JAGIELLONIAN UNIVERSITY MEDICAL COLLEGE

Laboratory Diagnostics

Educational subject description sheet

Basic information

Department Faculty of Medicine	**Didactic cycle** 2016/17
Field of study Medical Program	**Realization year** 2017/18, 2018/19
Study level long-cycle master's degree program	**Lecture languages** English
Study form full-time	**Block** obligatory for passing in the course of studies
Education profile general academic	**Mandatory** obligatory
Disciplines Medical science	**Examination** examination
Subject related to scientific research Yes	**Standard group** E. Clinical non-procedural medical disciplines

Subject coordinator	Bogdan Solnica, Maria Kapusta, Joanna Góralska
Lecturer	Bogdan Solnica, Maria Kapusta, Beata Kuśnierz-Cabala, Katarzyna Gawlik, Joanna Góralska, Małgorzata Malczewska-Malec, Urszula Raźny, Iwona Wybrańska, Barbara Zapała, Dorota Pawlica-Gosiewska

Period Semester 3	**Examination** credit **Activities and hours** lecture: 4, seminar: 8, classes: 16	**Number of ECTS points** 2.0

Periods Semester 5, Semester 6	**Examination** examination **Activities and hours** lecture: 6, seminar: 20	**Number of ECTS points** 2.0

Goals

C1	Transfer of knowledge about how the laboratory works, what are the possibilities and limitations of laboratory diagnostics.
C2	To familiarize students with the principles of collecting biological material for laboratory tests, and with factors affecting the course of the analytical process and the result of the test.
C3	To familiarize students with laboratory diagnostic algorithms in diagnosing and differentiating and treatment monitoring of organ and systemic disorders.
C4	Transfer of knowledge regarding the correct interpretation of laboratory test results useful in the diagnosis of diseases.
C5	To familiarize students with the principles of cooperation of a doctor with diagnostic laboratory.

Subject's learning outcomes

Code	Outcomes in terms of	Effects	Examination methods
Knowledge – Student knows and understands:			
W1	methods of diagnostic and therapeutic procedures appropriate for specific disease states	O.W3	classroom observation, multiple choice test

W2	the causes, symptoms, principles of diagnosis and therapeutic management of the most common internal diseases and their complications in adults: 1) cardiovascular diseases, including ischemic heart disease, heart defects, endocarditis, myocardial infarction, pericardial infarction, heart failure (acute and chronic), diseases of arteries and venous vessels, arterial hypertension - primary and secondary, pulmonary hypertension, 2) respiratory system diseases, including respiratory tract diseases, chronic obstructive pulmonary disease, bronchial asthma, bronchial dilatation, cystic fibrosis, respiratory infections, interstitial diseases of the lungs, pleura, mediastinum, obstructive and central sleep apnea, respiratory failure (acute and chronic), respiratory tumors, 3) diseases of the digestive system, including diseases of the mouth, esophagus, stomach and duodenum, intestines, pancreas, liver, bile ducts and gallbladder, 4) diseases of the internal secretion system, including diseases of the hypothalamus and pituitary gland, thyroidism, parathyroidism, adrenal cortex and medulla, ovaries and testicles, and neuroendocrine tumors, polyglandular syndromes, various types of diabetes and metabolic syndrome – hypoglycaemia, obesity, dyslipidemia, 5) diseases of the kidneys and the urinary tract, including acute and chronic renal failure, glomerulonephrine and interstitial kidney diseases, kidney cysts, kidney stones, urinary tract infections, urinary tract neoplasms, in particular of bladder and kidney neoplasms, 6) hematopoietic diseases, including bone marrow aplasia, anemia, granulocytopenia and agranulocytosis, thrombocytopenia, acute leukemia, myeloproliferative and myelodysplastic-myeloproliferative tumours, myelodysplastic syndromes, mature B and T lymphocytes tumors, bleeding diatheses, thrombophilia, life-threatening conditions in hematology, blood disorders in other organ diseases, 7) rheumatic diseases, including systemic connective tissue diseases, systemic vasculitis, joint inflammations involving spinal cord, metabolic bone diseases, osteoporosis and osteoarthritis in particular, gout, 8) allergic diseases, including anaphylaxis and anaphylactic shock and angioedema, 9) water-electrolyte and acid-base disorders: dehydration conditions, overhydration conditions, electrolyte, acidic and alkaline disorders	E.W7	classroom observation, multiple choice test
W3	the types of biological materials to be used for laboratory diagnosis and the rules for the collection of test material	E.W39	classroom observation, multiple choice test
W4	theoretical and practical basics of laboratory diagnostics	E.W40	classroom observation, multiple choice test
W5	possibilities and limitations of laboratory tests in emergency situations	E.W41	classroom observation, multiple choice test

W6	the causes, symptoms, principles of diagnosis and therapeutic management of the most common diseases of children: (1) rickets, tetanus, convulsions, (2) heart defects, myocarditis, endocarditis, pericarditis, cardiomyopathy, arrhythmia, heart failure, hypertension, syncope, (3) acute and chronic diseases of the upper and lower airways, congenital defects of the respiratory system, tuberculosis, cystic fibrosis, asthma, allergic rhinitis, urticaria, anaphylactic shock, angioedema, (4) anemia, hemorrhagic diatheses, conditions of bone marrow failure, pediatric neoplastic diseases, including solid tumors typical of childhood, (5) acute and chronic abdominal pain, vomiting, diarrhea, constipation, gastrointestinal bleeding, peptic ulcer disease, non-specific intestinal diseases, pancreatic diseases, cholestasis and liver diseases, and other acquired diseases and congenital defects of the digestive tract, (6) urinary tract infections, congenital anomalies of the urinary system, nephrotic syndrome, renal stones, acute and chronic renal failure, acute and chronic nephritis, systemic kidney diseases, urinary tract disorders, vesicoureteral reflux disease, (7) growing disorders, thyroid and parathyroid diseases, adrenal diseases, diabetes, obesity, disorders of puberty and gonadal functions, (8) cerebral palsy, encephalomyelitis, meningitis, epilepsy, (9) the most common infectious diseases of childhood, (10) genetic syndromes, (11) diseases of connective tissue, rheumatic fever, juvenile arthritis, systemic lupus, dermatomyositis	E.W3	classroom observation, multiple choice test
W7	basic methods of fetal diagnostics and therapy	E.W5	classroom observation, multiple choice test
W8	causes, symptoms, principles of diagnosis and therapeutic management in the most common diseases of the nervous system, including: 1) headaches: migraines, tension headaches and headache syndromes and neuralgia of the nerve V, 2) cerebral vascular diseases, in particular stroke, 3) epilepsy, 4) infections of the nervous system, in particular meningitis, borreliosis, herpetic encephalitis, neurotransmission diseases, 5) dementia, in particular: Alzheimer's disease, frontal dementia, vascular dementia and other dementia syndromes, 6) basal ganglia diseases, Parkinson's disease in particular, 7) demyelinating diseases, multiple sclerosis in particular, 8) diseases of the neuromuscular system, lateral atrophic sclerosis and sciatic neuralgia in particular, 9) craniocerebral injuries, cerebral palsy in particular	E.W14	classroom observation, multiple choice test
W9	basics of early detection of neoplastic diseases and principles of screening in oncology	E.W24	classroom observation, multiple choice test
W10	causes, symptoms, principles of diagnosis, therapeutic and prophylactic management in the most common bacterial, viral, parasitic and fungal diseases, including pneumococcal infections, viral hepatitis, acquired immunodeficiency syndrome (AIDS), sepsis and hospital infections	E.W34	classroom observation, multiple choice test

W11	causes, symptoms, principles of diagnosis and therapeutic management in the most common diseases and specific problems in the practice of a family physician	E.W38	classroom observation, multiple choice test
W12	principles of diagnostics of infectious diseases and can interpret the results	E.W52	classroom observation, multiple choice test
Skills – Student can:			
U1	plan the diagnostic procedure and interpret its results	O.U3	classroom observation, multiple choice test
U2	perform differential diagnosis of the most common diseases of adults and children	E.U12	classroom observation, multiple choice test
U3	interpret the results of laboratory tests and identify the causes of abnormalities	E.U24	classroom observation, multiple choice test
U4	collect and retain test material for use in laboratory diagnostics	E.U28	classroom observation, multiple choice test
U5	plan diagnostic, therapeutic and prophylactic procedures	E.U16	classroom observation, multiple choice test
Social competences – Student is ready to:			
K1	perceive and recognize own limitations and self-assessing educational deficits and needs	O.K5	classroom observation
K2	implement the principles of professional camaraderie and cooperation in a team of specialists, including representatives of other medical professions, also in a multicultural and multinational environment	O.K9	classroom observation

Calculation of ECTS points

Semester 3

Activity form	**Activity hours***
lecture	4
seminar	8
classes	16
preparation for classes	14
preparation for colloquium	14
Student workload	**Hours** 56
Workload involving teacher	**Hours** 28
Practical workload	**Hours** 16

* hour means 45 minutes

Semester 5, Semester 6

Activity form	Activity hours*
lecture	6
seminar	20
preparation for classes	10
preparation for examination	19
participation in examination	1

Student workload	**Hours** 56
Workload involving teacher	**Hours** 26

* hour means 45 minutes

Study content

No.	Course content	Subject's learning outcomes	Activities
1.	2nd year, 3rd semester	W1, W2, W3, W4, W5, W6, W8, U1, U2, U3, U4, K1, K2	classes, seminar, e-learning lecture
2.	Lecture - 4 hours Laboratory tests in the diagnostic process. Diagnostic characteristics of the test. Analytical characteristics of the laboratory method – limit of detection and quantification, linearity, measurable range. Causes of error affecting the result of the laboratory test - pre-laboratory factors and analytical variability.	W1, W4	lecture
3.	Laboratory tests in life-threatening states. Point-of-care testing.	W4, W5	lecture
4.	Seminar - 8 hours Causes and types of error affecting the result of laboratory testing. Determining the magnitude of the error.	W4, U3	seminar
5.	Principles of doctor's cooperation with the diagnostic laboratory. Complete blood count - methodology and diagnostic significance.	W1, W2, U4, K2	seminar
6.	Interpretation of complete blood count results - case studies and laboratory results with discussion.	W2, W3, U3	seminar
7.	Laboratory diagnostics in hematology - anemia and proliferative diseases.	W2, W6, U1, U3	seminar
8.	Standard urine analysis - methodology and diagnostic significance.	W2, W3, U3, U4, K1	seminar

9.	Calculating the value of diagnostic characteristics parameters of the test and assessing its usefulness in the diagnostic process – case studies.	W4, U3, K1	seminar
10.	Testing of water-electrolyte metabolism and and acid-base balance. Methodology, disturbing factors.	W2, W5, U1, K2	seminar
11.	Diagnostics of blood coagulation and fibrinolysis disorders.	W2, W6, U1, K2	seminar
12.	Classes - 16 hours Rules for collecting material for laboratory tests. Interpretation of test results taking into account bias and random error.	W3, W4, U4, K1	classes
13.	Complete blood count - methodology and diagnostic significance.	W2, W4, U1	classes
14.	Laboratory classes in the CBC laboratory of the University Hospital Diagnostics Department. Presentation of diagnostic methods and hematological analyzers.	W4, U3, K2	classes
15.	Laboratory diagnostics in hematology - interpretation of laboratory test results, clinical case studies.	W1, U3, K2	classes
16.	Interpretation of standard urine analysis results - clinical case studies.	W2, U3, K2	classes
17.	Analytical examinations of cerebrospinal fluid, body cavity fluids, feces - clinical case studies.	W8, U2, U4	classes
18.	Interpretation of water-electrolyte and acid-base disorders - clinical case studies.	W2, U1, U3, K2	classes
19.	Interpretation of coagulation and fibrinolysis test results - clinical case studies.	W2, U2, U3, K2	classes
20.	3rd year, 5th semester	W1, W10, W11, W12, W2, W5, W6, W7, W8, W9, U1, U2, U3, U4, U5, K2	seminar, lecture
21.	Lecture - 6 hours Diagnostics of civilization diseases - the use of laboratory tests to assess the risk for obesity complications, cardiovascular risk and metabolic syndrome.	W1, W11, W2	lecture
22.	Laboratory tests in preventive medicine.	W1, W11, W2, W9	lecture
23.	Personalized medicine - the use of genetic testing.	W1, W6, U5, K2	lecture
24.	Seminar - 20 hours Clinical biochemistry and laboratory diagnostics of carbohydrate metabolism disorders.	W1, W11, W2, W6, U2, U3, U5	seminar
25.	Clinical biochemistry and laboratory diagnostics of lipid metabolism disorders. Clinical case studies, discussion about laboratory diagnostic strategies and interpretation of laboratory tests results.	W1, W11, W2, U3, U5, K2	seminar
26.	Laboratory diagnosis of cardiovascular diseases. Clinical case studies. Laboratory diagnostic strategies and interpreting laboratory test results.	W1, W2, W5, U2, U3, U4, U5, K2	seminar

27.	Laboratory diagnostics of liver diseases. Clinical case studies. Laboratory diagnostic strategies and interpreting laboratory test results.	W1, W10, W11, W12, W2, U1, U2, U3, K2	seminar
28.	Laboratory diagnostics of endocrine diseases. Clinical case studies discussing laboratory diagnostic strategies and interpreting laboratory test results.	W11, W2, W6, U2, U3, U5	seminar
29.	Laboratory diagnostics of malignancies - tumor markers. Clinical, case studies discussing laboratory diagnostic strategies and interpreting laboratory results.	W1, W2, W9, U2, U3, U5, K2	seminar
30.	Diagnosis of trace elements and vitamins deficiencies. Clinical case studies discussing laboratory diagnostic strategies and interpreting laboratory results.	W2, W6, U1, U3, K2	seminar
31.	Laboratory diagnostics of primary and secondary hypertension. Clinical case studies discussing laboratory diagnostic strategies and interpreting laboratory results.	W11, W2, U1, U3	seminar
32.	Laboratory tests in gynecology and obstetrics. Clinical case studies discussing laboratory diagnostic strategies and interpreting laboratory results.	W12, W2, W7, U1, U3, U5, K2	seminar
33.	Laboratory diagnostics of nervous system diseases. Clinical case studies discussing laboratory diagnostic strategies and interpreting laboratory results.	W2, W6, W8, U1, U2, U3, K2	seminar

Course advanced

Semester 3

Teaching methods:

case study, laboratories (labs), lecture, problem solving method, case study method, presentation, group work, seminar, lecture with multimedia presentation

Activities	Examination methods	Credit conditions
lecture	multiple choice test	To pass classes in the form of lectures, it is necessary to familiarize with the presented materials and correctly answer test questions on the lecture platform. The final test covering topics from seminars, classes and lectures consists of 50 questions. Four answers are prepared for each question - only one answer is correct. 60% of correct answers are required to pass the test. The number of credits obtained for passing Laboratory Diagnostics in the second year of study is included in the final score and grade for the course.
seminar	multiple choice test	The final test covering topics from seminars, classes and e-learning lectures consists of 50 questions. Four answers are prepared for each question - only one answer is correct. 60% of correct answers are required to pass the test. The number of credits obtained for passing Laboratory Diagnostics in the second year of study is included in the final score and grade for the course.
classes	classroom observation, multiple choice test	Observation and assessment of student work. The theoretical content is included in the final test.

Semester 5, Semester 6

Teaching methods:

case study, laboratories (labs), lecture, problem solving method, case study method, situation method, presentation, seminar

Activities	Examination methods	Credit conditions
lecture	multiple choice test	To pass classes in the form of lectures, it is necessary to familiarize with the presented materials and correctly answer test questions on the lecture platform. The final test covering topics from seminars and lectures consists of 40 questions. Four answers are prepared for each question -only one answer is correct. 60% of correct answers are required to pass the test. Criteria for obtaining an exam grade: 5.0 90% - 100% 4.5 85% - 89 % 4.0 75% - 84% 3.5 70%-74% 3.0 60% -69% 2.0 ≤ 60%
seminar	classroom observation, multiple choice test	Observation and assessment of student work. The final test covering topics from seminars and lectures consists of 40 questions. Four answers are prepared for each question -only one answer is correct. 60% of correct answers are required to pass the test. Criteria for obtaining an exam grade: 5.0 90% - 100% 4.5 85% - 89 % 4.0 75% - 84% 3.5 70%-74% 3.0 60% -69% 2.0 ≤ 60%

Additional info

1. Student's absence from classes for excused reasons must complete the classes at a time agreed with the lecturer. The course coordinator gives permission to make up classes. Classes must be done before the credit date.
2. Unexcused absence from obligatory classes (classes, seminars) shall result in not passing the course within the first date.
3. A student who has not been admitted for credit on the first date for unexcused absences may take the second date for credit only after completing the remaining course classes.

Entry requirements

Only students who completed the first part of the laboratory diagnostics course in the 3rd semester can join the laboratory diagnostics classes in the 5th semester. Repetition of the course means the necessity to participate again all classes and credits. In justified cases, however, it is possible to be released from participation in part or the whole course by the Course Coordinator.

Literature

Obligatory

1. Rifai N. Tietz Fundamentals of Clinical Chemistry and Molecular Diagnostics. Elsevier 2013

Optional

1. White D, Lawson N, Masters P McLaughlin D. Clinical Chemistry. Garland Science 2016

Standard effects

Code	Content
E.U12	perform differential diagnosis of the most common diseases of adults and children
E.U16	plan diagnostic, therapeutic and prophylactic procedures
E.U24	interpret the results of laboratory tests and identify the causes of abnormalities
E.U28	collect and retain test material for use in laboratory diagnostics
E.W3	the causes, symptoms, principles of diagnosis and therapeutic management of the most common diseases of children: (1) rickets, tetanus, convulsions, (2) heart defects, myocarditis, endocarditis, pericarditis, cardiomyopathy, arrhythmia, heart failure, hypertension, syncope, (3) acute and chronic diseases of the upper and lower airways, congenital defects of the respiratory system, tuberculosis, cystic fibrosis, asthma, allergic rhinitis, urticaria, anaphylactic shock, angioedema, (4) anemia, hemorrhagic diatheses, conditions of bone marrow failure, pediatric neoplastic diseases, including solid tumors typical of childhood, (5) acute and chronic abdominal pain, vomiting, diarrhea, constipation, gastrointestinal bleeding, peptic ulcer disease, non-specific intestinal diseases, pancreatic diseases, cholestasis and liver diseases, and other acquired diseases and congenital defects of the digestive tract, (6) urinary tract infections, congenital anomalies of the urinary system, nephrotic syndrome, renal stones, acute and chronic renal failure, acute and chronic nephritis, systemic kidney diseases, urinary tract disorders, vesicoureteral reflux disease, (7) growing disorders, thyroid and parathyroid diseases, adrenal diseases, diabetes, obesity, disorders of puberty and gonadal functions, (8) cerebral palsy, encephalomyelitis, meningitis, epilepsy, (9) the most common infectious diseases of childhood, (10) genetic syndromes, (11) diseases of connective tissue, rheumatic fever, juvenile arthritis, systemic lupus, dermatomyositis
E.W5	basic methods of fetal diagnostics and therapy
E.W7	the causes, symptoms, principles of diagnosis and therapeutic management of the most common internal diseases and their complications in adults: 1) cardiovascular diseases, including ischemic heart disease, heart defects, endocarditis, myocardial infarction, pericardial infarction, heart failure (acute and chronic), diseases of arteries and venous vessels, arterial hypertension - primary and secondary, pulmonary hypertension, 2) respiratory system diseases, including respiratory tract diseases, chronic obstructive pulmonary disease, bronchial asthma, bronchial dilatation, cystic fibrosis, respiratory infections, interstitial diseases of the lungs, pleura, mediastinum, obstructive and central sleep apnea, respiratory failure (acute and chronic), respiratory tumors, 3) diseases of the digestive system, including diseases of the mouth, esophagus, stomach and duodenum, intestines, pancreas, liver, bile ducts and gallbladder, 4) diseases of the internal secretion system, including diseases of the hypothalamus and pituitary gland, thyroidism, parathyroidism, adrenal cortex and medulla, ovaries and testicles, and neuroendocrine tumors, polyglandular syndromes, various types of diabetes and metabolic syndrome – hypoglycaemia, obesity, dyslipidemia, 5) diseases of the kidneys and the urinary tract, including acute and chronic renal failure, glomerulonephrine and interstitial kidney diseases, kidney cysts, kidney stones, urinary tract infections, urinary tract neoplasms, in particular of bladder and kidney neoplasms, 6) hematopoietic diseases, including bone marrow aplasia, anemia, granulocytopenia and agranulocytosis, thrombocytopenia, acute leukemia, myeloproliferative and myelodysplastic-myeloproliferative tumours, myelodysplastic syndromes, mature B and T lymphocytes tumors, bleeding diatheses, thrombophilia, life-threatening conditions in hematology, blood disorders in other organ diseases, 7) rheumatic diseases, including systemic connective tissue diseases, systemic vasculitis, joint inflammations involving spinal cord, metabolic bone diseases, osteoporosis and osteoarthritis in particular, gout, 8) allergic diseases, including anaphylaxis and anaphylactic shock and angioedema, 9) water-electrolyte and acid-base disorders: dehydration conditions, overhydration conditions, electrolyte, acidic and alkaline disorders
E.W14	causes, symptoms, principles of diagnosis and therapeutic management in the most common diseases of the nervous system, including: 1) headaches: migraines, tension headaches and headache syndromes and neuralgia of the nerve V, 2) cerebral vascular diseases, in particular stroke, 3) epilepsy, 4) infections of the nervous system, in particular meningitis, borreliosis, herpetic encephalitis, neurotransmission diseases, 5) dementia, in particular: Alzheimer's disease, frontal dementia, vascular dementia and other dementia syndromes, 6) basal ganglia diseases, Parkinson's disease in particular, 7) demyelinating diseases, multiple sclerosis in particular, 8) diseases of the neuromuscular system, lateral atrophic sclerosis and sciatic neuralgia in particular, 9) craniocerebral injuries, cerebral palsy in particular
E.W24	basics of early detection of neoplastic diseases and principles of screening in oncology
E.W34	causes, symptoms, principles of diagnosis, therapeutic and prophylactic management in the most common bacterial, viral, parasitic and fungal diseases, including pneumococcal infections, viral hepatitis, acquired immunodeficiency syndrome (AIDS), sepsis and hospital infections

Code	Content
E.W38	causes, symptoms, principles of diagnosis and therapeutic management in the most common diseases and specific problems in the practice of a family physician
E.W39	the types of biological materials to be used for laboratory diagnosis and the rules for the collection of test material
E.W40	theoretical and practical basics of laboratory diagnostics
E.W41	possibilities and limitations of laboratory tests in emergency situations
E.W52	principles of diagnostics of infectious diseases and can interpret the results
O.K5	perceive and recognize own limitations and self-assessing educational deficits and needs
O.K9	implement the principles of professional camaraderie and cooperation in a team of specialists, including representatives of other medical professions, also in a multicultural and multinational environment
O.U3	plan the diagnostic procedure and interpret its results
O.W3	methods of diagnostic and therapeutic procedures appropriate for specific disease states