MEDICAL UNIVERSITY - PLEVEN
FACULTY OF MEDICINE

DISTANCE LEARNING CENTER

DIVISION OF PHYSICS AND BIOPHYSICS

MEDICAL PHYSICS

PRACTICAL EXERSICES – THESES

ENGLISH MEDIUM COURSE OF TRAINING
SPECIALTY OF MEDICINE

ACADEMIC DEGREE **MASTER**

PROFESSIONAL QUALIFICATION **DOCTOR OF MEDICINE**

Developed by: Prof. M. Alexandrova, DSc

1. Measurements and units of measure. To describe the metric units of measure; to explain what the seven fundamental units are; to explain how we can write derived units.

2. Errors: classification, accuracy, theory of errors. To explain the difference among gross, systematic and random errors; to calculate the accuracy of an individual direct measurement; to calculate the accuracy of a group of direct measurements; to calculate the accuracy of indirect measurements.

3. Total magnification of a compound microscope. Magnification of objective lens and eyepiece lens. To explain mechanical and optical structure of a compound microscope; to explain the terms magnification, definition, resolution, and depth of focus; to explain the purpose of oil-immersion objectives, to calculate total magnification of compound microscope, magnification of objective and eye-piece; to evaluate the accuracy of the measurement.

4. Measuring microobjects by light microscope. Through the use of eye-piece micrometer and eye-piece grid to measure linear size and area of microobjects; to determine thickness of transparent bodies.

5. Determination of average diameter, average area and diameter distribution of erythrocytes - application of statistical concepts. To explain the terms general and statistical totality, random and representative sample; to explain purpose of statistical characteristics average value, standard deviation of an individual measurement, standard deviation of the mean result, confidence probability or confidence level; to determine average diameter, average area and diameter distribution of erythrocytes.

6. Evaluation of liquids dynamic viscosity. To explain difference between laminar and turbulent flow; to explain the viscosity as an internal friction coefficient of a real fluid; to explain purpose of basic parts of the viscometer of Ostvald-Pinkevich; to measure dynamic viscosity of liquid using the capillary method of Poiseuille.

7. Evaluation of liquids surface tension. To explain the terms molecular pressure, cohesion pressure, surface tension; to determine surface tension using method of blowing away air bubbles.

8. Pressure. Air pressure. Blood pressure. Air humidity. To explain the terms pressure, air pressure, blood pressure, and humidity; to explain the Korotkov's method for indirect measurement of blood pressure; to determine humidity using the psychrometer of August.

9. Determination of lens power of spherical lens. To determine the principal focus, focal length, and lens power of a convex lens; to find the image distance, principal focus, focal length, and lens power of a concave lens.

10. Measurement of concentration of biological liquids and pharmaceutical preparations by refractometer. To explain the relationship between the optical refraction and the wave character of light; to explain the dependence of refraction on the light speed; to explain the purpose of basic parts of the refractometer; to determine actual concentration of biological liquids and preparations by index of refraction using refractometer.

11. Measurement of concentration of optically active liquids by polarimeter. To explain difference among linearly, circularly and elliptically polarized light; to explain the polarization of light by double refraction; to explain purpose of basic parts of the polarimeter; to measure actual rotation angle of sugar solutions using polarimeter**.**

12. Electrocardiography (ECG). To explain the origin of electric field and potential distribution around the heart; to explain the connection of different type leads used in electrocardiography; to measure the wave amplitudes and duration of time intervals on the

electrocardiogram recorded.

13. Measurements with electric instruments. To explain the difference between a voltmeter and an ammeter; to measure voltage and current in a circuit; to calculate the resistance and power of a circuit element.

14. Graduation of semiconductor thermometer. To explain the difference between conductors, insulators and semiconductors; to explain the difference between the common measurement of resistance and bridge-measurements, to explain the advantages of semiconducting thermometer, to graduate semiconducting thermometer.

15. Graduation of thermoelement. To describe and explain the different thermoelectric effects; to explain what determines the efficiency of a thermoelectric converter; to can graduate a thermoelement.

16. V-A characteristic of crystal diode To explain difference between conductors, insulators, and semiconductors; to explain the terms P-N junction, crystal diode, V-A characteristic; to make measurements and plot a graph of V-A characteristic of a crystal diode.

17. V-A characteristics of Biologically Active Point (BAP). To find a BAP of lung meridian on the base of its low electric resistance; to plot the current-voltage characteristic of BAP at constant pressure of active electrode on the skin

18. Determination of an actual auditory threshold of hearing. To explain relation and difference between objective and subjective sound characteristics; to explain the use of decibel scale to compare sound intensities; to plot actual auditory threshold curve – audiogram.

19. Light measurements: comparison of the intensity of two light sources and determination of the integral sensitivity of photocell. To define luminous and illuminated object; to define the terms of photometry: luminous intensity, luminous flux, illuminance; to compare the luminous intensities of two light sources; to determine the integral sensitivity of a photopile.

20. Measurements with electron oscilloscope. To explain the arrangement of cathode-ray tube; to explain when oscilloscope is preferable to use; to measure the amplitude of voltage and current, period and frequency of sine electric signal.

21. Frequency dependence of human skin impedance. To explain and investigate the dependence of impedance of human skin upon the frequency of electric current; - to define the basic terms of RC circuit; - to model the impedance of the human skin using RC circuit.

22. Revision. To revise the experimental procedures of the topics, to solve some numerical problems

23. Colloquium. It includes experiment performance, theory test and interview.