MUNICIPAL HYGIENE

Subject and tasks of municipal hygiene

Municipal hygiene – section of hygiene, studying influence factors of environment on the person and developing preventive actions for creation favorable conditions of life of the population.

The basic sections of municipal hygiene:

-. **Hygiene of air** (action of it physical and chemical factors on organism, problems of air pollution),

-Hygiene of water and water supply,

-Hygiene of ground (endemic and epidemic diseases),,

-Hygiene of the occupied places, **hygienic demands to clearing of occupied places**,

-Influence weather and climate on the person, prevention meteothropic reactions in people,

-Recreational hygiene, prevention pollution of health resort resourses

Concept about climate and microclimate

Climate – it is **average long-term complex of physical parameters of atmosphere air in significant territory (region, country, etc.).**

Microclimate – it is **physical parameters of air in small territory (quarter, street) or in rooms.**

Major factors of microclimate:

Temperature of air

Humidity of air

Speed of air movement

Atmospheric pressure (it is usual is not taken into account at estimation microclimate).

HEAT REGULATION SYSTEM OF ORGANISM AND INFLUENCE FACTORS OF MICROCLIMATE

HEAT REGULATION SYSTEM

CHEMICAL HEAT REGULATION Q1 (Thermo-genesis),
PHYSICAL HEAT REGULATION Q2 (Thermo-return)

Q1 = Q2

CHEMICAL HEAT REGULATION Q1 (thermo-genesis)

It depend only from Temperature of air

(Zone of apathy - 15-25 ^{0}C – optimal state of heat regulation)

Below 15 ^{0}C - rising of thermo-genesis, Above 25 ^{0}C - decreasing of thermo-genesis.

Above 35 ^{0}C – failures of thermoregulation system - (Thermal fatigue, Thermal edema foots, Thermal attrition, Thermal cramps, Thermal shock, Thermal syncope)

WAYS OF PHYSICAL HEAT REGULATION (Thermo-return):

1. HEAT - CODUCTION (30-40 %) – conduction heat to objects of environment

A) Convection - to air (depends from T, E, V)

B) Conduction – to contact subjects (depends from T of a subject, it heat conductivity and area of contact with a subject)

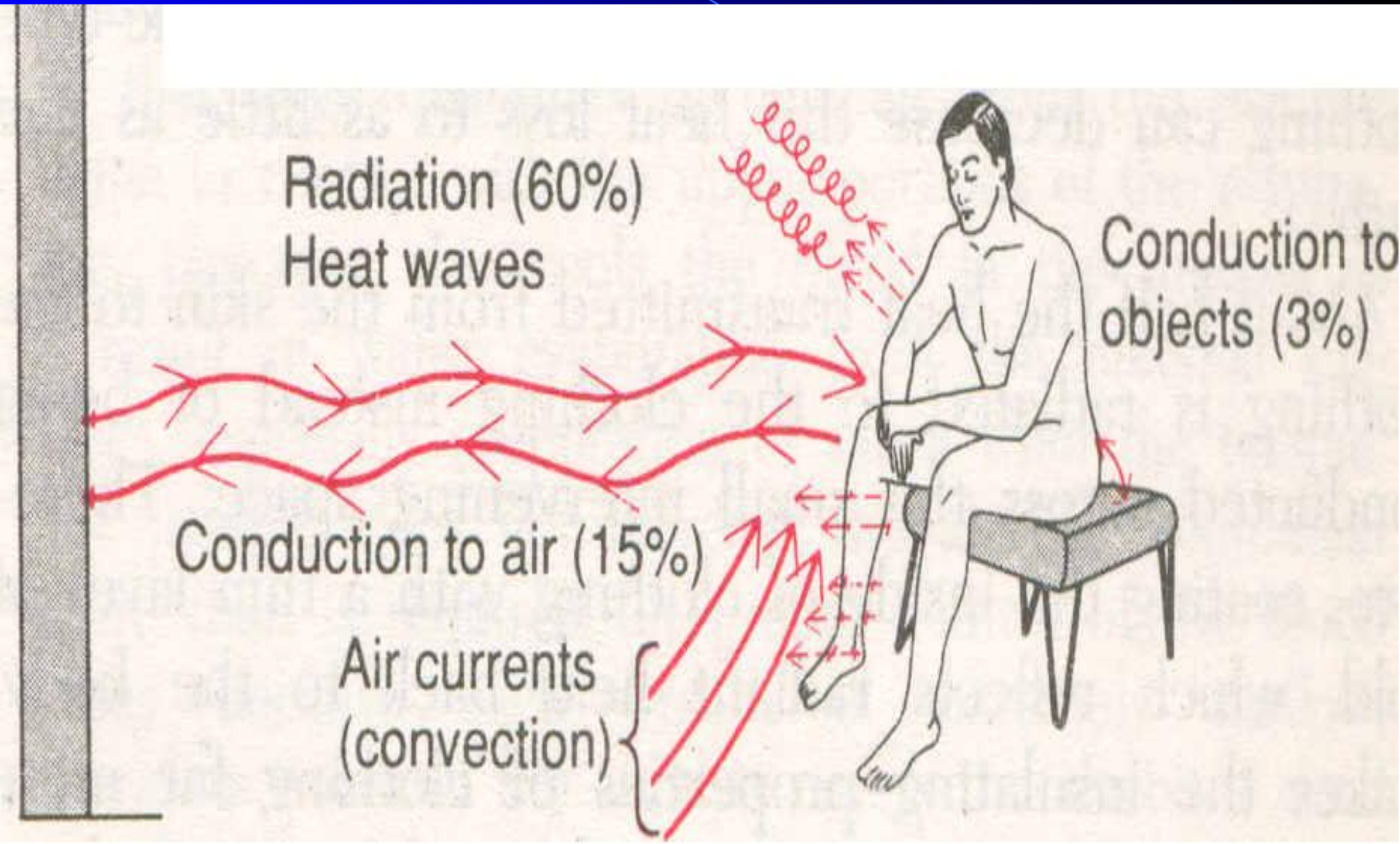
2. HEAT - EVAPORATION (10-15 %) – evaporation of perspiration from surface of the body

Depends from T, E, V of air

3. HEAT - IRRADIATION (40-45 %) giving heat to environment by Infra-red beams

Depends from radiation T - difference between temperature of body (36,6 C) and temperature of environmental objects (walls, floor, furniture)

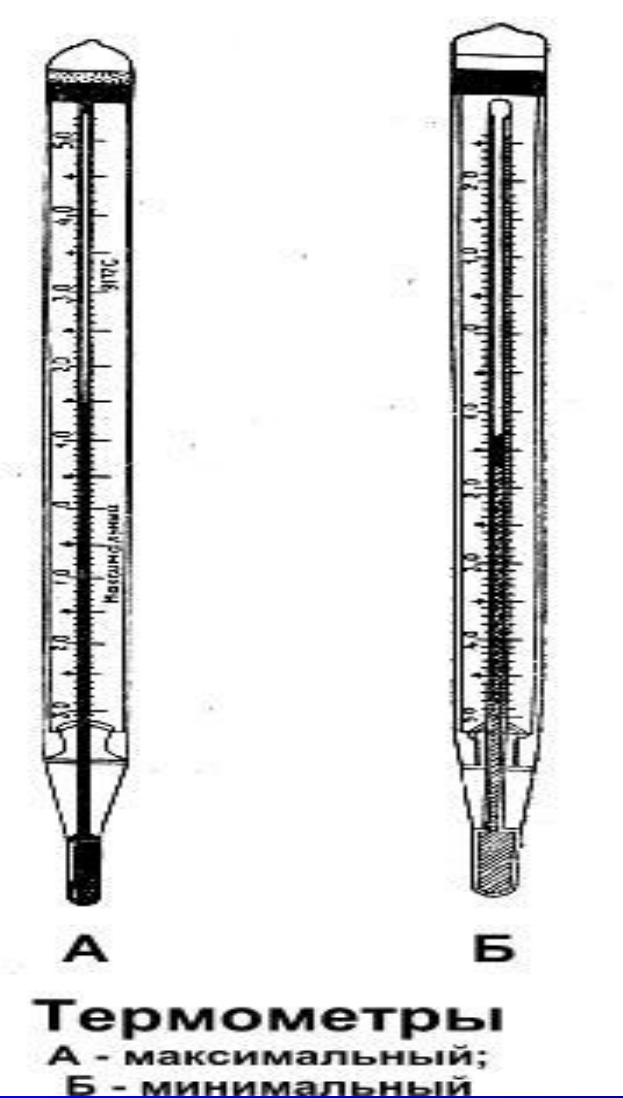
WAYS OF PHYSICAL HEAT REGULATION



THE NORMS OF MICROCLIMATE FOR DIFFERENT PREMISES AND DEVICES FOR IT INVESTIGATION

Factor microclimate	*Kind of premise*	*norms*
Temperature of air *Devices:* thermo-meter, thermograph	Inhabited Sports halls Operational hall	18-22 C 16-18 C 22-25 C
Air humidity *Devices:* Psychrometer, hygrometer	Inhabited Operational hall	40-60 % up to 55%
Speed of air *Devices:* anemometer, Catathermometer	Inhabited Child establishments	0,2-0,4 m/s 0,07-0,1 m/s

Temperature of air, instruments **of its measuring**



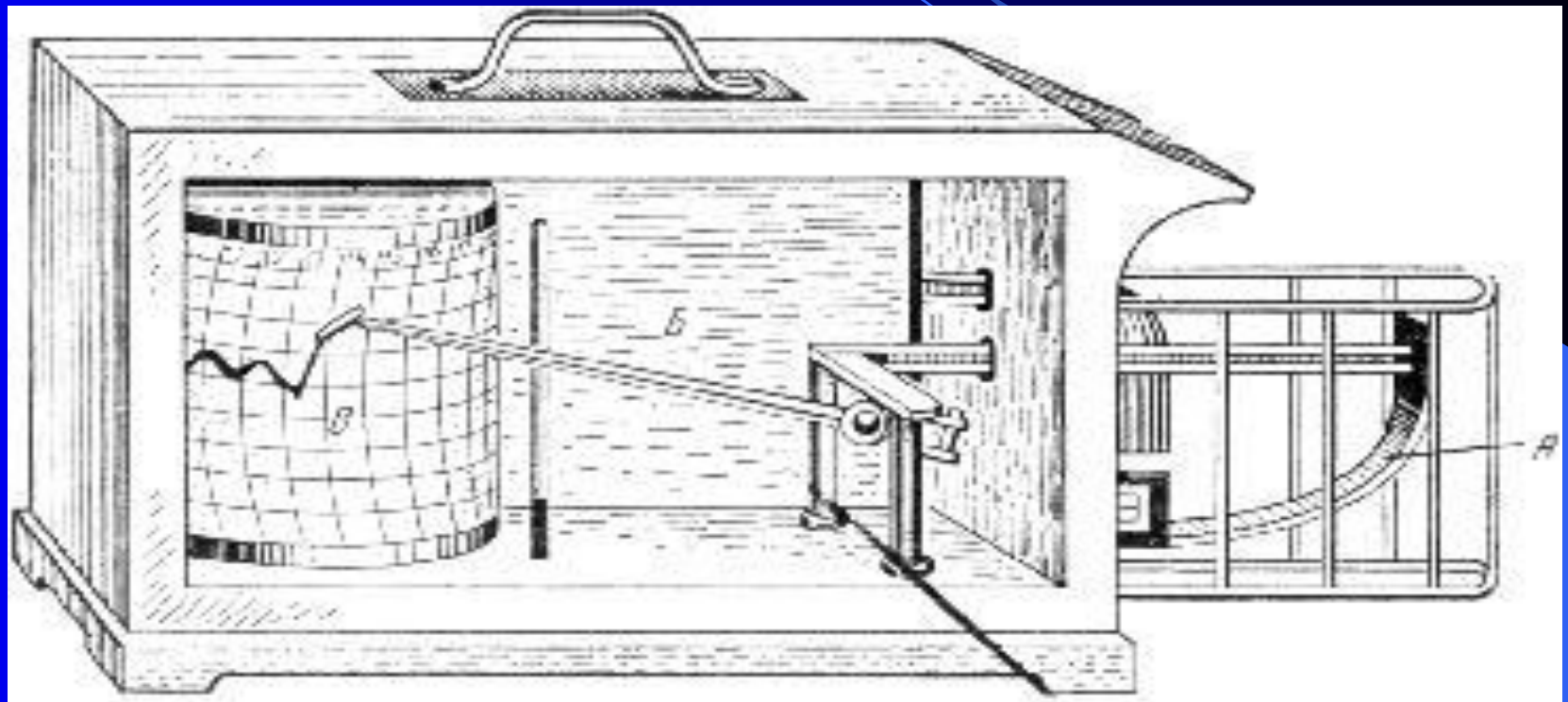
The thermometers may be: home, minimum and maximal.

The home thermometer - shows temperature in the given place, it does not fix the temperature.

The minimal thermometer fixes least temperature for any period.

The maximal thermometer fixes greatest temperature for any period. The medical thermometers are kind of maximal thermometers.

THE THERMOGRAPH



Термограф.

А - пластинка, наполненная толуолом; Б - перо; В - вращающийся барабан

Humidity of air

Kinds of humidity:

a) Absolute – amount of water pairs in air in present time (g / m3 or mm. Hg.)

b) Maximal - the greatest possible saturation of air by water pairs at given temperature,

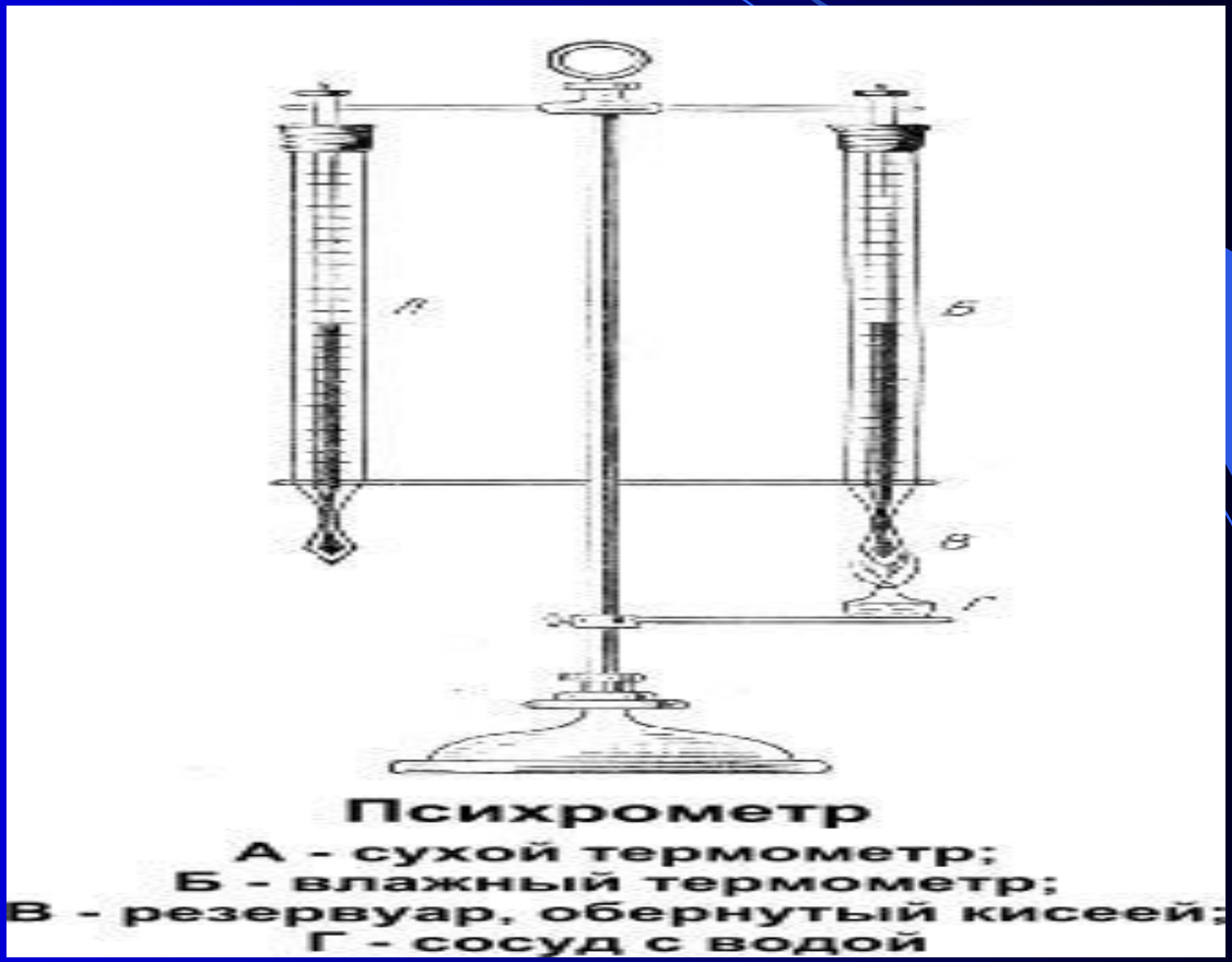
c) Relative = absolute / maximal in %.

Norm of air humidity is 40-60 % (30-70 %), at smaller humidity - dryness of skin and mucous membranes, at the greater – infringement of heat return.

In operational hall - up to 55 % (prevention explosion narcotic-air mix).

Devices for measurement of humidity of air:

AUGUST'S PSYCHROMETER



Психрометр

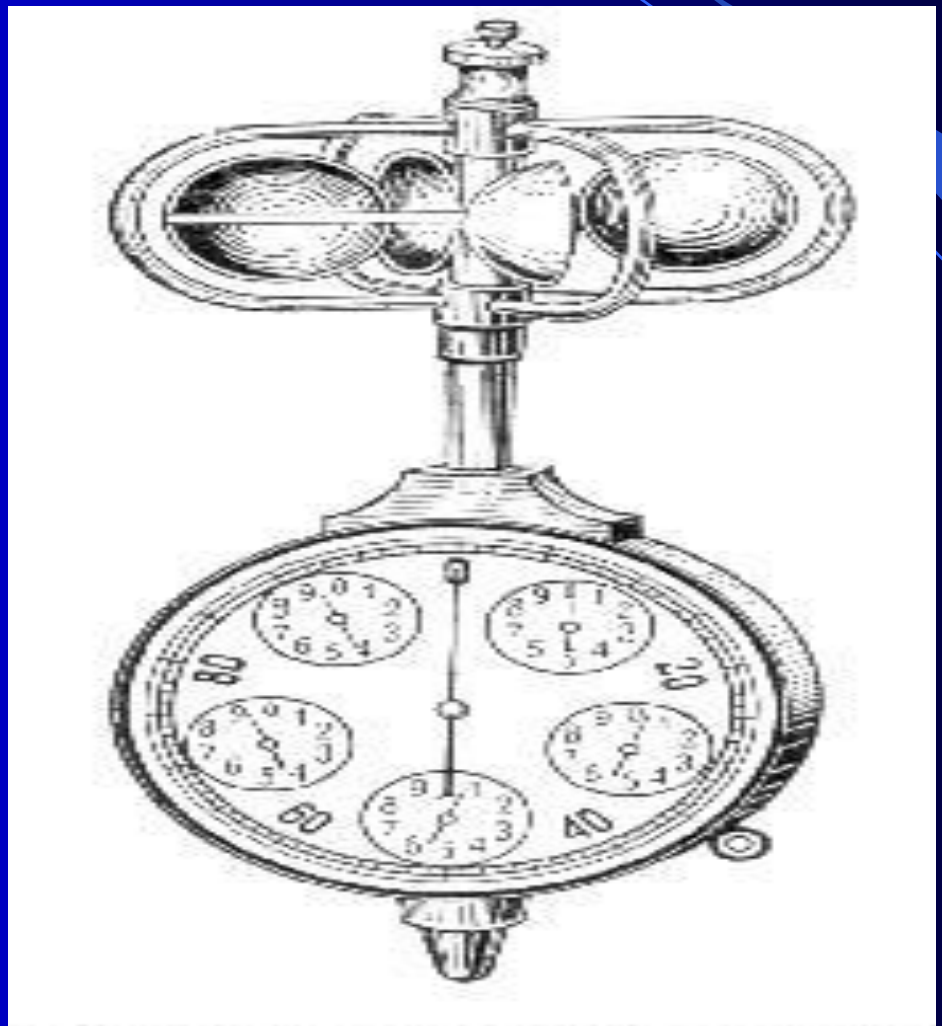
А - сухой термометр;
Б - влажный термометр;
В - резервуар, обернутый кисеей;
Г - сосуд с водой

ASSMAN'S PSYCHROMETER (Aspiration)

Аспирационный психрометр
А - металлические трубки с резервуарами термометров; Б - трубки, через которые просасывается исследуемый воздух; В - аспиратор; Г - защитная пластинка; Д - пипетка

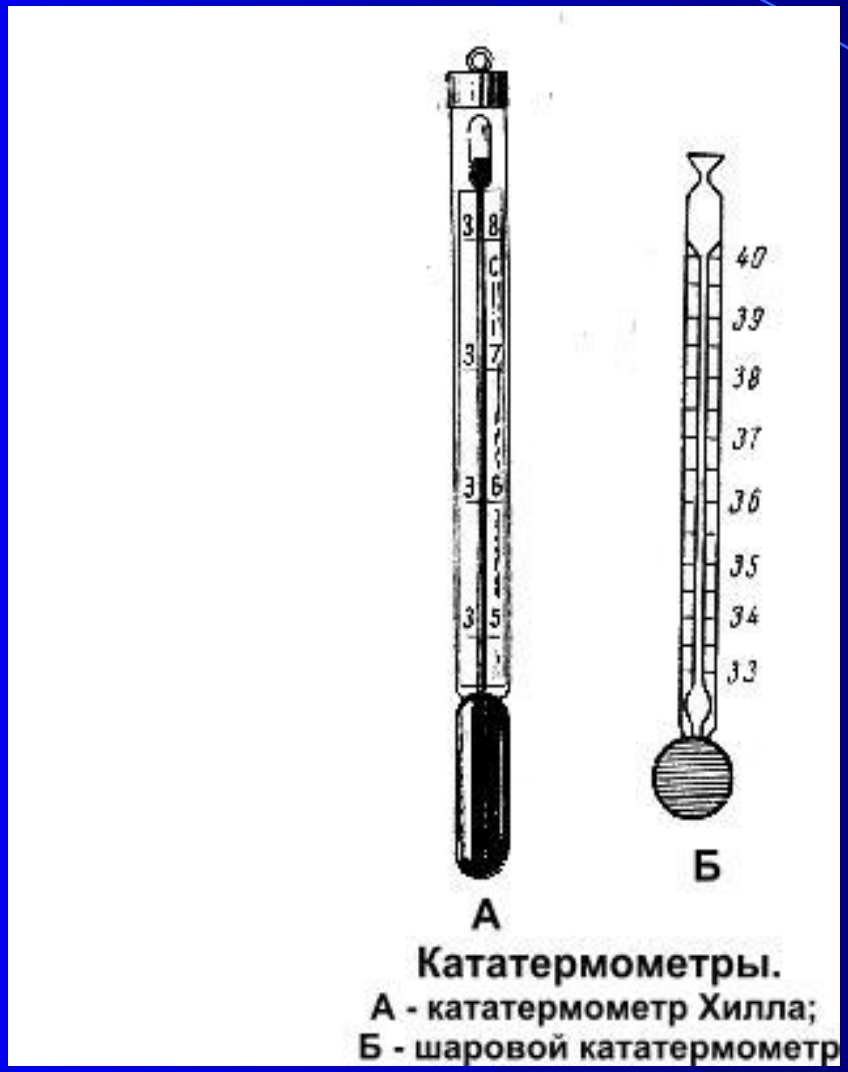
Devises for estimation speed movement of air

1. ANEMOMETER



Чашечный анемометр

2. KATATERMOMETER



Кататермометры.
А - кататермометр Хилла;
Б - шаровой кататермометр

By the katatermometer we investigate Cooling ability of air (CAA).

Then we calculate speed of movement of air from CAA under the formula Hill.

$$X = \left(\frac{\frac{H}{Q} - 0{,}2}{0{,}4} \right)^2$$

where H — cooling ability of air, Q — a difference between temperature of body of the man (36,5 C) and temperature of a premise (room), 0,2 and 0,4 — empirical factors, X — speed of movement of air in m/s.

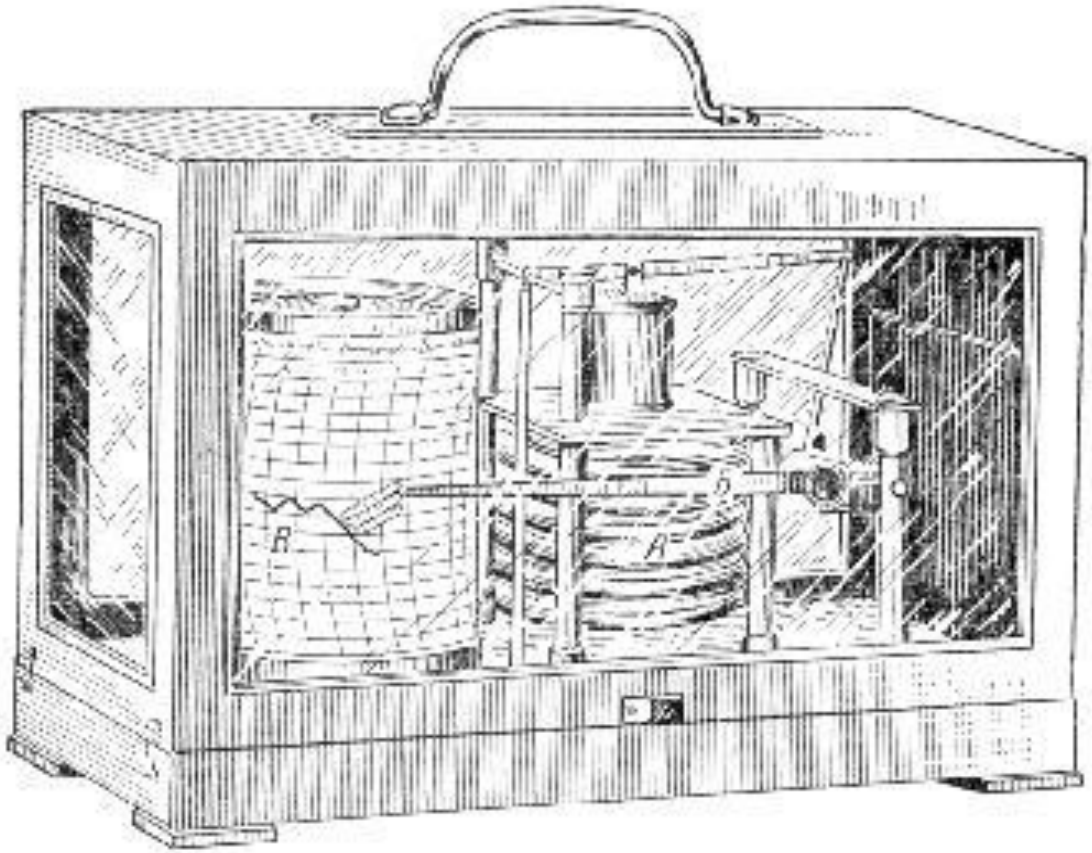
" Rose of winds "

The direction of a wind can be: north - east, north, north – west, west, south – west, south, south – east, east.

For investigation direction air movement on open places use Wind rose - graphic representation of primary direction of air movement in the given district during year - is very important at accommodation various objects of pollution.

DEVICES FOR ESTIMATION ATHMOSPHERIC PRESSURE

Барометр - анероид



Барограф.

А - анероидные коробки; Б - стрелка с пером;
В - вращающийся барабан с бумажной лентой

METHODS OF COMPLEX ESTIMATION OF MICROCLIMATE

It is estimation of all factors of microclimate in room by one index.

Application methods of complex estimation of microclimate:

- for estimation microclimate in room
- for improvement microclimate in room (air condition)
- in health resort science – for dozation of air procedures

in hygiene of work – in hot industry

METHOD KATATHERMOMETRY

We investigate the cooling-off period of dry katatermometer from 38 C up to 35 C in sec.

Cooling ability of air is determined under the formula :

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

where F - factor of katatermometer,

t – time of cooling in sec.

Norm H - 5,5 - 7 mcal / sm2 sec

METHOD OF EFFECTIVE TEMPERATURES

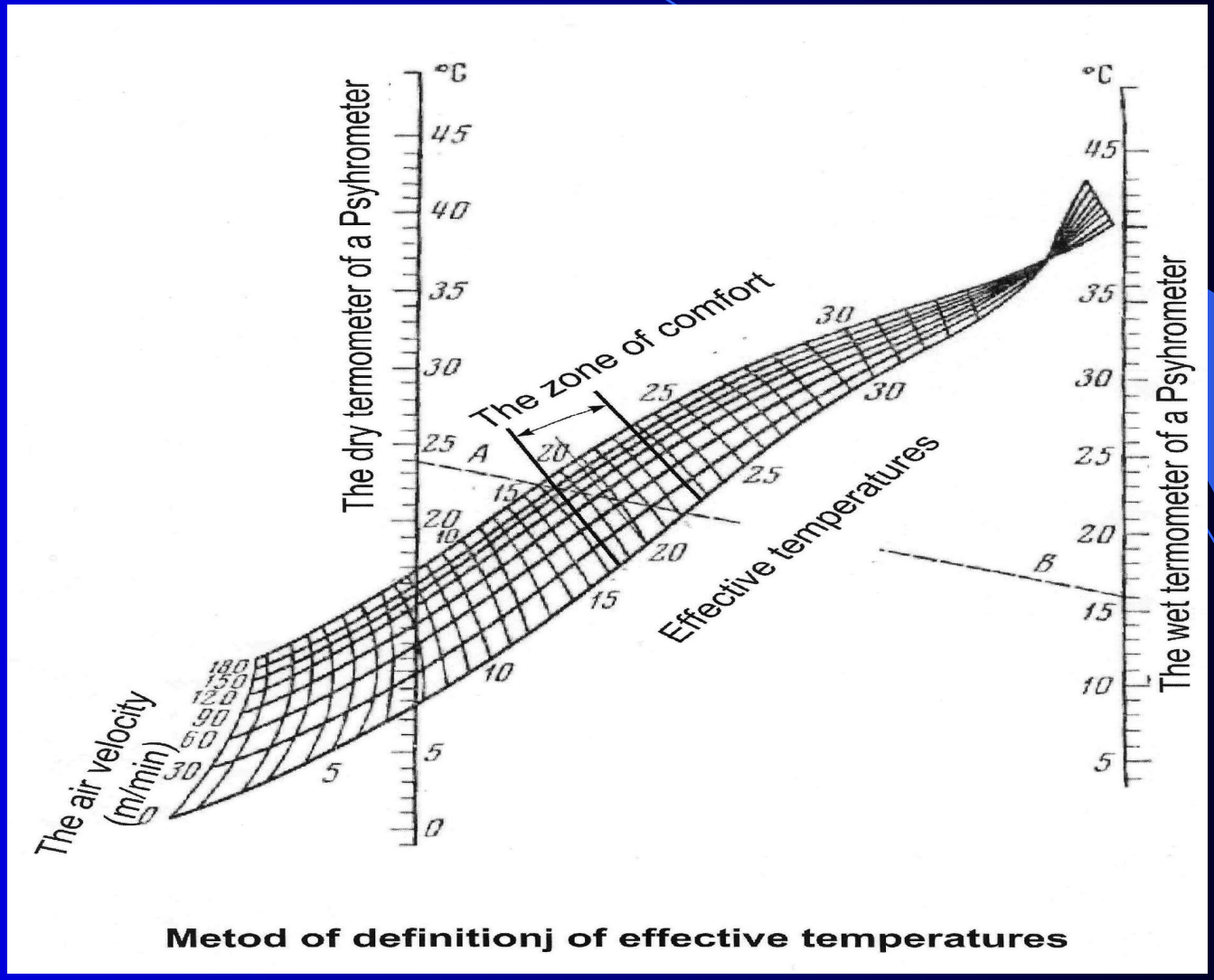
t C

E = 100%, V = 0 m/s

Zone of comfort 17,1 – 21,7 0C (50% of investigated person)

Line of comfort 18,1 – 18,9 0C (100% of investigated person)

NOMOGRAMM FOR DEFINITION EFECTIVE TEMPERATURE



Metod of definitionj of effective temperatures

METHOD OF EQUIVALENT - EFFECTIVE TEMPERATURES

In other special chambers were changed parameters of T, E, V so, that thermal condition of person was like, as in zone of comfort in first chamber.

The tables of interrelation T, E, V for reaching zone comfort on effective temperature were created.

It is the base of conditioning of air.

METHOD OF EQUIVALENT - EFFECTIVE RADIATION TEMPERATURES

Besides other factors of microclimate was taken into account radiation temperature (difference between temperature of body and temperature of environmental objects).

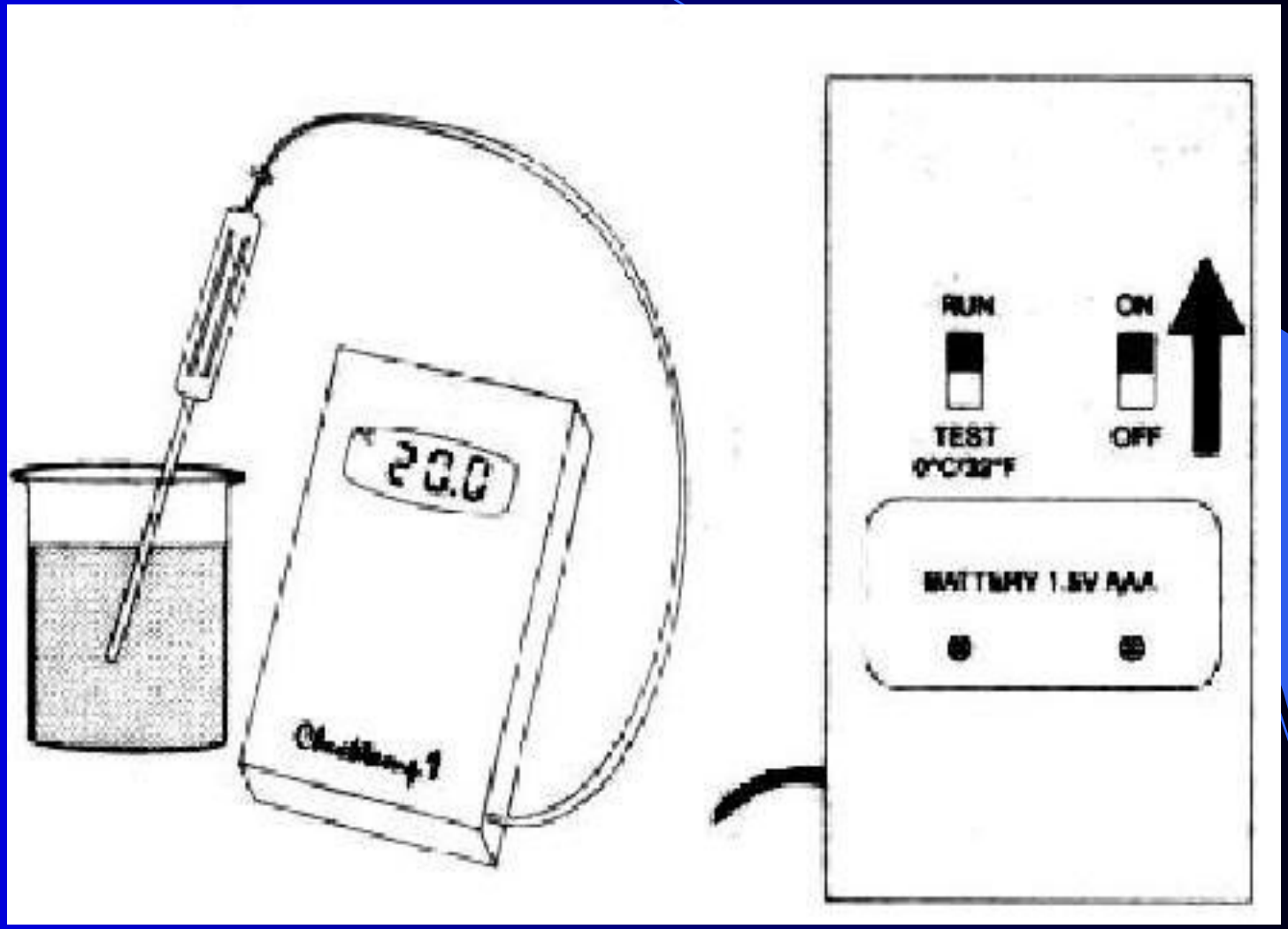
BY THERMAL FEELIND PEOPLE In a PREMISE:

1) biographical method - interrogation people in a premise about their thermal feeling

2) method of dermal temperatures:

Temperature	Temperature skin of forehead (t1)	Temperature back of the hand (t2)	t1 - t2	thermal feeling
10	31,2	24,2	> 6	cold
20	33,5	29,1	3 - 4	comfort
30	35,3	33,1	2,2	hot
35	35,8	35,6	< 1,5	Very hot

DEVICE FOR ESTIMATION SKIN TEMPERATURE



Concept “weather” and “climate”

Weather - dynamic complex of physical properties of air for a short time interval (hours, day, weeks).

Climate - the long-term mode of weather in the given district, it parameters - monthly average temperature of air, average amount days with deposits and etc.

Thus, weather - the changeable phenomenon, a climate - statistically constant parameters.

BASIC GROUPS WEATHER FORMING FACTORS

1. **GELIOPHYSICAL - intensity solar radiation, solar activity.**

PARAMETERS OF SOLAR ACTIVITY:

1) Wolf coefficient (W) - amount maculae on the Sun
2) Coefficient S - general area of maculae on the Sun
3) Intensity of radio emission of the Sun on a wavelength 10,7 sm
4) Intensity «solar wind» - corpuscular streams (protons, electrons etc.) from the Sun

2. **GEOPHYSICAL - intensity geomagnetic field, geomagnetic activity (magnetic fluctuations and impulses)**

- **ELECTRICAL STATE OF THE ATMOSPHERE - electric intensity, potential gradient, electric conductivity of air, ionization** (contents + or – aeroions), **electromagnetic oscillations.**

4. METEOROLOGICAL - temperature, humidity, speed and direction of air, atmospheric pressure, etc.

5. SYNOPTIC - cloudiness, deposits

Synoptic factors are caused by atmospheric circulation of warm and cold air masses.

3 types of air masses - **warm, cold, neutral (local).** At their movement are formed **atmospheric fronts - warm, cold, occlusion.**

6. CHEMICAL COMPOSITION of ATMOSPHERE - content O2, CO2, pollutants

Types of atmospheric circulation:

Cyclone - atmospheric whirlwind with low pressure in the center and movement of air weights counter-clockwise.

It is characterized by unstable weather - it is cloudy, deposits, hurricanes, typhoons. The big differences of pressure, temperatures, contents O 2.

Biothopic weather.

Anticyclone - the atmospheric phenomenon with a high pressure in the center and movement of air clockwise.

Clear weather - strong heat in the summer or a frost in the winter. Sharp differences are not present - more favorable weather.


ANTICYCLONE
CYCLONE

The reasons of Metheotropic Reactions.

At a periodical sharp changes of weather factors at people can arise MR, expressed than more, than sharper changes of weather are observed during day or some hours.

All people by metheo-sensibility share on 2 categories:

a) **meteostable** - tolerant - young healthy people

b) **meteosensitive** - by the different data it is 30-70 % of the population, in old age, among ill patients - up to 90 %.

Displays of MR

1) **Easy degree -** asteno-vegetative syndrome. (Mass character and synchronism with changes of weather - presence MR).

2) **Average degree -** the head and intimate pains, the expressed changes of pulse, the BP, asthma.

3) **Heavy degree -** aggravation of chronic diseases - insults, heart attacks, attacks bronchial asthma - growth mortality of patients.

Diseases, at which are marked MR

1) Diseases, at which presence MR is authentically proved:

- **Cardiovascular diseases** - statistically growth number of insults, hypertonic crisises, heart attacks and mortality at biothropic weather,
- **Bronchial asthma** - increase attacks of asthma, mortality of patients,
- **Rheumatism** - activation disease, strengthening polyarthritis, artralgya - at 90 % of patients,
- **CNPD (chronic nonspecific pulmonary diseases)** - in 60-72 % of patients.

2) Diseases, at which there are data on presence MR:

-- Diseases gastro-enteritis way (stomach ulcer, gastritis, colitis) - 40-60 % of patients

-- Illnesses of kidneys - 40-50 %,

-- Diabetes - 20 %,

-- Psychyatric frustration - 50 % of patients,

-- Ophthalmologic, surgical pathology etc.

Among ill children 25-45 % - meteosensitive.

Medical estimation of weather

In a basis of all medical classifications - the concept of N.Vvedenski about **force of external irritation: low, average and high level.**

By G.Fedorov's classification - **3 types of weather: optimal, irritating and acute**, by other classifications from 4 up to 7 types.

The main thing in medical estimation weather - account quickly fluctuation of weather factors - it differences during the hour, day.

Definition degree variability of weather.

$$K = \frac{N}{n} \times 100\ \%,$$

Where:

K - coefficient variability of weather, %

N - number days with contrast change of weather

n - total number days in the season

Degree variability of weather

Weather	Coefficient variability, %
Very stable	25
Stable	25 – 30
Changeable	30 – 50
Very changeable	More than 50

Scientists Yalta scientific research institute named by Sechenov have offered

General Clinical Index of Pathogenicity of Weather - the sum of changes of individual indexes of weather for day by the most important factors.

If the Index 0-19 - optimal weather,

If the Index 20-49 - irritating weather (demands strengthened medical control),

If the Index more than 50 - sharp weather (demands strict medical control).

System of prevention of MR

1) **General hygienical methods** - improvement conditions of life and work, normalization microclimate, measures for decrease negative influence weather at works on open air (in agriculture, construction etc.).

2) **Organizational measures:** account metheosensibility patients in a polyclinic and a hospital, organization medical weather forecasts, medical recommendations to the population in MASS-MEDIA etc.

3) Treatment-and-prophylactic measures:

а) **Increase nonspecific resistancy of organism** - stay on fresh air, vitamins, balanced diet etc.

b) **Sparing mode** – stay in bed, restriction of climatic and physiotherapeutic procedures, prohibition of operations, stomatologic procedures, direction in dispensaries, sanatoria etc.

в) **Pharmacological measures** by specific and nonspecific means - sedative, hypotensive, etc.

Can be **seasonal prevention -** regular reception small dozes preparations in adverse months in the given area.

Seasons for seasonal prophylaxis cardiovascular diseases for the south of Ukraine and **in Crimea (V.Bardov, 1990)**

Most unfavorable months on rising frequency of exacerbations:
hypertonic crisises - 2,3,4,5 and 12
attacks stenocardia -1,2,3,4,5 and 11
myocardial infarction -1,2,3,4,5,7,8
violation of cerebral circulation (insults)- 1,3,4,5,6,12

Urgent prevention measures will be carried out for metheosensitive cardiological and other patients in hospital in the periods and days biothropic weathers on the basis of urgent medical weather forecasts.

Hygienic value climate

Climate - a long-term mode of weather in the given district.

CLIMATE FORMING FACTORS

1. **Geographical latitude, defining inflow solar radiation**
2. **Height above sea level, relief and kind of earth surface (water, land, green, snow)**
3. **Features of circulation of air masses**
4. **Closeness to the seas and oceans.**

THE BASIC PARAMETERS of CLIMATE:

Monthly and year average parameters:

1. **Temperature of air**
2. **Humidity**
3. **Amount of deposits**
4. **Atmospheric pressure**
5. **Rose of winds and it speed**
6. **Amount clear and bad weather days**
7. **Duration of winter**

COEFFICIENT INSTABILITY of CLIMATE

$$K = A/B,$$

Where: A - amount days with labile weather
B - amount days in the season (season, year)

The coefficient $K > 0,5$ is regarded as unfavorable weather

ACCLIMATIZATION

Acclimatization - complex functional - morphological changes in organism, directed to the adaptation to new climatic conditions.

2 stages:

a) **Partial acclimatization or adaptation** - the first hours - 14 day (at ill people - about 30 and more days).

b) **Full acclimatization** - after 14 day - some months, to conditions of Far North - up to 1,5 years.

During acclimatization it is reduced resistancy of organism to adverse factors of environment - growth diseases, asteno-vegetative syndrome etc.

Prevention adverse displays of acclimatization:

- Elimination of the reasons - to avoid without necessity sharp changes of a climate, is especial the patient, to older persons and children,

- Increase general resistancy of organism - hardening, a balanced diet etc.

- Sparing mode of climatic procedures on southern resorts.