

NATIONAL UNIVERSITY OF PHARMACY DEPARTMENT OF PATHOLOGICAL PHYSIOLOGY

HYGIENE IN PHARMACY AND ECOLOGY

**«Hygienic assessment of natural and artificial
illumination, ventilation of pharmacy premises»**

KHARKIV, 2017/18

Plan of lecture

1. Basic light values, units of measurement.
2. Natural and artificial illumination.
3. Methods of hygienic assessment of natural and artificial illumination.
4. Natural and artificial ventilation.
5. Methods of hygienic assessment of natural and artificial ventilation.

Suggested Reading

Basic

- Hygiene in Pharmacy. Manual for foreign students of higher schools / O. S. Kalyuzhnaya, O. P. Strilets, L. S. Strelnikov et al. – 2nd Edition, supplemented and revised. – Kharkiv: NUPh, 2013. – 224 p.
- Bardov V. G. Hygiene and Ecology/ Editer by V. G. Bardov. – Vinnytsya : Nova Knyha Publishers, 2009. – 687 p.

Auxiliary

- Kjellstrom Y. Basic environmental health / Y. Kjellstrom, K. Guidotti. – Oxford. – 2001. – 546 p.
- General Hygiene and environmental health / Zaporozhan V. M., Bazhora Yu. I., Vitenko I. S. et al. – Odessa, 2005. – 300 p.

Information resources, including the Internet

- 1. Library of NPhaU: <http://lib.nuph.edu.ua>
- 2. Specialized medical and biological portals of the Internet.

LIGHT

DAYLIGHT

LAMPLIGHT



**MIXED
ILLUMINATION**



LIGHT IS A PART OF RADIATION ENERGY FLUX THAT IS PERCEIVED BY THE HUMAN EYE IN THE FORM OF VISUAL SENSATION.



LUMINOUS FLUX IS A PART OF RADIATION ENERGY FLUX THAT ARISES LIGHT SENSATION.

UNIT - LUMEN (LM).

Illumination is luminous flux density on the surface that is lightened.

Light unit - lux (lx).

The Lux (lx) is illuminance that is received on the area of 1 m^2 , when 1 lm luminous flux strikes the surface and is uniformly distributed.

DAYLIGHT IS CHARACTERIZED BY ITS UNIFORMITY AND BY FREQUENCY CONTENT THAT IS ADVANTAGEOUS FOR THE HUMAN EYE.

THE SOURCE OF THE DAYLIGHT (NATURAL ILLUMINATION) IS THE SUN.



The illumination in rooms is 1% of outdoor illumination.

FACTORS THAT HAVE AN IMPACT ON VOLUME OF DAYLIGHT IN ROOMS

EXTERNAL

INTERNAL

EXTERNAL FACTORS

LIGHT CLIMATE OF THE REGION

Geographic latitude of the region, quantity of unshadowed days, weather conditions, amount of clouds, atmosphere transparency, month of the year, time of day.



INTERNAL FACTORS

WINDOWS ORIENTATION TO THE SIDES OF THE WORLD, FLOOR OF A BUILDING

THE TYPES OF INSOLATION REGIME IN THE ROOMS

Insolation regime	Window orientation	Cycle of insolation, hours	Area of the insolated floor, %
Maximal	south-eastern, south-western	5 - 6	80
Moderate	southern, eastern, western	3 - 5	40 – 50
Minimal	north-eastern, north-western, northern	less than 3	up to 30

THE TIME OF INSOLATION OF LIVING QUARTERS, CLASSROOMS AND OTHER ALIKE ROOMS MUST BE NOT LESS THAN 3 HOURS.

WINDOW ORIENTATION

THE HIGHEST BACTERICIDAL EFFECT IS OBTAINED IN THE ROOMS THAT ARE ORIENTED TO SOUTHERN RHUMBS.

IN THE ROOMS THAT ARE ORIENTED TO NORTHERN RHUMBS, THIS EFFECT IS DECREASED TWOFOLD AT A DISTANCE OF 0,5 M. FROM THE WINDOW.

INTERNAL FACTORS

NUMBER, DIMENTION AND DISPOSITION OF THE WINDOWS

- UPPER SIDE OF THE WINDOW IS SET CLOSER TO THE CEILING. THE DISTANCE FROM THE UPPER SIDE OF THE WINDOW TO THE CEILING IS -15-30 cm!
- THE WINDOWS RECTANGULAR IN SHAPE ARE ADVANTAGEUS.



INTERNAL FACTORS

**THE ROOM DEPTH IS THE DISTANCE FROM THE
WINDOW WALL TO THE OPPOSITE ONE**

**THE ROOM DEPTH MUST BE NOT MORE THAN
6,5 M!**

QUALITY OF WINDOWS AND CLEANLINESS FACTORS

WINDOWS MUST BE TRANSPARENT AND CLEAN



HYGIENIC REQUIREMENTS FOR ILLUMINATION

- illumination should be sufficient in its intensity;
- it should be uniform;
- it should not create sharp shades;
- neither the sources of light, nor the reflected surfaces should be blinding for the eyes;
- artificial illumination should be safe;
- artificial illumination should approximate natural by its spectrum.



HYGIENIC ASSESSMENT OF NATURAL ILLUMINATION

**DESCRIPTIVE METHOD
QUANTITY OF THE WINDOWS,
THEIR ORIENTATION,
DIMENTIONS,
COLOUR OF THE WALLS**

GEOMETRIC PARAMETERS

LIGHT FACTOR

FALLING ANGLE

ORIFICE ANGLE

**LIGHT-ENGINEERING
PARAMETERS**

**COEFFICIENT
OF NATURAL LIGHTING (CNL)**

**LIGHT FACTOR IS THE RATIO OF THE GLASS SURFACE
OF WINDOWS TO THE AREA OF THE FLOOR.**

**1/4 – FOR PHARMACIES WITH INTENSIVE VISUAL PERFORMANCE
1/6 - FOR OTHERS**

**FALLING ANGLE IS THE ANGLE OF LIGHT INCIDENCE
FROM THE WINDOW ON THE HORIZONTAL SURFACE
(NOT LESS THAN 27°)**

**ORIFICE ANGLE IS THE ANGLE THAT IS FORMED BY
TWO LINES, ONE OF WHICH LINKS A WORKING PLACE
WITH THE UPPER SIDE OF THE WINDOW, AND THE
OTHER ONE IS LINKED WITH THE HIGHEST POINT OF
THE SHADE BUILDING.**

NOT LESS THAN 5°

LIGHT-ENGINEERING PARAMETERS

The coefficient of natural lighting (CNL) is the ratio of horizontal illumination inside the room to simultaneously measured illumination of horizontal surface in the open air that is expressed as a percentage.

1,5 – 2 % - for rooms with intensive visual work;
1 % - for other rooms.



LAMPLIGHT IS THE ILLUMINATION OF THE BUILDING ONLY BY THE SOURCES OF ARTIFICIAL LIGHT.

MIXED ILLUMINATION IS THE ILLUMINATION WHEN INSUFFICIENT BY STANDARDS DAYLIGHT IS COMPENSATED BY THE LAMPLIGHT.



LAMPLIGHT

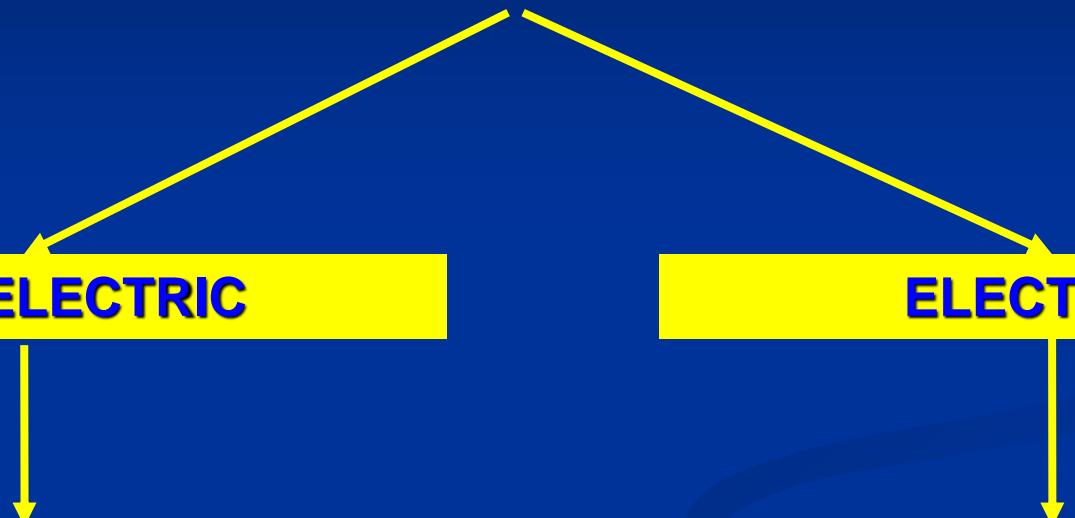
SOURCES

NONELECTRIC

ELECTRIC

PETROLEUM LAMPS,
CANDLES

FILAMENT LAMPS,
LUMINESCENT LAMPS



FILAMENT LAMPS



LUMINESCENT LAMPS
ARE LOW-PRESSURE
GAS-DISCHARGE
LIGHT SOURCE.

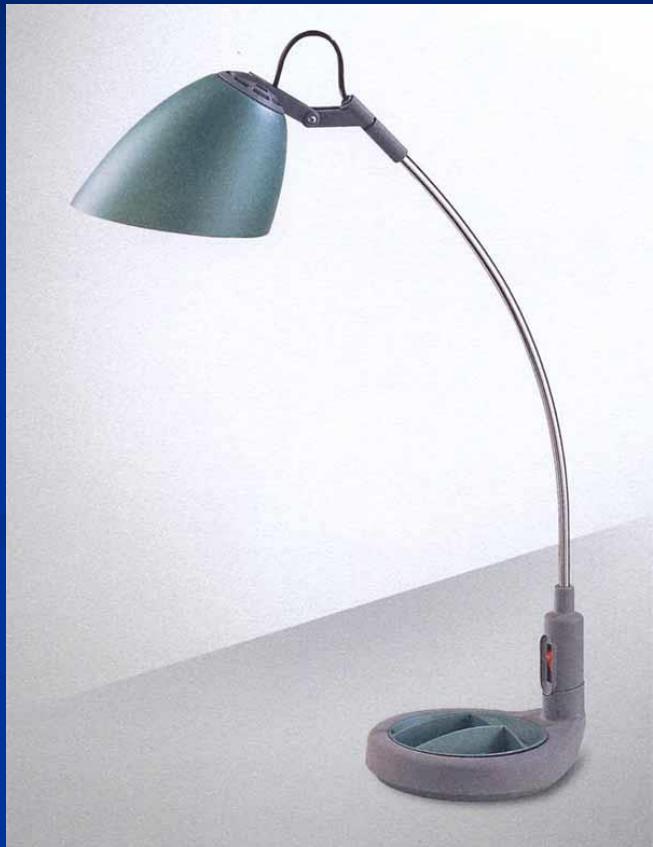


ADVANTAGES

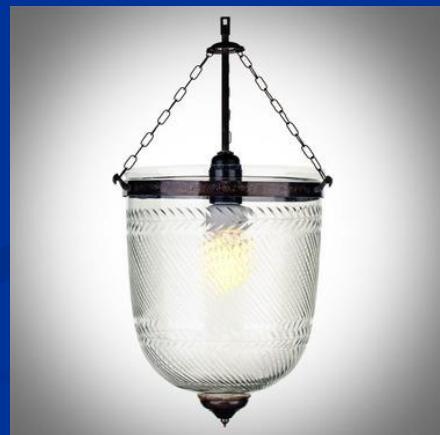
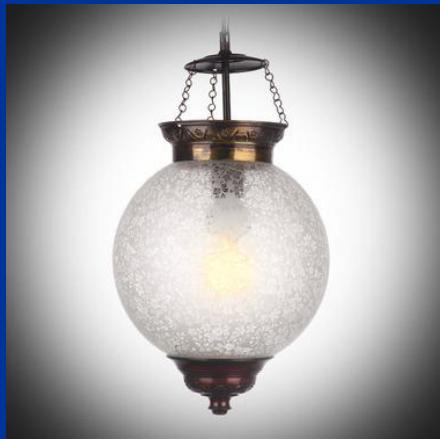
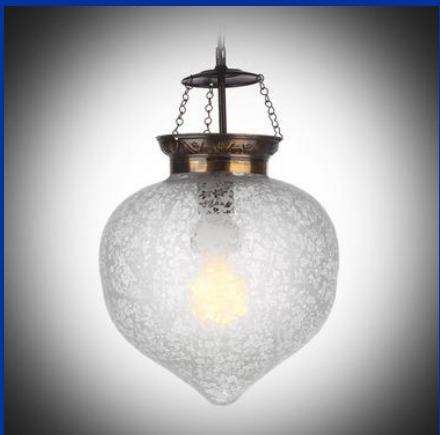
- range of colour grade;
- low power intensity;
- life cycle (10 000 hours);
- spectrum



1. DIRECT LIGHT LUMINAIRE:



2. UNIFORMLY DIFFUSED LIGHT LUMINAIRES:



3. REFLECTIVE LIGHT LUMINAIRES:



4. SPOT AND REFLECTIVE LIGHT LUMINAIRES:



5. REFLECTIVE AND SCATTERED LIGHT LUMINAIRES:



THE LEVELS OF ILLUMINATION FOR PHARMACIES:

Designation of room	illumination, lx	Light source
Hall for visitors	150	ЛЛ
Assistant room, aseptic room, analytical room, packaging room	500	ЛЛ
Room for distillation, washing room, sterilization room	150	ЛЛ
Rooms for acid, disinfection solution, and fuel storage	75	ЛЛ
Storage room	10	ЛН

HYGIENIC ASSESSMENT OF ARTIFICIAL ILLUMINATION

**DESCRIPTIVE METHOD
TYPE OF ILLUMINATION,
NUMBER OF SOURCES,
NUMBER , TYPE OF LAMPS**

INSTRUMENTAL CONTROL

LUXMETER

**CALCULATION METHOD
(METHOD OF «WATT»)**

VENTILATION

Ventilation is a complex of technical means that provides air exchange.



Ventilation is a regulated room heat exchange that creates healthy environment

Inhaled air

Oxygen – 21%

Carbon dioxide – 0,04%

Expired air

Oxygen – 16%

Carbon dioxide – 4,5%

↑ Temperature

↑ Humidity

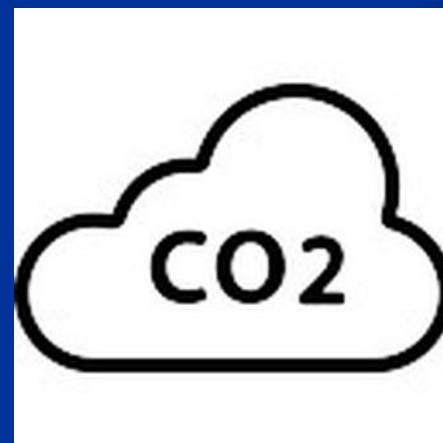
The substances that can poison the premises air:

- Carbon dioxide
- Sweat decomposition products and organic dust
- Intestinal gas
- Microorganisms

CARBON DIOXIDE CONTENT IN AIR IS THE SANITARY INDEX THAT SHOWS THE DEGREE OF AIR POLLUTION.

In case of low physical activity a person exhales 22,6 L of carbon dioxide per hour.

Permissible concentration of CO₂ is 0,1%.



VENTILATION



NATURAL



ARTIFICIAL



NATURAL VENTILATION

Natural ventilation is due to air from protective design elements

Natural factors of ventilation:

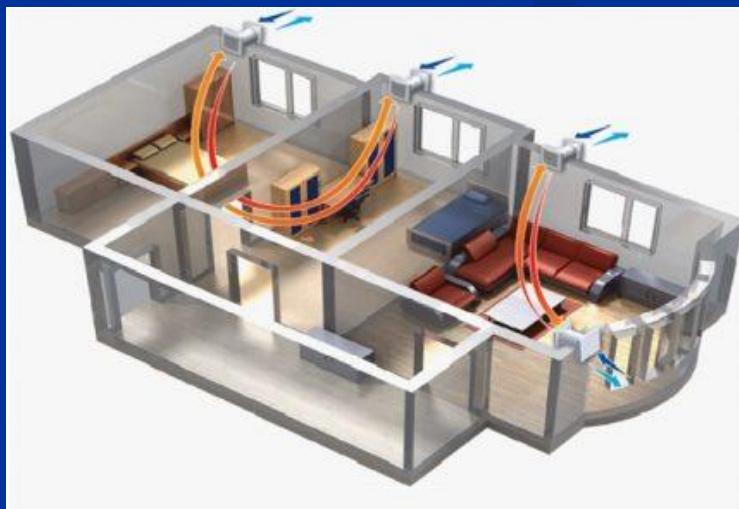
- **wind pressure**
- **temperature difference**



ARTIFICIAL VENTILATION IS DUE TO MECHANICAL ACTIVATORS OF AIR MOVEMENT

Artificial ventilation is used mainly in industrial and public places.

- ✓ By purpose the ventilation is differentiated ***plenum, exhaust and plenum-exhaust ventilation.***
- ✓ By the site of action ventilation may ***be general and local.***



Advantages of artificial ventilation:

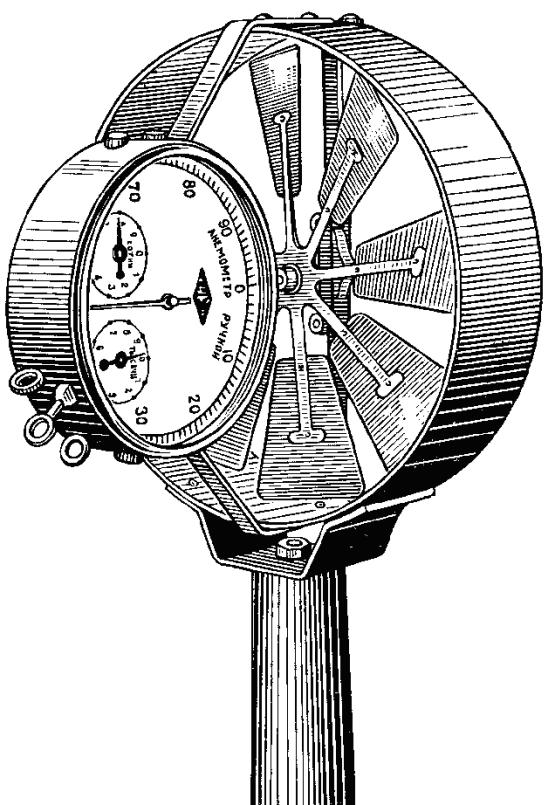
- optimality of higienic conditions
- equality of room ventilation
- given parameters of climate control

Hygienic requirement to systems of ventilation:

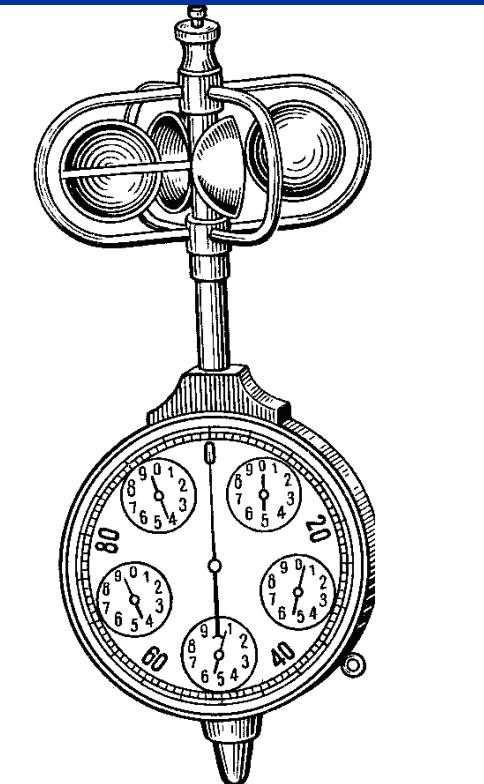
- ✿ purity of air, temperature, humidity;
- ✿ velocity of motion;
- ✿ simplicity, safety;
- ✿ regularity, quietness.

V -THE VELOCITY OF AIR MOTION IN THE SYSTEM OF VENTILATION IS DEFINED BY THE ANEMOMETRIC INSTRUMENT.

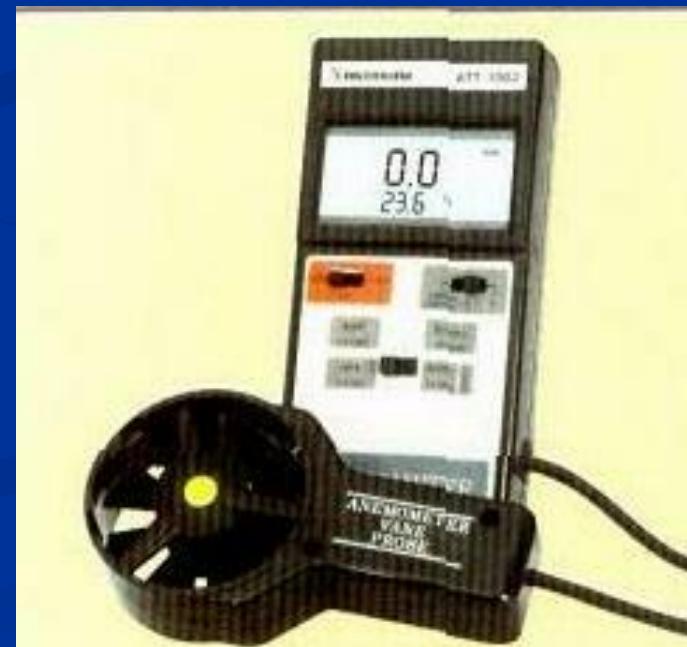
**VENT
ANEMOMETER**



**CUP
ANEMOMETER**



**PORTABLE CUP
ANEMOMETER**



THANK YOU FOR ATTENTION!