kg, are exposed to heating in special furnaces, further are taken and in heated condition a kind move on forming presses where by pressure from them receive shaped products. The last go on a special platform in shop for cooling. Temperature of ingots 1600°C , temperature of an external surface of heating furnaces 120°C . Surpluses of obvious heat make 25 kcal/m^3 in hour. Giving of ingots in heating furnaces, штамповочные the press and on a special platform is mechanised and carried out by means of manipulators. Work punchers concerns a category of works of average weight - II. At studying of weather conditions on workplaces punchers in the summer (temperature of external air 20°C) the following has been established: air temperature $28-30^{\circ}\text{C}$, relative humidity of 40%, radiant heat of 1500 kcal/m^3 in hour, speed of movement of air of $0,5-0,7$ m/sec.

Give answers to following questions:

1. Estimate weather conditions in shop.
2. Name the actions necessary for decrease of quantity of radiant heat and its influence on workers.

Situational task

In dyeing weaving mill shop it is spent degumming and dyeing of silk fabrics. The capital equipment - mechanical барки the periodic action, representing capacities with the solutions having temperature $60-90^{\circ}\text{C}$. Over capacities drums on which fabrics are located are strengthened. In

the course of manufacture are used: sulfanol, soda ash, liquid ammonia, oleic soap, various emulsions, acetic acid, etc. the Unloading of fabrics from vats and water delivery in them are mechanised. Reagents are filled in with the working woman manually (a bucket on 8-10), she fills a fabric in a drum, watches a technology course. Surpluses of obvious heat in shop make $7 \text{ kcal/m}^3 \text{ hour}$. At studying of weather conditions in shop during the cold period of year it has been established that temperature on workplaces $26-29^\circ\text{C}$, humidity of 96-98 %, speed of movement of air of 0,3-0,5 m/sec.

Give answers to following questions:

1. Name, what devices spent measurement of parametres of a microclimate.
2. Estimate weather conditions in shop.
3. Make recommendations about improvement of weather conditions in shop.

Situational task

In galvanic shop in special baths the covering of details by various metals (nickel, chrome, zinc, copper, etc.) by their electrodepositionv from water solutions of salts is made. Temperature of solutions $+40^\circ\text{C}$. Before a detail covering, as a rule, are exposed to clearing of a rust, fat and other pollution in baths of degreasing by means of solutions of alkalis and in baths of etching by means of solutions of inorganic acids. Temperature of these solutions $70-80^\circ\text{C}$. The worker serving a line, suspends a detail (weight to 10 kg), on special suspension brackets and watches process. Transfer of details from one bath in another is mechanised. Baths are equipped by local exhaust ventilation (onboard suction). Surpluses of obvious heat in shop make $5 \text{ kcal/m}^3 \text{ hour}$. At measurement of parametres of a microclimate on workplaces it is established that in the winter air temperature $18-20^\circ\text{C}$, humidity of air of 70-72%, speed of movement of air of 0,3-0,5 m/s.

Give answers to following questions:

1. What devices spent measurement of meteorological parametres?
2. Estimate weather conditions in shop.
3. Name ways emission of heat at working in these conditions.

Situational task

In thermal shop of machine-building factory training of metal details for giving of the raised hardness is spent by it. Process develops of

following stages: heating of products in furnaces at temperature 800-900°C, fast cooling in baths (water, oil), secondary heating to 250-350°C in the baths filled with solutions of salts, oils, and the subsequent slow cooling. In shop there are 4 hardening electric furnaces and 8 oil baths equipped with local exhaust ventilation. Surpluses of obvious heat in shop make 81 kcal/m³ hour. The temperature of a surface of hardening furnaces is equal 120°C. At microclimate studying on workplaces heat-treaters at furnaces it has been found in the winter that the temperature fluctuates from 25 to 30°C, thermal radiation to 1800 kcal/m³ in hour, relative humidity of 50-60%, speed of air of 0,5-0,7 m/s. Work treaters concerns a category of works of average weight - II.

Give answers to following questions:

1. Estimate weather conditions in shop.
2. How heat exchange at working in such conditions is carried out?
3. You can give what recommendations about a work and rest mode, and also about a drinking mode?

Situational task

In thermal shop of machine-building factory the hot processing of metal directed on change of its physical and chemical structure and giving to metal of certain hardness, viscosity is made, electric conductance, etc. metal training develops of two operations: heating of products in furnaces to temperature 800-900°C, fast cooling in baths (water, oil), secondary heating to 250-350°C in the baths filled with solutions of salts, oils, and the subsequent slow cooling. On the plan the equipment and its placing is shown. Surpluses of obvious heat in shop make 81 kcal/m³ hour. The temperature of a surface of furnaces is equal 80°C, the temperature of a surface of loading windows makes 480°C. Intensity of radiant heat on workplaces to 1200 kcal/m³ hour. Workplaces of heat-treaters are equipped by air souls. Work of heat-treaters concerns a category of works of average weight.

Give answers to following questions:

1. Name the devices necessary for measurement of weather conditions.
2. Define admissible parametres of weather conditions on workplaces of heat-treaters.
3. How heat exchange at working in these conditions is carried out?

Situational task

In tannic shop of skinnery chemical processing of skins of animals in the water solutions containing tannin is spent, salts of trivalent chrome, etc. Hardening is made in tubs, drums at temperature of solutions to 40°C. Preparation of a tannic extract is conducted in tanks at temperature 100°C. After hardening skin are washed out by water in opened kettles. Surpluses of obvious heat in shop - 5 kcal/m³ hour. Temperature of an external surface of a tank for extract preparation +50°C. Work beamsman concerns a category of average weight - II and. For studying of weather conditions in the winter on workplaces used aspiration psychrometer and heat loss anemometer. Speed of movement of air of 0,5 m/s, indications of the dry thermometer of psychrometer 25°C, damp - 23°C. Calculate relative humidity of air.

Give answers to following questions:

1. Estimate weather conditions in shop.
2. To the equipment it is necessary to show what requirements to reduce receipt of heat, a moisture in a premise?

Situational task

In martin shop of metal works the steel melt in special furnaces is carried out at temperature 1600°C. As raw materials the steel breakage and pig-iron which load into the furnace through windows by means of the charging car serves; a part of additives (iron and manganous ore, etc.) Throw in the furnace manually shovels. After the fusion termination (7-8 hours) a steel from a final aperture of the furnace merge through a trench in разливные ladles. Preliminary through another, located above, an aperture merge in bowls slag. Surpluses of obvious heat indoors to 250 kcal/m³ hour (80% at the expense of radiant heat). Temperature of external surfaces of martin furnaces from 120 to 250°C, temperature of a floor of a working platform at the furnace +150°C. At studying of weather conditions of work of steelmakers and its improvised it has been established that on workplaces air temperature fluctuated from 23 to 25°C (temperature of external air +15°C), radiant heat the change most part was within 1200-2400 kcal/m³ hour. At some manual operations though also short-term (to 30 mines), radiant heat reached 9000 kcal/m³ hour.

Give answers to following questions:

1. Estimate weather conditions in shop.
2. How it is carried out теплоотдача an organism in the given conditions?

3. Name actions for protection working from influence of radiant heat.

Situational task

In washing shop of factory there is a furnish of cloth fabrics. It consists, first of all, in валке, which purpose - fabric consolidation, coupling, перепутывание strands of wood among themselves; it is reached by processing by the fulling car — compression, pressure and a fabric friction in a soap solution (50°C). Further the fabric is washed out in warm water (40°C) and wrung out on a centrifuge. Transportation of the goods from weaver's shop in washing and from washing барок to a centrifuge is made on manual trolleys, from fulling cars to washing баркам - direct mechanical transfer to plaits. Fulling cars and барки - opened. Work отделочниц concerns a category of lungs on severity level. Surpluses of obvious heat in this premise - no more than 11 kcal/m³ hour. At studying of weather conditions on workplaces in the summer (temperature of external air 22°C) it has been found that air temperature makes 29-30°C, relative humidity to 85-90%, speed of movement of air less than 0,3 m/sec.

Give answers to following questions:

1. It is possible to measure by what devices relative humidity?
2. Estimate an industrial microclimate in the given shop.
3. Specify ways heat emission at working in these conditions.

Situational task

In drum-type shop of skinnery processing of skin by solutions of tannins is made. This process is made in open tubs with tannins, and skin are consistently transferred from one tub to another, being in each of them within days. In shop there are two lines of tubs, concentration of tannins increases from the beginning by the end of some tubs. Temperature of solutions to 35°C. After tan the leather are washed out by hot water (+60°C) in open washing drums and further are transferred in a finishing shop. Transfer of skin from one equipment in another is mechanised. Work аппаратчиков concerns a category of lungs on severity level. Surpluses of obvious heat indoors do not exceed 12 kcal/m³ hour. At studying of weather conditions in shop on workplaces the following data has been obtained: air temperature 15°C, relative humidity of 90%, speed of movement of air of 0,5 m/sec, temperature of external air +3°C.

Give answers to following questions:

1. Estimate weather conditions in shop.
2. What devices spent definition of parametres of a microclimate?
3. Name actions for improvement of weather conditions in shop.

Situational task

In electrolysis shop of aluminium factory aluminium by electrolysis the alumina dissolved in fused cryolite is made. The electrolysis bath represents the metal casing which bottom part is deepened in a floor and lining by coal blocks. These blocks are the bath cathode. The bath is filled fused at $+950^{\circ}\text{C}$ cryolite. Alumina is periodically loaded into it. From above in a bath the coal anode is lowered. At passage of a current from the anode to the cathode through an electrolit layer the metal aluminium collecting at the bottom of a bath and periodically (every 3-4 days) taken of a bath by means of a vacuum ladle is allocated. The shop is equipped by the baths of average capacity located in 4 numbers. Baths are supplied by shelters in the form of curtains. Baths are served operators which work concerns a category of works of average weight. Surpluses of obvious heat in shop make 100 kcal/m^3 hour. In shop natural ventilation through windows in longitudinal walls of a building and aeratic a lantern in a roof is carried out. At studying of weather conditions on workplaces in the summer (external temperature of air $21,5^{\circ}\text{C}$) it has been revealed that air temperature fluctuates from 28 to $33,9^{\circ}\text{C}$, speed of movement of air of $0,5-0,8\text{ m/sec}$, relative humidity of $20-30\%$. In processing of baths and performance of various manual operations (26% of working hours) operators are exposed to influence of radiant heat to 1200 kcal/m^3 hour. In shop vacation spots (air temperature $29-30^{\circ}\text{C}$, speed of movement of air of $0,5-0,7\text{ m/sec}$) are equipped. Estimate weather conditions in shop.

Give answers to following questions:

1. By what way it is carried out heat emission at operators in these conditions?
2. It is possible to recommend what actions for preventive maintenance of overheats?

Situational task

In mechanical shop of machine-building factory cold processing of metal products on turning, drilling, milling machine tools is made. Surpluses of obvious heat indoors make 9 kcal/m^3 hour. Work of turners is connected with redurable and a raising of weights (10 kg), is carried out

standing. At studying of weather conditions on workplaces during the winter period of year it has been revealed that air temperature fluctuates from 8 to 15°C (the lowest was on workplaces near to doorways), humidity of air of 50%, speed of movement of air from 0,5 to 0,8 m/sec.

Give answers to following questions:

1. It is possible to measure by what devices the named meteorological parametres?
2. Estimate weather conditions in shop.
3. What actions are necessary for struggle against cooling working in the closed premises during the cold period of year?

Situational task

Working conditions of loaders of the refrigerator occupied with packing of products in refrigerating chambers were studied. Work of loaders is mechanised. Products are delivered in refrigerating chambers on self-propelled carts where with the help forks clamp auto-loaders rise on necessary height and keep within in stacks. Loading of the working day makes 86%. Employment of workers in refrigerating chambers alternates with work on open platforms of refrigerators (50% of working hours in refrigerating chambers). Air temperature in refrigerating chambers from-18 to 20°C. Temperature of a floor and walls from-20 to-22°C. Relative humidity of 80-96%, speed of movement of air to 0,2 m/sec.

Give answers to following questions:

1. Name devices by which it is possible to measure meteorological - parametres.
2. By what ways it is carried out heat emission an organism in these conditions?
3. Name the actions necessary for the prevention of overcooling of an organism.

Situational task

In the weaver's shop equipped with automatic machine tools of mark AT-85, silk fabrics are made. The weaver carries out one working day prior to 2500 working receptions and makes a way about 10 km. The premise is characterised by insignificant surpluses of obvious heat. The shop is located in windowless and no-background a building with air conditioning. At measurement of parametres of a microclimate during the

winter period it has appeared that air temperature 21-23°C, relative humidity of 68-73%, speed of movement of air of 0,5-0,6 m/sec.

Give answers to following questions:

1. Name the devices necessary for measurement of meteorological parametres.
2. Estimate weather conditions in shop.
3. By what ways it is mainly carried out heat emission an organism in these conditions?

III. THE HYGIENIC ESTIMATION OF THE INDUSTRIAL DUST AND ITS INFLUENCE ON THE ORGANISM OF THE WORKING

Situational task

In a colliery face there is a coal mining by means of a combine "Donbass". On a workplace breaker the dust maintenance in air - 200 mg/m³. On disperse structure a dust mainly fine-dispersed, to 5 microns - 78%, the maintenance of free dioxide of silicon equally 8%.

Give answers to following questions:

1. Give the characteristic of a dust and define maximum concentration limit.
2. Specify the list of preventive actions for struggle against a dust on the given site of work.

Situational task

Ore extraction occurs in a deaf not aired face. After explosion copper- sulphide ores have been selected air tests on a dust content of the air environment, concentration was equal 400 mg/m³ at the maintenance of free dioxide of silicon - 10%.

Dispersion of a dust

Size of motes	To 2 microns	From 2 to 5 microns	From 5 to 10 micron	More than 10 micron
Quantity of motes	75	60	52	13

Give answers to following questions:

1. State an estimation of a dust content and calculate dispersion in percentage.
2. Specify preventive actions for struggle with dust formation.

Situational task

In manufacture of asbesto-technical products on one of sites mixture in the bunker of asbestos with a clap is made. Over the bunker local exhaust ventilation in the form of an umbrella is placed. Workplace inspection has shown that the maintenance in dust air makes 40 mg/m^3 . As a part of a dust of 50% of asbestos. At medical examination working P. (the age of 40 years, the work experience on this site of 10 years) showed complaints to an easy short wind at physical pressure. Palpatopercussion - without changes, at auscultation breath by places is a little weakened. Radiographic it is revealed diffuse strengthening of sosudisto-bronchial drawing of lungs.

Give answers to following questions:

1. Give the characteristic of a dust and define maximum concentration limit.
2. Estimate a state of health of the worker.
3. Specify preventive actions.

Situational task

In foundry shop on a workplace fettler air dust content makes 30 mg/m^3 , at the maintenance of free dioxide of silicon of 70%. Local exhaust ventilation is presented by a lattice from a table. Medical inspection of worker, by a trade обрубщик, age of 45 years, the work experience in shop of 10 years is spent. Showed complaints to cough without sputum, a short wind at physical pressure. Palpatopercussion the pulmonary sound with a box shade, mainly in the bottom departments of lungs is found out. Breath rigid with presence of dry rattles. Radiographic it is revealed: pulmonary fields it is moderate emphysematous, pulmonary drawing is deformed mainly in the bottom departments of lungs against which individual nodular formations are defined.

Give answers to following questions:

1. Estimate a state of health of the worker.
2. Name improving actions.

Situational task

In melting branch of metal works the steel melt is made. Definition of a dust content of the air environment in a working zone has allowed to establish that the initial weight of the filter is equal 0,3815 gr, after test selection - 0,4065 gr, the volume of stretched air is equal 500 l. The chemical analysis of a dust has shown that the maintenance of oxides of iron - 90%, manganese oxides - 5%.

Give answers to following questions:

1. Give the dust characteristic, calculate its quantity and compare to maximum concentration limit.
2. Specify preventive actions.

Situational task

In perfumery manufacture in shop of manufacturing of powder on a workplace the dust content of the air environment makes 16 mg/m³. Powder structure: kaolin clay with the maintenance to 46% of the connected dioxide of silicon and silicate-talc. The workplace is equipped by local exhaust ventilation in the form of an umbrella. Surveyed a state of health of working woman N., by a trade parting powder, age of 50 years, the experience of 15 years. It showed complaints to dry cough. Percuss - without changes, at direct auscultation breath is a little weakened. At roentgenoscopy are established in the bottom shares of lungs individual small nodular shades.

Give answers to following questions:

1. Give the dust characteristic, specify maximum concentration limit.
2. Estimate a state of health of the working woman.

Situational task

In printing house in shop of a manual set investigated a dust content of the air environment. Concentration of a dust of lead was equal 0,5 mg/m³.

Give answers to following questions:

1. Name sources of formation of a dust.
2. Specify the plan of preventive actions.

Situational task

At machine-building factory in grinding- blooming branch dry polishing of details from pig-iron of the average size electrocorundumly is made by circles. On a workplace of rubber air test on a dust has been

selected. Initial weight of the filter 0,3125 gr, after, test selection - 0,3200 gr, volume of stretched air of 500 litres. Dust structure - silicon carbide. Ventilation on a workplace is absent.

Give answers to following questions:

1. Specify the list of elements of installation for test selection by a weight method.
2. Calculate concentration of a dust and compare to maximum concentration limit.
3. Give the plan of preventive actions.

Situational task

At machine-building factory in assemblage shop welding works are spent. On a workplace of the welder defined a dust content of the air environment. Concentration of a dust on a workplace is equal 5 mg/m^3 . A dust chemical compound - 6,5% окиси manganese and 4,6% of dioxide of silicon.

Give answers to following questions:

1. What occupational diseases can arise at workers of the given trade?
2. Give the dust characteristic.
3. Specify the list of preventive actions.

Situational task

Researches of a dust content of the air environment were spent at brick-works at a workplace of firing facilities. As the given trade brick loading enters into the roasting furnace. Loading is made manually. The dust maintenance is equal in air of a working premise 20 mg/m^3 . Dispersion of a dust: to 5 microns - 58%, from 5 to 10 microns - 40%, over 10 microns - 2% of particles. The maintenance of free dioxide of silicon - 3%.

Give answers to following questions:

1. Estimate dispersion of a dust from the point of view of possibility of its penetration into respiratory organs and compare a dust content to maximum concentration limit.
2. Specify the plan of improving actions.

Situational task

In branch of manufacturing of details for children's toys polyethylene of low pressure (in the form of granules) is used. Air tests were selected on a workplace where granules fall asleep in a funnel of the special car. Further polyethylene is warmed up and arrives in press forms. The dust maintenance in a zone of breath of the worker makes 20 mg/m^3 .

Give answers to following questions:

1. Estimate a dust content of the air environment.
2. What dust by origin and to formation?
3. Make the plan of preventive actions for struggle against a dust content.

Situational task

In foundry shop on a workplace where there is a knockout molding box from details of the average size, concentration of a dust in air of 60 mg/m^3 . A dust of the mixed structure with the maintenance of dioxide of silicon over 50%. Dispersion definition has shown that a dust in the size: to 2 microns - 75, from 2 to 5 microns - 61, from 5 to 10 microns - 52, more than 10 microns - 12.

Give answers to following questions:

1. Define dispersion of motes in percentage.
2. Estimate the dust maintenance in air of a working premise and compare to maximum concentration limit
3. Give the plan of preventive actions.

IV. THE HYGIENIC ESTIMATION OF LEVELS OF INDUSTRIAL NOISE

Situational task

Detailed studying of technological process of the polygraphic enterprise, kinds of the equipment, its arrangement in shops has allowed to reveal the basic sources of formation of noise which are printing, press cars, etc. So, on a workplace of the type-setter of a manual set the pulse noise generated at work of the adaptation for cabin of lines which general level reaches to 92 dBA is registered. At work line composition cars the noise which general level makes 84 dBA is generated, on a workplace type-metalater at the expense of work linearly-probilnogo the machine tool – level reaches to 85 dBA. On a preparation site gluing a source of formation

of noise work of a glutinous mixer is, the general which equivalent level makes 83 dBA. Also it has been defined that at work of the hydraulic press car the noise level made 84 dBA, and on relief printing workplaces - 90 dBA according to the Sanitary regulations and standards №0120-01 «The sanitary code of admissible noise levels on workplaces».

Give answers to following questions:

1. Define excess of the general noise level on workplaces according to the Sanitary regulations and standards №0120-01.
2. Specify preventive actions for decrease in an adverse effect of noise in the working.

Situational task

In mechanical shop the lathes which work is a source of intensive noise are placed. Workers are exposed to influence of noise during change.

The measured noise levels in dB in octava strips

Frequency, Hz Place measurements	31,5	63	125	250	500	1000	2000	4000	8000	The general level, dBA
At the lathe	76	88	94	88	86	96	89	74	73	80
Maximum permissible level, Sanitary regulations and standards №0201-01	107	96	87	82	78	75	73	71	69	80

Give answers to following questions:

1. Compare the measured noise levels to the sanitary code of admissible noise levels on workplaces according to the Sanitary regulations and standards №0120-01.
2. Offer preventive actions for decrease in an adverse effect of noise on the working.

Situational task

The leading factor of the industrial environment of sewing manufacture is the noise concerning constant, broadband noise. The

analysis of spectral structure of noise has shown that the most intensive noise was marked on high frequencies in sewing shops.

The frequency characteristic of industrial noise on the basic workplaces of sewing manufacture, dB

Workplace	Average frequencies in octava strips, Hz							
	31,5	63	125	250	500	1000	2000	4000
	Level of sound pressure, dB							
Sorter	110	100	85	82	78	73	70	68
Measurer	75	98	87	80	76	74	72	71
Whitewasher	72	85	84	80	75	68	70	68
Cutters	85	93	90	88	85	73	71	70
Gatheringer	76	85	84	85	80	75	73	70
Sewer	88	98	93	82	80	80	76	75
Press operators	85	90	86	81	80	76	75	72
The Sanitary regulations and standards №0120-01	107	95	87	82	78	75	73	71

Give answers to following questions:

1. Compare the measured noise levels to the sanitary code of admissible noise levels on workplaces according to the Sanitary regulations and standards №0120-01.
2. Specify preventive actions for decrease in an adverse effect of noise in the working.

Situational task

The basic sources of noise in autorepair shops is a work of machine tools, compressors, the automatic machines which intensity depends on quantity of simultaneously working cars, from their technical condition and a design, also one of possible sources of formation of industrial noise is work of ventilating systems. Measurements of noise levels were spent on various workplaces of shops and sites at work and system switching-off of conditioning.

The general level of industrial noise on workplaces of drivers and workers of autorepair shops, dBA

The working place	Equivalent level of industrial noise, dBA			Maximum permissible level, dBA
	min	max	M±m	
Car mechanics	80,2	85,8	83±0,52	80
Mechanics	79,3	85,8	82±0,56	80
Aggregator	79,1	83,4	81±0,52	80
Battery attendant	71,6	76,6	74±0,49	80
Autoelectricians	69,2	74,3	72±0,57	80
Carburetorer	75,4	81,6	78±0,38	80
Tyre fitter	73,9	78,6	76±0,51	80
Vulcanizer	71,9	78,8	76±0,50	80
Electro-gas welder	76,9	84,6	81±0,52	80
Turners	78,2	88,2	85±0,67	80
The Sanitary regulations and standards №0120-01 «The Sanitary code of admissible noise levels on workplaces»				

Give answers to following questions:

1. Define excess maximum permissible level of noise on workplaces according to the Sanitary regulations and standards №0120-01.
2. Specify preventive actions for decrease in an adverse effect of noise in the working.

Situational task

Industrial noise, being the leading adverse factor influencing working women during all change, it is characterised as constant, broadband, a mechanical origin. The basic sources of noise are trepalno-combing, lentochno-rovnichnye, spinning and weaving looms. The most considerable of excess. Maximum permissible level (80 dBA) are observed on workplaces of weavers (100 dBA), прядильщиц (96,2 dBA), трепальщиц (95,6 dBA) and чесальщиц (90,4 dBA).

Give answers to following questions:

1. Define excess of the general noise level on workplaces it agree of maximum permissible level on the Sanitary regulations and standards №0120-01.

2. What preventive actions for decrease in an adverse effect of noise on working are effective in the present state of affairs?

The general level of industrial noise in producing departments of textile manufacture, dBA

Shop	Workplace	Intensity of noise, dBA			MPL, dBA
		min	max	M±m	
The spinning	Scutchern	74,8	95,6	78,3±1,12	80,0
	Comber	75,3	90,4	79,5±0,53	80,0
	Underwing moth	72,5	86,8	78,3±0,6	80,0
	Spinner	75,7	96,2	79,1±0,85	80,0
The weaver's	Winder	72,5	88,3	75,1±0,5	80,0
	Sizer	73,1	83,5	75,6±0,6	80,0
	Weavers	86,0	100,0	90,1±0,55	80,0
The finishing	Preparer	74,2	78,8	76,1±0,55	80,0
	Dyer	72,5	76,0	74,3±0,21	80,0
	Printer	73,4	78,6	76,2±0,4	80,0

V. THE HYGIENIC ESTIMATION OF LEVELS OF INDUSTRIAL VIBRATION

Situational task

Grinder mechanical shop leads up stamps to the set forms and the sizes by means of rotary pneumatic grinding machines EP-1097 (2,8 kg). In the course of work various nozzles and metal mills are used. Grinder at processing of stamps works standing, densely keeping the machine all brush of the right hand, the left brush supports a flexible shaft or covers a shaft near to the right. Force of pressing the tool of 5-15 kg depending on a kind of the used worker of a head. Work directly with grinding machines occupies 5 hours. Other working hours go on preparatory - operations, work with drawings, etc. In an operating time with machines of breaks it is few. Levels vibration velocity, transferred to hands (measurement was spent IIIIB-1), are presented in the table.

Give answers to following questions:

1. Estimate levels of vibration velocity, transferred to hands, weight of machines and the force of pressing put in the course of work.
2. What actions of radical character are necessary for improvement

of working conditions.

3. Make recommendations about the rational organisation of a mode of work with the given machines for preventive maintenance of vibrating - illness.

Levels of vibration velocity

Compound frequencies of octava strips, Hz	16	32	63	125	250	500	1000	2000
Levels of values vibration velocity, dB	110	110	118	115	114	105	102	100

Situational task

Working conditions of fellers of logging enterprise during the winter period were studied. Wood preparation is conducted by complex brigades and includes cutting of trees by motor saws, dragition trees to a loading place tractors and their loading on motor vehicles. The complex brigade consists of 6 persons: a of feller, the tractor operator, 2 fettlers boughs and 2 loaders. Fellers work petrol-powered type "Druzhba-4", weight of the tool of 12,3 kg. Feller works standing, brushes of hands compresses rubber handles petrol-powered saw (with force of 12-25 kg) which holds at waist level, and smoothly enters a saw into a tree. Working hours timing has shown that at вальщика пиление trees occupies 1 hour of 40 minutes Other working hours goes on performance of the operation, not connected with vibration. At measurement of levels of oscillatory speed on the handle petrol-powered saw following levels of industrial vibration have been defined.

Levels vibration velocity

Compound frequencies of octava strips, Hz	16	32	63	125	250	500	1000	2000
Levels of values vibration velocity, dB	-	-	118	117	114	108	100	92

Give answers to following questions:

1. It is possible to measure by what devices vibration levels in this range of frequencies?
2. Estimate working conditions of feller.
3. Make recommendations about decrease in influence of parametres of vibration on the working.

Situational task

Working conditions of workers of forming shop of factory of heavy mechanical engineering were studied. Process manual forming consists of following operations: preparations of a workplace, check of serviceability of model and the analysis of a filling mix, facing of model by a mix, fillings of the form over a facing layer a forming mix (the earth, sand, clay, caustic, liquid glass, etc. components). After filling of the form the worker takes out model, eliminates large and small damages, blows the form carbonic gas. For consolidation of the forming earth are used pneumatic ramming type TP-1 (weight of 11,5 kg, number of blows 650 in minute). At ramming the worker the right hand covers the handle pneumatic ramming, left supports a trunk ramming. Working hours at ramming are distributed as follows: direct work with ramming occupies 2,5 hours, the rest of the time goes on furnish and assemblage of forms, service of a workplace, etc. At measurement of levels vibration velocity on the handle ramming the firm device «Brjul and Ker» have been defined following levels of industrial vibration.

Give answers to following questions:

1. Estimate working conditions of the former.
2. Make recommendations about the rational organisation of a mode of work and rest of the former.
3. What actions of treatment-and-prophylactic character are necessary for preventive maintenance of vibrating illness?

Levels vibration velocity

Compound frequencies of octava strips, Hz	16	32	63	125	250	500	1000	2000
Levels of values vibration velocity, dB	120	120	115	98	90	85	85	80

Situational task

Working conditions of the borer were studied. The borer works as a part of the complex brigade consisting from 3 faceman-timbermans and one of demolition. In a complex brigade there is no combination of trades. The basic operations at drilling are introduction of a chisel column in breed, drilling, drill extraction, puncher shift before the beginning drill next of spur and drill change. Effort of pressing to the puncher handle – to 40 kg. Drilling time occupies 45% of a labour shift. Results of measurement of levels vibration velocity on the handle of the pneumatic puncher are presented in the table.

Levels vibration velocity

Compound frequencies of octava strips, Hz	16	32	63	125	250	500	1000	2000
Levels of values vibration velocity, dB	138	138	130	120	115	105	100	98

Give answers to following questions:

1. It is possible to measure by what devices intensity of the vibration transferred to hands of the working?
2. Estimate working conditions of the borer.
3. Make recommendations of organizational-technical character - about preventive maintenance of vibrating illness.

Situational task

Riveter assembly shop of aviation factory drills and rivets preliminary marked panels. For rivet pneumatic hammers are used, is powerful 2,9 kg. Clincher works standing, keeping a hammer one or two hands. Effort of pressing to a hammer to 13 kg. An operating time with a hammer of 5 hours. Levels vibration velocity on the handle riveting a hammer look in the table.

Give answers to following questions:

1. Estimate working conditions riveters.
2. What organizational-technical and hygienic actions are necessary for preventive maintenance of vibrating illness?

Levels vibration velocity

Compound frequencies of octava strips, Hz	16	32	63	125	250	500	1000	2000
Levels of values vibration velocity, dB	99	120	117	117	117	110	102	99

Situational task

Studying of working conditions fettlers on diesel locomotive plant was spent. A stump - the closing stage of processing foundry drains, including removal of the rests burning-in forming and rod mixes, agnails, cutting down of defects drains. These operations fettlers carry out chipping hammers of type P-3 (it is powerful 5 kg, number of blows 1500-2000 in minute). Adaptations for these hammers are various on length and the form, plug-in tools. Fettler works standing, the right hand it holds the handle of a hammer equipped with the valve, regulating giving of compressed air; the left keeps the plug-in tool. The effort of pressing depending on a kind of processed moulding makes 18-25 kg. The operating time with chipping hammers makes 60% of a labour shift. Levels vibration velocity on the handle of a hammer the following:

Give answers to following questions:

1. Name the devices necessary for measurement of intensity of vibration, transferred to hands of the worker.
2. Estimate levels of the vibration betrayed on hands.
3. What organizational-technical actions are necessary for preventive maintenance of vibrating illness?

Levels vibration velocity

Compound frequencies of octava strips, Hz	16	32	63	125	250	500	1000	2000
Levels of values vibration velocity, dB	125	135	130	123	120	117	115	115

Situational task

Working conditions of weavers of silk-weaving industrial complex were studied. The weaver's shop is located on 3rd floor of a four-storeyed building and equipped by automatic machine tools of mark AT-100. Weaving process consists in an interlacing of threads of a basis (a longitudinal thread of a fabric) with threads a duck (a cross-section thread).

Levels vibration velocity

Compound frequencies of octava strips, Hz	16	32	63	125	250	500	1000	2000
Levels of values vibration velocity, dB	125	135	130	123	120	117	115	115

The shuttle recharge on these machine tools occurs without participation of the worker. One weaver serves 10 machine tools, carrying out for change to 2000 working receptions (elimination of breakages of a thread, etc.), and makes a way to 10 km. Loading of the working day of 95%. Vibration levels on a workplace the following.

Give answers to following questions:

1. What device spent vibration measurement in this range of frequencies?
2. Estimate vibration levels, using existing specifications.
3. Make recommendations about decrease in influence of parametres of vibration on the working.

Situational task

Working conditions of drivers of auto-loaders of type 4043 were studied. Work of the driver is carried out in the compelled working pose - sitting, demands pressure of muscles of the top and bottom extremities in connection with necessity to switch control levers. By data timekeeping supervision, drivers are exposed to influence of vibration during 75% of working hours. Results of measurement of levels vibration velocity are presented in the table.

Give answers to following questions:

1. It is possible to measure by what devices vibration parametres?
2. Estimate vibration levels, using corresponding specifications.
3. Name the actions necessary for decrease of influence of vibration

on an organism of the driver.

Levels vibration velocity

Place measurements	Root-mean-square value vibration velocity (sm/sec) in octava strips of frequencies (Hz)					
	8	16	32	64	125	250
Seat	2,3					
Cab floor	1,0	0,8				
The transmission lever		0,7	3,2	4,1	5,3	10,8
Pedal of a foot brake		3,0	2,6	1,8	1,0	1,0
Steering wheel		2,0	2,0	1,0	1,0	0,5

Situational task

Working conditions of concreters of forming shop of factory of ferro-concrete products were studied. Concreters carry out following operations: preparation of forms, filling of forms with a concrete mix, formation of products on platforms vibrator and forming machines. Platforms vibrator are established on rigid rubber support. At formation of products workers spend levelling of a concrete mix by a shovel, standing on the floor. At formation of wide products workers are compelled to rise for a vibrating surface of concrete. Duration of influence of vibrations on working 1 hour 50 mines in change. Levels levels vibration the basic workplaces concreters (floor) reached 105 and 108 dB at compound frequencies of octava strips of 31,5 and 63 Hz.

Give answers to following questions:

1. Estimate levels of vibration of workplaces of concreters, using corresponding specifications.
2. What way carries out vibration transfer with platform vibrator on a workplace of the concreter?
3. Name the actions necessary for decrease of vibration (its parametres) on a workplace of the concreter.

Situational task

Working conditions of workers thermal power station shops were studied. The shop capital equipment (turbogenerators, coppers, etc.) is located on the isolated bases. Machinists of coppers and turbogenerators supervise parametres boiler unit, turbines, the generator. Work is carried out from the control panels located directly in shop at the working

equipment. Loading of the working day of 96%. Results of measurement of parameters of vibration of a floor are presented in the table.

Levels vibration velocity

Branch	Root-mean-square value виброскорости (mm/sec) in octava strips of frequencies (Hz)					
	2	4	8	16	32	63
The machine	6	7	4	2	15	10
The boiler	1	1	1	8	3	3

Give answers to following questions:

1. It is possible to measure by what devices intensity of vibration of a workplace?
2. Estimate results of measurement of parameters of vibration of a workplace.
3. What actions are necessary for the prevention Distributions of vibration from the working equipment?

VI. THE HYGIENIC ESTIMATION OF LEVELS OF ELECTROMAGNETIC RADIATION

Situational task

At factory of the medical equipment packages for packing of a dressing from plastic polyvinyl-chloride are made. Welding perfolevly films is carried out by energy of electromagnetic fields of a range of frequencies of 30-40 MHz on installation of type MCT-3. The equipment has a great number unshieldedly high-frequency elements: plates of the condenser (rollers), the arranged condensers and feeding lines. In shop two installations work. For Em-radiation easing high-frequency elements were screened. For screens are used: steel sheets in the thickness of 0,5 mm (installation №1) and an aluminium grid (cells 10x10 mm). Before shielding in shop measurements of intensity of Em-fields at work of 2 installations are spent. Results of gaugings are presented in the table.

Give answers to following questions:

1. Name the device by which measurements were made.
2. Compare levels to norms.

Intensity of electromagnetic fields

Measurement place	Before shielding		After shielding	
	electric component, V/m	magnetic component, A/m	electric component, V/m	magnetic component, A/m
On a workplace (installation №1)	160-176	3	8-12	0,5
On a workplace (installation №2)	166-1168	12	28-36	2,3

Situational task

In rod branch of foundry shop for drying of cores high-frequency heating is used. A range of working frequencies of 20-48 MHz, capacity of 400-800 Vt. In shop 6 installations, type drying chambers work simultaneously. Studying of working conditions has revealed on workplaces drying chambers presence of Em-fields of various intensity. At partially screened loading apertures it equaled 120-190 V/m, at open lateral apertures – 68-84 V/m. It is offered to carry out shielding of loading apertures and lateral apertures close-meshed a metal grid. Repeated measurements have established the following: intensity of the Em-field at loading apertures 3,8 V/m, at lateral apertures - 14-16 V/m.

Give answers to following questions:

1. What device spends intensity measurements?
2. Estimate efficiency of shielding.

Situational task

At repair of radar-tracking equipment in factory workshops the adverse conditions characterised by high intensity of an irradiation at the expense of several radar stations working simultaneously (RADAR) in a range of 300 MHz-300 of GHz are created. Workers are occupied by repair of radar-tracking equipment to 60% of all working hours (the working day of 6 hours).

Intensity of electromagnetic fields

Gauging place (workplace of repair work)	Indications of a measuring instrument of the device, in mcVt
At simultaneous work 2 RADAR	100-120
At simultaneous work 4 RADAR	200-260

Give answers to following questions:

1. Name the device by which gaugings are spent.
2. Compare the calculated sizes to norms.
3. Specify improving actions.

Situational task

The branch of beam therapy has 4 physiotherapeutic devices: two – "Luch-250" and two – "Luch-300". Devices work in a range of microwave frequencies - 300 MHz. Holiday of procedures is carried out by the nurse within all working day - 6 hours. The hygienic inspection spent in branch, has established Em-radiation presence. Thus the capacity of radiation - measured in places of a possible finding of the medical personnel, unequal. At holiday of procedures in a cabin equipped with two devices, the device measuring instrument has shown 220-260 mcVt; at the moment of equipment adjustment to work – 84-86 mcVt.

Give answers to following questions:

1. Name the device by which gaugings are spent.
2. Estimate the received results of gaugings, having compared them to norms.
3. Specify improving actions.

Situational task

In physiotherapeutic branch of polyclinic there is the special equipment working in a range of ultrahigh and ultrahigh frequencies. Last is presented by four devices UVCh-4, a range of frequencies – 30-50 MHz and four - devices "Luch-58", a range - 50-300 MHz. Devices "Luch-58" are placed in the separate cabins divided by screens from a cotton fabric with inclusion of a microwire. Devices UVCh-4 of old model are placed indoors not permanently, not isolated from a place of a possible finding of the personnel, and EMF, arising at holiday of procedures, can influence. It is necessary to mean that the staff nurses serving this branch,

work in it of 6 hours. At the gaugings made in given physiotherapeutic branch, following levels of Em-radiation are established: at holiday of procedures at devices " Luch-58" - 4 mcVt/sm^2 ; at holiday of procedures at devices UVCh-4-12-40 V/m.

Give answers to following questions:

1. Specify devices by which gaugings of intensity of Em-radiation are made.
2. Estimate levels of intensity and compare the data to norms.
3. State the plan of measures on protection of the medical personnel in physiotherapeutic branch.

Situational task

In shop of mass production of overalls spot welding by means of currents of high frequency is used. The shop is equipped by the installations of type DKV-2 working in a range not of 20-48 MHz. Studying of working conditions has shown: installations of high-frequency heating with a view of elimination of a radio noise are concluded in metal cabins. Workplaces of the operators serving these installations, are placed in cabins. On workplaces of operators measurements of Em-radiation by device IEMP -1 are spent. The following was thus revealed: at use dipole aerials of the indication of a measuring instrument have made $5\mu\text{A}$ (1 scale); at use of the frame aerial — $5\mu\text{A}$ (2 scale).

Give answers to following questions:

1. Calculate radiation levels.
2. Estimate the received sizes and compare them to norms.
3. Specify protection frames.

Situational task

At furniture factory high-frequency heating dielectrics is widely applied: for drying of wood and for patching wooden products. Wood drying is made in the combined way: the ferry under pressure and high-frequency heating upon installations of type high-frequency generator. It represents screened sheets the chamber in which there is a working condenser. Work on installation develops of consistently proceeding 4 stages: in electric field between condenser plates the wood which is subject to processing is located, then the generator joins, control over an operating mode of installation further is carried out during heating and drying of wood, final operation is the unloading processed, a material.

The generator feeding the condenser, is in a premise adjoining to the chamber. In this premise the operator watches work of the generator and drying chamber. Studying of technological process and working conditions has shown that separate elements of the generator and observation ports in the chamber it is bad экранированы. Intensity EMF was defined by device IEMP-1. Thus the device measuring instrument has shown: at dipole antenna - $30\mu\text{A}$ (3 scale), at use of the B. frame aerial - $20\mu\text{A}$ (3 scale).

Give answers to following questions:

1. Calculate Em-radiation levels.
2. Estimate the received sizes, having compared them to norms.
3. Make the plan of improving actions.

Situational task

In thermal shop for induction heating of metals the special equipment presented by universal melting-hardening furnaces by capacity 30-60 mcVt, working frequencies 60-100 kHz is used. Technological process: the detail which is subject to heating, is located in a conductor (solenoid). At current passage through a conductor in it the variable Em-field is created, in a processed detail there is a current, it heats up to t° 700-1000°C, at this temperature certain time then it is cooled is maintained. Studying of working conditions of the workers serving hardening inductor, has shown: the workplace is on distance of 50-60 sm from an external surface inductor, operation time with Vch-heating makes 2-4 hours per change. Em-radiation measurement on separate sites of training has established considerable intensity electric and the magnetic fields which have demanded carrying out of protective measures in the form of installation of screens. It was offered to replace the wooden forward panel of a generating case on all-metal of aluminium in the thickness of 0,5 sm, the batteries of air condensers located on a roof of a case of the generator, to close an iron grid (0,3x0,3 mm). The Vch-transformer to mount together with the generator in shielded a metal case. The given researches are presented in the table.

Give answers to following questions:

1. What device spends measurements?
2. Estimate efficiency of shielding.
3. Compare the measured levels to norms.

Intensity of electromagnetic fields

Gauging place	Gauging level	Before shielding		After shielding	
		magnetic component, A/m	electric component, V/m	magnetic component, A/m	electric component, V/m
At the forward panel of a generating case	At level of a breast of the worker	80-110	15-35	2-4	0,5-1
On a workplace of annealer	At level of a head of the worker	60-120	18-48	16-25	1-2
In 3 metres from a transformer box	At level of a breast of the worker	20-140	2-5	8-12	0,3-0,8

Situational task

Polyclinic inspection of a state of health of 108 persons working with sources shortwave both ultrashort waves on radio- and television stations, has shown: subjectively - complaints to headaches, undue fatigability, infringement of a night dream, a pain in the field of heart; objectively in 28 cases functional changes are revealed from nervous and cardiovascular systems which were shown in unsharply expressed asthenic conditions and sosudisto-vegetative shifts. A tendency to a bradycardia and a hypotonia. From peripheral blood the tendency to erythropenia and a thrombocytopenia is noted. Hygienic inspection of working conditions of radio engineers and radio technicians has allowed to establish that shortwave both ultrashort waves sources work in a range of 14,88 and 69,7 MHz; presence, high frequencies and ultrahigh frequencies on workplaces reaches: ultrashort waves-transmitters – 74-86 V/m, shortwave transmitters - to 66 V/m.

Give answers to following questions:

1. Estimate a state of health surveyed and offer treatment-and-prophylactic actions.
2. Results of medical examination compare with the hygienic data and make recommendations about improvement of working conditions.

Situational task

On radio station researches of working conditions with an estimation of the operations which are carried out by the personnel were conducted. Radio sending devices work in a range of the microwave oven. The given inspections are presented in the table.

Capacity of radiation and duration of influence at performance of various operations

The operation name	Instrument readings - measuring instrument (mcVt)	Duration of an irradiation in % to working hours
Automatic switching	32	2-6
Manual switching	94	10
Reorganisation and adjustment of transmitters, control over devices of transmitters	64	35
Supervision at the panel of transmitters	100	6
Repair and preventive maintenance of transmitters	500	40
Operating mode check	540	40

Give answers to following questions:

1. Name the device by which gaugings were spent.
2. Estimate the received results taking into account employment various kinds of work.
3. Compare levels of intensity with norms.

Situational task

On coherent and broadcasting radio stations studying of a condition of some physiological functions of 2 groups working has been spent. I group made the personnel of radio stations on duty, II group - the experts making repair and check of an operating mode of transmitters. Hygienic

researches have established presence of Em-fields and unequal industrial loading working on radio stations. Physiological researches have shown: reduction of endurance, stability of attention, lengthening of the latent period of conditioned reflexes, change of some vegetative functions and so forth these changes were more expressed in II group working.

Intensity of a field and duration of an irradiation working on radio stations, presence of functional shifts in an organism

Carried out operations	Field intensity, V/m	Functional shifts	Duration irradiations for change in %
Adjustment and control over devices of transmitters	11-43	single cases	35
Supervision at the panel of transmitters	4-15	no	65
Repair and preventive maintenance of transmitters	100-180	significant	60
Check of a mode of transmitters	112-250	significant	60

Give answers to following questions:

1. Compare and estimate working conditions of both groups working.
2. Make the plan of measures on improvement of working conditions.

VII. THE ESTIMATION OF TOXICOLOGICAL METHODS RESEARCHS

Situational task

As solvent of some hydrocarbons the chemical substance with following indicators of toxicity has been defined: $LC_{50} = 635 \text{ mg/m}^3$, coefficient of a practicable inhalation poisoning (CPIP) = 203,0; $Lim \text{ ac} = 48,8 \text{ mg/m}^3$, $LD_{50} \text{ a skin} = 237 \text{ mg/m}^3$, $LD_{50} \text{ per os} = 50 \text{ mg/kg}$.

Give answers to following questions:

1. Define a class of danger of solvent.
2. Calculate Zac for studied substance.

Situational task

Offered for introduction in manufacture as polyvinylchloride stabilizers the new synthetic substance has following indicators: maximum concentration limit = $0,85 \text{ mg/m}^3$, $LC_{50} = 1200 \text{ mg/kg}$, LD_{50} at drawing on a skin of $2,630 \text{ mg/m}^3$, coefficient of a practicable inhalation poisoning (CPIP) = 2,7.

Give answers to following questions:

1. Calculate a missing indicator of toxicity (Lim ac).
2. Studied solvent concerns what class of danger.

Situational task

Comparative toxicity of fluorides earth metals is studied (barium, magnesium, calcium and strontium) in sharp experiences on mice, threshold concentration are defined at airborne influence – Lim ac and cumulative effect coefficient of a cumulation (CC) in experiences on rats. Results of researches are presented in the table.

Parametres of toxicity of fluorides earth metals

Substance	LD_{50} , mg/kg	Lim ac, mg/m^3	CC
BaF_2	250	4	4
MgF_2	2250	21	6
CaF_2	4250	37	5
SrF_2	10600	45	8

Give answers to following questions:

1. Define a class of danger of fluorides and their toxicity.
2. Calculate roughly safe level of substance (RSLs) for strontium fluoride (molecular weight 126, LD_{50} in $\text{mA/kg} = 34,9$).
3. What optimum connections in the hygienic relation for use in the industry?

Situational task

As solvents and in organic synthesis are used chlorinated and fluorinated ethanes. There is data about the deadly concentration received in sharp experiences on mice. Results of researches are presented in the table.

Give answers to following questions:

1. Establish a class of danger to the studied solvents and recommend the least toxic for application in the industry.
2. Calculate roughly safe level of substance (RSLs) for dichloroethane.

Comparative toxicity of solvents

The name and the substance formula	LC ₅₀ , mg/l
Dichloroethane C ₂ H ₄ Cl ₂	12,4
Dichlorofluoroethane C ₂ H ₃ Cl ₂ F	151,0
Tetrachloroethane C ₂ H ₂ Cl ₄	40,0
Tetrafluorodichloroethane C ₂ F ₄ Cl ₂	3000,0

Situational task

On skilled installation works on manufacturing of anodes with ruthenium a covering are conducted. In the course of work in air of a working zone the aerosol of hydroxichlorid ruthenium arrives. Literary materials about influence of this connection on a human body and animals are absent. At working with ruthenium salts complaints to cough and feeling of irritation in a throat are marked, and at medical inspection are found out pittings a mucous membrane of a partition of a nose. In experimental researches at introduction of hydroxichlorid ruthenium in stomach LD₅₀ it has appeared 1250 mg/kg equal for rats, for mice - 462 mg/kg. At powder entering of hydroxichlorid ruthenium in conjunctival sac of an eye of a rabbit was marked long blepharospasm, and in the subsequent a checkmate of all fabrics of an eye. At daily drawing on a skin of rats 15 % water's solutions of hydroxichlorid ruthenium for 4-5 th day were formed cankers. The threshold of irritating action Lim ac for the person at 1-minute expositions makes 4,45 mg/m³.

Give answers to following questions:

1. Establish a danger class of hydroxichlorid ruthenium.
2. Calculate roughly safe level of substance (RSLs) on the equation:
RSLs = 0,2 x Lim ac.
3. Recommend actions for improvement of working conditions at work with hydroxichlorid ruthenium.

Situational task

In manufacture of organic glass use methyl-acrilat – CH₂-CHCOOCH₃ and butylacrilat - CH₂-CHCOOC₄H₉. It is supposed to apply geptilacrilat – C₂H₃COOC₇H₁₅. On mice its deadly concentration have been established. The expressed picture of an intoxication developed for 5-7 days. Animals became languid, inactive, had the dirty tousled wool. On opening dystrophic changes in a liver are found out. In the table parametres of toxicometry acrilats are presented.

Comparative toxicity of acrilats

Substance	LC ₅₀ , mg/m ³	Maximum concentration limit, mg/m ³
Metilacrilat	9200	20
Butylacrilat	7800	10
Geptilacrilat	1020	-

Give answers to following questions:

1. Define a danger class geptilacrilats and calculate roughly safe level of substance (RSLs) of geptilacrilat.
2. Recommend for use in the industry less dangerous acrilats.
3. Explain, than increase of toxicity for the given group of connections is caused.

Situational task

Replacement of morpholine, synthetic rubber used in manufacture, on its derivative N-ethyl-morpholin is supposed. Both connections represent colourless flying liquids with a pungent smell. Volatility of morpholine at 20°C - 53 mg/l, etilmorfolin - 38 mg/l. Last we will well dissolve in water that should cause slow saturation of an organism. Results of definition of parametres toxicometry are presented in the table. At steam inhalation of morpholine the irritation mucous, a sharp short wind, excitation, spasms is observed. On opening — sites of hemorrhages and an inflammation in lungs, a dystrophy of a liver and kidneys. At inhalation of ethylmorpholine irritating action, short-term excitation, then oppression, slackness, spasms was marked. Changes in parenchymatous bodies it is not revealed. Morpholine causes heavy chemical burns with apobiosis subject fabrics. Ethylmorpholine possesses less expressed irritating properties.

Toxicity and danger indicators morpholine and N-etilmorfolin

Substance	LC ₅₀ , mg/l	Roughly safe level of substance (RSLs)
Morpholine	12	4,4
N-etilmorfolin	18	2,1

Give answers to following questions:

1. Define a danger class of morpholine and ethylmorpholine and character of action of these connections on an organism.
2. Calculate roughly safe level of substance (RSLs) for ethylmorpholine.
3. Estimate expediency of replacement morpholine in manufacture - on ethylmorpholine taking into account physical and chemical properties and results of toxicological researches.

Situational task

Comparative toxicity of fluorides alkaline-earth is studied, metals (barium, magnesium, calcium and strontium) in sharp experiences on mice, threshold concentration are defined at inhalation — Lim ac and coefficient of cumulation (CC) in experiences on rats. Results of researches are presented in the table. At influence of all connections intoxication symptoms were same: the excitation phase was replaced by a depression, infringement of coordination of movements, areflexia.

Parametres of toxicity of fluorides of alkali-earth metals

Substance	LD ₅₀ , mg/kg	Lim ac, g/m ³	CC
BaF ₂	250	4	4
MgF ₂	2250	21	6
CaF ₂	4250	37	5
SrF ₂	10600	45	8

Give answers to following questions:

1. Define a class of danger of fluorides.
2. Recommend, optimum connections in the hygienic relation for use in the industry.

Situational task

In experimental researches on rats at a priming four-chloride carbon had been received following parametres of toxicometry: LC₅₀=56 mg/l, Lim ac=1,9 mg/l, Lim ch=0,041 mg/l. For the purpose of an estimation of a functional condition of an organism at animals are defined: a condition vegetative nervous system (on an electrocardiogram), endocrine, a liver, the central nervous system.

Give answers to following questions:

1. Define a zone of sharp and chronic action of four-chloride carbon and draw the conclusion about its potential danger concerning possibility of occurrence of sharp and chronic poisonings.

2. On the basis of LC_{50} calculate roughly safe level of substance (RSLs) in air of a working zone and compare to maximum concentration limit.

3. On the basis of Z_{ac} and Z_{ch} for some chemical substances draw the conclusion about their danger concerning occurrence of sharp and chronic poisonings.

Zones of sharp and chronic action

Substance	Z_{ac}	Z_{ch}
Benzene	133	19
Isopropyl nitrit	9,3	60
Ammonia	100	1
Methyl mercaptosfos	2	10

Situational task

In manufacture of butyl rubber replacement of chloride methyl (CH_3Cl), used as a thinner monomers, chloride ethyl (C_2H_5Cl) is supposed. Toxic properties chloride ethyl are studied: LC_{50} for mice it is equal 145 mg/l, for rats - 160 mg/l. The clinical picture of a sharp poisoning was characterised by narcosis development. At unitary - influence on rats of steams chloride ethyl in concentration of 1,2 mg/l within 4 hours were marked the expressed changes of conditioned-reflex activity (lengthening of the latent period). This concentration is accepted as threshold in sharp experience. As much as possible achievable concentration chloride этила at 20°C is equal in air 4422 mg/l. From the literature it is known that LC_{50} chloride methyl for rats it is equal 5,8 mg/l, Lim_{ac} - 0,23 mg/l, coefficient of a practicable inhalation poisoning (CPIP) in 70 times exceeds that for chloride ethyl.

Give answers to following questions:

1. Define a zone of sharp action and coefficient of a practicable inhalation poisoning (CPIP) for chloride ethyl and a danger class.
2. Calculate roughly safe level of substance (RSLs).

Situational task

Toxic properties and character of action arsenic acid caesium (CsH_2AsO_4) in sharp and chronic experiences are studied. At substance introduction in stomach LD_{50} it has appeared to a priming of rats equal the 4-sentry, a threshold of sharp inhalation action (Lim_{ac}) it is equal 5,2 mg/m³. In chronic experience at inhalation receipt arsenic acid caesium in concentration of 5 mg/m³ for 4 hours per day of 5 times per week within 4

months the greatest changes are revealed from cardiovascular (change in an electrocardiogram), nervous systems and kidneys (maintenance increase in whey of blood of uric acid, nitrogen-urea and creatine). At influence arsenic acid caesium at level of $0,33 \text{ mg/m}^3$ are revealed unstable changes in the maintenance To in whey and leukocytes in peripheral blood. This concentration is accepted as threshold in chronic experience (Lim ch). In experiences on rats, rabbits and porpoises it is established local irritating and cutaneous-resorptiv action arsenic acid caesium.

Give answers to following questions:

1. Calculate a zone of chronic action arsenic acid caesium and define a class of its danger.
2. Being based on results of the toxicological characteristic arsenic acid caesium, make recommendations about structure of the medical commission for periodic medical inspection working and necessary special researches.

VIII. HYGIENIC REQUIREMENTS TO APPLICATION OF PESTICIDES IN AGRICULTURE

Situational task

At sanitary inspection of a warehouse for storage of pesticides it is established that pesticides are stored in the adapted premise which walls are brought down from boards, floors wooden, there are cracks in walls and floors. Pesticides are stored in the adapted premise which walls are brought down from boards, floors "in bulk". In a warehouse the account of arrival and the expense of pesticides is conducted irregularly, their various workers of state farms receive.

Give answers to following questions:

1. Estimate possibility of storage of pesticides in the given premise.
2. State an estimation of correctness of a receiving and delivery of pesticides from a warehouse.

Situational task

The doctor on factory hygiene at carrying out of sanitary control over preparation and carrying out of sowing works has established that the progress of seeds of a cotton of fentiuram is made on cotton manufactory in a separate premise dresser by cars, packing in bags of the pickled seeds is

made manually by shovels, mark and sew up bags in the same of premises. The pickled seeds from a warehouse are transported in economy in bags not marked by means of any improvised transport. In the end of a season of works not used pickled seeds are left on a brigade camp without protection.

Give answers to following questions:

1. State an estimation of correctness of work at dresser seeds.
2. Estimate correctness of transportation and storage of the pickled seeds.

Situational task

At sanitary inspection of working conditions of workers of the state farm working with pesticides, it is established that the working day is equal to 8 hours, a lunch break of 40 minutes, cotton fields are processed insecticide organophosphorous compound, all workers are provided personal protection equipment (respirators with cartridges of mark A, overalls from cotton a material, rubber gloves and boots. After work respirators, gloves and boots are washed out to water then are dried on air. The overalls are stored on racks, 1 time once a week, in hot water with soap is erased, the premise is centralised cleaned by sweeping.

Give answers to following questions:

1. Estimate a work and rest mode.
2. Estimate correctness of set personal protection equipment (PPE).
3. Specify rational measures on neutralisation PPE, polluted by the given pesticide.

IX. THE ESTIMATION OF INDUSTRIAL VENTILATION

Situational task

In forge shop нагретые ingots are exposed on press of forging, to punching and pressing. Adverse factors are radiant heat to 1800 kcal/m^3 hour, the raised maintenance in air of oxide carbon and sulphurous gas. The forge shop is on I floor of a two-storeyed building. In shop are located forge the press and heating furnaces, ventilation is absent.

Give answers to following questions:

1. What system of ventilation can be offered in this shop?
2. What should be temperature?

Situational task

In tinctorial shop colouring of fabrics by the paints dissolved in a weak solution of acetic acid is carried out, at temperature 96-98°C. Colouring is made in tinctorial kettles. The cores maleficences shops are warmly and excesses of moisture. The shop is located on the ground floor of a 3-storeyed building. The size of a premise 14x30x5 m. Shop is equipped 16 closed kettles. In shop local exhaust ventilation and general exchange forced ventilation is projected. Exhaust installation carries out an extract from shelters tinctorial kettles, productivity of installation is equal 63.500 m³/hour. Distribution blowing air is made in a working zone by triangular nozzles of half-internal type, in number of 11 pieces. Productivity blowing installations is equal 47.000 m³/hour. Temperature of submitted air 33°C. Thermal emissions are equal in shop 623.200 kcal/hour. Desirable conditions in the winter: temperature 19°C, humidity no more than 75%, in the summer temperature on 5°C above external, humidity no more than 75%.

Give answers to following questions:

1. Estimate projected system of ventilation.
2. Whether there correspond Sanitary regulations and size standards the offered parametres of a microclimate?

Situational task

In thermal shop metal details heat in hardening furnaces and further lower in lead baths. Adverse factors are radiant heat to 1200 kcal/m³ hour and the raised maintenance of lead in air. The shop is located in a 1-storeyed building, near to mechanical shop. In shop 4 lead baths and 2 hardening furnaces are established. Baths are equipped by local exhaust ventilation in the form of onboard suction, the general capacity 2000 m³/hour. Forced ventilation is presented by the air souls located on a workplace at hardening furnaces. Speed, air in a target aperture of 2 m/sec, section 0,6 area m², temperature submitted air 18°C.

Give answers to following questions:

1. Estimate existing system of ventilation in thermal shop.
2. Define volume of submitted air and compare to an extract.

Situational task

In painting shop painting of products of the small and average sizes spray-type by a method with paint application on solvent solvent-nafta is spent. Colouring process is made in an exhaust case, speed in a working

aperture of a case of 0,7 m/sec, section 1 area m^2 . In shop 4 flueblocks are located. Forced ventilation is absent.

Give answers to following questions:

1. Estimate system of exhaust ventilation and its capacity.
2. What it is necessary to provide blowing ventilation system?

Situational task

In etching branch etching of metal products by solutions of sulfuric acid is made. Adverse factors are — steams of sulfuric acid and water steams. The etching shop is located indoors in the size 16x8 m, height of 5,5 m and equipped by 4 etching baths, 2 washing and 2 baths for neutralisation. Near to this shop the galvanic is located. Exhaust ventilation local, is presented in the form of an umbrella by capacity 3.000 m^3 /hour over each etching bathroom. Forced ventilation the general with giving in the top zone. Volume of arriving air 12.000 m^3 /hour.

Give answers to following questions:

1. Estimate system of ventilation of the given site by a principle and a scene of action.
2. Give the characteristic of air balance and define frequency rate of air exchange.

Situational task

In foundry shop in dressing branch knockout of products is made on tables with knocking-out grate lattices which are equipped by local exhaust ventilation in the form of onboard *отсосов*, with in a speed in a working aperture of 4 m/sec. Inflow is carried out by the general mechanical ventilation in the top zone through chinked apertures with a speed of 0,5 m/sec.

Give answers to following questions:

1. Estimate system of ventilation of the given site and the offered speeds of inflow and an extract.
2. What devices are necessary for measurement of speed of movement of air?

Situational task

In foundry shop in summertime it is established that the external temperature of air is equal 21°C and indoors - 30°C, intensity of thermal radiation on a workplace cupola melter – 3.000 kcal/ m^2 hour, concentration of oxide carbon in a zone of breath of 20 mg/ m^3 . Superfluous thermal

emissions are equal 12.000 kcal/ hour in the summer. In shop there is only a natural extract through a lantern in a roof. Ventilation through window apertures is absent, since they are made of glass blocks. The organised inflow is not present.

Give answers to following questions:

1. Calculate necessary volume of submitted air on struggle against heat.
2. Estimate existing ventilation and specify its most expedient system in foundry shop.

Situational task

The sushilnoe branch of printing shop of cotton-printing factory is equipped 5 drying machine Near to workplaces dryers branch pipes of local forced ventilation (5 branch pipes) are located. The area of an exhaust outlet of everyone is equal - 0,06 m², air moves with a speed of 0,8 m/sec. At shop inspection it is established: air temperature 28°C, relative humidity of 60%, the maintenance of steams of aniline - 2 mg/m³. Settlement capacity of forced ventilation is equal 10.000 m³/hour.

Give answers to following questions:

1. Define capacity of forced ventilation and compare to settlement volume.
2. Estimate ventilation system.

Situational task

In dyeing shop at tinctorial-finishing factory in kettles colouring of fabrics by aniline dyes is made. Kettles are equipped by local exhaust ventilation in the form of flueblocks. Giving of air by forced ventilation is carried out on workplaces through the branch pipes located at level of 2 metres from a floor. In the given shop the maintenance of steams of aniline in air of 0,4 mg/m³, relative humidity of 80% and air temperature 29°C. Rated capacity of exhaust ventilation is equal 12.000 m³/hour. Check of productivity of exhaust ventilation has allowed to establish that diameter of an exhaust air line is equal 0,7 m, an average quadratic high-speed pressure of 3.6 mm (measured by a pneumometric tube and micromanometer CAGI).

Give answers to following questions:

1. Estimate ventilation system (by a principle and a scene of action).
2. Calculate productivity of exhaust ventilation and compare to the design data.

Situational task

In forge shop there is 4 forge press and 3 heating furnaces. The general cubic capacity of a premise 20.000 m³. Local exhaust ventilation is presented in the form of umbrellas at heating furnaces, the size 0,5x1 m everyone, speed in a reception aperture of an umbrella of 0,8 m/sec. Air giving is carried out by air souls the general productivity 5.000 m³/hour.

Give answers to following questions:

1. Calculate capacity of exhaust ventilation.
2. Estimate frequency rate of an exchange and air balance.

Situational task

Arc welding of details is made in a cabin which is equipped by local mechanical exhaust ventilation in the form of lateral suction, located directly over a welding table. The volume of deleted air through lateral suction is equal 1500 m³/hour at the area 0,28 m². Receipt input system of ventilation air is carried out by leak-in from a surrounding premise through apertures between walls of a cabin and a floor.

Give answers to following questions:

1. Calculate speed in an aperture lateral suction and estimate it.
2. Estimate the offered system of ventilation.

Situational task

The thermal shop is located in an one-storeyed, one-flying building, squared, height of 12 m. In a roof are equipped opening lanterns. Window apertures on the front parties of a building are located at 2 levels-1,8 m and 5 m from a floor. Thermal emissions in shop of 100 kcal/ m³hour.

Give answers to following questions:

1. On the basis of the offered situation, specify what system of ventilation it is necessary to arrange and as it is necessary for operating at various times year.

X. THE ESTIMATION OF INDUSTRIAL ILLUMINATION

Situational task

In mechanical shop machining of details is made. The minimum size of details of 0,17-0,3 mm, a background and a detail of grey colour, factor of reflexion of 35%. Light exposure combined also makes 1500 lux.

Give answers to following questions:

1. Define character of visual works on Construction size standards and regulations 2.01.05-98 "Natural and an artificial lighting» and compare light exposure.
2. Offer measures on improvement of light conditions.

Situational task

In spinning shop integrity of threads is observed. The minimum size of object of distinction of 0,4 mm, a background and details of dark colour. System of light exposure the general, thus level of light exposure 120-200 lux.

Give answers to following questions:

1. What devices measure light exposure and by what documents is regulated.
2. Estimate level of light exposure and offer measures on improvement of light conditions.

Situational task

In thermal shop training of cut parts of metal tools with the subsequent cooling in technical oils with allocation of a dust, a smoke and a soot from 5 to 10 mg/m³ is made. Work is spent in the afternoon, illumination natural, carried out through the windows located within the precincts of a premise. Clearing of windowpanes is made 2 times a year. The minimum size of object of distinction 2-4 sm.

Give answers to following questions:

1. Define character of visual works.
2. Estimate values daylight factor (DF) on Construction size standards and regulations 2.01.05-98 "Natural and an artificial lighting» and offer actions for improvement of light conditions.

Situational task

The clap arrives in sorter-pickers aggregation n which it is cleared of impurity, is loosened and reeled up on a core in the form of a canvas.

Work is made indoors where walls are painted in green, a ceiling – in white, a floor – in brown colour. The minimum size of object of distinction more than 5 mm. The dust maintenance in air of a working zone more than 12 mg/m^3 , illuminating installations are executed by system of the general illumination of type "Universal", dustproof. Level of light exposure 100-200 lux. Clearing of fixtures is made 1 time in 6 months.

Give answers to following questions:

1. Than definition conditions to equipment are regulated at light exposure measurement?
2. Estimate light exposure levels, terms of clearing of fixtures, selection of colour furnish of premises and offer measures on improvement of light conditions.

Situational task

On filature factory "Tola" site integrity of silk is observed. Working are during a labour shift – standing, despite the fixed place. At definition time smearing object contours it is equal 22 seconds, time of definition of stability of 3 minutes.

Give answers to following questions:

1. Define stability of not clear vision.
2. Define stability of clear vision.
3. Make recommendations about improvement of function of sight of the working.

Situational task

At research of a functional condition of sight of working assembly shop of plastic factory it is defined functions of the visual analyzer and the following data is obtained: before work critical frequency of merge of light flashings (CFMLF) - 30 Hz, throughput of the visual analyzer - 2,8 bit/second these indicators became equal. In second half of labour shift accordingly - 25 Hz and 3,8 bit/second.

Give answers to following questions:

1. What devices investigate indicators of organs of vision.
2. Estimate changes of function of the visual analyzer.
3. Make recommendations about the rational organisation of labour process for preventive maintenance of languor of sight.

Situational task

In weaver's shop kenaf factories weaving is made. Work in shop 2 replaceable. Illumination system – the general, glow lamps. Work standing (supervision over quality of let out production). At research of function of sight the worker had obtained following data: before work speed of the transferred visual information is equal 3 bit/sek, stability of clear vision of 78,8%. After the work termination investigated indicators became accordingly 5,6 bit/sek and 88,6%.

Give answers to following questions:

1. What devices define indicators of organs of vision?
2. Estimate the received results of a physiological condition of the visual analyzer.
3. Make recommendations about improvement of an operating mode and light conditions.

Situational task

In garment factory "Yoshlic" shop it is spent close fabrics for preparation in conveyor a site for sewing. Lighting installations are located along a wall, sources are glow lamps type "Universal". Split-hair accuracy work. At research of function of sight at working of 36 Hz, stability of clear vision of 70% are defined before work critical frequency of light flashings, speed of the transferred visual information is equal – 2 bit/second. After the change termination these indicators have changed accordingly: 22 Hz, 86% and 3,8 bit/second.

Give answers to following questions:

1. Estimate a physiological condition of the visual analyzer.
2. Tell improving measures on improvement of light conditions.

XI. THE ACCOUNT, REGISTRATION AND INVESTIGATION OF OCCUPATIONAL DISEASES AND PROFESSIONAL POISONINGS

Situational task

On January, 13th the worker of grain factory has addressed in polyclinic with complaints to severe pains in the field of a humeral joint. After inspection the diagnosis - sharp cervicobrachial plexitis has been made. The patient has been hospitalised on January, 14th at 15⁰⁰ o'clock. At investigation of a case of the occupational of disease the doctor on

factory hygiene, and also the doctor on hygiene of a food participated. At studying of working conditions of the worker the following has been defined. The worker performed works on a bread batch. In an operating time the worker, often opening a furnace door, watches a bread batch, thus the top part of a trunk of the worker is influenced by the raised temperature of air (130⁰C) and the raised level of infra-red radiation.

Give answers to following questions:

1. State an estimation of timeliness of notification Center state sanitary epidemiology inspection and investigations of a case of the occupational of disease.

2. Whether it is possible to diagnose the occupational of disease, and what improving actions are necessary in this case for improvement of working conditions of the worker?

Situational task

In polyclinic to the oculist the worker-builder with complaints to severe pains in the field of eyes has addressed. At finding-out of the reasons it has been revealed, the worker during welding works worked without personal protection equipment (PPE). The diagnosis electrophthalmia has been put by the doctor 14.05 at 12 o'clock, after rendering of the medical help of the patient has been sent home. In Center state sanitary epidemiology inspection the emergency notice on a case of the occupational of disease has been sent 16.05 morning at 9⁰⁰ o'clock. The doctor on factory hygiene after reception of the emergency notice, 17.05 9 o'clock in the morning has made investigations of a case and the reasons of occurrence of the sharp occupational of disease, then has made necessary papers.

Give answers to following questions:

1. State an estimation of timeliness of notification Center state sanitary epidemiology inspection and investigations of a case of the occupational of disease.

2. State an estimation of timeliness of carrying out of investigation of a case of the occupational of disease.

Situational task

The welder has addressed at 9⁰⁰ o'clock to the shop therapist with complaints to acute pains in the field of eyes. The worker has been sent at 11⁰⁰ o'clock by the shop therapist in hospital and is sent in Center state sanitary epidemiology inspection the emergency notice 058 registration

form. For investigation of the reasons of occurrence of the occupational of disease by the doctor on factory hygiene next day special investigation at 17⁰⁰ o'clock has been made.

Give answers to following questions:

1. State an estimation of timeliness of sending of the emergency notice and carrying out of investigation of a case of the occupational of disease.
2. What documents the doctor on factory hygiene in the present state of affairs should issue?

Situational task

At reception of the notice the doctor on factory hygiene has independently made investigation of the reasons of occurrence of the occupational of a poisoning. After inspection carrying out has issued the certificate under the form 362 registration form. Also has left one copy in object administration. In the certificate of investigation of the reasons of occurrence of the occupational of a poisoning has made improving actions.

Give answers to following questions:

1. State an estimation to tactics of carrying out of actions by the doctor on factory hygiene.
2. What data are contained by the certificate 362 registration form?

XII. STUDYING OF DISEASE WORKING WITH TIME DISABILITY

Situational task

The young doctor has addressed to the head of department of factory hygiene Center state sanitary epidemiology inspection with the request to teach it to make correctly the report under the form 16 acting disability (AD) about acting disablement working for a year and what the data for this purpose is required.

Give answers to following questions:

1. Tell about stages of registration of the report 16 AD.
2. Explain a role of the doctor of factory hygiene Center state sanitary epidemiology inspection at carrying out of the analysis of disease with acting disablement.

Situational task

In Ministry of Health the data on disease working light industry for 2012 has arrived. Thus in the report the following data is given that the indicator of disease with time disability on 100 working in cases makes 110, and in days – 1050.

Give answers to following questions:

1. How to estimate disease level in the given industry?
2. Disease concerns what level working in a studied industry?

Situational task

At carrying out of the analysis of disease with acting disablement at furniture factory it has been revealed that the basic harmful production factors are the dust, noise, a gassed condition of air of a working zone and an adverse microclimate. It is known that average development of production to one workers for one working day makes 4.500 sum, the means spent for payment of the sick-list in the sums on 1 worker in day, makes 1.500 sum. Under the form 16 acting disability labor loss in days make 410 days.

Give answers to following questions:

1. What it is necessary to know to the doctor on factory hygiene for calculation of the economic damage caused by disease?
2. Under what formula calculation of the economic losses caused from disease with acting disablement and to that it is equal is conducted?

Situational task

According to the order of Ministry of health and Center state sanitary epidemiology inspection of RUz have been carried the thematic sanitary investigations devoted to questions of working conditions of women on a number of leaders of light industry on which basis it is necessary to develop preventive actions.

Give answers to following questions:

1. What measures of preventive maintenance of influence of the compelled worker of a pose?
2. List groups of actions for a labour safety of women.
3. Name groups of improving actions in connection with motherhood.

XIII. STUDYING OF THE ORGANIZATION AND CARRYING OUT OF MEDICAL INSPECTIONS ON MANUFACTURE

Situational task

At medical inspection employees of laboratory showed complaints to undue fatigability, weakness, drowsiness, emotional instability, headaches, shyness, shyness. At objective research the small and frequent tremor of fingers of an outstretched arm of eyelids, sometimes гингивиты was marked. In laboratory devices with mercury filling are used. The mercury maintenance in air fluctuated from 0,01 to 0,05 mg/m³. In scrape plasters from walls and in a floor parquet are found out mercury traces. Devices are established on the laboratory tables covered vinyl plastic. General ventilation.

Give answers to following questions:

1. Estimate results of medical inspection and working conditions in laboratory.
2. Offer actions for improvement of working conditions.

Situational task

At periodic medical inspection of shareholders of shop of assemblage of autodevices bluish- gray the border along the edges of gums, reticulocytosis over 10 %, bazofilno-granular erythrocytes, the raised maintenance porphyrines (more than 60 mkg/l) and aminolevulinic acid (more than 2 mg of %) in urine in some cases is found out. A plumbing is made by an alloy containing 40% of tin and 60% of lead, and alternates with assembly processes. Workplaces are equipped by local exhaust devices, providing on workplaces of shareholders speed of movement of air of 0,1 m/sec. Pritochnyj air moves in the top zone of a premise. The lead maintenance in air fluctuates from 0,04 to 0,09 mg/m³.

Give answers to following questions:

1. Define character of a state of health of workers and specify treatment-and-prophylactic actions.
2. State an estimation to working conditions and specify improving actions.

Situational task

At medical inspection working branches of colouring of fine details of machine-building factory showed complaints to frequent nasal bleedings, hypodermic hemorrhages, a headache, dizziness, irritability,

weakness, appetite loss. The blood analysis in some cases has shown an anaemia (erythrocyte 3500000), leucocytopenia (leukocytes 3500), thrombocytopenia (thrombocytes 150000). In shop colouring of fine details on open tables is made. As solvent the benzene, which maintenance on a workplace - 100 mg/m^3 , on distance of 10 m – 15 mg/m^3 is used. The industrial premise is equipped mechanical, general, a forced-air and exhaust ventilation.

Give answers to following questions:

1. Define character of a state of health of workers and specify treatment-and-prophylactic actions.
2. State an estimation of working conditions and specify improving actions.

Situational task

At check of carrying out of preliminary physical examinations at factory "Tashximselfash" the doctor on factory hygiene has established the following: during check at factory 3 classes have come for work of 12 persons with working conditions. In a health centre are found out only on again arrived 10 out-patient cards. By check of out-patient cards it is noticed that at two workers physical examination date later, than date of the order on employment. In 1 card there is no commission conclusion, in two other cards there is no professional route.

Give answers to following questions:

1. What conclusion the doctor on factory hygiene on the revealed situation should give?
2. Based on the results of testing what the doctor on factory hygiene should make documents?

Situational task

At the enterprise 144 persons work. From them 18 persons in working conditions of 1 class, 36 persons 2 classes, 78 - 3 classes and 17 persons - 4 classes. Administration carrying out of periodic medical surveys by order of №200 is planned.

Give answers to following questions:

1. Who takes part at revealing of a contingent for periodic medical surveys?
2. What quantity of the working should pass honey survey?
3. What documents are made out following the results of the work set forth above, tell their maintenance?

Situational task

At the physical examination spent by the therapist and the neuropathologist in March of current year, the working woman of branch of colouring of fine details of machine-building factory has shown complaints to frequent nasal bleedings, hypodermic hemorrhages, a headache, dizziness, irritability, weakness, appetite loss. At a laboratory blood test: erythrocytopenia - till 3.100.000, leucopenia – 3.500, a thrombopenia and lymphocytosis. The work experience in shop of 8 years. Colouring of fine details in shop is spent on open tables. As solvent the benzene which maintenance in air of a working zone reached 45 mg/m³ (maximum concentration limit of 5 mg/m³) is used. Shops are equipped general and local exhaust ventilation. Physical examination was spent 2 years ago.

Give answers to following questions:

1. State an estimation of correct carrying out periodic medical inspection (commission structure, periodicity, completeness a laboratory researches), using the order of of Ministry of health of RUz №200.
2. Estimate working conditions and character of a state of health of the working woman and specify preventive actions.

XIV. THE BASIC MEASURES OF PREVENTIVE MAINTENANCE OF THE INDUSTRIAL TRAUMATISM

Situational task

According to the order of of Ministry of health and Center state sanitary epidemiology inspection of RUz have been spent thematic a dignity. The inspections devoted to questions of preventive maintenance of an industrial traumatism (chemical burns) on a number of the enterprises of the chemical industry on which basis it is necessary to develop preventive actions.

Give answers to following questions:

1. What measures of preventive maintenance of an industrial traumatism?
2. List groups of actions for a labour safety of women.

Situational task

At studying of the reasons of an industrial traumatism at the machine-building enterprise for the last year 8 cases of an industrial

traumatism with disability for three days and more days have been defined, at total number working, equal 1500 persons. Also it is known that the total number of days of invalidity on all working days has made 45 days.

Give answers to following questions:

1. Calculate frequency factor (Ff).
2. Calculate weight factor (Wf) accidents at the studied enterprise.

Situational task

At studying of the reasons of an industrial traumatism at workers-builders (assemblers) at the under construction enterprise for 2 quarter of the last year 3 cases of an industrial traumatism with disability for three days and more days have been defined, at total number working, equal 256 persons. Also it is known that the total number of days of invalidity on all working days has made 15 days.

Give answers to following questions:

1. Calculate frequency factor (Ff).
2. Calculate weight factor (Wf) accidents at the studied enterprise.

Situational task

At studying of the reasons of an industrial traumatism at workers of the chemical enterprise for passed half a year 7 cases of an industrial traumatism with disability for three days and more days have been defined, at total number working, equal 430 persons. Also it is known that the total number of days of invalidity on all working days has made 35 days.

Give answers to following questions:

1. Calculate frequency factor (Ff).
2. Calculate weight factor (Wf) accidents and factor of losses (FI) at the studied enterprise.

XV. CARRYING OUT OF PROFOUND SANITARY INSPECTION ON INDUSTRIAL OBJECTS

Situational task

At check of instructions Center state sanitary epidemiology inspection specified in the certificate of inspection deepened a dignity, the doctor on factory hygiene has established the following: for today reconstruction of ventilating system of galvanic shop (before end of works 6-8 days are necessary even) is not finished completely. Without consent

Center state sanitary epidemiology inspection in forge shop the small furnace for heating of metal products is established and started in action.

Give answers to following questions:

1. How the doctor on factory hygiene in the present state of affairs should arrive?
2. What documents are necessary for issuing?

Situational task

At check of instructions Center state sanitary epidemiology inspection specified in the certificate of inspection deepened a dignity, the doctor on factory hygiene has established the following: without consent Center state sanitary epidemiology inspection in forge shop the small furnace for heating of metal products which is started in action is established.

Give answers to following questions:

1. How doctor Center state sanitary epidemiology inspection should arrive?
2. What improving actions are necessary for introducing on the given manufacture?

Situational task

At check of instructions Center state sanitary epidemiology inspection specified in the certificate of inspection deepened a dignity, the doctor on factory hygiene has established the following: for today reconstruction of ventilating system of galvanic shop (before end of works 6-8 days are necessary even) is not finished completely. Without consent Center state sanitary epidemiology inspection in forge shop the small furnace for heating of metal products is established and started in action.

Give answers to following questions:

1. How the doctor on factory hygiene in the present state of affairs should arrive?
2. What documents are necessary for issuing?

Situational task

At check of instructions Center state sanitary epidemiology inspection specified in the certificate of inspection deepened a dignity, the doctor on factory hygiene has established the following: for today reconstruction of ventilating system of galvanic shop (before end of works 6-8 days are necessary even) is not finished completely. Without consent

Center state sanitary epidemiology inspection in forge shop the small furnace for heating of metal products is established and started in action.

Give answers to following questions:

1. How the doctor on factory hygiene in the present state of affairs should arrive, what documents are necessary for issuing?
2. It is necessary to give what instructions?

Situational task

In preparatory shop kenaf factories the cut of belts of bales, division into parts and their sketch on conveyor a tape breaking cars is made. On breaking to the car impregnation of a fibre hot emulsion by a way sparge through the atomizers placed in the top part of the car is made. At work in air a dust considerable quantity is allocated, also in air the aerosol emulsion is allocated. Over breaking by car the exhaust umbrella, on a place of an overlay of a fibre on breaking the car the local exhaust panel with a speed of air of 1,5 m/sec, 0,8 m/sec - in an exhaust umbrella is established. The general forced ventilation of air submits air at height of 4 m from a floor, exhaust deletes air on premise perimetre at height of 3 m from a floor.

Give answers to following questions:

1. Estimate correctness of a choice of ventilating system.
2. Estimate efficiency of ventilation and give offers on increase of efficiency of ventilation
3. How doctor Center state sanitary epidemiology inspection should arrive?
4. What improving actions are necessary for introducing on the given manufacture?

XVI. CARRYING OUT OF CERTIFICATION OF WORKPLACES ON INDUSTRIAL OBJECTS

Situational task

At carrying out of certification of a workplace of the former of a forming site of foundry shop it is established that the maintenance carbonic oxide (substances 4 classes of danger) in air of a working zone exceeds maximum concentration limit in 4 times. Actual time of its influence of 480 mines (at 8 hour labour shift). Concentration of a dust in 5 times exceeds maximum concentration limit at actual influence of 300

minutes. Intensity of local vibration exceeds maximum permissible limit (MPL) on 6 dB, noise – on 13 dBA at actual influence of these factors of 240 minutes. Intensity of infra-red radiation insignificant (110 Vt/m^2). Levels of other factors of the industrial environment within admissible sizes.

Give answers to following questions:

1. Define an actual state of working conditions of the former on a workplace.
2. Define the size of surcharge on the basis of an actual point.

Situational task

At carrying out of certification of a workplace of working thermal shop of metallurgical industrial complex it has been established that the maintenance carbonic oxide (substances 4 classes of danger) in air of a working zone exceeds maximum concentration limit in 5 times at actual time of influence of 480 mines (at 8 hour labour shift). Thus concentration of a dust exceeds maximum concentration limit in 4,5 times (actual time of influence of 300 minutes). Intensity of local vibration exceeds MPL on 12 dB, noise – on 15 dBA at actual influence of these factors of 240 minutes intensity of infra-red radiation exceeds MPL in 2,5 times at actual time of influence of 240 minutes. Air temperature on a workplace 30°C at actual time of influence of 420 minutes. Capacity of performed dynamic work more than 90 Vt, actual time of influence work is carried out of 360 minutes in a working pose "standing" in inclined position to 30° 45-50% of time of a labour shift. Levels of other factors of the industrial environment within admissible sizes.

Give answers to following questions:

1. Define an actual state of working conditions of the former on a workplace.
2. Define the size of surcharge on the basis of an actual point.

Situational task

At carrying out of certification of a workplace of the founder it has been established that in air of a working zone on a site of thermoplastic moulding the formaldehyde maintenance exceeds maximum concentration limit in 15 times, hydrocarbons - in 5 times. Actual time of its influence of 480 mines (at 8 hour labour shift). Concentration of a dust also in 5 times exceeds maximum concentration limit at actual influence of 300 minutes Intensity of local vibration exceeds MPL on 5 dB, noise – on 10 dBA at

actual influence of these factors of 240 minutes. Intensity of infra-red radiation exceeds in 2 times (at actual influence of 300 minutes). Levels of other factors of the industrial environment within admissible sizes.

Give answers to following questions:

1. Define an actual state of working conditions of the founder on a workplace.
2. Define the size of surcharge on the basis of an actual point.

Situational task

At carrying out of certification of a workplace of working thermal shop «Modular factory» it has been established that the maintenance carbonic oxide (substances 4 classes of danger) in air of a working zone exceeds maximum concentration limit in 6 times at actual time of influence of 480 mines (at 8 hour labour shift). Thus concentration of a dust exceeds maximum concentration limit in 3,5 times (actual time of influence of 300 minutes). Intensity of local vibration exceeds MPL on 5 dB, noise – on 10 dBA at actual influence of these factors of 240 minutes. Intensity of infra-red radiation exceeds MPL in 2,5 times at actual time of influence of 240 minutes. Air temperature on a workplace 30⁰C at actual time of influence of 420 minutes. Capacity of performed dynamic work more than 100 Vt, actual time of influence work is carried out of 360 minutes in a working pose "standing" in inclined position to 30⁰ 50-60% of time of a labour shift. Levels of other factors of the industrial environment within admissible sizes.

Give answers to following questions:

1. Define an actual state of working conditions of the founder on a workplace.
2. Define the size of surcharge on the basis of an actual point.

THE EXAMPLE DECISION OF SITUATIONAL PROBLEMS

Situational task

At carrying out of profound sanitary inspection the doctor on factory hygiene, studying results of laboratory researches, has established that in air of a working zone on a site of thermoplastic moulding the formaldehyde maintenance exceeds maximum concentration limit in 15 times, hydrocarbons - in 5 times.

Give answers to following questions:

1. What the doctor on factory hygiene in the present state of affairs should make?
2. What documents are made out in such cases?

The decision:

1. In the present state of affairs the doctor on factory hygiene considers to inappropriate hygienic requirements a chemical compound of air of a thermoplastic site in which excess of maximum concentration limit of formaldehyde makes 15 times (maximum concentration limit of $0,5 \text{ mg/m}^3$), hydrocarbons – 5 times (at maximum concentration limit of 300 mg/m^3). By carrying out of sanitary inspection the reasons owing to which, there was a given situation are established.

2. Made papers: the conclusion in «The report of laboratory researches of air of the closed premises» (the f. 330/at) and «The certificate of sanitary inspection» (f. 315/at).

Situational task

At carrying out of the analysis of disease with morbidity with temporal disability at enterprise "Tashhimselmash" for manufacture of polymeric details, it has been revealed that the basic harmful production factors are noise, a gassed condition and a dust content of air of a working zone, and a heating up microclimate. It is known that average development of production to one workers for one working day makes 1.500 sum, the means spent for payment of the sick-list in the sums on 1 worker in day, makes 800 sum. Under the form 16 morbidity with temporal disability loss ability to work in days make 200 days.

Give answers to following questions:

1. What it is necessary to know to the doctor on factory hygiene for calculation of the economic damage caused by disease?

2. Under what formula calculation of the economic losses caused from disease with temporary disability of works and to that it is equal is conducted?

The decision:

1. For calculation of an economic damage it is necessary to know: loss of labour in days (Ld) on a line «A1» of temporary disability in report 16 morbidity with temporal disability, average development of production to one workers for one working day (Pr) and the means spent for payment of the sick-list in the sums on 1 worker in day (Pay).

2. Calculation of the economic losses caused by disease, is made under the following formula: $EL = Ld \times (Pr + Pay)$

$$EL = 200 \times (1.500 + 800) = 460.000 \text{ sum.}$$

**THE LEGISLATIVELY-STANDARD DOCUMENTS USED AT
THE DECISION OF SITUATIONAL PROBLEMS
ON HYGIENE OF LABOR**

The list of legislative documents:

1. Constitution RUz from 12/8/1992;
2. The law «About health protection of citizens», 1996;
3. Labor code RUz, 1996;
4. The Law «About the state health control», 1992;
5. The Command of Ministry of Health RUz №200 from June, 23rd, 2012 «About enhancement of system preliminary at inflow on operation and periodic medical inspections of workers of Republic Uzbekistan»;
6. The Command of Ministry of Health RUz №710 from 12/2/1999 «The standing about Centers of the State sanitary-and-epidemiologic supervision of Republic Uzbekistan»;
7. The Command of Ministry of Health RUz №283 from 1992 «The hospital registration documentation of sanitary-and-prophylactic institutions», etc.

The list of operating standard documents for carrying out of the State sanitary inspection

1. Sanitary regulations and size standards № 0014-94 «Sanitary regulations by operation with cutting compounds, technological lubricating oils and oils»;
2. Sanitary regulations and size standards № 1117-94 «The sanitary code and regulations by operation with radiants of electromagnetic fields of a radio-frequency gamut»;
3. Sanitary regulations and size standards № 0046-95 «Hygienic normatives. Maximum concentration limit of hazardous substances in work area air»;
4. Sanitary regulations and size standards № 0064-96 «The sanitary code of tolerance levels of electromagnetic fields of radio distress frequencies»;
5. Sanitary regulations and size standards № 0113-01 «Precautionary health control of new operating procedures, technique, gears, instruments, chemicals and other commodity concerning a working hygiene»;
6. Sanitary regulations and size standards № 0117-01 «The infra sound sanitary code on workers places»;
7. Sanitary regulations and size standards № 0120-01 «The sanitary code of noise levels on benches»;
8. Sanitary regulations and size standards № 0122-01 «The sanitary code of common and local chattering on benches»;
9. Sanitary regulations and size standards № 0203-06 «The sanitary code of a microclimate of an industrial premises»;
10. Sanitary regulations and size standards № 0208-06 «Sanitary regulations of production process and hygienic requirements to a production equipment»;
11. Sanitary size standards № 245-71 «The sanitary code of projection of industrial organisations»;
12. State standard 12.1.007-76 "Hazardous substances. Grading and security general requirements»;
13. State standard 12.1.005-88 «Common sanitary-hygienic demands to work area air»;
14. Construction size standards and regulations 2.04.05-97 "Heating, ventilating and air conditioning»;
15. Construction size standards and regulations 2.01.05-98 "Natural and an artificial lighting»;
16. Construction size standards and regulations 2.09.04-98 "Administrative and household buildings».

