МИНИСТЕРСТВО ЗДРАВООХРАНЕНИЯ РЕСПУБЛИКИ БЕЛАРУСЬ
БЕЛОРУССКИЙ ГОСУДАРСТВЕННЫЙ МЕДИЦИНСКИЙ УНИВЕРСИТЕТ
КАФЕДРА ОБЩЕЙ ГИГИЕНЫ

ОБЩАЯ ГИГИЕНА

GENERAL HYGIENE

Лабораторный практикум

3-е издание, исправленное

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ASSESSMENT OF HUMAN HEALTH
(METHODS AND TECHNIQUES FOR ASSESSING HUMAN HEALTH)

Date_____

Learning objectives:

1. To learn basics of assessment of human health at the individual, group (collective) and population level.
2. To learn methods and techniques used in solving scientific and practical problems in assessing human health.
3. To learn definition of hygienic prenosological diagnostics.
4. To learn definition of preventive medicine, types of medical prevention.
5. To learn classification of risk factors.

THEORETICAL SECTION

Give a definition

Hygiene —_____

_____

_____

Prophylaxis — _____

_____

_____

In hygiene the following concrete methods of research are applied:

1. _____
2. _____
3. _____
4. _____

Principles of hygienic standardization:

1. _____
2. _____
3. _____
4. _____
5. _____

KEY QUESTIONS

1. Assessment of human health at the individual, group (collective) and population level.
2. Criteria for assessing individual health.
3. Methods and techniques used in assessing human health.
4. Hygienic prenosological diagnostics: definition, purpose, subject, procedure.
5. Premorbid conditions of the human body, their signs, evaluation criteria.
6. Preventive medicine, types of medical prevention.
7. Classification of risk factors.

Student's signature_____ **Teacher's signature**_____

HYGIENIC ASSESSMENT OF THE INFLUENCE OF MICROCLIMATE ON HUMAN HEALTH. RESEARCH METHODS AND HYGIENIC ASSESSMENT OF MICROCLIMATE PARAMETERS (TEMPERATURE, HUMIDITY, AIR SPEED, ATMOSPHERIC PRESSURE)

Date_____

Learning objectives:

1. To learn definition and features of weather and climate, climate classification.
2. To learn definition of acclimatization, physiological changes in the human body, developing during the acclimatization.
3. To learn definition of «microclimate» and factors, which influence its formation.
4. To learn basics of human heat exchange and thermoregulation.
5. To master methods of determination and hygienic assessment of temperature, humidity, air velocity and atmospheric pressure.
6. To master the hygienic evaluation of windrose.
7. To learn physiological reactions to changes in atmospheric pressure

THEORETICAL SECTION

Give a definition

Climate — _____

_____

_____

Weather — _____

_____

_____

Microclimate — _____

_____

_____

Acclimatization — _____

_____

_____

Absolute humidity — _____

_____

_____

Maximal humidity — _____

_____

_____

Relative humidity — _____

_____

_____

Saturation deficiency — _____

_____

_____

A wind rose — _____

_____

_____

Fill the table

Factor	Health effects
High atmospheric pressure	
Low atmospheric pressure	

PRACTICAL WORK

The microclimate of premises and its hygienic estimation.

1. Definition of a Temperature Mode.

The air temperature is measured by _____

Standard (normal) values = _____

_____

To define a temperature mode of premises it is necessary to take air temperature in the following points: in the center and at the external and internal walls at the distance of 10 cm from them and at the level of 0.1–1–1.5 m from the floor. The obtained data are written to the protocol and analyzed on vertical and horizontal lines.

Actual values = _____

Conclusion:_____

_____

_____

2. Hygienic assessment of humidity.

The humidity is measured by

Standard (normal) values = _____

_____

_____

a) Finding humidity using table.

To assess humidity, use «Table for determining air humidity according to August psychrometer readings».

Actual value (relative humidity by the table) = _____

b) Finding humidity using devices.

Temperature of the dry thermometer = _____

Temperature of the wet thermometer = _____

1. K (absolute humidity) = $f - a \times (t_1 - t_2) \times B$

f — the maximum humidity (temperature of the wet thermometer); a — psychometric factor 0.0011; t_1 — temperature of the dry thermometer; t_2 — temperature of the wet thermometer; B — barometric pressure in mm Hg

Actual value (absolute humidity) = _____

2. R (relative humidity) = $K/F \times 100$ %

K — absolute humidity; F — the maximum humidity (temperature of the dry thermometer)

Actual value (relative humidity) = _____

3. D_{physic} (physical deficiency of saturation) = $F_{t\ room} - K$

Actual value (deficiency of saturation) = _____

4. Dew-point temperature (equate the obtained value of absolute humidity to maximum and find the required temperature in the table)

Actual value (dew-point temperature) = _____

Conclusion:_____

_____

3. Hygienic assessment of air velocity

The air velocity is measured by _____

Standard (normal) values = _____

_____

Actual values = _____

Conclusion: _____

_____

4. Hygienic assessment of atmospheric pressure

The atmospheric pressure is measured by _____

Standard (normal) values = _____

_____

Actual values = _____

Conclusion: _____

_____

PROBLEMS SOLVING

Example. Indications of dry and wet bulbs of aspirating August psychrometer in the living room are +19 ºC and +18 ºC respectively. Atmospheric pressure is 740 mmHg.

Determine the absolute humidity, relative humidity, saturation deficiency, dew point temperature. Compare the result with the hygienic standard.

F (the maximum humidity of the dry thermometer) = 16.48 mmHg (table)
f (the maximum humidity of the wet thermometer) = 15.48 mmHg (table)

1. $K = f — a \times (t_1 – t_2) \times B = 15.48 – (0.0011 \times (19 – 18) \times 740) = 14.67$ mmHg

2. $R = K/F \times 100\ \% = 14.67/16.48 \times 100\ \% = 90\ \%$

3. $D_{physic} = F_{t\ room} – K = 16.48 – 14.67 = 1.814$ mmHg

4. Dew-point temperature = 17.2 ºC

Conclusion: During the hygienic assessment of the microclimate parameters, it was found that the relative humidity exceeds the norm (actual = 90 %, normal = < 75 %).

Tasks. 1. Indications of dry and wet bulbs of aspirating August psychrometer in the classroom are +22 ºC and +18 ºC respectively. Atmospheric pressure is 755 mmHg.

Determine the relative humidity (according to the formula and table), saturation deficiency, asses them. What is the dew point temperature?

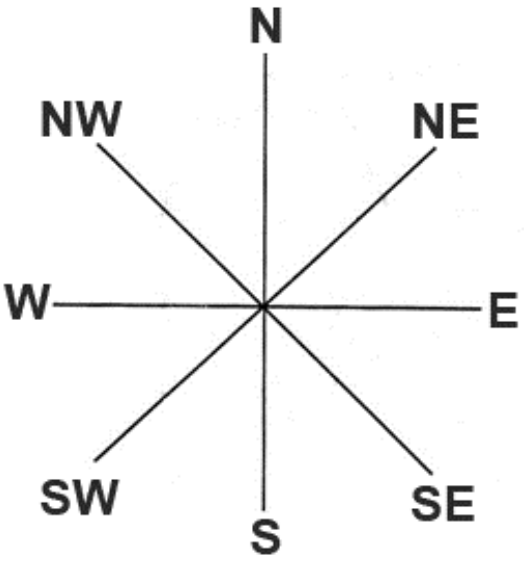
Perform hygienic assessment of calculated data (compare the result with the hygienic standard).

2. The parameters of microclimate in two closed rooms are: in the first — the air temperature is 22 ºC, and the relative humidity — 61 %, in the second — 16 ºC and 78 %, respectively. In which of the rooms is the value of physical saturation deficiency higher?

3. The frequency of wind direction in the region in 5 years is:

- Northwest wind — 19 %;
- North wind — 9 %;
- Northeast wind — 8 %;
- East wind — 11 %;
- Calm — 5 %.
- Southeast wind — 31 %;
- Southern wind — 6 %;
- Southwest wind — 5 %;
- Western wind — 6 %;

Draw a wind rose. Indicate optimal location for chemical factory.



TRAINING TEST

1. Choose the parameteres of microclimate:

a. temperature;
b. humidity;
c. air movement speed;
d. light.

2. Choose the correct formula: Deficiency of saturation:

a. $K = f — a \times (t_1 — t_2) \times B$;
b. $R = K/F \times 100$ %;
c. $D_{physic} = F_{t\ room} - K$;
d. $H = F/a$;
e. $Q = T_{0body} - T_{0air}$.

3. Optimal value for humidity in the living room is:

a. 30–65 %;
b. 20–50 %;
c. 20–50 mm Hg;
d. 45–55 %;
e. 40–60 %.

4. Air velocity is measured by …

a. Anemometer;
b. Kata thermometer;
c. Psychrometer;
d. Thermometer.

5. Humidity is measured by …

a. Anemometer;
b. Katathermometer;
c. Psychrometer;
d. Thermometer.

6. Temperature is measured by…

a. Anemometer;
b. Katathermometer;
c. Psychrometer;
d. Thermometer.

7. Types of humidity are:

a. relative;
b. absolute;
c. maximal;
d. barometric.

8. Decompression disease caused by…

a. rapid decrease in the pressure;
b. rapid increase in the pressure;
c. rapid decrease in the tempetature;
d. water pollution.

9. Optimal value for humidity in the living room is:

a. 30–65 %;
b. 0.5–1 m/s;
c. > 0.3 m/s;
d. < 0.3 m/s;
e. 40–60 %.

10. Choose the correct formula: Relative humidity:

a. $K = f — a \times (t_1 — t_2) \times B$;
b. $R = K/F \times 100$ %;
c. $D_{physic} = F_{t\ room} - K$;
d. $H = F/a$;
e. $Q = T_{0body} - T_{0air}$.

KEY QUESTIONS

1. Weather and climate, features and definition. The notion of climatic factors. Climate classification, their hygienic characteristics.

2. The mechanism of thermoregulation in the human organism and ways of heat transfer. Hygienic significance of the atmospheric and indoor air, its role in the microclimate formation and mechanisms of the organism heat exchange.

3. Physiological basics of human heat exchange and thermoregulation, physiological reactions in the comfortable or uncomfortable (hot or cold) microclimate. Influence of high and low temperature with high humidity on the human organism.

4. Acclimatization and adaptation as a complex socio-biological process of human adaptation to the new environment. Physiological changes in the human body, developing during the acclimatization and adaptation to unusual conditions.

5. Definition of «microclimate» and factors, which influence its formation.

6. Research methods and hygienic assessment of microclimate parameters in residential premises and medical institutions (temperature, humidity).

7. The notion of seasonal and meteodiseases. Meteodependence. The value of active prevention, taking into account the influence of weather conditions on the human body.

8. Physiological and hygienic significance of atmospheric pressure. Physiological reactions to changes in atmospheric pressure.

9. Low and high atmospheric pressure, its influence on the human organism. Decompression and altitude diseases

10. Physiological and hygienic significance of air movement. Windrose, methods of it's preparation and hygienic evaluation.

11. Research methods and hygienic assessment of microclimate parameters in residential premises and medical institutions (air velocity, atmospheric pressure).

Notes and problems solving

Student's signature_____ **Teacher's signature**_____

HYGIENIC ASSESSMENT OF THE INFLUENCE OF MICROCLIMATE ON HUMAN HEALTH. HYGIENIC ASSESSMENT OF THE COMBINED EFFECT OF METEOROLOGICAL FACTORS ON THE HUMAN BODY

Date_____

Learning objectives:

1. To master hygienic evaluation of complex action of meteorological factors on the human body.

2. To learn Kata thermometry and Effective temperature methods, methods of research and hygienic assessment of the thermal state of the human body.

3. To learn measurement indicators characterizing the body's response to the impact of meteorological factors: heatfeelings, average body temperature, cold test, potassium iodide by the method of Minor.

THEORETICAL SECTION

Fill the table

Thermal balance of the human body

Heat gain	Heat loss

Give a definition

Effective temperature (ET) — _____

_____

_____

Thermal comfort — _____

_____

_____

PRACTICAL WORK

Fill in the table «Protocol of hygienic evaluation of complex action of meteorological factors» results of the calculations (p. 12).

Definition of air movement speed with the help of a Kata thermometer

A kata thermometer is heated up to a certain temperature (above air temperature), and then in case of cooling under the influence of temperature and air movement the device will lose certain quantity of heat at a certain level of temperature. Knowing the amount of cooling and the air temperature, we may calculate the air movement speed according to the empirical formulas and tables.

A spherical kata thermometer is placed in a vessel with hot water at the temperature of 65–70 °C until the painted spirit fills half of the top tank. After that the kata thermometer is wiped dry

rag and hanged up on a support in a place where it is necessary to define air movement speed. Further by means of a stop watch time we define the time in seconds for which the column has fallen from T_1 to T_2. It is possible to take intervals from 40–33 °C, from 39–34 °C, from 38–35 °C, i. e. such an interval, a partial value of which from division of the sum T_1 and T_2 should be equal to 36.5 °C. The test is repeated 2–3 times and the average indexes are calculated. Further on their basis we calculate the amount of cooling H. The cylindrical kata thermometer amount of cooling and the spherical kata thermometer are calculated with an interval of 38–35 °C applying following formulas:

1. H (cooling capacity of the air) = F/a

F — the katathermometer factor, a constant showing the quantity of heat, lost from 1 cm^2 of the device surface during its cooling from 38 to 35 °C (indicated on the back surface of every katathermometer), $mcal/cm^2$; a — time of cooling, s

2. V (air movement speed) = $\left[\frac{H/Q-0.2}{0.4}\right]^2$

H — cooling capacity of the air; Q — difference between an average body temperature 36.5° and surrounding air temperature

$$Q = T°_{body} — T°_{air}$$

3. Define effective temperature on the scale and the nomogramm and to give recommendations about its optimization.

Assessment of a human body reactions on the meteorological factors action

1. Skin temperature:

To estimate its dynamics, it should checked strictly in certain points. Which are as follows:

– on the forehead — between superciliary arches on 0.5 cm above their upper edge;
– on the breast — at a breast upper edge;
– on the hand — back surface, between the bases of the first phalanxes of the thumb and index fingers.

If we feel comfort the temperature of a skin of a forehead and a breast is equal to 31–34 °C, a hand skin — 30–31 °C.

2. Definition of the average temperature:

$$T = 0{,}07 \times F + 0{,}5 \times B + 0{,}43 \times H$$

F — temperature of the forehead; B — temperature of the breast; H — temperature of the hand; Comfort condition — 32–34 °C

3. Definition of breast and hand surface temperature fluctuations range.

In comfortable conditions the difference between the breast and hand temperature should be 3–4 °C if it is less than 2,5 °C — is a thermal discomfort, and if it is more than 4 °C — it is cold discomfort.

4. Cold Test:

For supervision we choose the limited sites of a skin on an open part of a body and on the usually covered clothes parts (a back, a leg). On the chosen site of skin you take the electrothermometer skin temperature. A metal jar filled with ice is placed on this place for 20–30s. After the expiry term the jar is removed. Each 2 min it is necessary to take skin temperature until the temperature of a skin reach the initial value.

In case the skin temperature will return until the initial level within 5 minutes, it testifies of good adaptation to cold, 10 min — satisfactory, 15 min and more — unsatisfactory.

5. Investigate the function of sweating (the iodinestarch test).

A small area of the skin (forehead) is covered with a solution containing iodine (10 g of castor oil, 15 g of 10 % iodine tincture and 75 ml of ethyl alcohol). After drying, the oiled place is powdered with potato starch. Sweat droplets in the presence of starch with iodine give a blue coloration.

The comfort zone corresponds to the conditions under which perspiration is expressed in the form of individual small dots. The appearance of blue spots indicates uncomfortable conditions for the accumulation of heat in the body.

Protocol of hygienic evaluation of complex action of meteorological factors

Parameter	Actual value	Comfort value
Average temperature indoors (°C)		
Relative humidity (%)		
Air speed movement (m/sec)		
Cooling capacity (mkal/cm^2 × sec)		
Effective temperature (°ET)		
Physiological reactions of the organism		
Heat sensation character		comfort
Pulse rate		60–80
Body temperature		36 °C
Forehead skin temperature		31–34 °C
Breast skin temperature		31–34 °C
Hand temperature skin		30–31 °C
The average skin temperature		32–34 °C
Range of breast and hand surface temperature fluctuation		3–4 °C
Cold test		Up to15 min
Character of sweating		

Conclusion: _____

_____

PROBLEMS SOLVING

Example. The speed of the air movement in the classroom was determined using a kata thermometer. The factor of the cylindrical kata thermometer equal 588 Mcal/cm^2, cooling time is 112 sec. In the classroom the temperature is +19 ºC.

Find the cooling capacity of the air (H), air movement speed.

Compare the result with the hygienic standard.

1. H = F/a = 588/112 = 5.25 mkal/cm^2 × sec.

2. Q = T$^o_{body}$ — T$^o_{air}$ = 36.5 — 19 = 17.5º.

3. V = $\left[\frac{H/Q-0.2}{0.4}\right]^2 = \left[\frac{5.25/17.5-0.2}{0.4}\right]^2$ = 0.0625 m/s.

Conclusion: During the hygienic assessment of the microclimate parameters, it was found that the actual cooling capacity of the air less the norm (actual = 5.25 mkal/cm^2 × sec, normal = = 5.5–7.0 mkal/cm^2 × sec), hot discomfort, air movement speed less the norm (actual = 0.0625 m/s, normal = 0.1–0.2 m/s).

Tasks. 1. In the living room the temperature of dry thermometer is +19 ºC, the temperature of wet thermometer is +15 ºC (measured by means of an August stationary psychrometer). The factor of the cylindrical kata thermometer equal 533 Mcal/cm^2, cooling time is 65 seconds.

Calculate the cooling capacity of the air (H), air movement speed and effective temperature (ET). Perform hygienic assessment of calculated data (compare the result with the hygienic standard). If the effective temperature is not included in the line comfort, show how to modify the parameters of the microclimate that ET went into it.

2. Perform a hygienic assessment of the air state in the classroom of the department before the start of classes and at the end of the working day according to the data given in the table:

Investigated indicators	Before the start of classes	At the end of the working day
Air temperature, ºC	21.5	26.4
Relative humidity, %	57	78
Cooling capacity of the air	6.5	3.6
Air movement speed, m/s	0.34	0.15

TRAINING TEST

1. The heat from the body can be lost through:

a. conduction; c. convection;
b. evaporation; d. radiation.

2. Methods of assessment complex effect of meteorological factors on the human body:

a. assessment of actual nutrition;
b. kata thermometry;
c. method of effective temperatures;
d. assessment the level of physical development.

3. The effective temperature combines the effects of the following:

a. air temperature; c. air velocity;
b. athmospheric pressure; d. relative humidity.

4. Standard (normal value) for effective temperature is:

a. 5.5–7.0 mcal/cm^2 × sec; c. 20–22 °C;
b. 17.2–21.7 °ET; d. 0.1–0.25 m/sec.

5. Parameters considered in integrated assessment of microclimate by kata thermometry:

a. pressure; c. air velocity; e. temperature.
b. sunlight; d. humidity;

6. Standard (normal value) for cooling capacity of the air is:

a. 5.5–7.0 mcal/cm^2 × sec; c. 20–22 °C;
b. 17.2–21.7 °ET; d. 0.1–0.25 m/sec.

7. Parameters that are not taken into account in integrated assessment of microclimate by method of effective temperatures:

a. atmospheric pressure; c. infrared heat;
b. air speed; d. temperature.

8. Acclimatization:

a. is a complex social and biological process of active adaptation to new climatic conditions, a special case of adaptation.

b. is the zone of the lowered pressure with its decrease from periphery to the center.

c. is condition of meteorological elements indoors, is determined by its temperature, humidity, speed of air movement and pressure.

KEY QUESTIONS

1. Hygienic evaluation of the complex influence of meteorological factors on the human body: methods and their comparative characteristics.
2. What is the kata thermometry method?
3. What is the method of Effective temperatures?
4. Measurement indicators characterizing the body's response to the impact of meteorological factors.
5. Hygienic evaluation of the complex influence of meteorological factors on the human body: methods and their comparative characteristics.

Notes and problems solving

Student's signature_____ **Teacher's signature_____**

HYGIENIC ASSESSMENT OF THE INFLUENCE OF MICROCLIMATE ON HUMAN HEALTH. FINAL CLASS ON THE TOPIC «HYGIENIC CHARACTERISTICS OF THE HUMAN ENVIRONMENT. PHYSICAL PROPERTIES AND CHEMICAL COMPOSITION OF ATMOSPHERIC AIR. HYGIENIC ASSESSMENT OF THE INFLUENCE OF MICROCLIMATE ON HUMAN HEALTH»

CONTROL QUESTIONS

1. Temperature of air characteristics, influence on a human organism, research methods, hygienic assessment.
2. Humidity of air characteristics, influence on a human organism, research methods, hygienic assessment.
3. Barometric pressure of air characteristics, influence on a human organism, research methods, hygienic assessment.
4. Movement of air characteristics, influence on a human organism, research methods, hygienic assessment. Wind rose.
5. Hygienic assessment of complex influence of meteorological factors on the human body: methods and their characteristics.
6. Heat exchange with the environment. Consequences of its violations: overheating, overcooling. Preventive measures.
7. Climate and weather. Acclimatization. Hygiene measures to facilitate acclimatization. Meteotropic diseases and their prevention.

EXAMPLES OF CONTROL CASE TASKS

1. Indications of dry and wet bulbs of aspirating August psychrometer in the living room are respectively +19 °C and +15 °C. Atmospheric pressure is 755 mmHg.

Calculate absolute humidity of air, relative humidity of air, saturation deficiency and dew-point temperature. Perform hygienic assessment of calculated data (compare the result with the hygienic standard).

2. In the classroom the temperature of dry thermometer is +18 °C, the temperature of wet thermometer is +15 °C (measured by means of an August stationary psychrometer). The factor of the cylindrical katathermometer equal 535 mkal/cm^2, cooling time is 65 sec.

Calculate the cooling capacity of the air (H), air movement speed and effective temperature (ET). Perform hygienic assessment of calculated data (compare the result with the hygienic standard). If the effective temperature is not included in the line comfort, show how to modify the parameters of the microclimate that ET went into it.

3. The frequency of wind direction in the region for 5 years.

Northwest wind	11 %
North	6 %
Northeast wind	5 %
East wind	8 %
Southeast wind	30 %
Southern wind	15 %
Southwest wind	7 %
The western wind	15 %
Calm	3 %

Draw a wind rose. Indicate optimal location for oil refineries.

HYGIENIC ASSESSMENT OF THE IMPACT OF ACCOMMODATION CONDITIONS ON HUMAN HEALTH. RESEARCH METHODS AND HYGIENIC ASSESSMENT OF NATURAL AND ARTIFICIAL LIGHTING IN ENCLOSED SPACES

Date_____

Learning objectives:

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

THEORETICAL SECTION

Fill the table

Effects of separate components of solar radiation on organism. Spectral distribution and biological activity of solar radiation

Kind of radiation	Wave length	Biological affect
Infrared		
Visual		
Ultraviolet:		
Range A		
Range B		
Range C		

Give a definition

Coefficient of natural light — _____

_____

_____

Light coefficient — _____

_____

_____

Depth coefficient — _____

_____

_____

Classification of types of lighting

Types of lighting:

1. _____
    a. _____
    b. _____
    c. _____
2. _____
    a. _____
    b. _____
    c. _____
3. _____

Requirements for artificial lighting:

1._____
2._____
3._____
4. _____
5. _____
6. _____
7. _____
8. _____

Fill the table

Characteristics of artificial lighting sources

	Incandescent lamps	**Fluorescent lamps**
Advantages		
Disadvantages		

PRACTICAL WORK

Hygienic estimation of natural lighting

The geometrical method

1. Determination of the light coefficient (LC)

LC (light coefficient) = $S_w \times n : S_f$

S_w — glazed area of 1 window; n — number of the windows; S_f — floor area

Standard (normal) values = _____

_____

Actual value = _____

Conclusion: _____

_____

2. Determination of the depth coefficient (DC)

DC (depth coefficient) = D/h

D — room depth; h — the height of the upper edge of the window from the floor

Standard (normal) values = _____

_____

Actual value = _____

Conclusion: _____

_____

3. Determination of the light and aperture angles (α, β)

Standard (normal) values = _____

_____

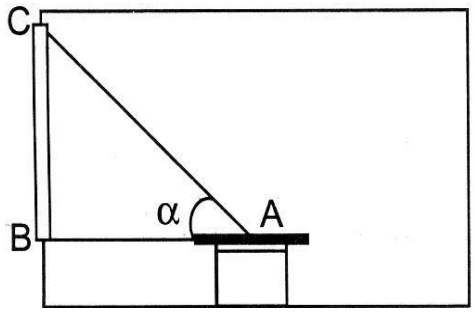


Fig. 1. Light angle
AB — is the distance from the working place to the lower line of the window; BC — is the height of the window; BC/AB — tg of angle α. Using the table, transform the tg into the angle value

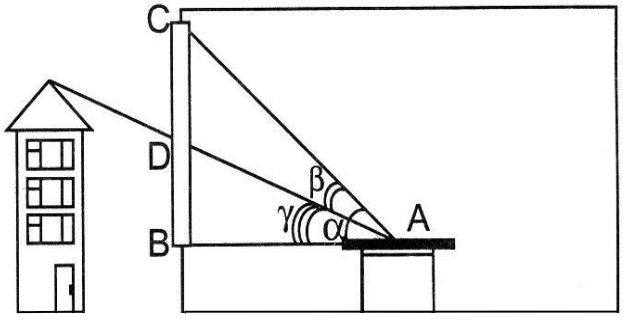


Fig. 2. Aperture angle
BD — distance between the line on the window glass from the opposite subject and the lower line of window; BD/AB — is tg of angle γ; Using the table, transform the tg into the angle value angle of opening β= angle α – angle γ

Actual value = _____

Conclusion: _____

_____

The technical lighting method

Device for measurement _____

Determination of the coefficient of natural light (CNL)

CNL (coefficient of natural light) = $E_1/E_2 \times 100$ %

E_1 — percentage of light exposure of a point indoors; E_2 — light exposure of the external point taking place (outdoor illuminance)

Standard (normal) values = _____

_____

Actual value = _____

Conclusion: _____

_____

Hygienic assessment of artificial illumination by the «Watts» method

the kind of sources of artificial lighting in the room _____

the number of sources of artificial lighting in the room _____

the power of one lamp _____

the area of the floor in the class-room _____

the length of the floor _____

the width of the floor _____

$$E = P \times Et / 10 \times K$$

K = 1,3 (reserve coefficient for residential and public premises); P = power of one lamp × number of lamps in the room / S_f; Et = for luminescent lamps = 150 lux; for incandescence lamps — in table «Size of the minimum horizontal light (lux) at specific capacity 10 W/m^2»

Actual values = _____

Conclusion: _____

_____

PROBLEMS SOLVING

Example. On a workplace in a university laboratory illumination was 360 lux. External lighting outdoor was 16300 lux. What is the coefficient of natural lighting? Compare the result with the hygienic standard.

CNL (coefficient of natural light) = $E_1/E_2 \times 100$ % = 360/16300 × 100 % = 2.2 %

Conclusion: During the hygienic assessment of the natural lighting, it was found that the coefficient of natural light less the norm (actual = 2.2 %, normal = ≥ 2.5 %).

Example. Depth of the living room — 7 m, length — 7 m, height — 3 m. The room has two windows, their height is 2.3 m above the floor, a glazed area of each of them 2.7 m^2. Calculate the coefficient of light, coefficient of depth. Compare the result with the hygienic standard.

LC = Sw:Sf = 2.7 × 2 : 7 × 7 = 5.4 : 49 = 1 : 9

DC = Depth of the room/height of windows above the floor = 7/2.3 = 3

Conclusion: During the hygienic assessment of the natural lighting, it was found that the light coefficient is optimal (actual = 1 : 9, optimal = 1 : 8 – 1 : 10), coefficient of depth not normal (actual = 3, optimal = ≤ 2.5).

***Example*.** Room in a hostel area of 24.4 m^2 illuminated by 3 incandescent lamps of 150 watts each, light — direct. Calculate the value of illumination in lux. Compare the result with the hygienic standard.

Et = 46 lux (from the table «Size of the minimum horizontal light (lux) at specific capacity 10 W/m^2»)

P = power of one lamp × number of lamps / S_f = 150 × 3 / 24.4 = 18.44 W/m^2

E = P × Et / 10 × K = 18.44 × 46 / 10 × 1.3 = 848.24 / 13 = 65 lux

Conclusion: During the hygienic assessment of the artificial illumination, it was found that the artificial illumination is sufficient (actual = 65 lux, optimal = 50 lux and more).

***Example*.** Reading hall area of 150 m^2 illuminated by 35 luminescent lamps of 45 watts each. Calculate the value of illumination in lux. Compare the result with the hygienic standard.

Et = 150 lux (constant)

P = power of one lamp × number of lamps / S_f = 45 × 35 / 150 = 10.5 W/m^2

E = P × Et / 10 × K = 10.5 × 150 / 10 × 1.3 = 121.2 lux

Conclusion: During the hygienic assessment of the artificial illumination, it was found that the artificial illumination is insufficient (actual = 121.2 lux, optimal = 400 lux and more).

Tasks. 1. Depth of the living room — 5.5 m, length — 3.5 m, height — 3.2 m. The room has two windows, their height is 2.8 m above the floor, a glazed area of each of them 2.6 m^2. Internal natural lighting is 360 lux, lighting outdoor — 15300 lux.

Calculate the coefficient of natural light, the light coefficient, coefficient of depth. Compare the result with the hygienic standard.

2. Area of room in a hostel is 13 m^2, illuminated by 2 incandescent lamps of 75 watts each, light — reflected. Calculate the value of artificial light using the method of «Watt», compare it with the hygienic standards for the living room.

3. Reading hall area of 150 m^2 illuminated by 26 luminescent lamps of 40 watts each. Calculate the value of illumination in lux, compare it with the hygienic standard.

TRAINING TEST

1. Coefficient of natural light

a. CNL = $E_1 / E_2 \times 100$ %;
c. LC = S_w:S_f;
e. tg β = $h_2 / L_1 + L_2$.
b. E = 150 P/13;
d. E = P × Et /10 × K;

2. The light coefficient is:

a. the ratio of illumination in the open air to illumination indoors;
b. the ratio of light angle to aperture angle;
c. the ratio of the area of windows to the floor area;
d. the ratio of window area to tangent of aperture angle.

3. Compared to incandescent lamps, fluorescent lamps have several advantages:

a. are characterized by low brightness;
b. create diffused light that does not give harsh shadows;
c. do not have a glare;
d. the appearance of monotonous noise during operation.

4. Types of lighting:

a. domestic;
c. natural;
b. climatic;
d. artificial.

5. Identify the range of ultraviolet radiation which promotes formation of vitamin D (in nanometers):

a. 265–315; c. 200–280; e. 280–320.
b. 280–310; d. 315–400;

KEY QUESTIONS

1. Significance of solar radiation, the spectral structure of solar light.
2. Concept of solar starvation, reasons, manifestations and prevention.
3. Physiological effect of various components of a solar spectrum.
4. Hygienic requirements to natural lighting, factors which influence the natural lighting.
5. The natural lighting determination methods.
6. Hygienic requirements to artificial lighting.
7. Sources of artificial lighting and their hygienic characteristics.
8. Systems of artificial lighting.
9. Methods of measurement of artificial lighting.

Notes and problems solving

Student's signature_____ **Teacher's signature**_____

HYGIENIC ASSESSMENT OF THE IMPACT OF ACCOMMODATION CONDITIONS ON HUMAN HEALTH. NATURAL AND ARTIFICIAL VENTILATION, TYPES AND THEIR HYGIENIC CHARACTERISTICS. VENTILATION EFFICIENCY ASSESSMENT

Date_____

Learning objectives:

1. To learn the role and hygienic value of the ventilation.
2. Studying types of ventilation their characteristics.
3. Studying indicators of the effectiveness of ventilation of premises.
4. To learn the research methods and hygienic assessment of carbon dioxide concentration.
5. To learn the hygienic assessment of ventilation indicators.

THEORETICAL SECTION

Give a definition

Ventilation — _____

_____

_____

Effects of Air Pollution:

1._____
2._____
3._____
4. _____
5. _____
6._____
7._____

Role of air in human health:

1._____
2._____
3._____
4. _____
5. _____

Fill the table

Sources of atmospheric air pollution

Outdoor Air Pollution	Indoor Air Pollution

Give a definition

Maximum permissible concentration (MPC) — _____

_____

_____

Ventilation volume — _____

_____

_____

Frequency rate of air exchange in 1 hour — _____

_____

_____

Types of ventilation:

1. _____

   a. _____

   b. _____

   c. _____

   _____

   _____

2. _____

   a. _____

   b. _____

   c. _____

Advantages of mechanical ventilation are:

1. _____

_____

2. _____

_____

3. _____

_____

4. _____

_____

5. _____

_____

PRACTICAL WORK

Calculating necessary ventilation volume and necessary frequency rate of air exchange in 1 hour

1. L_n (necessary ventilation volume) = $\frac{C*n}{P_1-P_2}$

C — volume of CO_2, expired by one person per hour, 22.6 l/h; n — number of people indoors; P_1 — CO_2 maximum admissible concentration in pro mil (1.0‰ = 0.1 %); P_2 — CO_2 concentration in the atmospheric air in pro mil (0.4‰ = 0.04 %)

Actual value = _____

2. K_n (necessary frequency rate of air exchange in 1 hour) = L_n / V
V — indoor cubage (cubature), m^3

Actual value = _____

PROBLEMS SOLVING

Problem solving algorithm:

1. L_n (necessary ventilation volume) = $\frac{C \times n}{P_1 - P_2}$

2. K_n (necessary frequency rate of air exchange in 1 hour) = L_n / V

3. L_a (actual ventilation volume) =

a) $L_a = \frac{C*n}{P-P_2}$

P — CO_2 actual concentration in a premise in pro mil

b) L_a = A × B × C = S × v × t

A (S) — ventilation apertures area (window leaf), m^2; B (v) — speed of the air movement through ventilating aperture, m/sec; C (t) — time of aeration, sec

4. K_a (actual frequency rate of air exchange in 1 hour) = L_a / V

5. Compare necessary and actual values, make a conclusion

Example. During the sanitary and hygienic examination of the air in the postoperative ward of the surgical department (indoor cubage 69.7 m^3), where 4 patients are located, the CO_2 content was 0.12 %. Determine the necessary and actual volume of ventilation and the rate of air exchange.

Determine the required ventilation volume and air exchange rate:
1. L necessary (L_n) = (C × n) / (P_1 – P_2) = (22.6 × 4) / (1 – 0.4) = 150.67 m^3
2. K necessary (K_n) = L_n / V = 150.6 / 69.7 = 2.16

Determine the actual ventilation volume and the rate of air exchange:
3. L actual (L_a) = (C × n) / (P – P_2) = (22.6 × 4) / (1.2 – 0.4) = 113 m^3
4. K actual = L_a /V = 113 / 69.7 = 1.62

Conclusion: the actual ventilation volume (113 m^3) is significantly lower than the required ventilation volume (150.67 m^3), the actual frequency of air exchange (1.62 times) is significantly lower than the required one (2.16 times), which indicates the ineffectiveness of ventilation in the examined ward. It is necessary to increase the ventilation time.

Example. In a room with an indoor cubage of 60 m^3, where there are 3 people, ventilation takes place due to a window, which is opened for 10 minutes every hour. The air velocity in the ventilation opening is 1 m/s, the window area is 0.15 m^2. Calculate the ventilation volume, frequency rate of air exchange in 1 hour. Compare the result with the hygienic standard.

Determine the required ventilation volume and air exchange rate:

1. L necessary (L_n) = (C × n) / (P_1 – P_2) = (22.6 × 3) / (1 – 0.4) = 113 m^3
2. K necessary (K_n) = L_n / V = 113 / 60 = 1.88

Determine the actual ventilation volume and the rate of air exchange:

3. L actual (L_a) = S × v × t = 0,15 × 1 × 600 = 90 m^3
4. K actual = L_a/V = 90/60 = 1.5

Conclusion: the actual ventilation volume (90 m^3) is significantly lower than the required ventilation volume (113 m^3), the actual frequency of air exchange (1.5 times) is significantly lower than the required one (1.88 times), which indicates the ineffectiveness of ventilation in the examined ward. It is necessary to increase the ventilation time.

Tasks. 1. Calculate the ventilation volume, frequency rate of air exchange in 1 hour for the living room of 4.5 × 5.5 × 3.0 m, which is home to 4 people. The concentration of CO_2 in the moment of research was 0.13%. Compare the result with the hygienic standard. Make a hygienic assessment of the effectiveness of ventilation and air exchange rate.

2. There are 3 people in the room of 3.5 × 2.5 × 3 m. Ventilation of the room is realized by opening the window for 10 minutes every hour. Area of the window opening — 0.5 × 0.3 m^2, air speed — 1.05 m/s. Calculate the ventilation volume, frequency rate of air exchange in 1 hour. Compare the result with the hygienic standard. Make a hygienic assessment of the effectiveness of ventilation and air exchange rate.

TRAINING TEST

1. Indoor pollutants include:

a. ozone;
b. tobacco smoke;
c. radon;
d. chlorides;
e. chemicals, released from household cleaners.

2. Air quality in living rooms and public buildings assessed by content:

a. ozone;
b. argon;
c. carbon dioxide;
d. nitrogen;
e. oxygen.

3. Natural ventilation depends on:

a. effects of differences of temperature;
b. diffusion of gases;
c. perflation and aspiration;
d. diffusion of metals;
e. water diffusion.

4. Systems of ventilation:

a. artificial;
b. accidental;
c. chemical;
d. natural;
e. permanent.

KEY QUESTIONS

1. Indoor air environment.
2. Sources of air pollution of residential and public premises.
3. Indicators of indoor air cleanliness.
4. Ventilation, its hygienic value.
5. Types of ventilation and their characteristics.
6. Indicators of the effectiveness of ventilation of premises.
7. Sources of air pollution and hygienic requirements for ventilation in the premises of healthcare organizations. Criteria for the cleanliness of the air of the premises of healthcare organizations.

8. The role of ventilation in the prevention of nosocomial infection.

9. Hygienic requirements for the organization of air exchange in the ward. Ventilation and aeration mode.

Notes and problems solving

Student's signature_____ **Teacher's signature**_____

HYGIENIC ASSESSMENT OF THE IMPACT OF ACCOMMODATION CONDITIONS ON HUMAN HEALTH. FINAL CLASS

CONTROL QUESTIONS

1. Natural lighting of dwellings: hygienic significance, criteria and evaluation methods.
2. Significance of solar radiation, the spectral structure of solar light. Physiological effect of various components of a solar spectrum: UV, visible beams, IR–rays
3. Concept of solar starvation, reasons, manifestations and prevention.
4. Hygienic requirements to natural lighting. Factors which influence the natural lighting. Determination methods
5. Prevention of the vision disorders.
6. Artificial lighting: hygienic significance, research methods.
7. Comparative hygienic assessment of various sources of artificial lighting.
8. Indoor air environment.
9. Sources of air pollution of residential and public premises.
10. Indicators of indoor air cleanliness.
11. Ventilation, its hygienic value.
12. Types of ventilation and their characteristics. Indicators of the effectiveness of ventilation of premises.
13. Sources of air pollution and hygienic requirements for ventilation in the premises of healthcare organizations. Criteria for the cleanliness of the air of the premises of healthcare organizations.
14. The role of ventilation in the prevention of nosocomial infection.
15. Hygienic requirements for the organization of air exchange in the ward. Ventilation and aeration mode.

EXAMPLES OF CONTROL CASE TASKS

1. On a workplace in a university laboratory illumination was 320 lux. External lighting outdoor was 15200 lux. What is the coefficient of natural lighting? Compare the result with the hygienic standard.
2. Depth of the room — 6 m, length — 5 m, height — 3 m. The room has two windows, their height is 2.5 m above the floor, a glazed area of each of them 2.5 m^2. Calculate the coefficient of light, coefficient of depth. Compare the result with the hygienic standard.
3. Center of workplace is 3 m from the window. The height of the upper edge of the glazing windows from the horizontal plane workplace 1.5 m. 7.5 m from the window there is a nearby building that rises above 5 m from the horizontal plane. Calculate the light angle on the workplace and the angle of the aperture (with picture). Compare the result with the hygienic standard.
4. Room in a hostel area of 10.3 m^2 illuminated by 2 incandescent lamps of 100 watts each, light — direct. Calculate the value of illumination in lux. Compare the result with the hygienic standard.
5. Reading hall area of 195 m^2 illuminated by 40 luminescent lamps of 50 watt each. Calculate the value of illumination in lux. Compare the result with the hygienic standard.
6. Calculate the actual and necessary number of air for the living room of 4.2 × 4.1 × 2.7 m, which is home to 4 people. The concentration of CO_2 in the moment of research was 0,18 %. Calculate the ventilation volume, frequency rate of air exchange in 1 hour. Compare the result with the hygienic standard.
7. In the lab with 4.9 × 5.7 × 3.2 m work 5 people. Dimensions of ventilation openings 0.15 × 0.4 m, air speed 1.3 m/s. Duration of ventilation is 10 minutes. Calculate the ventilation volume, frequency rate of air exchange in 1 hour. Compare the result with the hygienic standard.

HYGIENIC ASSESSMENT OF DRINKING WATER QUALITY. RESEARCH METHODS AND HYGIENIC ASSESSMENT OF PHYSICAL, ORGANOLEPTIC AND CHEMICAL INDICATORS OF WATER QUALITY

Date_____

Learning objectives:

1. To learn methods of research and hygienic assessment of the physical and organoleptic characteristics.
2. To learn methods of research and hygienic assessment of the content of substances in water, indifferent and have a positive physiological significance (carbonates, bicarbonates, calcium, magnesium).
3. To learn methods of research and hygienic assessment of chemical indicators of organic pollution of water (ammonia nitrogen, nitrite, oxidation).
4. To learn water treatment methods: clarification (coagulation and filtration), disinfection (physical methods: boiling, water treatment with UV, ultrasound; chemical methods: chlorination, ozonation).
5. To analyze advantages and disadvantages of different methods of water disinfection.

THEORETICAL SECTION

Fill the tables

Compare the sources of drinking water

Criteria	Surface water	Ground water

Communicable diseases associated with water

Group	Disease	Pathogene	Source
Waterborne diseases			
Waterwashed diseases			
Water-based diseases			
Water-related diseases			
Waterdispersed diseases			

Give a definition

Hardness — _____

_____

_____

Oxidability — _____

_____

_____

Residual chlorine — _____

_____

_____

Fill the table

Compare the water supply systems

Individual system	Central system

PRACTICAL WORK

Determination physical and organoleptic properties of water.

Determination of chromaticity of water

100 ml of filtered test water is poured into the cylinder, then look down into the cylinder on a white background and select a cylinder on a standard scale, the color of the solution in which corresponds to the color of the test water (Table 1).

Table 1

Standard scale for chromaticity definition

Cylinder number	1	2	3	4	5	6	7	8	9	10
Chromaticity degrees	0	5	10	15	20	25	30	40	50	60

The result:_____

Conclusion:_____

Determination of water transparency

The test water is well shaken and poured into a cylinder. A slide is placed under the cylinder, on which the Snellen font is pasted. Then gradually release the water through the tap, find the maximum height of the column of water through which it is possible to read the text of the font. This height of the remaining column of water, indicated in cm, will express the degree of transparency.

The result:_____

Conclusion:_____

Chemical analysis of water

Qualitative determination of ammonia salts with approximate quantitative assessment (express method)

Reagents:

1. Nessler reagent.
2. Potassium-sodium tartrate (Ferrotic salt), 50 % solution.

Technique of determination: 10 ml of the test water is poured into a test tube with a diameter of 13–14 mm, 0.2–0.3 ml of potassium-sodium tartrate and 0.2 ml of Nessler reagent are added. After 10–15 minutes, an approximate determination is carried out according to Table 2.

Table 2

Approximate content of ammonia and ammonium ions

Color		Ammonia and ammonium ions, mg/L
on the side	above	
without color	without color	< 0.05
without color	very pale yellowish	0.1
very pale yellowish	pale yellowish	0.3
pale yellowish	yellowish	0.5
yellowish	light yellow	1.0
light yellow	yellow	2.5
yellow	dark-yellow	5
dark-yellow	brown, muddy	10

The result:_____

Conclusion:_____

Qualitative determination of nitrite nitrogen with approximate quantitative assessment (express method)

Reagents: Griss reagent.

Technique of determination: 10 ml of test water is poured into a test tube with a diameter of 13–14 mm, 1 ml of 10 % Griss reagent is added and heated to 50–60 °C in a hot water. After 10 min, the resulting color is compared with the scale of visual determination (Table 3). For the development of color without heating, samples are left for 15–20 min at room temperature.

Table 3

Approximate content of nitrites

Color		Nitrites, mg/L
on the side	**above**	
without color	without color	<0,003
without color	very pale pink	0,003
very pale pink	pale pink	0,007
pale pink	very light pink	0,013
very light pink	light pink	0,05
light pink	pink	0,1
pink	intensive pink	0,2
intensive pink	red	0,5
intensive pink	dark red	1,0

The result:_____

Conclusion:_____

Determination of water hardness

Reagents:

1. Ammonia-buffer solution.
2. 0.1n. trilon B solution.
3. Indicator: Eriochrome black T.

Technique of determination: 100 ml of pre-filtered test water is poured into the flask, 5 ml of ammonia-buffer solution and 6 drops of the eriochrome black indicator are added, then slowly titrated with 0.1 n. trilon B solution until the wine-red color turns blue.

The hardness of the analyzed water in milligram equivalents will be equal to the number of milliliters of 0.1 n. solution of trilon B, which went to titration of 100 ml of water.

The result:_____

Conclusion:_____

Determination of temporary water hardness

Reagents:

1. 0,1 n. hydrochloric acid solution.
2. Indicator: methylorange.

Technique of determination: 100 ml of the test water is poured into the flask, 2 drops of methylorange are added and titrated from the burette with 0,1 n. hydrochloric acid solution until the yellow color changes to a weak pink; for better capture of the transition of one color to another, a flask with the same water and 2 drops of methylorange in it is placed next to it. The amount of milliliters of 0.1 n. hydrochloric acid solution used for titration of 100 ml of water corresponds to the hardness of water in milligram equivalents.

The result:_____

Conclusion:_____

Determination of the oxidability of water with Mor salt

Reagents:

1. 0.01 n. solution of potassium permanganate ($KMnO_4$).
2. 0.01 n. solution of Mor salt.
3. 25 % solution of sulfuric acid (H_2SO_4).

Technique of determination: Pour 100 ml of tested water into the flask, add 5 ml of 25 % H_2SO_4 solution and pour 10 ml of 0.01 n. $KMnO_4$ solution. Wait for 15 minutes. Then add 10 ml of 0.01 n. solution of Mor salt to the sample. The discolored solution should be titrated with potassium permanganate until a weak pink staining appears, the consumption of 0.01 n. $KMnO_4$ (A_1) solution is recorded. This consumption of permanganate indicates the amount of titrant, which is necessary for the oxidation of organic substances in 100 ml of water.

For the final calculation, it is necessary to set the correction factor (K) $KMnO_4$. Pour into the same flask 10 ml 0.01 n of the solution of the salt of Mor and again titrate 0.01 n. with a solution of $KMnO_4$ until a pale pink color appears, the consumption of 0.01 n is recorded solution $KMnO_4$ (A_2).

The calculation is made according to the formula:

$X = ((A_1 + A_2) — 10) \times 0,8 \times К$

The result:_____

Conclusion:_____

KEY QUESTIONS

1. Physiological, hygienic and epidemiological importance of water.
2. Diseases related to water.
3. Sources of drinking water.
4. Sources of water pollution.
5. Water supply systems.
6. Requirements to drinking water.

Notes and problems solving

Student's signature_____ **Teacher's signature_____**

HYGIENIC ASSESSMENT OF DRINKING WATER QUALITY. METHODS FOR IMPROVING WATER QUALITY

Date_____

Learning objectives:

1. To learn water treatment methods: clarification (coagulation and filtration), disinfection (physical methods: boiling, water treatment with UV, ultrasound; chemical methods: chlorination, ozonation).

2. To analyze advantages and disadvantages of different methods of water disinfection.

THEORETICAL SECTION

Fill the table

Classification of water treatment methods

Basic		**Special**
Clarification and decolouration		
Disinfection		
Chemical	Physical	

Give a definition

Sedimentation — _____

_____

_____

Coagulation — _____

_____

_____

Advantages and disadvantages of different methods of water disinfection

Method	**Chlorination**	**Ozonation**	**UV-disinfection**
Advantages			

End of the table

Method	Chlorination	Ozonation	UV-disinfection
Disadvantages			

PRACTICAL WORK

Determination of the amount of aluminum sulfate required for water coagulation

Reagents:

1. 12 % sodium bisulfate solution.
2. Indicator: 1 % alcohol solution of methylroth.
3. Solution of $Al_2 (SO_4)_3 \times 18\ H_2O$.

Technique of determination: When water is coagulated with aluminum sulfate, the temporary water hardness is determined first of all. To do this, 100 ml of water is poured into a glass or flask, 2 drops of 1 % alcohol solution of methylroth are added. The water turns yellowish. It is titrated drop by drop 12 % sodium bisulfate solution before pink staining, the number of drops of sodium bisulfate used for titration indicates the temporary hardness of water in degrees.

Having determined the disposable hardness, they proceed to experimental coagulation of water with a solution of $Al_2 (SO_4)_3 \times 18\ H_2O$ in three glasses. 200 ml of test water is poured into these glasses.

X drops of coagulant are added to the first glass; X — 4 drops are added to the second glass; X — 8 drops are added to the third glass and thoroughly mixed.

The choice of the number X (drops) depends on the temporary water hardness and is carried out according to table:

Temporary water hardness	4°	5°	6°	7°	8°	9°	10°	11°	12°
X (the amount of drops)	8	12	16	20	24	28	32	36	40

For example, the temporary hardness is 8°, then 24 drops of coagulant are added to the first glass, 20 drops to the second glass, and 16 drops to the third. At the time of application of the coagulant, the water is mixed for 1 min. Then they are monitored for 10-15 minutes. Choose a glass in which coagulation goes best (large flakes are formed earlier, quickly settling to the bottom). If coagulation is the same in all glasses, then choose the one where the least amount of coagulant is introduced. Based on the selected glass, the required amount is calculated coagulant per 1 liter of water. Suppose we chose the first glass, where 24 drops of aluminum sulfate solution were added. If 24 drops of coagulant are needed for 0.2 liters of water, then 120 drops or 4.8 ml per 1 liter.

The result:_____

Conclusion:_____

Determination of the amount of bleach required for chlorination

Technique of determination: To determine the required dose of chlorine during chlorination, a trial chlorination of water is carried out. Field test conditions chlorination is carried out in three cups in each of which is poured 200 ml of the investigated water, put the glass sticks and using calibrated pipettes (25 drops equal 1 ml) add a 1 % chlorine solution: in the first — 1 drop in the second drop 2, the third 3 drops. The water in the glasses is mixed well and after 30 minutes the presence of residual chlorine in it is determined. To do this, 2 ml of a 5 % solution is added to each glass potassium iodide, 2 ml of hydrochloric acid (1: 5), 1 ml of 1 % starch solution and mix thoroughly. In the presence of residual chlorine, the water turns blue, the more intense the more residual chlorine it contains. The water in the glasses where the blue staining appeared is titrated drop by drop with a 0.7 % solution of sodium thiosulfate before discoloration, stirring it after adding each drop.

To calculate the dose, choose the glass where the discoloration occurred from 2 drops of sodium thiosulfate, because the content of the residual chlorine in this glass is 0.4 mg / l (1 drop of 0.7 % sodium thiosulfate solution binds 0.04 mg of chlorine, which, when converted to 1 liter, corresponds to $0.04 \times 5 = 0.2$ mg / l). If the discoloration occurred from a single drop, the residual chlorine content is not enough — 0.2 mg/ l; with discoloration from 3 drops, the residual chlorine content is excessive — 0.6 mg / l. Depending on the results of the trial chlorination, the amount of bleach required for chlorination of 1 liter of water is calculated.

The result:_____

Conclusion:_____

PROBLEMS SOLVING

Task: In urban settlement water supply based on the use of artesian water. Well depth 185 m water disinfection system recently is not functioning. Analysis of water from the tap:

- chromaticity, degrees — 20, a yellowish color;
- transparency cm — 23;
- smell, points — 4, moldy;
- taste, points — 3, astringent;
- ammonia nitrogen, mg/l — 1.3;
- nitrite nitrogen, mg/l — 0;
- nitrate nitrogen, mg/l — 22;
- sulphates, mg/l — 36;
- chlorides, mg/l — 58;
- iron, mg/l — 26;
- total hardness, mEq/L — 12;
- oxidability, mg O_2 /l — 6;
- the total bacterial count in 1 ml — 300;
- total coliform bacteria per 100 ml — 80.

1. Specify normative value for each of parameter. Evaluate each parameter has according to the standard value.
2. Make a written report on the suitability of water for drinking purposes.
3. What methods are used for improving the quality of drinking water?

TRAINING TEST

1. The uses and applications for water include the following:

a. drinking and food preparation purposes;
b. personal hygiene activities including bathing and laundering;
c. resurban irrigation and street cleaning.

2. The main sources of drinking water are:

_____ and _____.

3. Correlate the options:

1. surface water _____ 2. ground water _____

a. more sanitary;
b. less exposed to pollution;
c. more contaminated;
d usually clean;
e. has low mineralization.

4. Nature of water pollution:

a. accidental; d. diffuse;
b. agricultural; e. chemical;
c. microbiological; f. permanent.

5. Waterborne diseases are:

a. leishnmaniasis; c. hepatitis A; e. trachoma;
b. typhus; d. salmonellosis; f. typhoid.

6. Water-washed diseases are:

a. scabies; c. typhus; e. leishnmaniasis;
b. chicken pox; d. trachoma; f. hepatitis A.

7. Water-based diseases are:

a. COVID-19;
b. hepatitis D;
c. dracunculiasis.

8. Water-related diseases are:

a. malaria; c. gangrene;
b. syphilis; d. trypanosomiasis.

9. Methemoglobinemia related to _____in drinking water.

10. Hardness of water may be:

a. temporary; d. seasonal;
b. biological; e. physical;
c. permanent; f. natural.

11. Guidelines for bacteriological water quality are based on:

a. Samonella typhi; c. Escherichia coli;
b. Ascaris lumbricoides; d. Hepatitis A virus

12. Correlate the options:

1. Temporary hardness a. shortage in drinking water causes the endemic goiter.
2. Fluoride b. are toxic substances causing acute and chronic poisoning.
3. Iodine c. may be diminished by boiling water.
4. Heavy metals d. have been linked to ‘blue-baby’ syndrome.
5. Nitrates e. excess may lead to dental or skeletal fluorosis.

Answer: _____

13. Name types of water supplies and systems:

1)_____; 2) _____

and then correlate the options:

a. public system; d. easy to control;
b. private system; e. higher risk of infections in a case of accident;
c. mostly not controlled; f. epidemiological risk of disease is lower.

14. Basic methods of quality water improving:

a. clarification; c. fluoridation; e. chemical;
b. degassing; d. bacterial; f. organic.

15. Removal of coarse grained suspended particles is _____.

16. Removal of Fe by their oxidation and transformation to insoluble compounds is called _____.

17. For drinking water disinfection are used:

a. ozone; c. chlorine substances; e. ionizing radiation;
b. heavy metals; d. ultrasound; f. aluminum.

18. Organoleptic parameters of water:

a. smell; c. colifags; e. general coliformed bacteria;
b. ammonia; d. chlorine; f. chromaticity.

19. Chemical parameters of water:

a. chromaticity; d. nitric acids salts;
b. chlorides; e. thermotolerant coliformed bacteria;
c. taste f. general microbic number.

20. Microbiological parameters of water:

a. smell; c. oxidability; e. colifags;
b. salts of ammonia; d. transparency; f. general coliformed bacteria

KEY QUESTIONS

1. Classification of methods to improve water quality (water treatment).
2. Methods of clarification and decolouration.
3. Classification of methods of disinfection of water.
4. Advantages and disadvantages of different methods of water disinfection.

Notes and problems solving

Student's signature_____ **Teacher's signature_____**

HEALTHCARE ORGANIZATIONS AND THEIR ROLE IN MEDICAL CARE OF THE POPULATION. HYGIENIC ASSESSMENT OF THE LAYOUT OF HEALTHCARE ORGANIZATIONS (USING THE EXAMPLE OF A MASTER PLAN FOR A HEALTHCARE ORGANIZATION)

Date_____

Learning objectives:

1. To learn requirements for the planning, construction and operation of healthcare organizations.
2. To learn hygienic requirements for the territory allocated for the construction of a healthcare organization.
3. To learn hygienic assessment of the general plan of the healthcare organization.

THEORETICAL SECTION

Fill the table

Types of hospital building construction

Type	Characteristics

Zones of territory of modern hospital:

1. _____
2. _____
3. _____

Hygienic requirements to hospital ground area choice:

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____
8. _____

KEY QUESTIONS

1. Hygienic requirements for the planning, construction and operation of healthcare organizations.
2. Ambulatory polyclinic organizations, their role in providing medical care to the population.
3. Hygienic requirements for the territory allocated for the construction of a healthcare organization: choice of location, size, zoning of the territory, landscaping.
4. Hygienic assessment of the general plan of the healthcare organization.

Notes and problems solving

Student's signature_____ **Teacher's signature**_____

HEALTHCARE ORGANIZATIONS AND THEIR ROLE IN MEDICAL CARE OF THE POPULATION. HYGIENIC ASSESSMENT OF THE INTERNAL LAYOUT OF A HEALTHCARE ORGANIZATIONS. HYGIENIC REQUIREMENTS FOR THE DESIGN AND EQUIPMENT OF THE WARD SECTION OF HEALTHCARE ORGANIZATIONS

Date_____

Learning objectives:

1. To learn requirements for the internal layout of a healthcare organization.
2. To learn requirements for the device and equipment of the ward section of the healthcare organization department.
3. To learn hygienic aspects of the prevention of infections associated with the provision of medical care.

THEORETICAL SECTION

Structural divisions of hospital:

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____

Give a definition

Ward section — _____

_____

_____

Disinfection — _____

_____

_____

Disinsection — _____

_____

_____

Deratization — _____

_____

_____

Nosocomial infections — _____

_____

_____

The structure of hospital section includes the following rooms:

1. _____
2. _____
3. _____
4. _____

Fill the tables

Main routes of transmission of nosocomial infections

Route	Description

Prevention of nosocomial infections

Nonspecific	
Specific	

KEY QUESTIONS

1. Sanitary and anti-epidemic measures in the healthcare organizations.
2. Organization and implementation of disinfection in healthcare organizations.
3. Hygienic aspects of the prevention of infections associated with the provision of medical care.
4. Hygienic assessment of the internal layout of a healthcare organization.
5. Hygienic requirements for the device and equipment of the ward section of the healthcare organization department.
6. Sanitary and epidemiological requirements for the treatment of medical waste.

Notes and problems solving

Student's signature_____ **Teacher's signature**_____

SANITARY AND HYGIENIC REQUIREMENTS FOR CATERING UNITS AND BUFFETS IN MEDICAL DEPARTMENTS OF HEALTHCARE ORGANIZATIONS

Date_____

Learning objectives:

1. To learn sanitary and hygienic requirements for catering units in healthcare organizations.
2. To learn hygienic requirements for buffets in healthcare organizations.
3. To learn basics of assessment of the sanitary and hygienic condition of the catering department and buffets in healthcare organizations.

THEORETICAL SECTION

Hygienic requirements for catering units:

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KEY QUESTIONS

1. Sanitary and hygienic requirements for catering units in healthcare organizations.
2. Hygienic requirements for buffets (area, availability of technological equipment, required set of utensils, number of seats for patients).
3. Assessment of the sanitary and hygienic condition of the catering department and buffets in healthcare organizations.
4. Hygienic assessment of the actual nutrition of patients in healthcare organizations based on the results of the analysis of the menu layout.

Student's signature_____ **Teacher's signature_____**

HYGIENIC REQUIREMENTS FOR MICROCLIMATE, ILLUMINATION AND VENTILATION OF PREMISES IN HEALTHCARE ORGANIZATIONS: OPERATING ROOMS, WARDS, CLINICAL LABORATORIES, HOSPITAL PHARMACY, UTILITY ROOMS, DIAGNOSTIC ROOMS

Date_____

Learning objectives:

1. To learn hygienic requirements for microclimate parameters in healthcare organizations.
2. To learn hygienic requirements for lighting in premises in healthcare organizations.
3. To learn hygienic requirements for the gas composition of air and ventilation of premises in healthcare organizations.

THEORETICAL SECTION

Hygienic requirements for microclimate, lighting, ventilation in healthcare organizations:

KEY QUESTIONS

1. Hygienic requirements for microclimate parameters in healthcare organizations.
2. Hygienic requirements for lighting in premises in healthcare organizations.
3. Hygienic requirements for the gas composition of air and ventilation of premises in healthcare organizations.

TRAINING TEST

1. Hygienic requirements to hospital ground area choice:

a. territory should be swamped and flooded by rivers, lakes, rain, melt waters;
b. territory should be placed in the settle zone of the city;
c. the area should be dry, on sandy or sabulous pure, safe soil;
d. far from sources of noise and environmental contamination, railways, airports, high-speed highways;
e. sanitary-protective zone should be 50-1000 m.

2. The proper level of subsoil waters is:

a. 1.0 m from surface of soil;
b. 1.5 m from surface of soil;
c. 2.0 m from surface of soil;
d. not less than 0.5 m from foundation base;
e. not less than 1.3 m from foundation base.

3. Territory zones of a modern hospital are:

a. industrial buildings;
b. medical buildings;
c. not medical buildings;
d. residential;
e. landscape gardening.

4. Requirements to the hospital site:

a. area of green plantings should be 60 % or more;
b. landscape gardening zone should be 25 m^2 per 1 bed;
c. building area should be 15 % or less of total area;

d. green plantings strip should be 15 m width into the perimeter of a hospital area;
e. distance between medical building should be 24 m or more.

5. Systems of hospital build-up are:

a. combined; c. separate; e. mixed.
b. centralized; d. decentralized;

6. Centralized system of hospital build-up:

a. all medical, medical-diagnostic and auxiliary departments of hospital are united in one building or in blocked building;
b different units are placed in separate buildings;
c. basic somatic departments are placed in main medical building;
d. infectious, maternity, children's, polyclinic, pathoanatomical departments and administrative unit are placed in separate buildings.

7. Mixed system of hospital build-up:

a. all medical, medical-diagnostic and auxiliary departments of hospital are united in one building or in blocked building;
b. different units are placed in separate buildings;
c. basic somatic departments are placed in main medical building;
d. infectious, maternity, children's, polyclinic, pathoanatomical departments and administrative unit are placed in separate buildings.

8. Benefits of decentralized build-up system:

a. all departments are well isolated;
b. prevention of hospital-acquired infection;
c. optimum conditions for medical-protective regimen;
d. lengthening of all communications;
e. duplication of some premises and equipment.

9. Structural divisions of a hospital are:

a. reception; d. production department;
b. ward units; e. polyclinic.
c. medical-diagnostic unit;

10. Medical-diagnostic unit of hospital is:

a. surgery block; d. anesthesiology;
b. department of regenerative treatment; e. X-ray department.
c. department of functional diagnostics;

11. Zones of surgery block are:

a. sterile; c. zone of limited mode;
b. zone of strict mode; d. zone of general hospital regimen;
e. infected zone.

12. A zone of strict mode of surgery block includes the following premises:

a. surgery room; c. wardrobe of personnel;
b. preoperative; d. equipment room;
e. postoperative wards with post of duty medical sister.

13. A zone of limited mode of surgery block includes the following premises:

a. preoperative; d. premises of surgeons and anesthesiologists;
b. premises for diagnostic researches; e. gypsum room.
c. sterilizing;

Student's signature_____ **Teacher's signature_____**

HYGIENIC REQUIREMENTS FOR THE CONDITIONS OF ACCOMMODATION OF PATIENTS AND WORKERS IN HEALTHCARE ORGANIZATIONS. FINAL CLASS

CONTROL QUESTIONS

1. Microclimate indicators (temperature, humidity, air speed) in the main premises of healthcare organizations: operating rooms, maternity rooms, blood transfusion departments, endoscopy rooms, somatic/infectious diseases wards and boxes, prenatal wards, postpartum wards, postpartum wards with the combined stay of mothers and newborn children , wards for newborn children, intensive care wards and others, as well as in diagnostic rooms (fluoroscopy, computed tomography, magnetic resonance imaging, ultrasound diagnostics, endoscopy) and in clinical laboratories.

2. Hygienic requirements for lighting in premises of healthcare organizations. Hygienic assessment of artificial lighting (general and local) and lighting equipment in healthcare organizations.

3. Artificial lighting. Color (spectrophotometric) temperature. Comparative assessment of the color temperature of artificial lighting sources in the outdoor environment (incandescent, halogen, fluorescent, LED) with the daylight spectrum. Hygienic and technical characteristics of light sources in terms of radiation spectrum, luminous flux, illumination, economic efficiency, service life, safety, environmental friendliness, disposal features. Advantages and disadvantages of individual sources of artificial lighting.

4. Hygienic requirements for shadowless lamps and ergonomics of their placement in operating rooms. Providing a shadow-free effect with polygonal reflectors.

5. Hygienic requirements for the disposal of artificial lighting sources used in healthcare organizations.

6. Gas composition (O_2, CO_2, N_2 content) of atmospheric, exhaled and alveolar air. Hypoxia. Hypercapnia. Carbon dioxide as an indirect indicator of the purity of the gas composition of indoor air. The volume of CO_2 emitted by a person.

7. The frequency of air exchange (volume of supplied and removed air) in individual rooms of the healthcare organizations: operating rooms, wards (somatic, intensive care, infectious diseases), clinical laboratories, hospital pharmacy, utility rooms (collection and temporary storage rooms for medical waste, used linen, disinfectants, etc.), diagnostic rooms (fluoroscopy, magnetic resonance imaging, computed tomography, ultrasound diagnostics, endoscopy, etc.).

8. Ventilation systems in healthcare organizations. Natural ventilation and artificial ventilation. Laminar and turbulent air flows. A system for purifying air supplied to premises operating on the "clean room" principle. Ultrafine air purification filters (HEPA filters). Hygienic requirements for suspended ceilings in operating rooms and other rooms operating on the "clean room" principle. Features of air supply and removal in operating rooms, intensive care wards, and wards with sanitary facilities. Local air exhaust. Indications for recirculation and air conditioning in healthcare organizations. Photocatalytic filters.

9. The main air pollutants in the environment of healthcare organizations are: biological (bacteria, viruses, etc.), chemical (medicines, etc.), mechanical (dust, etc.). Air disinfection in healthcare organizations with ultraviolet rays. The design of bactericidal lamps and the principle of operation. Ozone and ozone-free bactericidal lamps and indications for their placement. Hygienic requirements for caring for bactericidal lamps. Procedure for disposal of bactericidal lamps. Safety requirements when using ozone bactericidal lamps for air disinfection in healthcare organizations.

10. Hygienic assessment of the effectiveness of ventilation (general and local) in healthcare organizations.

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HYGIENIC REQUIREMENTS FOR PERSONAL HYGIENE OF HEALTHCARE WORKERS AND PATIENTS

Date_____

Learning objectives:

1. To learn hygienic aspects of the prevention of infections associated with the provision of medical care.
2. To learn basics of hygienic treatment and disinfection of hands of healthcare workers and patients.
3. To learn basics of organization of washing and disinfection of clothing of healthcare workers.

THEORETICAL SECTION

Hygienic requirements for personal hygiene of healthcare workers and patients:

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KEY QUESTIONS

1. Sanitary and anti-epidemic measures.
2. Organization and implementation of disinfection in healthcare organizations.
3. Hygienic aspects of the prevention of infections associated with the provision of medical care.
4. Hygienic treatment and disinfection of hands of healthcare workers and patients.
5. Hygienic requirements for sterile and everyday sanitary clothing for workers in healthcare organizations.
6. Organization of washing and disinfection of clothing of healthcare workers.
7. Hygienic requirements for hospital bed linen, underwear and footwear of patients.

Student's signature_____ **Teacher's signature_____**

HYGIENIC REQUIREMENTS FOR THE MANAGEMENT OF MEDICAL WASTE IN HEALTHCARE ORGANIZATIONS. FINAL CLASS ON TOPICS OF 3 SEMESTER

Date_____

Learning objectives:

1. To learn classification and types of medical waste.
2. To learn methods of disposal of medical waste.
3. To learn hygienic, epidemiological and environmental significance of medical waste.

THEORETICAL SECTION

Give a definition

Medical waste —_____

_____

_____

Types of waste:

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____

The major sources of healthcare waste are:

_____

_____

_____

_____

_____

_____

KEY QUESTIONS

1. Hygienic, epidemiological and environmental significance of medical waste.
2. Classification and types of medical waste: safe, epidemiologically hazardous, extremely epidemiologically hazardous, toxic, radioactive.
3. Methods of disposal of medical waste: chemical, thermochemical, incineration, pyrolysis and others.
4. Disposal of mercury-containing waste: amalgiation, thermal demercurization, mechanical-chemical method.
5. Methods of destruction and disposal of pharmaceutical waste: incineration, electrochemical destruction.
6. Disposal of radioactive medical waste: self-decontamination, incineration, pressing, cementing.

Student's signature_____ **Teacher's signature_____**

HYGIENIC ASSESSMENT OF ENERGY VALUE AND NUTRITIONAL ADEQUACY OF THE DIET. CRITERIA FOR RATIONING THE HUMAN BODY'S NEEDS FOR NUTRITION, PHYSIOLOGICAL REQUIREMENTS FOR THE NUTRITION OF THE POPULATION. METHODS FOR DETERMINING THE HUMAN BODY'S NEEDS FOR ENERGY AND NUTRIENTS

Date_____

Learning objectives:

1. Studying methods of determining the daily energy consumption and the needs for basic nutrients in accordance with the physiological norms of nutrition.

2. Studying the theoretical concepts of quantitative and qualitative characteristics of rational nutrition.

THEORETICAL SECTION

Foods are classified according to their functions under the following heads:

1. _____

2. _____

3. _____

Give a definition

Total energy expenditure (TEE) — _____

_____

_____

_____

Basal metabolic rate (BMR) — _____

_____

_____

_____

Physical activity level (PAL) — _____

_____

_____

_____

Methods for determining energy expenditure:

1. _____

2. _____

3. _____

4. _____

Fill the table

Rational or adequately nutrition

Macronutrients	Functions	Food sources
Proteins		
Fats		
Carbohydrates		

Laws of rational (adequate) nutrition:

1. _____
2. _____
3. _____
4. _____
5. _____

Protein requirement is ____ g/Mcal (____ % animal origin), fat requirement is ____ g /Mcal (____ % plant origin), carbohydrates requirement is ____ g /Mcal.

PRACTICAL WORK

Calculation of individual daily total energy expenditure using physical activity level

1. Find the value of basal metabolic rate (BMR) in the table «Basal metabolic rate (BMR, kcal/day)».
2. Calculate value of BMR per 1 h. (BMR/h) = BMR/24
3. Calculate the duration of the various activities (sleep, study or work, housework, passive rest) per day
4. Calculate your energy expenses for each type of activity using the physical activity level (PAL, table «Physical activity levels for various types of activities»).

The results of calculations should be made into the table:

$$TEE = EE_{sleep} + EE_{study/work} + EE_{high\ active\ time} + EE_{low\ active\ time}$$

$$E_1 = BMR/h \times Spending\ time_1 \times PAL_1$$

BMR = _____; BMR/h = _____.

Activity	Time, h	BMR/h, kcal/hour	PAL	Energy expenditure, kcal
1. Sleep and rest in bed				
2. Studying (working)				
3. High activity time (dancing, washing, ironing etc.)				
4. Low activity time (reading, watching TV, etc.)				
Total	**24 h**			

Calculation of individual physiological needs in basic nutrients and biologically active substances

Using the calculated TEE and the tables «The balanced Megacalorie» and «Norms of physiological requirement for nutrients and energy for men and women», fill in the Recommended column in the protocol on the pages 61–62.

PROBLEMS SOLVING

***Example*.** Calculate total energy expenditure of the student (male, age — 22, 70 kg; studies 8 hours, sleeping — 8 hours, social activity — 4 hours, resting — 4 hours).

1. BMR = 1750 kcal/day
2. BMR/h = 1750/24 = 73 kcal/hour
3. TEE = 584 + 818 + 876 + 438 = 2716 kcal

Activity	Time, h	PAL	BMR/h, kcal/hour	Energy expenditure, kcal
1. Sleep and rest in bed	8	1	73	8 × 1 × 73 = 584
2. Studying	8	1.4	73	8 × 1.4 × 73 = 818
3. High activity time	4	3	73	4 × 3 × 73 = 876
4. Low activity time	4	1.5	73	4 × 1.5 × 73 = 438
Total	**24 h**			2716 kcal

***Example*.** The total energy expenditure of the teacher is 1920 kcal. Calculate proteins, fats and carbohydrates physiological requirements by using the balanced Megacalorie.

1. 1920 kcal = 1.92 Mcal
2. Proteins requirement = 1.92 × 30 g/Mcal = 57.6 g
3. Animal origin proteins requirement = 57.6 × 0.6 = 34.6 g
4. Fats requirement = 1.92 × 33 g/Mcal = 63.4 g
5. Plant origin fats requirement = 63.4 × 0.3 = 19 g
6. Carbohydrates requirement = 1.92 × 145 g/Mcal = 278.4 g

Task. Calculate total energy expenditure for teacher (male, 45 y.o., 75 kg; sleeps 8 hours, works 8 hours, low activity is 5 hours, high activity is 3 hours) using physical activity levels. Also find proteins, fats and carbohydrates physiological requirements by using balanced Megacalorie.

KEY QUESTIONS

1. Rational (adequate) nutrition. The laws of rational (adequate) nutrition.
2. Methods for determination of energy expenditure.
3. The law of nutrient (plastic) adequacy of nutrition. Formula of balanced diet.
4. The proteins and their role in human nutrition. Foods that are the main sources of complete protein.
5. Fats and their role in human nutrition. Foods that are major sources of fats.
6. Carbohydrates and their role in human nutrition. Foods that are major sources of carbohydrates.

Notes and problems solving

Student's signature_____ **Teacher's signature_____**

HYGIENIC ASSESSMENT OF THE ENERGY VALUE AND NUTRITIONAL ADEQUACY OF THE DIET. CALCULATION OF THE ACTUAL NUTRIENT INTAKE AND ENERGY VALUE OF THE DIET ACCORDING TO THE 24-HOUR RE-CALL METHOD

Date_____

Learning objectives:

1. Studying methods of determining the actual nutrient intake and energy value of the diet.
2. Studying the theoretical concepts of quantitative and qualitative characteristics of rational nutrition.

THEORETICAL SECTION

The methods are most commonly used to assess food intake:

1. _____
2. _____
3. _____
4. _____

Protein provides _____ calories/g, fat provides _____ calories/g, carbohydrates provide _____ calories/g (inscribe the correct numbers).

PRACTICAL WORK

Case study «24-hours dietary re-call»

Estimate the actual nutrients intake using the 24-hours dietary re-call method. Fill out the table on page 58–59 and calculate the actual intake of nutrients. Put the result in the Actual column in the protocol on the pages 61–62.

PROBLEMS SOLVING

Task. Student (age — 22, body weight — 76 kg; studying for 7 hours, sleeping — 8 hours, social activity — 5 hours, resting — 4 hours) intakes 74 g of proteins, 87 g of fats and 319 g of carbohydrates. Calculate total energy intake and compare it with the total energy expenditure.

KEY QUESTIONS

1. Rational (adequate) nutrition. The laws (principles) of rational (adequate) nutrition.
2. Methods of determining the actual consumption of nutrients and energy.

Case study «24-hours dietary re-call»

Food consumption data:

Food	Amount, g	Intake									
		protein, g	fat, g	carbs, g	Ca	Fe	Mg	Vitamin C	Vitamin A	Vitamin D	Energy
Breakfast											
Lunch											
Dinner											

End of the table

Food	Amount, g	Intake									
		protein, g	fat, g	carbs, g	Ca	Fe	Mg	Vitamin C	Vitamin A	Vitamin D	Energy
Dinner											
Additionally ×											
Snacks											
Total											

× Brunch/afternoon snack

Student's signature_____ **Teacher's signature**_____

Notes and problems solving

HYGIENIC ASSESSMENT OF THE ENERGY VALUE AND NUTRITIONAL ADEQUACY OF THE DIET. ASSESSMENT OF THE ADEQUACY OF ACTUAL DIET TO THE NEEDS OF THE HUMAN BODY, RECOMMENDATIONS FOR RATIONALIZING NUTRITION

Date_____

Learning objectives:

1. Studying methods of hygienic assessment of the energy value and nutritional adequacy of the diet.
2. Studying methods of rationalizations nutrition.

PRACTICAL WORK

Hygienic assessment of the adequacy of actual nutrition

№	Indicators	Unit	Recommended	Actual	Deviation	
					Lack	Excess
1.	Energy value	kcal				
2.	Proteins,	g				
	animal origin proteins	g				
3.	Fats,	g				
	Plant origin fats	g				
4.	Carbohydrates	g				
5.	Minerals:	mg				
	Ca					
	Fe					
	Mg					
6.	Vitamins:	mg				
	C					
	A					
	D					
7.	Calorific value by:	%				
	Proteins		12			
	Fats		30			
	Carbohydrates		58			
8.	Ratio (by mass) Proteins:Fats:Carbs	g	1:1.2:4.6			

End of the table

№	Indicators	Unit	Recommended		Actual	Deviation	
						Lack	Excess
9.	Calorific value by:	%	*4 meals a day*	*3 meals a day*			
	breakfast		25	30			
	lunch		35	40 – 45			
	afternoon snack		15	–			
	dinner		25	25 – 30			

Conclusion: _____
_____
_____
_____
_____

Recommendations for rationalizing nutrition: — _____
_____
_____
_____
_____
_____
_____
_____
_____

PROBLEMS SOLVING

Task. Nurse (female, 45 y. o., 60 kg) sleeps 8 hours, works 8 hours, has 4 hours of low activity and 4 hours of high activity per day. Intake of nutrients is 75 g of proteins, 100 g of fats and 350 g of carbohydrates.

Calculate her total energy expenditure, requirements for macronutrients, actual energy intake. Compare her actual energy intake and total energy expenditure, actual intake of nutrients and requirements.

Make a conclusion about her diet. Is it rational? How to improve her diet?

TRAINING TEST

1. Energy body use for ingestion and digestion of food, and for the absorption, transport, interconversion, oxidation and deposition of nutrients is called:

a. basal metabolism;
b. growth;
c. dietary-induced thermogenesis;
d. physical activity level.

2. The metabolic response to food increases total energy expenditure by:

a. about 78 % of the BMR over a 24-hour period in individuals with a mixed diet;
b. about 10 % of the BMR over a 24-hour period in individuals with a mixed diet;
c. about 1 % of the BMR over a 24-hour period in individuals with a mixed diet;
d. about 50 % of the BMR over a 24-hour period in individuals with a mixed diet.

3. According to the law of the energetic adequacy of nutrition:

a. food must be cooked in accordance to the digestive system enzymic abilities;
b. the dietary intake food calorific value must correspond to the organism energy consumption;
c. food must not be toxic and must be harmless in epidemiological aspect;
d. food intake hours must correspond to the organism biological rhythms.

4. According to the law of nutrient (plastic) adequacy of nutrition:

a. food must be cooked in accordance to the digestive system enzymic abilities;
b. food must not contain the etiological agents of infectious foodborne diseases;
c. food intake hours must correspond to the organism biological rhythms;
d. all nutrients must be contained in optimal quantities and ratios.

5. Principles of rational diet:

a. the last food intake must be not less than 2–2.5 hours before sleeping;
b. adults must have 3–4 meals a day;
c. intervals between food intakes must be less than 5 hours;
d. intervals between food intakes must be more than 5 hours in day time;
e. adults must have 2–3 meals a day.

6. The group of energy-yielding foods include:

a. foods rich in protein;
b. foods rich in carbohydrate and fat;
c. foods rich in vitamins, minerals.

7. Classification of types of nutrition includes:

a. intuitive nutrition;
b. preventive nutrition;
c. rational nutrition;
d. clinical nutrition.

8. Sources of unsaturated fats are:

a. meat products, meat pies, sausages;
b. oily fish;
c. cakes and biscuits;
d. nuts and seeds.

9. According to the formula of balanced nutrition for adults:

a. the ratio between proteins, fats, carbohydrates is 1 : 1 : 2;
b. the ratio between proteins, fats, carbohydrates is 1 : 1.1–1.2 : 4.6;
c. the ratio between proteins, fats, carbohydrates is 1 : 4 : 9.

10. The amount of energy used for basal metabolism in a period of time is called _____

_____

11. According to the law of biotic adequate nutrition:

a. the dietary intake food calorific value must correspond to the organism energy consumption
b. food must not be toxic and must be harmless in epidemiological aspect
c. food must be cooked in accordance to the digestive system enzymic abilities
d. food intake hours must correspond to the organism biological rhythms

12. The main sourses of proteins are:

a. fruits;
b. vegetables;
c. fish;
d. seeds;
e. milk;
f. meat;
g. eggs

13. Carbohydrate requirements:

a. 4 g/Mcal;
b. 33 g/Mcal;
c. 1 g/kg body weight
d. 145 g/Mcal;
e. 4 kcal/1 g.

KEY QUESTIONS

1. The law of nutrient (plastic) adequacy of nutrition. Classification of nutrients. Formula of balanced diet.

2. Methods for determination of energy expenditure and methods of determining the actual consumption of nutrient energy.

3. Classification of nutrients. Formula of balanced diet.

4. The impact of nutrition on health. Preventive and therapeutic role of nutrition.

5. Hygienic assessment of adequacy of dietary requirements of an organism, the development of recommendations for optimizing nutrition.

Notes and problems solving

Student's signature_____ **Teacher's signature_____**

HYGIENIC ASSESSMENT OF NUTRITIONAL STATUS.
RECOMMENDATIONS FOR OPTIMIZING NUTRITIONAL STATUS

Date_____

Learning objectives:
1. Nutritional status definition, stages of nutritional status assessment.
2. Classification of nutritional status.
3. Criteria and methods of nutritional status assessment.

THEORETICAL SECTION

Give a definition

Nutritional status is _____

_____

_____

Nutritional status classification

<table>
<tr><td rowspan="4">1. _____</td><td rowspan="2">1. _____</td><td>1. _____</td><td>1. _____</td></tr>
<tr><td>2. _____</td><td>2. _____</td></tr>
<tr><td rowspan="2">2. _____</td><td rowspan="2">3. _____</td><td>3. _____</td></tr>
<tr><td>4. _____</td></tr>
</table>

Stages of nutritional status assessment are

1. _____

2. _____

3. _____

Methods of nutritional status assessment

Nutrition	1._____ 2._____ 3._____ 4._____ 5._____
Somatotype	1._____

Physical development, functional and adaptive reserves of the body	1._____ 2._____ 3._____
Protein, mineral, vitamin metabolism	1._____ 2._____ 3._____
Immunologicalresistance of skin and mucous membranes	1._____ 2._____

PRACTICAL WORK

Methods of assessment the state of health that has developed under the influence of actual nutrition

(Put the result in the protocol on the page 70)

Assessment of somatoscopic indicators of physical development

Somatoscopic characteristics of the main types of body constitution

Type of constitution	Chest shape	Epigastric angle	Leg shape[1]	Belly shape	Skeleton development (points)[2]	Muscles development (points)[3]	Body fat (points)[4]
Asthenoid	Flattened	< 90°	O-shape	Sunken	1	1	1
Thoracic	Cylindrical	90° < 90°	X, H, O-shaped	Straight	1–2	1–2	1–2
Muscular	Cylindrical and conic	90° > 90°	X, H, O-shaped	Straight	2–3	2–3	1–2
Digestive	Conic	> 90^0	X-shaped	Bulging	2–3	1–2	2–3

Notes:

[1] Leg shape:

O-shaped legs (genu varum), when standing with closed heels and spread toes, there is a distance between the inner edges of the knee joints, the legs are arched as if; the axis of the lower leg with the axis of the thigh forms an angle open inwards;

H-shaped legs — a straight position in which the axes of the thighs and shins are parallel, the legs are straight.

X-shaped legs (genu valgum) — the knees are shifted, the axes of the lower legs diverge, the axis of the thigh with the axis of the lower leg form an angle open to the outside.

[2]Development of skeleton: the massiveness of the skeleton should be noted, based on the relief and size in the area of large joints (elbow, knee, wrist). There are three grades: thin (1 point), medium (2 points), and massive (3 points).

[3] Muscles development:

When evaluating musculature, it is necessary to take into account the entire musculature as a whole, and not just one segment. Evaluation of musculature is carried out in two directions: quantitative development of the muscle layer, qualitative state of the musculature (tone, elasticity).

There are three degrees of muscle development: small (1 point), medium (2 points), and large (3 points). Determination of muscle tone is established by probing the muscles in a relaxed and tense state: weak tone (1 point), medium (2 points), good (3 points). It is quite enough to give a

general assessment of the musculature, taking into account both its quantitative development and the degree of elasticity (tone).

[4]Body fat deposition — development of subcutaneous adipose tissue. There are three degrees of development of fat deposition: small (1 point) — the bone relief (shoulder girdle, shoulder blades, ribs) clearly protrudes; medium (2 points) — the bone relief is not clearly expressed; large (3 points) - smoothed bone relief, rounded contours.

Conclusion: Type of constitution is _____

Assessment of somatometric indicators of physical development

Somatometric indicators of physical development is determined using generally accepted methods for measuring body weight and length, the circumference of the chest in pause, on inhalation and exhalation (chest excursion).

1. Standing **height**:

The subject stands straight, hands at the seams, heels together, toes apart. The patient touches the height meter rack with his heels, buttocks and the interscapular area. The head should be in such a position that the line mentally drawn from the upper edge of the tragus of the ear to the lower edge of the eye socket is horizontal.

2. **Body weight** measurement using medical scales: weighing is performed on an empty stomach, without clothes and shoes. The subject is standing in the middle of the weighing platform.

3. Measuring the **chest circumference** with a centimeter measuring tape. Chest circumference is measured at rest, maximum inhalation and maximum exhalation. The tape is applied from behind at the lower corners of the shoulder blades, in front along the edge of the periarticular circle (in men), in women — along the IV rib.

Body mass index

Body mass index (BMI) = weight / (height)², (kg/m²).

Normal value of BMI is mentioned in the table.

Category	BMI (kg/m^2)
Underweight (Severe thinness)	< 16,0
Underweight (Moderate thinness)	16,0–16,9
Underweight (Mild thinness)	17,0–18,4
Normal range	18,5–24,9
Overweight (Pre-obese)	25,0–29,9
Obese (Class I)	30,0–34,9
Obese (Class II)	35,0–39,9
Obese (Class III)	≥ 40,0

Assessment of body composition

Measuring the thickness of the skin-fat fold using a transparent ruler or caliper at three points.

1. On the abdominal wall in the iliac region along the parasternal line (5 cm from the navel).
2. Along the mid-axial line at the level of the breast nipple.
3. At the angle of the shoulder blade.

At the same time, in the first 2 points, the skin with subcutaneous fat is captured by the fingers in the horizontal direction, at the angle of the shoulder blade — in the vertical. The measured thickness of the fat fold is divided by 2.

Actual value (average at three points) = _____

Body surface area (BSA) = 134 × BW + 52.6 × BH

BW — body weight, kg; BH — standing height, cm.
Actual value (body surface area) = _____

Body fat weight (BFW) = SF × BSA × 0.0632

SF — is the average thickness of the skin-fat fold at three points, mm; BSA — is the surface area of the body, cm^2; 0,0632 — is an empirical coefficient.
Actual value (body fat weight) = _____

Body fat content (BFC) = (BFW / BW) × 100 %
BFW — is the amount of body fat, g; BW — is the body weight, g.
Actual value (body fat content) = _____

The amount of lean body weight (LBW) = BW — BFW
BW — is the body weight, g; BFW — is the amount of body fat content, g.
Actual value (lean body weight) = _____

ACE body fat % norms		
Description	**Women**	**Men**
Essential Fat	10–13 %	2–5 %
Athletes	14–20 %	6–13 %
Fitness	21–24 %	14–17 %
Average	25–31 %	18–24 %
Obese	32 % +	25 %+

Assessment of phisiometric indicators of physical development

Phisiometric indicators of physical development is determined using generally accepted methods for measuring the muscular strength of the hands (by dynamometry) and the vital capacity of the lungs (by spirometry).

Measuring the muscular strength of the hands with a manual dynamometer

It is necessary to squeeze the dynamometer as much as possible with the hand extended and withdrawn to the side. Take into account the maximum result.

Strength index = (Muscle strength of the right hand (kg) / body weight (kg)) × 100 %
Normally strength index for male is 70–75 %, for females 35–40 %.

Measurement of the vital capacity of the lungs using a spirometer

The patient takes a maximum breath, holding his breath, tightly wrap his mouth around the mouthpiece and exhale all the air into the tube. The maximum indicator of 2–3 measurements is taken into account.

Vital index

Vital index = lung vital capacity (ml) / body weight (kg)
Normally vital index for male is > 60 ml/kg, for females is > 50 mg/kg.

Cardio-respiratory index (CRI)

Cardio-respiratory index (CRI) = heart rate / breathing rate

At rest, the CRI is close to 4–5 and shows the consistency of the respiratory and cardiovascular systems and their interdependence. The sharp increase in the CRI indicates cardiovascular system stress, while its decrease indicates the initial signs of decompensation in the respiratory system.

Test Ghencea. Index of resistance to hypoxia

Test Ghencea with arbitrary breath holding (breath holding on exhalation) gives an indication of the reserves of oxygen for metabolic needs of the body.

At rest, the pulse is counted for 30 sec. The patient makes 3 deep breaths, then inhale — exhale and holds his breath, holding nose with his fingers. Delay time breathing recorded stopwatch. After the resumption of breathing count pulse for 30 sec.

Assessment is based on the index of resistance to hypoxia (IRH) with the breath-holding time.

$$\textbf{Index of resistance to hypoxia (IRH)} = \frac{\text{heart rate for 30 seconds after holding your breath}}{\text{time breath holding}}$$

$$= \text{————————} =$$

Duration breath-holding time is evaluated by a four-point system: excellent condition — more than 50 sec; good — 30–50 sec; average — 20–29 sec; poor — less than 20 sec.

Normally IRH less or equal to 1 (it is less than the higher resistance to hypoxia).

Assessment of functional parameters of nutritional status. Index of physical status

The development of physical condition can be evaluated on an index of physical status (IPS).

$$\textbf{IPS} = \frac{(700 - 3 * \text{heart rate} - 0{,}8333 * \text{SBP} - 1{,}6667 * \text{DBP} - 2{,}7 * \text{Age} + 0{,}28 * \text{BW})}{(350 - 2.6 * \text{Age} + 0{,}21 * \text{BH})} =$$

$$\textbf{IPS} = \frac{(700 - 3 * \_\_\_ - 0{,}8333 * \_\_\_\_\_ - 1{,}6667 * \_\_\_\_ - 2{,}7 * \_\_\_ + 0{,}28 * \_\_\_\_)}{(350 - 2.6 * \_\_\_ + 0{,}21 * \_\_\_\_\_)}$$

where, IPS — index of physical condition; heart rate — pulse rate, beats/min; Age — calendar age, years; SBP — systolic blood pressure, mmHg; DBP — diastolic blood pressure, mmHg; BW — body weight, kg; BH — body height, cm.

IPS assessed taking into account received numerical grades for the following levels: low — less than 0,375; below average — 0,375–0,525; average — 0,526–0,675; above average — 0,676–0,825; high from — 0,826 or more.

Adaptive reserves. Adaptation potential.

In order to assess the level of an integrated health and detect possible violations of adaptation is calculated integral measure of the adaptation reserves of the circulatory system — adaptation potential.

$$\text{AP} = 0{,}011 * \text{heart rate} + 0{,}014 * \text{SBP} + 0{,}008 * \text{DBP} + 0{,}009 * \text{BW} -$$

$$- 0{,}009 * \text{BH} + 0{,}014 * \text{Age} - 0{,}27 =$$

$$= 0{,}011 * \_\_\_\_ + 0{,}014 * \_\_\_\_\_ + 0{,}008 * \_\_\_\_\_ + 0{,}009 * \_\_\_\_\_ -$$

$$- 0{,}009 * \_\_\_\_\_ + 0{,}014 * \_\_\_\_\_ - 0{,}27 = \quad ,$$

where, AP — adaptation potential; heart rate — pulse rate, beats / min; Age — calendar age, years; SBP — systolic blood pressure, mmHg; DBP — diastolic blood pressure, mmHg; BW — body weight, kg; BH — body height, cm.

Assessment of the results: satisfactory adaptation: 2.20 or less — for young men; 1.96 or less — for young women; stress adaptation: 2.21–2.43 — for young men; 1,97–2,23 — for young women; poor adaptation and failure of adaptation: 2.44 or more — for young men; 2.24 or more — for young women.

Nutritional status assessment protocol

Sign	Indicator	Physiological norm	Actual value	Deviation
Body composition	Body weight, kg			
	Body height, cm			
	Body mass index, kg/m²	18,5–25,0		
	Body fat, %	M F		
Functional parameters	Index of physical state, units	Above 0,526		
	Strength index, %	M 70–75 F 35–40		
	Lungs vital capacity, ml	According nomogramm		
	Vital index, ml/kg	M > 60; F > 50		
	Cardio-respiratory index, units	4–5		
	Duration of breath-holding, sec	30 and more		
	Index of resistance to hypoxia	≤ 1		
Adaptation parameters	Adaptation potential, units	≤ 2,6		
	Morbidity (number of acute respiratory infection case within previous year)	Less than 4 cases in a year		

Conclusion _____

Type of nutritional status _____

_____

Recommendations for optimizing nutritional status _____

_____

_____

_____

_____

_____

Note: for the stabilization of body weight in the case of excess or lack is necessary to increase (reduce) the energy value of the daily diet of the calculated value. Weight gain of 1 kg correspond to excess consumption of food calories 6800 kcal. Therefore, the correction of the daily diet for a month will be 6800 kcal/30 day = 227 kcal/day.

TRAINING TEST

1. Correlate nutritional status and definition the number and the letter):

1. The optimal (ideal) status;
2. The normal (usual) nutritional status;
3. The insufficient status;

a) characterized by strong health and wide range of adaptive reserves;

b) charactarised by narrow range of adaptive reserves, decreased working capacity and health condition;

c) characterized by absence of functional and structural changes and adequate range of adaptive reserves.

Answer: _____

2. Normal value of BMI is:

a. 18.5–29.9; b. 19.5–25; c. 18.5–24.9; d. 22–30.

3. For the characteristics of physical development, functional and adaptive reserves of the body can be assessed using the following methods:

a. physiometric; b. somatometric; c. biochemical; d. physiological.

4. Organize chronologically the steps of nutritional status assessment from the beginning:

_____. correction of nutritional status;
_____. assessment of actual nutrition and identifying limiting factors in the diet;
_____. health assessment related to nutrition;
_____. definition of a type of nutritional status.

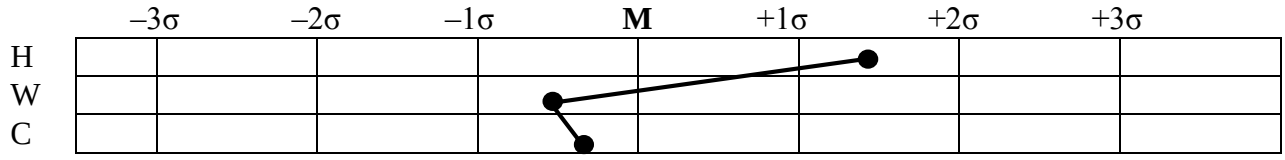
PROBLEMS SOLVING

Example. During assessing the nutritional status studied physical development of 1nd year students. The obtained data were compared with individual arithmetic surveyed group (female, 17 years, time of working, sleeping, social activity 8 hours each):

Sign	Individual data (a)	M	σ	Difference between individual data and M (a-M)	Sigma deviation (a-M)/σ
Height	165	162	±2,1	+3	+3/2.1 = +1.43
Weight	61	62	±1,8	–1	–1/1.8 = –0.56
Chest circumference	83	84	±2,0	–1	–1/2.0 = –0.5

Draw a profile of physical development of student and assess it.

Profile of physical development



Height — above average, weight — above average, chest circumference — average, disproportional physical development.

Task. During assessing the nutritional status studied physical development of students. The obtained data were compared with individual arithmetic surveyed group (male, 20 years, time of working, sleeping, social activity 8 hours each).

Sign	Individual data (a)	M	σ	Difference between individual data and M (a-M)	Sigma deviation (a-M)/σ
Height	181	176	±2.3		
Weight	72	74	±2.1		
Chest circumference	94	93	±2.4		

Draw a profile of physical development of student and assess it.

KEY QUESTIONS

1. Nutritional status definition, stages of nutritional status assessment.
2. Classification of nutritional status.
3. Criteria and methods of nutritional status assessment.
4. Characteristic of the common and optimal (ideal) nutrition status.
5. Alimentary diseases: definition of the concept, causes, classification.
6. Insufficient nutrition status. Hypotrophy, alimentary dystrophy and dwarfism: clinical symptoms, prevention.
7. Diseases of protein-energy malnutrition: classification, diagnosis, clinic, prevention.
8. Excess nutrition status. Obesity: causes, classification, diagnosis, prevention.
9. Protein excess nutrition syndrome: causes of development, manifestations, prevention.

Notes and problems solving

Student's signature_____ **Teacher's signature_____**

HYGIENIC ASSESSMENT OF NUTRITIONAL STATUS AND PROVISION OF THE HUMAN BODY WITH VITAMINS. RECOMMENDATIONS FOR OPTIMIZING THE VITAMIN SUPPLY OF THE HUMAN BODY

Date_____

Learning objectives:

1. Classification and physiological significance of vitamins in the organism.
2. To master the methods of detection and assessment of the vitamin sufficiency in the organism and the methods and measures of hypo- and avitaminosis prevention.
3. The most frequently occuring hypovitaminosis states in cases of both individual and collective nutrition. Their causes.
4. Avitaminosis and their clinical characteristics.
5. Hygienic principles of prophylaxis of hypovitaminosis and avitaminosis.
6. Detecting the hypo- and avitaminosis in cases of both individual and collective nutrition.
7. Organizing the hypovitaminosis prevention measures and assess their effectiveness.
8. Revealing the deficit of vitamins in the human organism by determining of the quantity of vitamin C in urine and to estimate the results.

THEORETICAL SECTION

Give a definition

Vitamins — _____

_____

_____

_____

Fill the table **Classification of Vitamins**

Vitamins

Types of Vitamin Status of Organism

By level of vitamin supply of organism the following are distinguished:

Avitaminosis —_____

_____

_____

Hypovitaminosis — _____

_____

_____

Normal supply — _____

_____

Hypervitaminosis — _____

_____

_____

Fill the table

Vitamin	**Sources**	**Functions of Vitamin**	**Symptoms of Vitamin Deficiency**	**Daily Requirement of Vitamin**
vitamin A				
vitamin D				
vitamin E				
vitamin K				
vitamin B_1				
vitamin B_2				
vitamin B_3				
vitamin B_5				
vitamin B_6				

End of the table

Vitamin	Sources	Functions of Vitamin	Symptoms of Vitamin Deficiency	Daily Requirement of Vitamin :
vitamin B_7				
vitamin B_9				
vitamin B_{12}				
vitamin C				

Methods of diagnostics of vitamin status are as follows:

The study of dietary vitamin and actual consumption of vitamins from food	The study of the vitamin status of the organism.

PROBLEMS SOLVING

***Example*.** The daily diet of patient contains 180 g of cabbage. The content of vitamin C in cabbage is 50 mg per 100 g. During cooking average vitamin C losses is 60 %. There is a decrease of skin capillary resistance. Excretion of ascorbic acid in the urine was 0.3 mg/h.

1. amount of ascorbic acid intake (excluding losses):

50 mg % – 100g

X mg % – 180g,

X = 180 × 50/100 = 90 mg %

2. actual intake (taking into account cooking loss of vitamin C):

90 mg – 100 %

Y mg – 40 %

$Y = 40 \times 90/100 = 36$ mg / day

3. estimate the amount of vitamin C that is excreted in the urine:

You must remember that with sufficient intake of vitamin C, its excretion in the urine is 0.7-1.0 mg / day.

In this task, excretion of ascorbic acid in the urine was 0.3 mg/day — indicating a lack of vitamin C

4. clinical manifestations must be evaluated:

In this task, a decrease of skin capillary resistance indicating a lack of vitamin C

Conclusion: insufficient amount of vitamin + nutritional recommendations (it is necessary to list the products — sources of vitamin C)

Tasks. 1. Patient complained a feeling of weakness and pain in the legs, leg fatigue when walking. In an interview with the patient have been revealed significant errors in its food: high daily consumption of confectionery products, regular use in nutrition of wheat bread flour, cream of wheat and porridge cooked from polished rice. During palpation found pain calves. Excretion of ascorbic acid in the urine was 0.2 mg/h. There is an increase of capillary fragility of the skin. What vitamins defficiency cause similar symptoms?

2. Patient complained of increased frequency of respiratory diseases and severe worsening ability to see objects at dusk. It is revealed that the patient is a strict vegetarian. Examination revealed follicular hyperkeratosis and disruption of normal color vision. What vitamins defficiency cause similar symptoms?

3. Student (male, 21 y.o., 75 kg) sleeps 7 h, studies 9 h, has 5 h of low activity and of 3 h high activity. The daily diet contains 50 g of broccoli as a vitamin C source. The content of vitamin C in broccoli is 89 mg per 100 g. During cooking average, vitamin C loss is 65 %. Objective data: increase in capillary fragility of the skin, decreased productivity. Excretion of ascorbic acid in the urine was 0.2 mg/h.

Assess providing the body with vitamin C.

TRAINING TEST

1. Vitamins — are essential substances that:

a. have plastic value;
b. have the energy value;
c. are macronutrients;
d. perform catalytic functions;
e. contained in drinking water.

2. Water-soluble vitamins include:

a. beta-carotene;
b. folic acid;
c. vitamin E (tocopherol);
d. vitamin K.

3. Fat-soluble vitamins include:

a. vitamin K;
b. pantothenic acid;
c. choline;
d. vitamin C;
e. vitamin B_{12}.

4. Specify the most characteristic symptom of vitamin A deficiency:

a. skin cyanosis;
b. swelling interdental papillae;
c. hypothermia;
d. formation of petechiae;
e. increase in the duration phase of dark adaptation.

5. Specify the most characteristic symptom of vitamin C:

a. follicular hyperkeratosis (goosebumps) in combination with petechiae;
b. burning sensation in the feet;
c. conjunctivitis and blepharitis;
d. corneal vascularization;
e. night blindness.

6. Select a product in which the vitamin C content greater than 100 mg %:

a. liver;
b. eggs;
c. fish;
d. rosehip;
e. sunflower oil.

7. A normal amount of ascorbic acid excreted in the urine is:

a. 0.5–0.6 mg / hour;
b. <0.2 mg / hour;
c. 0.7–1.0 mg / hour;
d. 0.03–0.25 mg / hour.

8. The main vitamin A provider:

a.cod liver;
b. bran;
c. potatoes;
d. cabbage;
e. citrus.

9. Insufficiency of which vitamin can cause pellagra:

a. folic acid;
b. pantothenic acid;
d. biotine;
c. niacine;
e. cyanocobalamin.

10. Select a product in which the vitamin C content is above 100 mg %:

a. cauliflower;
b. citrus;
c. strawberry;
d. red bell pepper;
e. garnet.

KEY QUESTIONS

1. The physiological role of vitamins and hygienic norms in daily ration.
2. Main food sources of vitamin C in nutrition.
3. Etiology, pathogenesis, symptoms of avitaminosis and hypovitaminosis C.
4. The methods of vitamin C sufficiency control in the human organism.
5. The method of vitamin C determination in urine (by Thilman's reagent).
6. Vitamins: definition, classification, functions.
7. Methods of assessing supply the body with vitamins.
8. Vitamin A: physiological significance, the daily demand, the main sources.
9. Vitamin C: The physiological significance of the daily demand, the main sources.

Notes and problems solving

Student's signature_____ **Teacher's signature_____**

PREVENTION OF FOOD POISONING OF MICROBIAL ETIOLOGY

Date_____

Learning objectives:

1. Studying the law of biotic adequacy of nutrition.
2. Food poisoning of microbial nature: toxicoinfections. Preventive measures.
3. Food poisoning of microbial nature: bacteriotoxicosis. Preventive measures.
4. Food poisoning of microbial nature: mycotoxicoses and phycotoxicoses. Preventive measures.

THEORETICAL SECTION

Give a definition

Food poisoning — _____

_____

_____

Food poisoning classification:

1. _____

a. _____

b. _____

_____

_____

_____

2. _____

a. _____

b. _____

c. _____

3. _____

Triple condition for the occurrence of foodborne diseases (infections):

1. _____

2. _____

3. _____

Additional factors for the occurrence of foodborne diseases (infections):

1. _____

2. _____

Fill the table

Nosological form	**Etiological factor**
Toxico infection	• _____ • _____ • _____ • _____ • _____ • _____ • _____ • _____ • _____
Toxicosis: • _____ • _____ • _____	• _____ • _____ • _____
Mixed	• _____ • _____

The epidemiological pattern of foodborne disease (infection) manifestations:

1. _____
2. _____
3. _____

4. _____

5._____

6. _____

7. _____

8. _____

Sources of food products contaminations with S. aureus: _____

_____

_____

Symptoms of botulism: _____

_____

_____

Preventive measures of bacterial food poisoning: _____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

PROBLEMS SOLVING

***Task*.** In the village, 3 families applied for medical help, presenting the following complaints: abdominal pain, repeated profuse vomiting, weakness, dizziness, cold sweat. 8 people got sick. All the families consumed various foods on the day of the disease. Common to all the products was milk, which was systematically bought from a resident of a neighboring village. On the day before the disease, in all cases, milk was consumed without pre-boiling (it was added to coffee, cocoa, to dilute porridge).

The day before the disease, a woman selling milk warned customers about stop delivering milk due to a veterinarian warning about the need to treat the cow for mastitis.

Determine the presumptive diagnosis and suspected product. Which priority measures must be taken?

Fill the table

Mycotoxicoses

Mycotoxins	Main producers	Sources of mycotoxins	Toxic effect
Aflatoxins B1, M1			
Trichothecene mycotoxins: dezoxinivalenol T-2 toxin			
Patulin			
Ochratoxin A			
Fumonisin B1			
Ergoalkaloids			

Phycotoxicoses

Phycotoxins	Main producers	Sources phycotoxins	Toxic effect
Group PSP (paralytic shell-fish poison): saxitoxin			
Group DSP (diarrheic shell-fish poison):okadaic acid, pektenotoxin			
Group neurotoxic: Brevetoxins			
Amnestic group: domoic acid			

KEY QUESTIONS

1. The law of biotic adequacy of nutrition.
2. Food poisoning: definition, classification.
3. Food poisoning of microbial nature: toxicoinfections. Preventive measures.
4. Food poisoning of microbial nature: bacteriotoxicosis. Preventive measures.
5. Food poisoning of microbial nature: mycotoxicoses and phycotoxicoses. Preventive measures.

Notes and problems solving

Student's signature_____ **Teacher's signature_____**

PREVENTION OF FOOD POISONING OF NON-MICROBIAL ETIOLOGY

Date_____

Learning objectives:

1. Studying food poisoning of non-microbial nature classification.
2. Studying poisoning with chemical impurities and their prevention.
3. Studying food poisoning with products of plant and animal origin: products that are poisonous in nature and products, poisonous under certain conditions, their prevention.
4. Studying food poisoning with poisonous mushrooms and plants prevention.
5. Studying food poisoning detecting.

THEORETICAL SECTION

Fill the table

Poisoning with products that are poisonous in nature	
Plant origin	Wild and cultivated plants 1. _____ 2. _____ 3. _____ 4. _____ 5. _____ 6. _____ 7. _____ 8. _____ 9. _____ 10. _____ Seeds of weeds of cereal crops 1. _____ 2. _____ 3. _____ 4. _____ 5. _____ Poisonous mushrooms 1. _____ 2. _____ 3. _____
Animal origin	Internal organs of individual fish species 1. _____ 2. _____ 3. _____ 4. _____ 5. _____ 6. _____ 7. _____ Some endocrine glands of slaughter animals 1. _____ 2. _____

End of the table

Poisoning with poisonous products under certain conditions	
Plant origin	Kernels of fruit seeds 1. _____ 2. _____ 3. _____ 4. _____ Containing _____; nuts _____; _____beans, containing _____; _____potato, containing _____. Conditionally edible mushrooms 1. _____ 2. _____ 3. _____ 4. _____, not subjected to proper culinary processing. Edible mushrooms — _____ _____
Plant origin	Liver, caviar of some fish species during the spawning period 1. _____ 2. _____ 3. _____ 4. _____ Mussels and crustaceans acquiring toxic properties _____ _____ Honey _____
Poisoning with impurities of toxic substances xenobiotics	1. _____ 2. _____ 3. _____ 4. _____ 5. _____ 6. _____ 7. _____ 8. _____

Preventive measures of non- microbial food poisoning:

_____
_____
_____
_____
_____
_____

What should a doctor do if a patient is suspected of food poisoning?

_____
_____
_____
_____
_____
_____
_____
_____

PROBLEMS SOLVING

***Task*.** Five of younger schoolboys ate broken apricots kernel. After 5 hours, the two children appeared dizziness, headache, nausea, general weakness (which have passed within 6 hours). One boy after 3 hours started vomiting, severe headache, dizziness, and diarrhea. The two children who have eaten most kernels seed, in 2 hours all the above mentioned symptoms were strongly expressed, one fainted. On examination, the doctor revealed a cyanotic face and mucosal conical and tonic spasms, trismus. The next day the one child died. In other children, after intensive therapy, the condition improved and they have recovered.

Determine the presumptive diagnosis and suspected product. Which priority measures must be taken?

TRAINING TEST

1. Food poisoning are:

a. usually chronic diseases;
b. rarely chronic diseases;
c. rarely acute disease;
d. usually acute disease.

2. Classification of food poisoning includes:

a. microbial food poisonings;
b. viral food poisonings;
c. food poisonings caused by plant;
d. unknown etiology;
e. non-microbial food poisonings.

3. Classification of microbial food poisoning includes:

a. foodborne diseases;
b. food poisoning unknown etiology;
c. food poisoning caused by chemical substances;
d. food toxicosis;
e. mixed food poisoning.

4. Classification of non-microbial food poisoning includes:

a. poisoning caused by fungi toxins;
b. poisoning caused by endocrine glands of animals (adrenal, pancreas);
c. poisoning caused by canned food containing botulinum toxin;
d. phycotoxycosis.

5. Doctor who diagnosed or suspecting food poisoning, has to:

a. notify about food poisoning Ministry of healthcare;
b. immediately transport the patient to the infectious department an ambulance;
c. notify about food poisoning Center of Hygiene and Epidemiology;
d. immediately prohibit further eating of suspected food;
e. take samples of suspected food, collect vomit, feces and urine, blood for blood culture and seeding on to the laboratory.

6. Specific symptoms of botulism are:

a. dry mouth;
b. bulbar paresis (dysarthria, dysphagia, nasal regurgitation);
c. double vision (diplopia), loss of accommodation;
d. paralysis of facial muscles;
e. increased salivation;
f. paralysis of respiratory muscles.

7. The source of staphylococcal toxcosis infections can be:

a. duck eggs;
b. cows with mastitis;
c. people with purulent-inflammatory diseases of the skin of the hands;
d. people with pharyngitis;
e. pastry.

8. Green and sprouted potatoes contain a toxic substance:

a. fagine; c. solanine; e. falloidine.
b. phazine; d. amygdaline;

KEY QUESTIONS

1. Food poisoning of non-microbial nature, their classification.
2. Poisoning with chemical impurities (pesticides, nitrogen-containing compounds, heavy metals). Prevention.
3. Food poisoning with products of plant and animal origin prevention.
4. Poisoning with poisonous mushrooms and plants prevention.
5. Tactics of the doctor in detecting food poisoning.

Notes and problems solving

Student's signature_____ **Teacher's signature**_____

HYGIENIC BASICS OF HUMAN NUTRITION IN CASE OF COMMON SOMATIC DISEASES. HYGIENIC PRINCIPLES OF CLINICAL NUTRITION

Date_____

Learning objectives:

1. To learn hygienic principles of dietary and therapeutic human nutrition.
2. To learn characteristics of the main therapeutic diets.

THEORETICAL SECTION

Give a definition

Clinical nutrition — _____

_____

_____

Basics of clinical nutrition:

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____
8. _____

Clinical nutrition includes 3 links influence on a human body:

1. _____
2. _____
3. _____

Fill the table

Diets

Type of diet	Appointment	Characteristics

End of the table

Type of diet	Appointment	Characteristics

Each diet should include:

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____

KEY QUESTIONS

1. Hygienic principles of dietary and therapeutic human nutrition.
2. Characteristics of the main therapeutic diets.
3. Catering in healthcare organizations.
4. Features of nutrition in coronavirus infection.

Student's signature_____ **Teacher's signature**_____

HYGIENIC BASICS OF HUMAN NUTRITION IN CASE OF COMMON SOMATIC DISEASES. FINAL CLASS

CONTROL QUESTIONS

1. Nutrition hygiene: definition, purpose, objectives. The contribution of scientists in the development of the science of nutrition. Modern problems of nutrition. Types of food.
2. Rational (adequate) nutrition. The laws of rational (adequate) nutrition.
3. The law of energy adequacy nutrition. Methods for determination of energy expenditure and methods of determining the actual consumption of nutrient energy.
4. The law of nutrient adequacy of nutrition. Classification of nutrients. Formula of balanced diet.
5. The proteins and their role in human nutrition. Foods that are the main sources of complete protein.
6. Fats and carbohydrates and their role in human nutrition. Foods that are major sources of fat and carbohydrates.
7. The law of enzymatic adequacy of nutrition, the consequences of its violation. The reasons of enzymopathies occurrence.
8. The law of biotic nutrition adequacy. Food poisoning: definition, classification, characteristic.
9. Food poisoning of microbial nature: foodborne diseases, characteristic. Preventive measures.
10. Food poisoning of microbial nature: toxicosis, characteristic. Preventive measures.
11. Food poisoning of microbial nature: mycotoxicoses, ficotoxicosis, their characteristic. Preventive measures.
12. Food poisoning is no of microbial nature. Chemical toxicity (pesticides, nitrogen compounds, lead): characteristic, prevention measures.
13. Food poisoning from products of plant and animal origin. Poisoning by poisonous mushrooms its prevention.
14. Actions physician in case of revealing food poisoning.
15. The law of biorythmological adequacy of nutrition. Principles of rational diet.
16. Nutritional standards for human for energy and nutrients. The criterion for determining.
17. Nutritional status. Classification of nutritional status.
18. Stages and methods of studying the nutritional status.
19. Alimentary diseases: definition, causes, classification.
20. Diseases of protein-energy malnutrition: classification, diagnosis, clinical manifestation, prevention.
21. Inadequate (insufficient) nutritional status. Hypotrophy, alimentary dystrophy and dwarfism: clinical symptoms, prevention
22. Excess nutritional status. Obesity: causes, classification, diagnosis, prevention. Alternative and reduced diet.
23. Vitamin C deficiency. Characteristics of C and hypo- and avitaminous states, diagnosis, treatment, prevention.
24. Nutritional diseases caused by deficiency in the diet of vitamins B: diagnosis, treatment, prevention.
25. Vitamin A deficiency: diagnosis, treatment, prevention.
26. Microelementoses typical for the population of the Republic of Belarus.
27. Hyposelenosis: clinical manifestations, prevention.
28. Iodine deficiency disease: clinical manifestations, prevention.

EXAMPLES OF CONTROL CASE TASKS

1. Student (female, age — 20, body weight — 55 kg) study at the university 10 hours (duration of sleeping is 6 hours, high-intensity aerobic dancing — 1 hour, housework — 6 hours, low activity — 1 hour). Calculate total energy expenditure using physical activity levels. Intakes 80 g of proteins, 110 g of fats и 320 g of carbohydrates. Calculate total energy expenditure, requirements for macronutrients, actual energy intake. Compare actual energy intake and total energy expenditure, actual intake of nutrients and his requirements. Make a conclusion about diet.

2. Student (male, 21 y.o., 80 kg) sleeps 8 h, studies 8 h, has 4 h of low activity and of 4 h high activity. The daily diet of patient contains 160 g of cabbage. The content of vitamin C in cabbage is 50 mg per 100 g. During cooking average vitamin C losses is 55 %. There is a decrease of skin capillary resistance. Excretion of ascorbic acid in the urine was 0.4 mg/h. Assess providing the body with vitamin C.

3. During assessing the nutritional status studied physical development of students. The obtained data were compared with individual arithmetic surveyed group (female, 20 years, time of working, sleeping, social activity 8 hours each):

Sign	**Individual data (a)**	**M**	**σ**	**Difference between individual data and M (a-M)**	**Sigma deviation (a-M)/σ**
Height	161	165	±2,3		
Weight	51	60	±1,6		
Chest circumference	79	84	±1,9		

Draw a profile of physical development of student and assess it.

HYGIENE OF CHILDREN AND ADOLESCENTS

Date_____

Learning objectives:

1. Studying criteria for health of children and adolescents.
2. To learn methods of research and assessment of physical development of children and adolescents.

THEORETICAL SECTION

Give a definition

Growth — _____

_____

_____

Development — _____

_____

_____

To assess the physical development of indicators are used:

1. _____
2. _____
3. _____

Methods of assessing the physical development of children and adolescents:

1. _____
2. _____
3. _____

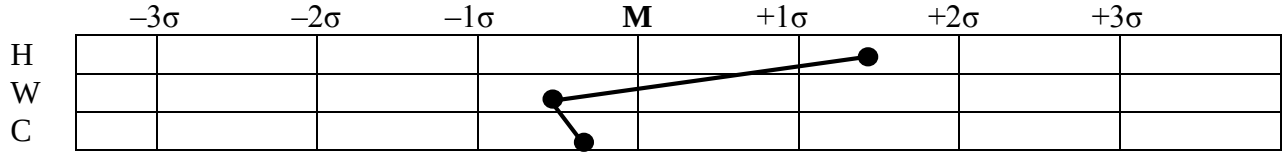
PROBLEMS SOLVING

Example. During assessing the nutritional status studied physical development of 1nd year students. The obtained data were compared with individual arithmetic surveyed group (female, 17 years, time of working, sleeping, social activity 8 hours each):

Sign	Individual data (a)	M	σ	Difference between individual data and M (a-M)	Sigma deviation (a-M)/σ
Height	165	162	±2,1	+3	+3/2.1 = +1.43
Weight	61	62	±1,8	–1	–1/1.8 = –0.56
Chest circumference	83	84	±2,0	–1	–1/2.0 = –0.5

Draw a profile of physical development of student and assess it.

Profile of physical development



Height — above average, weight — above average, chest circumference — average, disproportional physical development.

Task. During assessing the physical development of child, the individual data need to be compared with average statistical values for the age of the child (female, 9 years):

Sign	Individual data (a)	M	σ
Height	131	132.52	±6.24
Weight	35.5	28.06	±4.97
Chest circumference	59	62.44	±4.62

Draw a profile of physical development of child and assess it.

TRAINING TEST

1. Types of physical development of children and teenagers are:

a. disharmonious;
b. harmonious (normal);
c. functional;
d. physiological;
e. abnormal.

2. The criteria characterizing health level of children are:

a. chronic or acute diseases;
b. level and degree of mental and physical development harmony;
c. functional state of organism systems;
d. degree of organism's resistance;
e. presence or absence of allergic reactions.

3. The first place of children and adolescents' chronic diseases occurs:

a. neuropsychiatric disorders;
b. incorrect posture, flat feet;
c. nasal disease (chronic tonsillitis);
d. short-sighted.

4. The acceleration reasons are:

a. increase in infectious diseases;
b. influence of a city way of life;
c. nutrition is more balanced;
d. improving healthcare;
e. endogenic.

5. Laws of growth and development of children are:

a. dependence of growth and development processes on age;
b. development of the musculoskeletal system;
c. tripling of body weight at 12 months;
d. non-uniformity of growth and development processes.

KEY QUESTIONS

1. Hygiene of children and adolescents: definition, purpose, objectives.
2. Biological and chronological age of a child. Criteria for assessment of biological age.
3. Criteria for health of children and adolescents. Health groups.
4. Methods of research and assessment of physical development of children and adolescents.

Notes and problems solving

Student's signature_____ **Teacher's signature_____**

OCCUPATIONAL HYGIENE. PREVENTION OF NEGATIVE IMPACT OF OCCUPATIONAL ENVIRONMENTAL FACTORS ON THE HUMAN BODY IN HEALTHCARE ORGANIZATIONS. HARMFUL OCCUPATIONAL FACTORS OF PHYSICAL, CHEMICAL AND BIOLOGICAL NATURE IN HEALTHCARE ORGANIZATIONS

Date_____

Learning objectives:

1. Studying goals and objectives of occupational hygiene.
2. Studying hygienic characteristics of working conditions in the industry.
3. Studying classification of harmful factors. Factors of the labor process.
4. Studying hygienic standards of working conditions. Occupational diseases and poisoning: types, definitions.
5. Studying hygienic characteristics of industrial dust, dust associated occupational diseases and their prevention.
6. Studying harmful effects of occupational noise and prevention of diseases related to noise.
7. Studying harmful effects of occupational vibration and prevention of diseases related to vibration.
8. Studying harmful effects of occupational heat and prevention of diseases related to occupational heat.

THEORETICAL SECTION

Give a definition

Occupational hygiene is _____

_____

_____

_____

_____

_____

The purpose of occupational hygiene: _____

_____

_____

_____

_____

_____

The tasks of occupational hygiene: _____

_____

_____

_____

_____

_____

Fill the table

Classification of harmful occupational factors

Group of factors	Examples of factors

Give a definition

Workload — _____

_____

_____

Tension of work — _____

_____

_____

Professional disease — _____

_____

_____

Professional poisoning — _____

_____

_____

Acute professional poisoning — _____

_____

_____

Chronic professional poisoning — _____

_____

_____

Main sources of dust at work: _____

_____

_____

Fill the tables

Dust professional pathology

Diseases	**Examples**
Dust respiratory diseases	
Dust diseases of the eyes	
Dust diseases of the skin	

Prevention of dust-related diseases

Aimed at technical process	**Aimed at occupational environment**	**Aimed at employees**

Main sources of noise at work: _____

_____

_____

_____

_____

Fill the tables

Noise-related health effects

Target	Effects
Ears	
Physiological effects	
Psycological effects	

Prevention of noise-related diseases

Aimed at technical process	Aimed at occupational environment	Aimed at employees

Main sources of whole-body vibration at work: _____

_____

_____

_____

Main sources of hand-arm vibration at work: _____

_____

_____

_____

Fill the tables

Vibration-related health effects

Whole-body vibration	Hand-arm vibration

Prevention of vibration-related diseases

Aimed at technical process	Aimed at occupational environment	Aimed at employees

Main sources of occupational heat at work: _____

_____

_____

Fill the tables

Occupational heat-related health effects

Health effects	Signs
Heat stroke	
Heat exhaustion	
Heat cramps	
Heat rash	

Prevention of heat-related diseases

Aimed at technical process	Aimed at occupational environment	Aimed at employees

KEY QUESTIONS

1. The purpose and objectives of occupational hygiene.
2. Classification of harmful factors. Factors of the labor process (severity and intensity).
3. Hygienic standards of working conditions. Occupational diseases and poisoning: types, definitions.
4. Hygienic characteristics of industrial dust.
5. Dust associated occupational diseases and their prevention.
6. Harmful effects of occupational noise and prevention of diseases related to noise.
7. Harmful effects of occupational vibration and prevention of diseases related to vibration.
8. Harmful effects of occupational heat and prevention of diseases related to occupational heat.

Student's signature_____ **Teacher's signature_____**

OCCUPATIONAL HYGIENE. PREVENTION OF NEGATIVE IMPACT ON THE HUMAN BODY OF OCCUPATIONAL FACTORS IN HEALTHCARE ORGANIZATIONS. OBLIGATORY MEDICAL EXAMINATIONS AND THE FREQUENCY OF THEIR COMPLETION BY HEALTHCARE EMPLOYEES

Date_____

Learning objectives:

1. Hygienic characteristics of working conditions in the industry. Classification of harmful factors. Factors of the labor process.
2. Studying classification of medical examinations (health checks).
3. Studying purposes of medical examinations (health checks).
4. Studying steps of the investigating a worksite incident.

THEORETICAL SECTION

Fill the table

Health checks (medical examination)

Type of medical examination	Purposes of medical examination

Working conditions based on the hygienic criteria, divided into four classes:

Class 1:_____

Class 2: _____

Class 3: _____

Class 4: _____

According to the degree of deviation from the parameters of the factors hygienic standards and intensity of the changes in the body of harmful working conditions of workers are divided into 4 degree of harmfulness:

Grade 1 Class 3 (3.1) _____

_____

Grade 2 Class 3 (3.2) _____

_____

Grade 3 Class 3 (3.3) _____

_____

Grade 4 Class 3 (3.4) _____

_____

Prevention of professional intoxications and diseases includes realization:

Legislative actions _____

_____

Organizational actions _____

_____

Technological actions _____

_____

Sanitary-technical actions _____

_____

Treatment-preventive actions _____

_____

TRAINING TEST

1. The section of preventive medicine studying (investigating) influence on a human body of labor process and factors of the industrial environment, for the purpose of a scientific substantiation of specifications and means of preventive maintenance of occupational diseases and other adverse consequences of influences of working conditions on working — _____

_____

2. Correlate the concept and its definition:

1. Working conditions	A. is the factor of environment, labor process which can cause an acute disease or sudden sharp deterioration of a state of health or even death.
2. Dangerous occupational factor	B. set of factors of labor process and the industrial environment in which the activity of the person is realized.
3. Safe working conditions	C. conditions at which influence on working harmful and dangerous production factors is excluded or their levels do not exceed hygienic specifications.

Answer: _____

3. Correlate the concept and its definition:

1. Professional disease	A. the disease developing after regular, long influence of small concentration or doses of harmful substance.
2. Chronic professional poisoning	B. the disease caused by the influence of harmful working conditions.
3. Acute professional poisoning	C. is the disease which has arisen after unitary(single) influence of harmful substance on a worker.

Answer: _____

4. Select the physical harmful factors:

a. temperature; c. pathogenic microorganisms; e. occupational noise;
b. antibiotics; d. occupational heat; f. vibration.

5. Select the chemical harmful factors:

a. antibiotics; c. heat; e. enzymes.
b. pathogenic microorganisms; d. industrial noise;

6. Examples of hazardous dusts in the workplace include:

a. mold fungi and spores; c. vegetable dusts;
b. metallic dusts; d. mineral dusts.

7. Pneumoconiosis are occupational diseases, caused by:

a. heat; d. noise;
b. vibration; e. enzymes;
c. dusts; f. pathogenic microorganisms.

8. Prevention of occupational dust-related diseases includes:

a. using sound-absorbent coverings;
b. personal protective equipment;
c. providing guidance on seat maintenance;
d. training workers in good work practices;
e. local exhaust ventilation;
f. design to minimize whole-body vibration;
g. reducing airborne noise;
h. elimination at the source.

9. Health effects of whole-body vibration:

a. back disorders; c. acoustic trauma;
b. headache; d. loss of balance.

10. Health effects of hand-arm vibration:

a. tingling and loss of sensation in the fingers;
b. shift in the threshold of hearing;
c. bone cysts in fingers and wrists;
d. loss of grip strength.

11. Prevention of occupational vibration-related diseases:

a. prohibition of overtime work;
b. measure vibration exposure;
c. pre-employment screening;
d. use of power chainsaws with low vibration handle.

12. Heat-related illnesses are:

a. stroke; c. cramps; e. rash
b. pneumoconiosis; d. exhaustion f. back disorders

13. The main health effects of occupational noise include:

a. bone cysts in fingers and wrists;

b. acoustic trauma;
c. noise-induced hearing loss;
d. production of hormones that affect the cardiovascular system;
e. shift in the threshold of hearing;
f. measure vibration exposure.

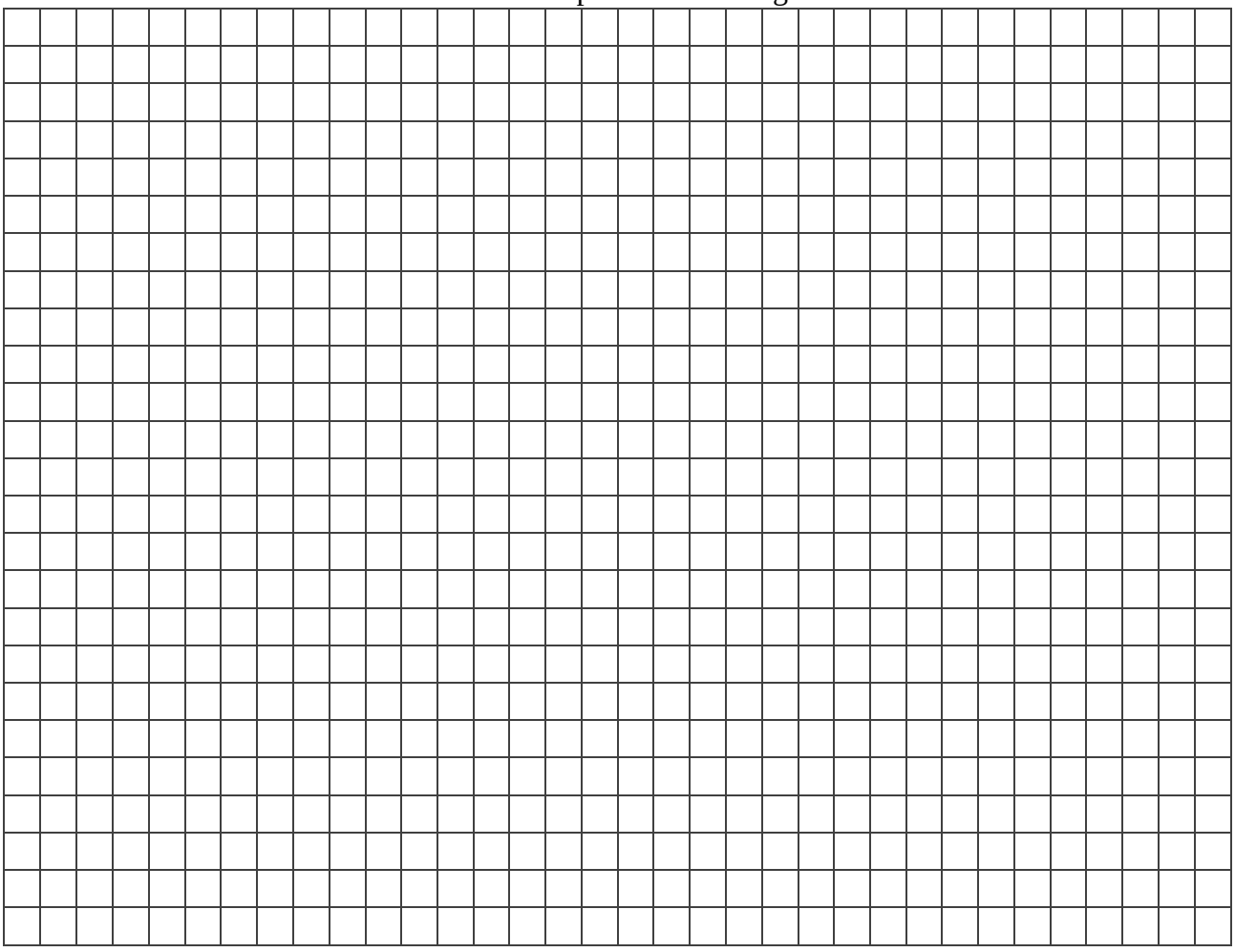
14. Prevention of occupational noise-related diseases:

a. reducing airborne noise by means such as shields, enclosures, and sound-absorbent coverings;
b. appropriate work schedules with adequate rest periods;
c. local exhaust ventilation;
d. individual protection measures;
e. reducing dust concentration;
f. elimination at the source.

KEY QUESTIONS

1. Harmful occupational factors in the work in industry and agriculture: impact on health.
2. Harmful occupational factors in the work in industry and agriculture: prevention.
3. Hygienic standards of working conditions.
4. Medical examinations of employees: types and terms of their conduct.
5. Role of preventive medical examinations in the prevention of occupational diseases

Notes and problems solving



Student's signature_____ **Teacher's signature_____**

OCCUPATIONAL HYGIENE. PREVENTION OF NEGATIVE IMPACT ON THE HUMAN BODY OF OCCUPATIONAL FACTORS IN HEALTHCARE ORGANIZATIONS. FINAL CLASS

CONTROL QUESTIONS

1. The purpose and objectives of occupational hygiene. Physiological-hygienic and socio-economic concept of labor. Classification of types of labor.

2. Optimal working conditions: definition of the concept, biological and social role. Factors determining the nature and conditions of work. Optimal, maximum permissible and maximum tolerable levels of factors that determine working conditions. Mode, severity, intensity of work. Classification of labor by severity and intensity. Indicators characterizing the severity and intensity of work.

3. Work and rest schedule: impact on people's health, performance and neuropsychic state. The hygienic role of the dynamic stereotype. Physiological and hygienic assessment of the work and rest regime.

4. Main harmful occupational factors. Acute and chronic occupational diseases. Preventive medical examinations and their role in the prevention of occupational diseases.

5. Industrial dust: classification, physical and chemical properties. Methods for studying dust levels in the air of industrial premises. Dust occupational diseases, their prevention.

6. Chemical factor in production. Routes of poisons entering the human body, hygienic characteristics of poisons. General patterns of action of industrial poisons on the human body. Occupational poisonings, their prevention. Lead, mercury, benzene, nitrogen oxides in production, clinical manifestations of poisoning, their prevention. Study of toxic substances in the air.

7. Industrial noise, physical and hygienic characteristics. Noise classification. The concept of intensity levels, sound pressure, sound volume. Measurement of general sound pressure level, instruments. Specific and nonspecific effects of noise on the human body. Hygienic noise regulation. Personal protective equipment. Vibration, types, hygienic characteristics. The impact of general and local vibration on the human body. Prevention of noise and vibration disease.

8. Infrared radiation in production: sources, measurement methods, standardization. Measures to prevent the adverse effects of thermal radiation.

9. Harmful production factors of physical, chemical and biological nature in HO. Maximum permissible levels (MPL) and maximum permissible concentrations (MPC) of factors affecting human health. The severity and intensity of the work of medical workers. Burnout syndrome. Harmful production factors when working in medical and diagnostic rooms (magnetic resonance imaging, computed tomography, X-ray studies, functional studies), in laboratories (clinical, microbiological, etc.). Visual strain when working with optical equipment. Negative effects of ultraviolet and infrared radiation and disinfectants on the human body.

10. The main directions for the prevention of occupational diseases among medical workers in certain specialties. Mandatory medical examinations and the frequency of their completion by healthcare employees. Assessing the timeliness and completeness of periodic medical examinations by healthcare workers.

CONTENT