

## Topic 1

### Introduction into laboratory practicum. Error theory

#### Objective

to study the procedure for processing data of direct and indirect measurements of physical quantities. Learn how to calculate the random error of the direct and indirect measurements.

#### Questions for discussion

1. Direct and indirect measurements of physical quantities.
2. Systematic and random errors, error theory
3. Estimation and calculation of random errors of direct measurements.
4. Estimation and calculation of random errors of indirect measurements.
5. Definition of the concepts of confidence interval, confidence probability. Finding the Student's coefficients.

#### Solve the problems:

1. The following values of hemoglobin concentration in blood were obtained from six patients: 75,7; 70,1; 91,2; 70,7; 71,4; 78,8. Estimate the true value of hemoglobin concentration through a mean value  $\bar{X}$  and confidence interval  $\Delta X$ , if a confidence level  $\gamma$  is 0,95. Student's coefficient  $t_{0,95,6} = 2,57$ .
2. The following values of the breath rate were obtained: 11, 14, 12 ( $\frac{1}{\text{min}}$ ). Calculate a confidence interval for the mean breath rate if a confidence level  $\gamma$  is 0,95 ( $t_{0,95,3} = 4,3$ ) and  $\gamma = 0,98$  ( $t_{0,98,3} = 7$ ).

#### Recommended literature:

1. Medical and biological physics for medical students: Textbook / L.V.Kukharenko et al. – Minsk: BSMU. 2016, pp. 28-32.