LEARNING AID FOR EXAM

1. The recommended duration of applying a tourniquet during phlebotomy:

a) not more than 1 min

b) not more than 3 to 4 min

c) not more than 5 to 10 min

d) no tourniquet is applied

2. Which of the following is the most common compication of phlebotomy?

a) haematoma

b) convulsions

c) fainting

d) hyperventillation

3. The supernatant obtained following the centrifugation of whole blood collected in a red-top (native) blood collection tube is called:

a) serum

b) white blood cells

c) thrombocytes

d) plasma

4. The blue-top blood collection tube (containing sodium citrate as anticoagulant) is used predominantly for the following:

a) coagulation tests

b) complete blood count

c) glucose concentration mesurement

d) uric acid concentration measurement

5. What type of blood collection tube is employed for the erythrocyte sedimentation rate test?

a) tube with trisodium citrate anticoagulant (black-top)

b) tube with dipotassium edetate anticoagulant (lavender-top)

c) tube with procoagulant (red-top)

d) tube with lithium heparinate anticoagulant (green-top)

6. Which anticoagulant does NOT prevent the coagulation of collected blood by binding calcium?

a) lithium heparinate

b) potassium oxalate

c) sodium citrate

d) ethylene diamine tetraacetate

7. Blood plasma is:

a) the liquid fraction of blood collected into a tube containing an anticoagulant

b) the liquid fraction of blood collected into a tube NOT containing an anticoagulant

c) the fraction of blood containing cells

d) the fraction of blood containing fibrin

8. Blood serum is:

a) the liquid fraction of blood collected into a tube NOT containing an anticoagulant

b) the liquid fraction of blood collected into a tube containing an anticoagulant

c) the fraction of blood containing cells

d) the fraction of blood containing fibrin

9. The volume of blood in an person with average traits is:

a) 80 ml/bwkg (body weight in kilograms)

b) 10 ml/bwkg

c) 200 ml/bwkg

d) 500 ml/bwkg

10. Which phase of sample processing is associated with the highest risk of events with a negative impact on the reliability of laboratory test results?

a) the preanalytical phase

b) the analytical phase

c) the postanalytical phase

d) no respective data are available

11. What instruction is given to an outpatient following phlebotomy?

a) Extend your arm and press the bandage on the needle site firmly

b) Bend your arm and press the bandage on the needle site firmly

c) Lie on your back and wait for 10 minutes

d) Have a large glass of water

12. What instruction is given to an outpatient prior to phlebotomy?

a) Drink much water or non-sweetened tea

b) Lie on your back and wait for 10 minutes

c) Have half a bar of chocolate

d) Wash your arm

13. What measure is required for the unambiguous identification of samples?

a) All of the below measures are important

b) The patient should be asked his/her name and it should be written on the collection tube

c) In the case of an unconscious patient, the personal data displayed on the wristband should be applied

d) In addition to the name of the patient, the birth date or the social security ID number should also be written on the collection tube

14. What precaution is required for transporting phlebotomy samples?

a) Transport the sample to its destination in the shortest possible time frame

b) Freeze the sample under any circumstance

c) Resuspend the sample by thourough shaking following phlebotomy

d) Lay samples in a box to avoid their slipping

15. What does the expression ’hemolyzed sample’ mean?

a) Red blood cells have ruptured and haemoglobin has been released

b) A lipid layer has formed on top of serum

c) The collected blood is red

d) Every red blood cell in the sampe has ruptured

16. What does the expression 'lipemic sample' mean?

a) The serum is milky white

b) Red blood cells have ruptured and haemoglobin has been released

c) The collected blood is white

d) Serum cholesterol levels are high

17. What issues are encountered with hemolyzed blood samples?

a) The levels of certain analytes, such as potassium and LDH, are erroneously high

b) Red blood cell count is erroneously low

c) Laboratory automats are unable to process these samples due to the failure of sample aspiration

d) White blood cell count is erroneously low

18. How can the hemolysis of blood samples be prevented?

a) The tourniquet should not be applied for more than 1 min before phlebotomy is performed

b) The collected blood sample should be shaken thoroughly

c) The arm of the patient should be rinsed with alcohol thoroughly

d) The needle site should be slapped before needle insertion

19. What measure should be taken to prevent lipemia?

a) The patient should refrain from having a fatty meal before phlebotomy

b) The tourniquet should not be applied for more than 1 min before phlebotomy is performed

c) The collected blood sample should be shaken thoroughly

d) The arm of the patient should be rinsed with alcohol thoroughly

20. Why is a laboratory sample collected in the morning hours preferred?

a) The levels of certain laboratory parameters have a diurnal cycle, requiring the standardization of the time of sample collection

b) Patients tolerate morning sampling better

c) Phlebotomy can be performed in a more facile manner in the daylight

d) Laboratories shut down for the night

21. The levels of which laboratory parameter show the most significant elevation when the patient rises from a seated position?

a) renin

b) hemoglobin

c) total protein level

d) cholesterol

22. The level of which laboratory parameter reaches its peak around noon?

a) iron

b) testosterone

c) hematocrit

d) adrenaline

23. Capillary blood is collected from infants younger than 1 year of age by pricking:

a) the lateral part of the underfoot

b) the heel

c) the index finger

d) the thumb

24. Which statement is FALSE for hemolyzed samples?

a) Hemolysis is visible from the presence of at least 0.01 g/L hemoglobin in the sample

b) Hemolysis causes interferences with chemical reactions

c) Hemoglobin interferes with photometric assays

d) The levels of intracellular analytes are elevated

25. Reference individuals for laboratory testing are:

a) Individuals selected based on various traits

b) Healty individuals

c) Professional athletes

d) All voluntary blood donors

26. The laboratory reference range is:

a) An interval of test results calculated by testing reference individuals

b) An interval of test results calculated by testing healthy individuals

c) The weighted average of the test results of reference and healthy individuals

d) An interval of test results calculated by testing all volunteers

27. A false negative laboratory test result is:

a) the test result of a person suffering from the condition he/she is tested for which is in the reference range

b) the test result of a person suffering from the condition he/she is tested for which is outside the reference range

c) the test result of a person NOT suffering from the condition he/she is tested for which is in the reference range

d) the test result of a person NOT suffering from the condition he/she is tested for which is outside the reference range

28. A true positive laboratory test result is:

a) the test result of a person suffering from the condition tested for which is outside the reference range

b) the test result of a person suffering from the condition tested for which is in the reference range

c) the test result of a person NOT suffering from the condition tested for which is in the reference range

d) the test result of a person NOT suffering from the condition tested for which is outside the reference range

29. Sensitivity is the probability:

a) that a positive test result of an individual suffering from the condition he/she is tested for is obtained

b) that a negative test result of an individual NOT suffering from the condition he/she is tested for is obtained

c) that an individual does NOT suffer from the condition he/she is tested for when a negative test result is obtained

d) that an individual suffers from the condition he/she is tested for when a positive test result is obtained

30. Specificity is the probability:

a) that a negative test result of an individual NOT suffering from the condition he/she is tested for is obtained

b) that a positive test result of an individual suffering from the condition he/she is tested for is obtained

c) that an individual does NOT suffer from the condition he/she is tested for when a negative test result is obtained

d) that an individual suffers from the condition he/she is tested for when a positive test result is obtained

31. Which is true for emergency laboratory tests?

a) The laboratory turn-around time is less than 1 hour

b) The test report is released only when the test is positive

c) The same emergency tests are used in all laboratories

d) The test results are released without being validated

32. Which of the following is true for alarm values?

a) All of the below

b) There is no uniform procedure, the alarm value can be set by the clinician who orders the test

c) The clinician who has ordered the test is informed immediately on a result exceeding the alarm value

d) Prompt clinical decision has to be made when a test result exceeds the alarm value

33. What type of test is associated with a low occurrence rate of false negative results?

a) a test with high sensitivity

b) a test with high specificity

c) a test with high positive predictive value

d) a test with high negative predictive value

34. What is the consequence of lowering the cut-off value of a laboratory test in which high values yield positive results?

a) The sensitivity of the test is increased

b) The specificity of the test is increased

c) Neither the sensitivity or the specificity of the test changes

d) None of the above

35. What measure of laboratory test performance should be prioritized if false positive results ha1ve severe consequences?

a) high specificity

b) high sensitivity

c) high positive predictive value

d) high negative predictive value

36. What is the consequence of increasing the cut-off value of a laboratory test in which high values yield positive results?

a) The specificity of the test is increased

b) The sensitivity of the test is increased

c) Neither the sensitivity or the specificity of the test changes

d) None of the above

37. The predictive value:

a) depends on the population studied

b) depends exclusively on the specificity of the test

c) depends exclusively on the sensitivity of the test

d) is independent of the prevalence of the condition tested

38. The ROC curve

a) displays the probabilities of obtaining true positive results and false positive results by considering various cut-off values

b) should have a slope of 45% for an optimal test

c) both are true

d) neither are true

39. What is the prerequisite of using a non-emergency laboratory test result for clinical decision making?

a) Validation by a qualified professional

b) The test result points to a disorder

c) Payment for the test

d) The clinician who ordered the test has received the results in print

40. What system of units is employed for most test results in Hungary?

a) SI units

b) Standard units

c) That changes from laboratory to laboratory

d) Conventional units

41. What is the chance of obtaining at least one positive result in a panel of laboratory tests performed on a healthy individual and consisting of 20 laboratory parameters with reference ranges covering 95% of the results delivered for healthy persons?

a) 64%

b) 5%

c) 1%

d) 10%

42. The following changes in laborator parameters are characteristic of metabolic syndrome:

a) all three answers are correct

b) low HDL cholesterol

c) high triglyceride levels

d) high uric acid levels

43. Lipemia of a blood sample collected from a fasting patient may correspond to:

a) high triglyceride

b) high HDL-cholesterol

c) high LDL-cholesterol

d) untreated renal disease

44. Which condition is associated with hyperlipoproteinaemia?

a) diabetes

b) hyperthyreosis

c) pneumonia

d) colon cancer

45. High vitamin C concentration may lead to lower cholesterol levels. The reason for this is:

a) vitamin C interferes with the cholesterol assay (leading to erroneously low measured cholesterol levels)

b) vitamin C is a protective agent against diabetes

c) vitamin C stimulates HDL-cholesterol synthesis in the liver

d) vitamin C stimulates bile production, facilitating the elimination of cholesterol

46. Which of the following parameters is NOT associated with the risk of cardiovascular disease?

a) albumin

b) microalbumin

c) C-reactive protein

d) blood lipids

47. Which of the following parameters is NOT associated with the risk of cardiovascular disease?

a) GPT

b) uric acid

c) homocysteine

d) blood sugar

48. Microalbuminuria indicates:

a) glomerular failure

b) the impairment of albumin production (the size of produced albumin molecules is too small)

c) tubular failur

d) liver failure

49. How many inborn metabolic diseases are covered by the mandatory newborn screening in Hungary?

a) 26

b) 3

c) 52

d) 1 (diabetes)

50. The most common cause of a newborn metabolic disorder is:

a) the deficiency of a specific enzyme, resulting in the accumulation of a precursor, and in the deficiency of a product

b) the deficiency of a specific enzyme, resulting in the deficiency of a precursor, and in the accumulation of a product

c) the absence of the receptor of a hormone which therefore fails to exert its effects

d) the immaturity of the organ functions of the newborn due to inadequate nutrition

51. Which is true for the most common inborn metabolic disorders?

a) They are tested for using blood samples collected within a week following birth and dried onto filter paper

b) They are tested for using chemical chemistry analyzers

c) The screening is performed along with vaccination at 6 weeks following birth

d) All thre answers are correct

52. Which general analytes accumulate in blood as a result of cell damage?

a) potassium and LDH

b) sodium and glucose

c) cholesterol and triglycerides

d) albumin and creatinine

53. The levels of which analyte are NOT influenced by liver damage?

a) creatinine kinase

b) GPT

c) gamma-GT

d) GOT

54. The blood concentration of which analyte increases in case of a skeletal muscle damage?

a) creatinine kinase

b) hemoglobin

c) albumin

d) glucose

55. Which analyte is tested routinely in case of a suspected myocardial infarction?

a) troponin T vagy I

b) myoglobin

c) cholesterol

d) CRP

56. The blood concentration of which analyte increases in pancreas inflammation?

a) lipase

b) creatinine

c) albumin

d) bilirubin

57. Which of the following conditions is an indication for testing cholesterol and triglyceride blood levels?

a) All three answers are correct

b) Arcus corneae in a patient younger than 50 years of age

c) Monitoring the efficiency of an antihyperlipidemic drug

d) A cardiovascular disease in the anamnesis of the patient

58. The oral glucose tolerance test is carried out in adults by:

a) dissolving 75 g anhydrous glucose in 300 mL water subsequently drunk by the patient in 5 minutes

b) dissolving 75 g anhydrous galactose in 300 mL water subsequently drunk by the patient in 5 minutes

c) dissolving 75 g anhydrous lactose in 300 mL water subsequently drunk by the patient in 5 minutes

d) dissolving 75 g anhydrous glucose in 300 mL water subsequently drunk by the patient in 2 hours

59. The concentration of C-Peptide in plasma or serum:

a) reflects endogenous insulin production

b) is the aspecific sign of inflammation

c) is a sign of an autoimmune response to circulating insulin

d) is proportional to glucose concentration

60. Serum fructosamine:

a) is a glycated serum protein, the product of the reaction between glucose and proteins

b) represents fructose concentrations in serum

c) is the oxidized form of fructose

d) is the reduced form of fructose

61. Regarding carbohydrate metabolism, serum fructosamine is an indicator of the following:

a) carbohydrate metabolism in the preceding 2 to 3 weeks

b) carbohydrate metabolism in the preceding 2 to 3 days

c) carbohydrate metabolism in the preceding 6 to 8 weeks

d) carbohydrate metabolism in the preceding 3 months

62. HbA1c is:

a) a glycated haemoglobin

b) the fetal haemoglobin fraction

c) a degradation product of haemoglobin

d) a pathological form of haemoglobin causing diabetes

63. The concentration of glycated haemoglobin depends on:

a) the concentration of blood glucose and of blood haemoglobin, as well as on the life span of red blood cells

b) carbohydrate intake

c) the size of red blood cells (mean corposcular volume, MCV)

d) the enzymatic activity of red blood cells

64. The therapeutic target value of HbA1c in diabetes is:

a) < 7 % (53 mmol/mol)

b) < 5 % (31 mmol/mol)

c) < 6% (42 mmol/mol)

d) < 8% (64 mmol/mol)

65. Why is blood collected for glucose measurement in a tube containing sodium fluoride?

a) Sodium fluoride inhibits glycolysis, preventing the decline of glucose levels before analysis

b) Sodium fluoride is an anticoagulant with red blood cells surviving when it is added

c) Fluoride is required for the measurement since it is the cofactor of a participating enzyme

d) Sodium fluoride shifts the photometric absorbance of glucose to the visible range

66. Which is true for the laboratory method for determining glucose levels?

a) both answers below are correct

b) glucose oxidase method

c) hexokinase method

d) neither answer is correct

67. The results of which glucose testing method are influenced by the presence of vitamin C?

a) glucose oxidase method

b) hexokinase method

c) both answers are correct

d) neither answer is correct

68. Insulin levels are elevated in:

a) Early type II diabetes

b) polycistic ovary syndrome

c) Insulinoma

d) All answers are correct

69. Which is true for the HOMA index?

a) Elevated values point to insuline resistance

b) It characterized the homocystein-cholesterol ratio

c) Low values point to insuline resistance

d) It points to a tumor in the ovaries

70. Which laboratory test is suitable for indicating complications of diabetes?

a) None of the below answers are correct

b) C-Peptide assay

c) Insuline assay

d) Identification of glutamate decarboxylase autoantibodies

71. Which is true for the production of HbA1c?

a) The production of HbA1c depends primarily on blood glucose levels assuming that haemoglobin levels are constant

b) It is catalyzed by glucokinase

c) It is a reversible process also producing ketoamine

d) All of the above answers are correct

72. The laboratory method employed for HbA1c quantitation is:

a) both immunoassay and HPLC

b) immunoassay

c) HPLC

d) neither of these methods is employed

73. The results of HbA1c measurement are influenced by:

a) all three factors below

b) the qualitative disorders of haemoglobin

c) red blood cell disorders

d) the quantitative disorders of haemoglobin

74. What is eAG?

a) The estimated average glucose level based on HbA1c concentration

b) The average HbA1c level

c) The HbA1c level expected by the age of the patient

d) Estimated renal function based on creatinine measurement

75. Which parameter should be controlled on a regular basis in the care of diabetic patients?

a) microalbuminuria

b) CRP

c) C-reactive protein

d) insulin

76. What is the smallest concentration of analit that is still measurable with enzyme immunoassay methods?

a) mmol/l

b) µmol/l

c) pmol/l

d) nmol/l

77. Which of the following immunoassays does not use labeled antibodies?

a) nephelometry

b) immunofluorescence

c) enzyme immunoassay (ELISA)

d) lumenescence

78. Which of the following measuring methods is not optical method?

a) fluorescence

b) spectrophotometry

c) cuolometry

d) ICP

e) UV photometry

79. Which of the following is the most common form of measuring the concentration of electrolytes (Na K Cl)?

a) conductometry

b) ion selective potentiometry

c) spectrophotometry

d) atomic absorbtion

80. Which one is the most common principle of measurement in blood cell-count machines?

a) conductometry Coulter principle

b) radioimmunoassay

c) spectrophotometry

d) turbidimetry

81. The sequence of protein fractions separated through electrophoresis from anode to cathode?

a) α1 globulin, α2 globulin, albumin, γ globulin, β1 globulin, β2 globulin

b) β1 globulin, β2 globulin, α1 globulin, α2 globulin, albumin, γ globulin

c) albumin, β1 globulin, β2 globulin, α1 globulin, α2 globulin, γ globulin

d) albumin, α1 globulin, α2 globulin, β1 globulin, β2 globulin, γ globulin

82. What is the basis of the Coulter principle method of measurement?

a) The conductance of cells, such as red blood cells, white blood cells and thrombocytes, is smaller, and, at the same time, their resistance is larger than that of plasma. Electrical impulses are generated in accordance with cell size

b) Make ions from neutral particles (molecules, atoms). Then separate the ions with the help of electromagnetic fields according to mass/charge ratio (m/z)

c) Measurable antigene competing the labeled antigene for the binding sites of the antibody

d) The light going through the solution is absorbed, thus the intensity of the light coming out is lower than that of the light going in. The amount of light absorbed depends on the species of the irradiated material, the analyte concentration and the length of the optical path

83. Which laboratorial task is not a task of the laboratory's analytical phase?

a) immunoassay test

b) electrophoresis

c) centrifugation

d) mass spectrometry

84. Which of the following documents is not one of quality management?

a) quality management manual

b) work intstructions

c) operational form

d) test application form

85. What is one of the most important chapters of the quality management manual?

a) professional requirements (staff, equipment, analytical processes, etc.)

b) collection of legal documents

c) standards

d) test result, sample riport

86. What is the function and purpose of quality control?

a) monitoring test processes, detection and correction failures

b) sanctioning faulty laboratory practice

c) controlling appropriate legal and professional guidelines

87. What is characteristic of the internal quality control process?

a) Biannual determination of control samples containing a defined set of analytes in undefined concentrations

b) Daily determination of control samples containing an undefined set of analytes

c) Daily determination of control samples containing a defined set of analytes in defined concentrations

d) Quarterly determination of control samples containing a defined set of analytes in undefined concentrations

88. The parts of the system of controls in laboratorial testing:

a) external, internal quality control processes

b) quality management procedures

c) job description

d) risk management

89. Imprecision of controll results means:

a) reliable evaluation of test results

b) absolute deviation from the target

c) systematic errors of test results

d) relative deviation of test results (random error)

90. What are the levels of comparison in the evaluation of external quality control?

a) every method, groupmethod, own method

b) determination of precision

c) determination of the limits of bias

91. What kind of analitical methods are propiate for point of care dignostical measuremets thanks for their dvelopments?

a) blood gas analysis

b) analysis of ions

c) analysis of enzimes (amylase, creatin kinase, transaminases)

d) cardiological parameteres (Troponins)

e) all the four andwers are good

92. What are the main preferences of POCT measurements?

a) there is no need for calibration

b) there is no need for controlling

c) minimal need of sample to be measured, quick turn around time of results

d) there is no need for documentation

93. What kind of detectation do we know during POCT?

a) electrophoresis

b) flow cytometry

c) ELISA

d) optical reflectancy, potenciometry

94. How do we measure the ion parameters at the point of care?

a) by direct potenciometry, with the help of ionselective electrodes

b) by immunturbidimetry

c) with electrophoresis

d) by immunchemical method

95. What kind of technical development helped the POCT to be used widely?

a) producing lyophilized reagents

b) application of biosensors

c) cuvettes ofsingle use

d) easy to use wash solutions

96. What kind of analitical method is available for doing measurement at point of patient care?

a) mass spectrometry

b) high performance liquid chromatography

c) immunturbidimetry

d) optical reflectancy

97. Why is it important to use quality assurance of POCT methods?

a) It is not importante, because it uses fully automated detections

b) it is not necessarry the biosensors to be controlled

c) it is essential to calibrate and control the POCT devices regurarly, in order to produce relevant and appropiate test results for correct diagnosis

d) it is not necessarry, because of making the whole procedure very slow

98. Which POCT device can help prevent disease complications, by making self control at home?

a) blood gas analyser

b) analyser of enzyme parameters

c) analyser of blood glucose

d) analyser of Troponins or CKMB

99. What kind of help can we get, when we find our POCT device working incorrectly at home?

a) we diassemble the device into parts as described in the manual

b) we change the batteries

c) just show our device to our physicants

d) with the help of the „green telephone number" as described in the manual, we call for special help from the manufacturer (calibrating, controling of device)

100. For what kind of measurements do we use the tests, which use immunchromtographic methods?

a) analysing drug compounds in urine samples, beta-HCG (test of pregnancy)

b) analysing enzimes

c) blood gas parameters

d) measurements of creatinin or karbamide (blood urea nitrogen)

101. What is the importance of analysing urine sample with test strips?

a) evaluate overdosing of medicines

b) detection of carbon monoxide poisoning

c) detection of Ca-oxalate crystals

d) by the help of ten different test parameters, we get informations about carbohydrate-metabolism, about hyperbilirubinaemias, together with the different inphlamatic and bacterial diseases of the kidney pathways

102. What kind of detection method can be used evaluating of the test strips?

a) visual detection or analysis applying optical reflectancy

b) application of electrophoresis

c) using spectrophotometry

d) use of direct potenciometry

103. What kind of reactions can be found on the reaction pads of test strips?

a) immunchromatographic reactions

b) direct potenciometry

c) detection by biosensors

d) detection of color products of red-ox reactions or as results of diazonium salt pruduction pathways, using optical reflectancy

104. What is the degree of the accuracy of urine test strips?

a) they measure activities of the compounds

b) they give international units of concentrations

c) they use ppm unit

d) the results are given in semiquantive values

105. What other study belongs to the primarily qualitative (semi-quantitative) complete analysis of the first, mid-stream, morning urine sample?

a) urine ELFO

b) determination of catecholamines

c) degradation products of serotonin

d) detection of particles (white blood cells, red blood cells, crystals, bacterias, epithel cells etc.) in urine by microscopy or by automatic optical procedure

106. What is inflammation? Choose the right answer!

a) The body's response to infection, including viral, bacterial and worm infection

b) The body's response to injury or insult, including infection, trauma, surgery, burns, cancer

c) The body's response to injury, including trauma, like sport injury or insect bite

d) The infectious agent's response including viral, bacterial and worm infection to the attack of the host immune system

107. Choose the right statement!

a) Basically inflammation is a harmful and dangerous response involving exclusively immune cells

b) Basically inflammation is a harmful and dangerous response involving immune cells, blood vessels, molecular mediators

c) Basically inflammation is a protective response involving immune cells, blood vessels, molecular mediators

d) Basically inflammation is a protective response involving exclusively immune cells

108. Choose the right statement!

a) Without proper control, inflammation can turn into a dangerous and harmful process, like: SIRS, sepsis, autoimmune diseases

b) Without proper medication, inflammation usually turns into a dangerous and harmful process, like: SIRS, sepsis, autoimmune diseases

c) Inflammation is a useful process that is always well controlled by the immune system, so the body never needs external intervention, like drug administration

d) Inflammation has different types. Acute and chronic. Chronic is characterized by sudden onset and short duration

109. Choose the WRONG statement!

a) Inflammation has different types: acute and chronic. Chronic is characterized by sudden onset and short duration.

b) Inflammation has different types: acute and chronic. Acute is characterized by sudden onset and short duration.

c) Chronic inflammation is characterized by gradual onset and long duration

d) Inflammation can be triggered by a number of factors, like infection, injury, allergic reaction, etc.

110. Why do we use laboratory test for the evaluation of inflammation?

a) Because all forms of inflammation can only be treated based on the result of a laboratory test

b) Because the fact of the blood test reassures the patient

c) Determining the extent and type of inflammation is important in many cases, therapeutic decision may depend on it

d) Because otherwise the fact of inflammation cannot be established

111. Choose the right statement!

a) There are proteins released into the bloodstream during inflammation. If their concentration increases or decreases significantly, then they can be used as systemic inflammatory markers

b) There are proteins released into the bloodstream during inflammation. These can be used as systemic inflammatory markers only if their concentration is exclusively increasing

c) There are proteins released into the bloodstream during inflammation. These can be used as systemic inflammatory markers only if their concentration is exclusively decreasing

d) The inflammatory markers also known as chronic phase reactants

112. Choose the WRONG statement!

a) Inflammatory markers also known as acute phase reactants

b) Inflammatory markers also known as chronic phase reactants

c) An increase in the concentration of serum proteins that are referred to as acute phase reactants (APR) accompanies inflammation and tissue injury

d) Change of concentration of acute phase reactants (APR) in inflammation and tissue injury is called acute phase response

113. Choose the right statement!

a) There are only a few inflammatory markers (acute phase reactants)

b) There are many inflammatory markers, which are all commonly measured in clinical practice

c) There are many inflammatory markers but none of them are commonly measured in clinical practice

d) There are many inflammatory markers (acute phase reactants) but only a few of them are commonly measured in clinical practice

114. Choose the right statement!

a) The most commonly measured inflammatory markers in clinical practice are C-reactive protein (CRP), erythrocyte sedimentation rate (ESR), and procalcitonin (PCT) and blood count

b) The most commonly measured inflammatory markers in clinical practice are interleukin 6 (IL-6), erythrocyte volume, and calcitonin

c) The most commonly measured inflammatory markers in clinical practice are interleukin 6 (IL-6), interleukin 1 (IL-1), and calcitonin

d) There are many inflammatory markers but none of them are commonly measured in clinical practice

115. Choose the WRONG statement!

a) Although there are many inflammatory markers, also known as acute phase reactants, those that are most commonly measured in clinical practice are C-reactive protein (CRP), erythrocyte sedimentation rate (ESR), and procalcitonin (PCT)

b) C-reactive protein (CRP), erythrocyte sedimentation rate (ESR), and procalcitonin (PCT) are nonspecific markers

c) C-reactive protein (CRP), erythrocyte sedimentation rate (ESR), and procalcitonin (PCT) are specific markers

d) The C-reactive protein (CRP), erythrocyte sedimentation rate (ESR), and procalcitonin (PCT) tests are not diagnostic for any particular condition, but they may help to identify generalized inflammation

116. Which one is NOT TRUE for C-reactive protein (CRP)?

a) is called „acute phase reactant”

b) is a protein produced by the liver as a response to cytokines in inflammation due to acute or chronic conditions

c) is a protein produced by the B lymphocytes as a response to cytokines in inflammation due to acute or chronic conditions

d) reacts with fraction C polysaccharide in pneumococcus wall

117. Which one is NOT TRUE for C-reactive protein (CRP)?

a) The level of it is extensively increased in bacterial infection; rapidly reacting parameter

b) Its concentration returns to normal levels once the inflammatory issue has resolved

c) Is a good marker in some autoimmune diseases

d) The level of it is slightly increased in bacterial infection; slowly reacting parameter

118. Which one is NOT TRUE for erythrocyte sedimentation rate (ESR)?

a) It measures the rate at which red blood cells (RBCs) in a test tube separate from blood serum over time, becoming sediment in the bottom of the test tube

b) The sedimentation rate increases with more inflammation

c) ESR is an indirect measurement of plasma protein concentrations and is influenced by a number of disease states

d) Erythrocyte sedimentation rate (ESR) increase is specific for worm infection

119. Which one is NOT TRUE for procalcitonin (PCT)?

a) Is a propeptide of calcitonin

b) Is produced in C-cells of the thyroid gland and also in the intestine and the lungs as response to infections

c) Its level does not increase in bacterial infection

d) Earlier marker of inflammation than the CRP

120. Choose the WRONG statement!

a) Cytokine storm is an extreme and uncontrolled release of pro-inflammatory cytokines, an excessive reaction of innate immunity

b) Cytokine storm can be triggered by a number of infectious and non-infectious agents: especially viral respiratory infections such as H5N1 influenza, SARS-CoV-2

c) IL-6 never takes part in the phenomenon of cytokine storm

d) IL-6 is elevated in infection, sepsis, and septicemia

121. Choose the WRONG statement!

a) Hypersensitivity reactions occur when the normally protective immune system responds abnormally, potentially harming the body

b) Hypersensitivity reactions occur when the protective immune system responds normally to an infective agent or allergen

c) Allergies are immune reactions to exogenous substances

d) Various autoimmune disorders as well as allergies fall under the umbrella of hypersensitivity reactions

122. Choose the right statement!

a) According to Gell and Coombs classification, hypersensitivity is of three different types: I, II, III

b) Type I, II, and III are all cell mediated reactions

c) Type I is IgE mediated hypersensitivity

d) Type III is cell dependent cellular toxicity

123. Choose the right statement!

a) According to Gell and Coombs classification, hypersensitivity is of four different types: I, II, III and IV

b) Type I, II, and III are T cell mediated whereas type IV is mediated by antibodies or immune complex

c) The first three (I, II, III) are delayed type reactions in contrast type IV is immediate

d) Type I is T cell mediated hypersensitivity

124. Choose the WRONG statement!

a) Type I hypersensitivity reactions are immediate allergic reactions, the symptoms occurs in minutes

b) Type I hypersensitivity reactions are for instance food and pollen allergies, asthma, hives, eczema, anaphylaxis

c) A symptomatic reaction only occurs in sensitized individuals, so they must have had at least one prior asymptomatic contact with the offending antigen

d) A symptomatic reaction only occurs in poly-sensitized individuals, so they must have had at least one prior asymptomatic contact with many offending antigen

125. Choose the WRONG statement!

a) Type I hypersensitivity is an allergic reaction provoked by re-exposure to a specific antigen called an allergen

b) After first time IgE antibodies bind to receptors (FcεRI) found on the surface of tissue mast cells and blood basophils and sensitize them

c) Upon secondary exposure, the IgE on the surface of the sensitized mast and basophil cells becomes cross-linked

d) When two IgE receptors are cross-linked, signal transduces through the γ chains of the receptor leading to an influx of calcium, which initiates the inactivation of the cell

126. Choose the WRONG statement!

a) When two IgE receptors are cross-linked, signal transduces through the γ chains of the receptor lead to an influx of calcium, which initiates both degranulation and release of mediators

b) Mediators such as histamines, leukotriene, and prostaglandin are released into the extracellular environment within minutes during type I. hypersensitivity reaction induce allergic reactions

c) Mediators induce the allergic symptoms through small vessels, smooth muscles, glands, platelets, eosinophil granulcytes, nerve endings

d) Mediators induce the allergic symptoms through small vessels and smooth muscles

127. True for type I. hypersensitivity reactions:

a) The process has only a few actors and steps

b) Laboratory diagnostics of type I. hypersensitivity reactions is based on the measurement of a few highly important and well-measurable elements only

c) The most frequently measured marker for type I. hypersensitivity reactions is eosinophil degranulation

d) There is no possibility for the determination of basophil activation and tryptase levels

128. True for type II. hypersensitivity reactions:

a) Type II hypersensitivity reactions are also known as “cytotoxic”, as they involve antibodies IgG or IgM that are specific to particular tissues within the body and cause destruction of cells in these tissues

b) Type II hypersensitivity reactions are also known as “tissuetoxic”, as they involve antibodies IgG or IgM that are specific to particular tissues within the body and cause destruction of cells in these tissues

c) The effector cells of type II. hypersensitivity reactions are most commonly NK eosinophils and basophils

d) Type II. hypersensitivity reactions are allergic reactions, never play role in autoimmune diseases

129. Choose the WRONG statement!

a) Type III hypersensitivity reactions are immune complex-mediated

b) Type III hypersensitivity reactions accompanied with tissue damage caused by antigen-antibody complex deposition (e.g., many vasculitides and glomerulonephritides)

c) Immune complexes are deposited in tissue, especially blood vessels

d) Immune complexes are deposited in bone marrow

130. Choose the WRONG statement!

a) The formation and elimination of antigen-antibody complexes is an important element in maintaining immunohomeostasis

b) If there are too many immune complexes that are not eliminated as a result of its excessive function, there will be pathological processes

c) Immune complexes formed during immune processes but not eliminated from the circulation for various reasons activate the complement system, macrophages and red blood cells

d) Immune complexes formed during immune processes but not eliminated from the circulation activate the complement system, granulocytes and platelets

131. Type IV hypersensitivity reactions are:

a) immediate allergic reactions

b) antibody mediated

c) the only hypersensitivity reaction that involves sensitized T lymphocytes

d) the only hypersensitivity reaction that involves sensitized plasma cells

132. Choose the WRONG statement!

a) Local drug reaction following topical application of drug is allergic contact dermatitis

b) DRESS syndrome (drug rash with eosinophilia and systemic symptoms syndrome) is delayed hypersensitivity reaction to a drug (administered per os)

c) Laboratory diagnosis of DRESS syndrome includes general laboratory tests: eosinophilia, thrombocytopenia, atypical lymphocytosis and specific laboratory test: lymhocyte transform test (LTT)

d) There is no drug-induced hypersensitivity reaction in clinical practice

133. True for Immunglobulin E (IgE):

a) It has a role in parasitic infections and allergies

b) This is an immunoglobuline, which is made up of the usual two heavy chains and one light chain

c) It crosses the placenta

d) It does not have a role in the laboratory diagnostics of allergies

134. Choose the WRONG statement!

a) Specific IgE tests are useful in the diagnosis of type I hypersensitive reactions

b) According to the recommendations specific IgE tests are the first choice, skin test is secondary

c) Sensitization can be classified by the RAST classes of IgE

d) Detection of specific IgE is based on antigen – antibody reaction which is highly specific

135. Choose the WRONG statement!

a) There are a number of techniques to create the condition of antigen-antibody binding in a specific IgE test, like ELISA-or immunoblot techniques

b) Allergen component testing can be used to identify cross reactions, make risk analysis and help immunotherapy

c) Allergen components belong to various protein families, but it does not mean different risk of sever allergic reaction

d) Heat-labile allergen components (profilins, PR10 proteins) in foods generally denature by cooking process, thus reducing the risk of reaction

136. Choose the WRONG statement!

a) The immune system has a vital role: it protects your body from harmful substances, germs and cancer cell

b) The primary lymphoid tissues are the bone marrow and thymus.

c) The secondary lymphoid tissues are the skin-associated lymphoid tissues

d) The whole immune response process is tightly controlled

137. NOT true for the immune response:

a) Many cell types and their various products are involved in the development of the immune response and the maintenance of immunological balance

b) The malfunction of an element can easily lead to mistake, a breakdown of immunohomeostasis. The problem can be decreased production or complete absence of certain components

c) It is possible that the function of an immune cell is damaged although the amount is normal

d) Autoimmune processes can develop for example when the immune system improves its ability to tolerate its own structures and launches an attack on the body's tissues or cell constituents

138. Why are laboratory diagnostics important in case of immunodeficiency?

a) It gives many people jobs, thus prevents unemployment

b) Laboratory tests that imply immunodeficiency help earlier diagnosis. After the diagnosis is made, the appropriate therapy can prevent or reduce the development of symptoms and complications

c) Laboratory tests clearly show immunodeficiency, so fewer clinical doctors are needed, a GP (general practice) is enough for the diagnostic and treatment of patients with immunodeficiency

d) Laboratory diagnostics are not important in the diagnosis of immunodeficiency

139. Choose the WRONG statement!

a) It is not recommended to start the laboratory diagnosis of immunodeficiency with screening tests, the proper tests are all specific assays

b) Laboratory studies are necessary to determine the presence of a primary immunodeficiency disease

c) Suspicion of immunodeficiency is usually raised by an individual experiencing some clinical problems, particularly recurrent and/or chronic infections

d) It is recommended to start the laboratory diagnosis of immunodeficiency with screening tests

140. Choose the WRONG one!

a) Information regarding the types of organisms, the sites of infection and the therapies required to treat the infections often help focus the laboratory studies

b) Clinical characteristics of immunodeficiency help focus laboratory tests

c) The first step during the diagnosis of immunodeficiency is to decide whether the immunodeficiency is primary or secondary. If it is primary and the trigger is some underlying problem, the root cause must be found and cured. Such as kidney disease, hematologic disorder, malabsorption etc.

d) The first step during the diagnosis of immunodeficiency is to decide whether the immunodeficiency is primary or secondary. If it is secondary and the trigger is some underlying problem, the root cause must be found and cured. Such as kidney disease, hematologic disorder, malabsorption etc.

141. During laboratory diagnosis of immunodeficiency the first laboratory tests are the screening tests for secondary immunodeficiency. This does NOT involve:

a) inflammatory markers, like CRP, sedimentation rate, blood count

b) clinical chemistry (diabetes mellitus, kidney function, etc)

c) immune cell function tests, like lymphocyte blast transformation test

d) laboratory diagnostics of infections, like HIV

142. Choose the right statement!

a) CD8+ T cells count measurement is an important element in the diagnosis of AIDS patients. This cell number decreases in AIDS patients

b) CD8+ T cells count measurement is an important element in the diagnosis of AIDS patients. This cell number increases in AIDS patients

c) CD4+ T cells count measurement is an important element in the diagnosis of AIDS patients. This cell number increases in AIDS patients

d) CD4+ T cells count measurement is an important element in the diagnosis of AIDS patients. This cell number decreases in AIDS patients

143. Choose the WRONG statement about Flow Cytometry!

a) It is a technology that simultaneously measures and analyses multiple physical and chemical characteristics of single cells, as they flow in a fluid stream past optical sensors

b) It provides information about the relative size, relative granularity or internal structure, of the cells

c) It is a useful method in the laboratory diagnosis of primary immunodeficiency, but we cannot use it in the diagnosis of secondary immunodeficiencies, e.g. AIDS

d) It measures the fluorescence emitted by fluorochrome labelled probes which bind specifically to cellular constituents such as cell surface antigens, like CD4

144. Choose the one which is NOT TRUE for the laboratory diagnosis of immunodeficiency:

a) Protein electrophoresis is a laboratory technique in which the blood serumis exposed to an electric current to separate the serum protein components into five major fractions by size and electrical charge. Decrease of the “gamma fraction” may indicate immunodeficiency

b) For more accurate (then amount of “gamma fraction”) quantification of immunoglobulins total IgG, IgA, IgM levels can be measured by several methods

c) The properties and functions of the IgG subclasses are different. Their selective absence can lead to various symptoms

d) Immunoglobulin levels do not depend on age

145. Choose the WRONG one!

a) An autoimmune disease occurs when the body’s immune system begins to attack its own antigens

b) In a significant proportion of autoimmune diseases, high-affinity antibodies are formed. Their detection helps the diagnosis of autoimmune diseases

c) Beside autoantibodies there aren’t any other important lab tests when evaluating a patient with a suspected autoimmune disease

d) Several techniques have been used to develop specific tests for autoantibody detection including immunodiffusion, immunoblotting techniques, immunofluorescence, enzyme immunoassays and recently flow cytometry for multiplex bead-based assays

146. Choose the right statement!

a) The presence of an autoantibody in a patient does not assure a diagnosis of an autoimmune disease alone

b) The presence of an autoantibody in a patient surely identifies a diagnosis of a certain autoimmune disease

c) Autoantibodies cannot be detected in healthy individuals and patients with non-autoimmune diseases

d) There are no seronegative cases of autoimmune disease when there is no detectable autoantibody despite the disease

147. Choose the one which is NOT TRUE for the detection of autoantibodies:

a) Many different methods are used to test for the presence an autoantibody, like immunofluorescence, immunoblotting techniques, immunodiffusion, enzyme immunoassays

b) Many of the methods are for the detection of a single specific antibody

c) Indirect immunofluorescence technique when we examine a complex tissue or cell enables us to detect a wide variety of autoantibodies at one step

d) There is no method to test multiple antibodies simultaneously

148. Choose the WRONG one!

a) In case of indirect fluorescence if the patient's sera contain specific antibodies that recognize the epitope of cell or tissue fixed onto the slide than the antibody bounds

b) The antibody bounded to the cell or tissue fixed onto the slide can be detected by fluorescenin (FITC) labelled detector antibody using a microscope

c) Autoantibodies to nuclear antigens (ANA) are a diverse group of antibodies that react against nuclear, nucleolar, or perinuclear antigens.

d) Antinuclear antibodies (ANA) always indicate systemic lupus erythematosus (SLE)

149. Choose the one which is NOT TRUE for the detection of autoantibodies:

a) Plenty of autoantibodies can be detected on various tissues

b) Commonly used tissues are rodent liver, kidney and stomach, monkey kidney, oesuphagus, cerebellum

c) Commonly used tissue are rodent bone

d) The antibody underlying the given immunofluorescence pattern can be accurately identified by other methods, such as ELISA, immunoblotting

150. Choose the one which is NOT TRUE for the identification of autoantibodies after screening method:

a) The antibody underlying the given immunofluorescence pattern can be accurately identified by other methods, such as ELISA, immunoblotting

b) It can be useful for making a diagnosis

c) It may help therapeutic decisions

d) These methods are never suitable for quantitative measurement, so they are never useful for the determination of disease activity

151. The main blood count parameters measured by hematology machines? (more correct answers!)

a) cell number: white blood cell, red blood cell, platelet count

b) hemoglobin concentration

c) hematocrit

d) LDH

152. When does IG rise? (more correct answers!)

a) bacterial infection

b) acute inflammation

c) pregnancy

d) gastric ulcer

153. From which blood sample can a blood count be measured? (more correct answers!)

a) blood sample with citrate

b) blood sample withEDTA

c) native serum

d) blood sample with haparin

154. Reticulated platelet (IPF) characteristic: (more correct answers!)

a) Young platelet with mRNA

b) Lifetime: 1 day

c) Elevated in ITP, in sepsis

d) is produced in the liver

155. Basic compatibility tests: (more correct answers!)

a) ABO

b) RH

c) DC

d) erythrocyte sedimentation rate

156. Factors influencing the agglutination reaction: (more correct answers!)

a) reaction temperature

b) reaction time

c) antigen-antibody ratio

d) auto control

157. Source of error in blood group determination: (more correct answers!)

a) Reagent expiration, follow instructions for use

b) Polyagglutination

c) lack of auto control

d) purity

158. Source of error in 2-sided laboratory blood grouping / Right side (more correct answers!)

a) weak or absent agglutination

b) unexpected positive agglutination

c) using non-clean devices

d) weak antigen not recognized

159. When is DC positive? (more correct answers!)

a) Transfusion complication

b) UHB

c) AIHA

d) myocardial infarction

160. List the serological techniques used in the blood type test! (more correct answers!)

a) plate method

b) conventional tubular method

c) microplate

d) gel card methodology

161. Screening tests for coagulopathies: (more correct answers!)

a) Prothrombin time

b) APTT

c) TT

d) Dabigatran test

162. Form of PT expression: (more correct answers!)

a) seconds

b) INR

c) min

d) hours

163. Reasons for prolongation of thrombin time: (more correct answers!)

a) dysfibrinogenaemia

b) hypofibrinogenaemia

c) direct thrombin inhibitory medications

d) pancreatic diseases

164. Anticoagulants: (more correct answers!)

a) coumarins

b) heparins

c) NOAC

d) PPI blockers

165. Syncumar contraindication: (more correct answers!)

a) acute gastrointestinal bleeding

b) severe hepatic or renal insufficiency

c) pregnancy

d) sinusitis

166. Characteristics of HIT: (more correct answers!)

a) a occurs on the first day of heparin treatment

b) the process is an IgG-induced immune-thrombocytopenia

c) severe, life-threatening thrombotic complication

d) the PLT number decreases by at least 50% during 2 consecutive determinations

167. Characteristic of HIT screening test: (more correct answers!)

a) gel card method

b) low sensitivity

c) low specificity

d) is independent of the immunoglobulin isotype

168. New types of anticoagulants: (more correct answers!)

a) LMWH

b) rivaroxaban

c) apixaban

d) edoxaban

169. What effect do vitamin K antagonists have on basic coagulation tests? (more correct answers!)

a) PT is prolonged

b) APTT prolonged

c) TT is normal

d) fibrinogen is normal

170. How do we monitor acenocoumarol-type drugs?

a) INR

b) APTT

c) Antithrombin

d) LDH

171. How do we monitor unfractionated heparin therapy?

a) INR

b) APTT

c) Antithrombin

d) LDH

172. What is the “subtherapeutic range” of drugs?

a) A range of drug concentrations lower than the therapeutic concentration range

b) A range of drug doses lower than the therapeutic concentration range

c) The concentration of drugs measured during the therapy

d) The concentration of drugs measured during the therapy

173. What is the trough concentration of drugs?

a) The lowest concentration measured during the therapeutic drug monitoring process

b) The concentration of a drug measured in a sample collected by inserting the sampling needle to a depth of more than 2 cm into the vein

c) The concentration of a drug measured in a blood sample collected shortly before the administration of the next dose

d) The drug concentration measured at the beginning of the pharmacotherapy of patients diagnosed with depression (e.g. with escitalopram or venlafaxin)

174. What type of sample is collected for monitoring tacrolimus levels?

a) serum

b) whole blood

c) plasma

d) red blood cell

175. What timing of sample collection should be employed for the therapeutic drug monitoring of methotreaxate?

a) 24 h

b) 12 h és 24 h

c) 2 h, 6 h és 12 h

d) 24 h, 48 h és 72 h

176. The area under the concentration-time curve is calculated for optimizing the doses of…

a) busulfan

b) carbamazepine

c) gentamycin

d) paracetamol

177. Which drugs are administered routinely along with the therapeutic monitoring of drug levels?

a) expectorants

b) antiepileptics

c) Calcium channel blockers

d) steroid antiinflammatory drugs

178. Which analytical technique can be used for assaying the widest range of drugs in the framework of therapeutic drug monitoring?

a) spectrophotometry

b) fluorescent polarization immunoassay

c) liquid chromatography-tandem mass spectrometry

d) functional assays (activity tests)

179. Which type of drugs are assayed using functional assays (activity tests) in the framework of therapeutic drug monitoring?

a) immunosuppressants

b) roborants

c) contraceptives

d) direct acting oral anticoagulants

180. Select the condition which may warrant therapeutic drug monitoring!

a) intensive care due to the altered physiological functions of the patient

b) female gender due to estrogen metabolism

c) fever due to the altered concentrations of proteins in blood

d) intensive physical exercise due to sweating

181. What impact does third spacing have on pharmacokinetics?

a) Renal excretion is increased

b) The volume of distribution increases

c) Absorption is impaired

d) The mechanism of protein binding changes

182. Which of the following is a pharmacokinetic parameter?

a) proton affinity

b) drug dose in mg units

c) apparent volume of distribution

d) rate of reproduction

183. Consider two drugs administered per os. The relative bioavaiability of drug ‘A’ is approximately 10%, while the relative bioavailability of drug ‘B’ is approximately 90%. Which drug is likely to exert larger interindividual pharmacokinetic variability?

a) Drug ‘B’

b) There is no substantial interindividual variability unless the two entitities are involved in a pharmacokinetic interaction

c) The pharmacokinetic variability is independent of bioavailability

d) Drug ‘A’

184. Sampling for therapeutic drug monitoring is performed 2 hours postdose for:

a) cyclosporine A

b) metothrexate

c) levetiracetam

d) vancomycin

185. What is a priori therapeutic drug monitoring?

a) Concentration measurement in blood prior to the first administration of the drug

b) The planning of the initial dosing regimen based on population pharmacokinetic/pharmacodynamic information, without knowledge on the individual patient characteristics

c) The evaluation of the active or toxic forms of a drug, or a biomarker showing a strong correlation with drug levels, following the appopriately timed collection of samples

d) The measurement of drug levels for documentation, not for clinical decision making

186. What is a posteriori therapeutic drug monitoring?

a) Concentration measurement in blood prior to the first administration of the drug

b) The planning of the initial dosing regimen based on population pharmacokinetic/pharmacodynamic information, without knowledge on the individual patient characteristics

c) The evaluation of the active or toxic forms of a drug, or a biomarker showing a strong correlation with drug levels, following the appopriately timed collection of samples

d) The measurement of drug levels for documentation, not for clinical decision making

187. What is PCR good for?

a) to determine a DNA sequence

b) for sequence-specific cleavage of DNA and RNA molecules

c) for DNA amplofication

d) for direct detection of antigen-antibody interactions

188. What is not necessary for a simple polymerase chain reaction?

a) nucleic acid template

b) dNTP mix

c) DNA helicase

d) DNA polymerase

189. Which enzymes are used in nucleic acid-based molecular diagnostics?

a) DNA polymerase

b) reverse transcriptase

c) restriction endonuclease

d) telomerase

190. Which is the exception (cuckoo's egg)?

a) translocation

b) deletion

c) DNA methylation

d) point mutation

191. What is characteristic of the FISH method?

a) a microscope is required

b) nucleic acid hybridization technique

c) suitable for deletion detection

d) suitable for DNA sequence determination

192. For which procedures can capillary electrophoresis be used?

a) Sanger sequencing

b) FISH

c) MLPA

d) Next-generation sequencing

193. In which process does the formation of nucleic acid double chains (hybridization, annealing) occur?

a) FISH

b) PCR

c) microarrays

d) capillary electrophoresis

194. Not typical for next-generation sequencing

a) suitable for whole genome sequencing

b) high throughput

c) sequencing library preparation

d) requires only minimal IT background

195. Characteristics of real-time PCR

a) usage of fluorophores

b) usage of TaqMan probe

c) special instrument is not required

d) suitable for target sequence quantification

196. Which is not a nucleic acid-based molecular diagnostics method?

e) FISH

f) ELISA

g) Sanger sequencing

h) PCR

197. Which of the following statements is false with respect to optical measurement methods?

a) Ions are formed from neutral particles (molecules or atoms). The ions are separated in an electromagnetic field based on their mass/charge (m/z) ratios.
b) The light passing through the solution is absorbed, and the intensity of the light beam which exits the sample cell is lower than that of the light which enters the cell. The amount of light absorbed depends on the type of sample, the concentration of the analyte and the length of the optical path.
c) When a particle returns from the excited state to the ground state light is emitted into all all directions.
d) Nephelometry is based on measuring the intensity of light dispersed after passing through an opalesque solution.

198. Which of the following statements is true with respect to chromatography as a separation technique?

a) In electrolytes proteins have positive or negative charge if the pH of the solution is different from the isoelectric pH.
b) The components which should be separated distribute between the two phases in contact with each other. One of the phases is stationary, and the other one is in motion in a defined direction.
c) It is a technique based on the measurement of the masses of ions formed from the analyte molecules and the types of ions generated in high vacuum.

199. Choose the name of the rule underlying the evaluation of quality control measurements.

d) Levey-Jennings rule
e) Westgard rule
f) Lamber-Beer rule
g) MSZ EN ISO 15189:2013 rule

200. Technique(s) suitable for detecting specific autoantibodies:

a) immunofluorescence

b) immunoblotting techniques

c) enzyme immunoassays

d) all

201. Choose the right statement!

a) An important laboratory test in the diagnosis of autoimmune diseases is the determination of the blood count, inflammatory markers and testosterone levels.

b) An important laboratory test in the diagnosis of autoimmune diseases is the determination of the blood count, inflammatory markers and complement protein levels.

c) An important laboratory test in the diagnosis of autoimmune diseases is the determination of the blood count, inflammatory markers and uric acid levels.

d) An important laboratory test in the diagnosis of autoimmune diseases is the determination of the blood count, inflammatory markers and HDL cholesterol levels.

202. Choose the wrong statement!

a) Antinuclear antibodies are autoantibodies specific for the nucleus and perinuclear antigens.

b) The antinuclear antibody test is a useful laboratory screening method in the investigation of autoimmune diseases.

c) Antinuclear antibodies neutralize radioactive isotopes in the body.

d) Antinuclear antibodies can be autoantibodies with different specificities, which can show different patterns during microscopic examination.

203. Choose the wrong statement!

In case of a positive result of the screening test (e.g. antinuclear antibody), it is useful to accurately identify the specific autoantibody using another method, because

a) it is useful in making a diagnosis

b) it may be suitable for quantitative determination

c) it helps the therapeutic decision

d) the result gives a clear diagnosis, so there is no need for a specialist examination

204. Choose the right statement!

a) Certain drugs can induce autoimmune diseases in a person genetically predisposed to them.

b) Medicines can never induce autoimmune diseases.

c) Certain drugs can induce autoimmune diseases in children and in the elderly population, regardless of genetic predisposition.

d) Certain drugs can induce autoimmune diseases in rodents but not in humans.

205. Choose the right statement!

a) Many components of the immune system are involved in the development of allergic symptoms, which can be fully investigated using in vitro laboratory methods.

b) Many components of the immune system are involved in the development of allergic symptoms, of which several important parameters - such as specific IgE, activation of basophil cells, tryptase level - can be examined by in vitro laboratory methods.

c) Many components of the immune system are involved in the development of allergic symptoms, of which several important parameters, such as specific IgE, activation of basophil cells, and cholesterol level, can be examined by in vitro laboratory methods.

d) Many components of the immune system are involved in the development of allergic symptoms, the functioning of which can only be investigated by in vivo methods, such as Prick test.

206. Choose the wrong statement!

a) There are several methods for testing allergen-specific IgE panels.

b) The specific IgE tests worked well for testing inhalant allergens (e.g. ragweed pollen), but they proved to be unsuitable for testing food allergens (e.g. peanut), so we do not use them.

c) The functioning of in vitro allergen-specific IgE tests is based on antigen-antibody connection.

d) The epitope offered in in vitro allergen-specific IgE tests is the epitope of the tested allergen, and the specific IgE in the patient's serum binds to it.

207. Choose the wrong statement!

a) When evaluating in vitro allergy tests, clinical symptoms must always be taken into account.

b) A weak positive result may mean sensitization, which is an asymptomatic and not yet allergic condition.

c) The best solution to avoid the appearance and worsening of allergies is for the sensitive person to encounter the largest possible amount of allergens in the shortest possible time.

d) The severity of the allergic reaction increases with the number of encounters with the allergen.

208. The following is not true for “allergen component testing”:

a) these tests are useful for identifying cross reactions

b) these tests are useful for risk estimation

c) these tests are useful for helping immunotherapy

d) these tests are in the experimental phase, their usefulness is not yet known

209. Choose the correct statement!

a) Celiac disease (gluten sensitivity) is a type of allergy (type I).

b) Celiac disease (gluten sensitivity) is not an immune-mediated process.

c) Celiac disease (gluten sensitivity) develops in genetically predisposed individuals, during which the consumption of gluten leads to damage to the small intestines.

d) Celiac disease (gluten sensitivity) cannot be tested with a laboratory test, it can only be detected by a histological method from a biopsy sample of the small intestine.

210. Choose the hemostasis screening tests (multiple answers are correct).

a) Activated partial thromboplastin time
b) Prothrombin time
c) Lipase
d) Thrombin time

211. Select the anticoagulant drugs (multiple answers are correct).

a) heparin
b) syncumar
c) vitamin C
d) rivaroxaban

212. Select the hemostasis genetic tests (multiple answers are correct).

a) FV Leiden factor
b) prothrombin 20210A gene
c) MTHFR gene

d) MYH19 gene

213. Which of the following are compatibility tests? (Multiple answers are correct)

a) AB0 test
b) RHD test
c) anti human globulin test
d) cytokine tests

214. Reasons underlying a prolonged activated partial thromboplastin time (multiple answers are correct):

a) heparin therapy
b) heparin contamination
c) lupus anticoagulant antibodies
d) cumarine therapy

215. Criteria of testing for heparin induced thrombocytopenia (multiple answers are correct):

a) 50% reduction in thrombocyte count
b) sudden onset of bleeding
c) onset of thrombosis
d) onset of a life-threatining condition

216. Parameters of peripheral blood count (multiple answers are correct):

a) Red blood cell count
b) White blood cell count
c) Thrombocyte count
d) glucose

217. Reasons underlying prolonged prothrombin time (multiple answers are correct):

a) Congenital or acquired deficiency of factors II, V, VII and X
b) Syncumar therapy
c) Vitamin K deficiency
d) acceptable blood-citrate ratio

218. Parameters tested in case of iron deficiency anaemia (multiple answers are correct):

a) Red blood cell count

b) Mean corpuscular volume
c) Serum iron concentration
d) Serum amylase concentration

219. Characteristics of iron deficiency anaemia (multiple answers are correct):

a) microcytaer anaemia
b) elevation of transferrin concentration
c) hypochromic anaemia
d) reduction of transferrin concentration

220. Which phase of therapeutic drug monitoring can often be described as the “black box” for the clinical laboratory considering the fact that it cannot control factors which influence the results of the measurement?
a) The measurement itself
b) The preanalytical phase starting with sample collection and ending with the admission of the sample in the laboratory
c) The phase starting with the admission of the sample in the laboratory and ending with the measurement
d) The phase starting with the measurement and ending with issuing the laboratory test report

221. Which of the following statements is true for the quality control of therapeutic drug monitoring?
a) Control measurements should be performed when the clinician requesting the test signals that the issued laboratory test report is erroneous
b) The quality of the measurement is evidenced by running calibrator samples
c) Matrix-matched calibrators and controls are used
d) In an external quality assessment scheme laboratories receive the same sample which is transferred from one laboratory to another after being tested

222. Select the type of data employed for the identification of the analyte peak in a liquid chromatography run.
a) Retention time
b) Front distance
c) Peak width
d) Peak height

223. Select the correct order of processes taking place in a triple quadrupole mass spectrometry measurement.
a) Collision, nebulization, selection of precursor ion, selection of product ion
b) Nebulization, selection of precursor ion, selection of product ion, collision
c) Nebulization, collision, selection of product ion, selection of precursor ion

d) Nebulization, collision, selection of precursor ion, selection of product ion

224. Select the definition of minimal inhibitory concentration.
a) The lowest concentration of an antimicrobial agent at which the inhibition of the growth of an isolated microorganism strain is visible
b) The lowest concentration of a psychotherapeutic agent at which the inhibition of the onset of a psychotic episode takes place
c) The lowest concentration of an oncological agent at which the inhibition of the proliferation of a malignant cell line takes place
d) The lowest concentration of an anticoagulant at which the anticoagulant effect is exerted.

225. Select the drug displaying a relationship between the 24-hour concentraton-time curve and the minimal inhibitory concentration.
a) Paracetamol
b) Linezolid
c) Mycophenolate
d) Lamotrigine

226. Which form of tenofovir attains concentrations in blood which raise the risk of renal tubule impairment?
a) tenofovir maleate
b) tenofovir alafenamid
c) tenofovir disoproxil fumarate
d) tenofovir mofetil

227. Select the drug which has not impact on the blood concentrations of digoxin.
a) Digibind
b) Clarithromycin
c) Omeprazole
d) Paracetamol

228. Which additional laboratory test is performed when monitoring biological therapy agents?
a) Measurement of the antibody formed against the drug
b) Determination of the number of colony-forming units
c) Serum glucose
d) Serum calcium

229. Which of the following statements is true?
a) Methylenedioxyamphetamine interferes with amphetamine immunoassay in a biological process through competitive protein binding
b) The creatine kinase concentration may be elevated in patients taking a statin antihyperlipidaemic drug due to skeletal muscle myopathy
c) Taking a nonselective beta-blocker may cause falsely elevated potassium test results

because the ion selective electrodes are sensitive to these drugs

d) Cephalosporins interfere with urine tests peformed using a biotinylated reagent