

MINISTRY OF HEALTH OF UKRAINE
KHARKIV NATIONAL MEDICAL UNIVERSITY

Department of Biochemistry

2021-2022

SYLLABUS OF EDUCATION COMPONENT

CLINICAL BIOCHEMISTRY

Elective educational component

Format of education	mixed
Field of knowledge	22 “Healthcare” (code and title of discipline)
Specialty	222 “Medicine” (code and title of discipline)
Education-professional programme	“Medicine” second (Master) level
Course	Fourth

Approved by the Department of Biochemistry

Protocol #18
d.d. August 30, 2021

Head of the Department

OA Nakonechna

August 30, 2021

Approved by the KhNMU Methodical
Committee on General and Preprofessional
Training

Protocol #01
d.d. August 31, 2021

Head

OY Vovk

August 31, 2021

Compilers:

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INFORMATION ABOUT LECTURERS WHO TEACH EDUCATIONAL COMPONENT

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Offline consultations: schedule and venue according to the schedule of the department.

Online consultations: schedule and venue by prior arrangement with the teacher.

Location: classes are held in the main building of KhNMU, Department of Biological Chemistry.

The syllabus of «Clinical Biochemistry» discipline is compiled in accordance with the Education professional programme (hereinafter – the EPP) “Medicine” and project of Standard of Higher Education of Ukraine (hereinafter - the Standard) for the second (Master's) level of higher education in the field of knowledge 22 "Healthcare" and specialty 222 «Medicine».

Description of discipline (abstract): the academic discipline "Clinical Biochemistry" is taught for fourth-year students during one semester. The studying of the academic discipline involve 3.0 ECTS credits, i.e. 90 hours (20 hours for practical classes and 70 hours for self-study).

The subject of the study of discipline: clinical investigations of typical states of patients in the diagnosis of different diseases, compilation of laboratory examination, treatment and control of long-term results.

Interdisciplinary relationships: the discipline creates the foundations for clinical diagnosis of common diseases, of the course of the disease monitoring, of the effectiveness of the drugs use monitoring, for preventive methodology of pathological processes. The acquired theoretical knowledge, practical skills and abilities form the clinical thinking of the students.

Prerequisites. The study of the discipline involves the prior mastering of disciplines in medical biology, biophysics, medical and bioorganic chemistry, morphological disciplines.

Postrequisites. The main provisions of the discipline should be applied in the study of related disciplines during the next years of study, is the basis for preparation for the licensing exam EDKI, preparation for study in higher education institutions in the programs of the third educational and scientific level of higher education.

Discipline page in Moodle system:

<http://distance.knmu.edu.ua/course/view.php?id=2562>

1. AIM AND TASKS OF DISCIPLINE

1.1. The aim of discipline "Clinical Biochemistry" - studying is the improvement of clinical thinking level by teaching students the practical application of modern theoretical knowledge of human biochemistry. Also a deep rationale for the clinical assessment of the typical states of patients in the diagnosis of diseases; the development of a plan for laboratory examination, treatment and control of long-term results.

1.2. The main tasks of discipline "Clinical Biochemistry" studying:

- to study the biochemical bases and biochemical symptoms of pathological processes;

- to study the tactics and methodology of clinical and biochemical research;

- to teach students to evaluate clinical and biochemical parameters.

1.3. Competences and results of training whose formation is facilitated by the discipline (interconnection with the normative content of the training of higher education graduates formulated in terms of the results of training in the Standard).

According to the requirements of the Standard, the discipline ensures acquisition of the following competences:

- *integral*: the ability to solve typical and complex specialized tasks and practical problems in the professional activity or in the process of learning, apply the acquired

knowledge, skills, abilities and personal qualities, values to perform the task of any level of complexity during professional activity or training.

- *general*: the ability to apply knowledge in practical situations; knowledge and understanding of the subject and understanding of the profession; ability to self-regulate and lead a healthy lifestyle, ability to adapt and act in a new situation; ability to choose communication strategy; ability to work in a team; interpersonal skills; ability to speak native language both orally and in writing; ability to speak second language; skills of using information and communication technologies; ability to abstract thinking, analysis and synthesis, ability to learn and be modernly trained; ability to apply knowledge in practical situations; ability to evaluate and ensure the quality of work performed; determination and persistence in terms of tasks and responsibilities; ability to act socially responsibly and socially consciously; the desire to preserve the environment.

- *special (professional)*: ability to interpret the results of laboratory and instrumental research; ability to process state, social, economic and medical information; ability to assess the impact of the environment on the health of the population; ability to assess the impact of socio-economic and biological determinants on the health of the individual, family, population.

1.3.2 The study of the discipline provides students with the acquisition of the following **program learning outcomes**:

PLO 1. Possess general and special fundamental and professionally-oriented knowledge, skills, abilities, competencies necessary to perform typical professional tasks related to activities in the medical field in the relevant position.

PLO 3. Apply the acquired knowledge, skills and understanding to solve typical problems of the doctor, the scope of which is provided by lists of syndromes and symptoms, diseases, emergencies, laboratory and instrumental research, medical manipulations.

PLO 5. Evaluate the results of surveys, physical examinations, laboratory and instrumental research data.

PLO 7. Determine the nature and principles of disease treatment.

PLO 16. Assess the impact of the environment on public health.

PLO 18. Assess and support human health, taking into account the impact of the environment and other health factors.

1.3.3. The study of this discipline forms **social skills** among applicants for education:

- communicativeness (implemented through: the method of working in groups and brainstorming in the analysis of biochemical cases, the method of presenting the results of independent work and their protection in a group)
- team work (implemented through: group work method and brainstorming in the analysis of biochemical cases),
- conflict management (implemented through: business games),
- time management (implemented through: the method of self-organization in classroom work in groups and independent work),
- leadership skills (implemented through: the method of presenting the results of independent work and their protection in a group).

2. INFORMATIONAL VOLUME OF DISCIPLINE

Parameters	Field of knowledge, specialty, educational and qualification level, EPP	Characteristics of discipline
		Full day courses
Number of credits 3.0	Field of knowledge 22 ‘Healthcare’ <small>(шифр і назва)</small>	Elective course
Total number of hours – 90	Specialty 222 ‘Medicine’ <small>(шифр і назва)</small>	Course:
		4
		Semester
		7
Hours for full day courses: practical – 20 Self-study – 70	Educational and qualification level : Master EPP “Medicine”	Practical classes
		20 hours
		Self-study
		70 hours
		Control type: <i>credit</i>

2.1 Subject description

2.2.1 Lecture topics

Not included in the curriculum.

2.2.2 Topics of seminars

Not included in the curriculum.

2.2.3 Topics of practical classes

№	Titles	Number of	Learning	Forms of
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		hours	methods	control
1.	Introduction to clinical biochemistry. The significance of clinical biochemistry for the diagnosis of diseases and their monitoring. Violation of the basic biopolymers metabolism. Clinical and biochemical characteristics of the appropriate metabolism parameters.	5	Verbal (lecture, conversation), visual (illustration), practical (independent work, case-method, brainstorming, pair work, group work, test tasks)..	Oral examination (individual and frontal); written survey; test control.
2.	Basic biochemical parameters used for medical diagnostics.	5		
3.	Clinical and biochemical investigations in cardiovascular diseases. Clinico-biochemical investigations in kidney and urinary duct diseases/	5		
4.	Clinico-biochemical investigations in diseases of liver and gastro-intestinal tract.	5		
	Total number of hours	20		

2.2.4 Topics of laboratory works

Not included in the curriculum.

2.2.5 Self-study

№ 3/П	Topics	Number of hours	Learning methods	Forms of control
<i>Part 1. General principles of metabolism.</i>				
1.	Topic 1. Typical disorders of carbohydrate, lipid and protein metabolism. Hypo- and hyperglycemia: types, mechanisms of development. Disorders of carbohydrate metabolism.	15	Practical (self-study)	Oral examination (individual and frontal); written survey; test control.
2.	Topic 2. Clinical and diagnostic value of determination in biological fluids of total protein and protein fractions, separate specific proteins (haptoglobin, C-reactive protein, ceruloplasmin, α -1 antitrypsin, antistreptolysin, orosomucoid, transferrin), carbohydrate-containing proteins and their fructosamine, sialic acids), apolipoproteins. Clinical and laboratory diagnosis and monitoring of diabetes mellitus. Clinical and diagnostic determination in the blood of indicators of acid-base balance and gas composition of blood, some indicators of mineral metabolism.	20		
3.	Topic 3. Classification of biochemical markers in cardiovascular pathology. Disorders of oxidative metabolism in acute myocardial infarction. Functional tests in renal pathology. Endogenous creatinine	20	Practical (self-study)	Oral examination (individual

	clearance. Biochemical tests to assess renal pathology. Biochemical markers of acute renal failure. Changes in biochemical parameters of blood and urine in glomerulonephritis and pyelonephritis, their assessment and diagnostic value. Changes in biochemical parameters of blood and urine in renal amyloidosis, their assessment and diagnostic value.			and frontal); written survey; test control.
4.	Topic 4. Biochemical markers of gastric disease: gastrin, pepsinogen I, pepsinogen II of blood. Evaluation of exocrine insufficiency of the pancreas to determine the activity of pancreatic enzymes in the blood and feces; some pancreatic tumor markers. General characteristics of biochemical parameters that characterize diseases of the hepatobiliary system.	15		
	Total number of students self-study hours:	70		

3. EVALUATION CRITERIA

3.1. Evaluation of educational success of students is carried out on the basis of the current "Instructions for evaluating the educational activities of students of KhNMU".

Evaluation of current educational activity (CEA)

During assessing the mastery of each subject of the discipline (CEA), the student is graded according to the traditional 4-point system: "excellent", "good", "satisfactory" and "unsatisfactory". The final score for CEA is defined as the arithmetic mean of traditional grades for each lesson and control work, rounded to 2 decimal places and converted into a multi-point scale according to the table.

4-point scale	200- point scale	4- point scale	200- point scale	4-point scale	200- point scale	4- point scale	200- point scale
5	200	4.67-4,69	187	4.14-4,16	166	3.82- 3,83	153
4.97-4,99	199	4.65-4,66	186	4.12- 4,13	165	3.79- 3,81	152
4.95-4,96	198	4.62-4,64	185	4.09-4,11	164	3.77-3,78	151
4.92-4,94	197	4.6-4,61	184	4.07-4,08	163	3.74-3,76	150
4.9-4,91	196	4.57-4,59	183	4.04-4,06	162	3.72-3,73	149
4.87-4,89	195	4.54- 4,56	182	3.7-3,71	148	3.32-3,34	133
4.85-4,86	194	4.52- 4,53	181	3.67-3,69	147	3.3-3,31	132
4.82-4,84	193	4.5- 4,51	180	3.65-3,66	146	3.27-3,29	131
4.8-4,81	192	4.47- 4,49	179	3.62-3,64	145	3.25-3,26	130
4.77-4,79	191	4.45- 4,46	178	3.6-3,61	144	3.22- 3,24	129
4.75-4,76	190	4.42- 4,44	177	3.57-3,59	143	3.2- 3,21	128
4.72-4,74	189	4.4-4,41	176	3.55- 3,56	142	3.17- 3,19	127
4.7-4,71	188	4.37- 4,39	175	3.52-3,54	141	3.15- 3,16	126
4.35-4,36	174	4.02-4,03	161	3.5-3,51	140	3.12-3,14	125
4.32-4,34	173	3.99-4,01	160	3.47- 3,49	139	3.1-3,11	124
4.3-4,31	172	3.97-3,98	159	3.45-3,46	138	3.07-3,09	123
4.27-4,29	171	3.94-3,96	158	3.42-3,44	137	3.05- 3,06	122
4.24-4,26	170	3.92-3,93	157	3.4-3,41	136	3.02- 3,04	121
4.22-4,23	169	3.89-3,91	156	3.37-3,39	135	3-3,01	120
4.19- 4,21	168	3.87- 3,88	155	3.35-3,36	134	Менше 3	Недостатньо
4.17-4,18	167	3.84- 3,86	154				

Conducting and assessing the credit

The credit is given to the applicant of higher education, who gave thorough answers to all theoretical questions, solved situational problems almost without mistakes.

3.2. List of questions to the credit

1. The purpose and objectives of clinical biochemistry.
2. Clinical and biochemical characteristics of congenital and acquired rejection of food carbohydrates.
3. Methods of diagnosis and correction of hydrolysis disorders of carbohydrates and their absorption in the intestine.
4. Clinico-biochemical characterization of glycogen cleavage in cells of the liver and muscles of the human body. Evaluation of the results of laboratory diagnostics of glycogenoses.
5. Clinico-biochemical characteristics of fructose and galactose metabolism disorders. Evaluation of the results of laboratory diagnostics of fructose and galactose metabolism disorders.
6. Mucopolysaccharidosis.
7. Typical disorders of digestion of lipids and their effect on the metabolism in the body.
8. Violation of fatty acid oxidation to CO₂ and H₂O in diabetes mellitus, diagnosis of this disorder.
9. Clinical-biochemical characterization of hyper- and dyslipoproteinemias.
10. Atherosclerosis. Mechanisms of development, the role of genetic factors. Biochemical correction of cholesterol content.
11. Lipidosis.
12. Urethrin cycle urea biosynthesis, enzyme blocks and diagnosis of these disorders.
13. Specific ways of transformation of separate amino acids, diagnostics of their infringement.
14. Primary hyperuricemia, clinical and biochemical characteristics of gout.
15. Secondary hyperuricemia, evaluation of the results of laboratory tests.
16. Creatine and creatinine, clinical and biochemical significance of metabolic disorders.
17. Clinical and diagnostic value of the study of residual nitrogen, individual components of residual nitrogen.
18. The concept of heme synthesis and intermediates used to diagnose disorders in its metabolism.
19. Hemoglobinopathy, evaluation of the results of laboratory tests.
20. Violation of the exchange of bile pigments in various forms of jaundice.
21. Clinico-biochemical characterization of hypo-, hyper-, dis-, paraproteinemia.
22. Diagnostic value of determination of individual proteins - haptoglobin, C-reactive protein, trypsin inhibitor and the like.
23. Indicators of acid-base condition investigated in the clinic.
24. Degradation of endogenous and exogenous substances in liver cells, influx of

technogenic environmental factors on the function of liver cells. Assessment of liver function disorders.

25. Evaluation of the results of functional tests in the study of metabolic processes in liver cells, as well as carbohydrate, protein, lipid, mineral (water, iron, copper), diagnostic value. Samples for assessing liver detoxification function.

26. Changes in biochemical parameters in chronic hepatitis, cirrhosis, cholelithiasis, their evaluation and diagnostic value.

27. Metabolism in the coronary vessels and heart muscle in acute myocardial infarction.

28. Evaluation of changes in the activity of blood plasma enzymes in acute myocardial infarction.

29. Change in biochemical parameters of metabolism in atherosclerosis, their evaluation.

30. Changes in biochemical parameters of metabolism at different stages of hypertension, evaluation of laboratory results.

31. Biochemical characteristics of renal clearance and renal threshold, their diagnostic value.

32. Clinico-biochemical changes in acute renal failure.

33. Diagnosis of chronic renal failure.

34. Characteristics of the conditions of formation in the kidneys of stones, their chemical composition and measures of prevention.

35. Role of kidneys and lungs in maintenance of acid-alkaline state of an organism, its disturbance.

36. Biochemical markers of gastric diseases: blood gastrin; pepsinogen I, pepsinogen II in the blood; analysis of gastric juice.

37. Assessment of endocrine insufficiency of the pancreas: determination in the blood of C-peptide, insulin, glucose, insulin resistance index HOMA-IR.

38. Assessment of exocrine insufficiency of the pancreas by determination in the blood and feces of the activity of pancreatic enzymes.

39. General characteristics of biochemical parameters that characterize diseases of the hepatobiliary system.

40. Enzymodiagnosics of liver diseases.

41. Changes in biochemical parameters in chronic hepatitis, their assessment and diagnostic value.

42. Changes in biochemical parameters in cirrhosis, their assessment and diagnostic value.

43. Changes in biochemical parameters in gallstone disease, their assessment and diagnostic value.

44. Changes in biochemical parameters in fatty infiltration of the liver (steatosis), their assessment and diagnostic value.

45. Clinical and diagnostic value of determination the indican in urine.

3. Rules for appealing the assessment

Applicants for higher education who are dissatisfied with the assessment of the discipline may contact the teacher of their academic group. The teacher explains to the student the evaluation criteria for the discipline. If the applicant of higher education after the explanation of the teacher is not satisfied with the assessment, he applies to the dean's office. The Dean's Office informs the applicant of higher education about the Regulations on the appeal of the results of the final control of applicants for education of KhNMU. The student submits an application for appeal in person in writing no later than the next day after the announcement of the results of the final control of the discipline. The dean registers the application in the educational and methodical department and submits it for the signature of the rector, prepares a draft order on the composition of the appeal commission, informs the student of the date and place of the meeting of the appeal commission. The application must be considered at a meeting of the Appeals Commission no later than the next two working days after its submission.

4. DISCIPLINE POLICY.

In order to successfully complete the relevant course, it is necessary to regularly attend practical classes; to have theoretical preparation for practical classes according to the subject; not to be late and not to miss classes; perform all necessary tasks and work in each lesson; be able to work with a partner or in a group; to address to teachers of a course on various questions on subjects of employment and to receive it when you need it.

Students can discuss different tasks, but their performance is strictly individual. It is not allowed to write off, use various software, tips, use a mobile phone, tablet or other electronic gadgets during classes for purposes other than the educational process. Students are not allowed to be late for practical classes.

Students with special needs can meet with the teacher or warn him before the start of classes, at the request of the student it can be done by the head of the group. If you have any questions, please contact the teacher.

Students' participation in research and conferences on this topic is encouraged.

All students of KhNMU are protected by the Regulations on Prevention, Prevention and Settlement of Cases Related to Sexual Harassment and Discrimination at Kharkiv National Medical University, designed to define an effective mechanism for resolving conflict situations related to discrimination and sexual harassment. This Regulation is developed on the basis of the following normative legal acts of Ukraine: the Constitution of Ukraine; Law of Ukraine "On Education"; Law of Ukraine "On Higher Education"; Law of Ukraine "On Principles of Preventing and Combating Discrimination in Ukraine"; Law of Ukraine "On Ensuring Equal Rights and Opportunities for Women and Men"; Convention for the Protection of Human Rights and Fundamental Freedoms; Convention for the Suppression of Discrimination in Education; Convention on the Elimination of All Forms of Discrimination against Women; General Recommendation № 25 to paragraph 1 of Article 4 of the Convention on the Elimination of All Forms of Discrimination against Women; Cultural Rights; UN Committee on Economic, Social and Cultural Rights); Recommendations on education in the spirit of international understanding, cooperation and peace and education in the spirit of respect for human rights and fundamental freedoms (UNESCO); The concept

of the State social program to ensure equal rights and opportunities for women and men for the period up to 2021. Kharkiv National Medical University provides education and work that is free from discrimination, sexual harassment, intimidation or exploitation. The University recognizes the importance of confidentiality. All persons responsible for the implementation of this policy (staff of deans' offices, faculties, institutes and the Center for Gender Education, members of the student government and ethics committee, vice-rector for research and teaching) are confidential about those who report or accuse of discrimination or sexual harassment (except when the law requires disclosure of information and / or when disclosure by the University is necessary to protect the safety of others).

KhNMU creates a space of equal opportunities free from discrimination of any national, racial or ethnic origin, sex, age, disability, religion, sexual orientation, gender, or marital status. All rights, privileges, programs and activities granted to students or staff of the University apply to all without exception, provided they are properly qualified. The anti-discrimination policy and the policy of counteracting sexual harassment of KhNMU are confirmed by the Code of Corporate Ethics and the Charter of KhNMU.

Behavior in the audience

It is important for students to follow the rules of good behavior at the university. These rules are common to all, they also apply to all faculty and staff, and are not fundamentally different from the generally accepted norms.

During classes it is allowed:

- leave the audience for a short time if necessary and with the permission of the teacher;

- drink soft drinks;

- take photos of presentation slides;

- take an active part in the class

Forbidden:

- eat (except for persons whose special medical condition requires another - in this case, medical confirmation is required);

- smoking, drinking alcohol and even low-alcohol beverages or drugs;

- use obscene language or use words that offend the honor and dignity of colleagues and faculty;

- gambling;

- damage the material and technical base of the university (damage inventory, equipment; furniture, walls, floors, litter the premises and territories);

- shouting, shouting or listening to loud music in classrooms and even in corridors during classes.

Occupational Health

The first lesson of the course will explain the basic principles of labor protection by conducting appropriate training. It is expected that everyone should know where the nearest evacuation exit to the audience, where the fire extinguisher is, how to use it, and so on.

5. ACADEMIC INTEGRITY

Applicants must adhere to the principles of academic integrity set forth in the Code of Academic Integrity of Kharkiv National Medical University, which is designed to support the idea of integrity and a dignified relationship between participants in the academic process; promoting the importance of academic integrity; resolved issues related to raising the quality of higher education; promoting the development of a positive reputation; raising the rating of teachers and the competitiveness of university graduates; development of skills of conscientious and correct work with sources of information; compliance with the requirements of scientific ethics and respect for the intellectual property of others; activation of independence and individuality in the creation of their own works, as well as increasing the responsibility for violating the generally accepted rules of citation.

The main tasks of implementing the policy of academic integrity at the University are: prevention and elimination of cases of academic fraud among students and teachers of the University, education of negative attitudes to plagiarism, carrying out constant purposeful work on the development of academic integrity. Teachers, researchers and students who show a desire for academic integrity should be a role model and raise the standard of educational and research activities in general. Violations of the rules of academic integrity should not adversely affect the reputation of the University and reduce the value of educational and scientific degrees obtained at the University.

6. References

Basic

1. Harper's Illustrated Biochemistry / V.W. Rodwell, D.A. Bender, K.M. Botham et al. – Mc Graw Hill Education, 2015. – 817 p.
2. Popova L. Biochemistry / Popova L., Polikarpova A. – Kharkiv: KNMU, 2021. – 540 p.
3. Harper's Biochemistry / Murray R.K., Granner D.K., Mayes P.A. et al. – Prentice-Hall Int. Inc., 1998 – 1014 p.

Extra

1. Halkerston I.D.K. Biochemistry: 2nd edition / Halkerston I.D.K. – The National medical series for independent study, 1988. – 522 p.
2. Stryer L. Biochemistry / Stryer L. – W.H. Freeman and Company, New York. – 1995. – 1064 p.
3. Molecular Cell Biology / H. Lodish et al. - W.H. Freeman and Company, N. York. – 2016. – 1170 p.

7. INFORMATION RESOURCES

1. Link to the discipline page in MOODLE:
<http://distance.knmu.edu.ua/course/view.php?id=2562>
2. Educational portal: <http://www.osvita.org.ua>.
3. Website of the National Library of Ukraine named after VI Vernadsky:
<http://nbuv.gov.ua>
4. Site of Kharkiv State Scientific Library named after VG Korolenko
<http://korolenko.kharkov.com>.

5. Official site of the Ministry of Education and Science of Ukraine:
<http://www.education.gov.ua>.
6. Website of the department: <http://www.knmu.kharkov.ua/>.
7. The site of the library of KhNMU: <http://libr.knmu.edu.ua>.
8. Provisions on prevention, prevention and settlement of cases related to sexual harassment and discrimination in KhNMU:
http://files.knmu.edu.ua:8181/upload/redakt/doc_uchproc/polog-sex.doc
9. Regulations on Academic Integrity and Ethics of Academic Relations at Kharkiv National Medical University:
http://files.knmu.edu.ua:8181/upload/redakt/doc_uchproc/polog_ad_etyka_text.pdf
10. The procedure for conducting classes on in-depth study by students of Kharkiv National Medical University of certain disciplines beyond the scope of the curriculum: http://files.knmu.edu.ua:8181/upload/redakt/doc_uchproc/nak-poriad-pogl-vyv-dysc.docx
11. Regulations on the Commission for Academic Integrity, Ethics and Conflict Management of KhNMU: http://files.knmu.edu.ua:8181/upload/redakt/doc_uchproc/polog_komis_ad_text.pdf.
12. Regulations on the recognition of the results of non-formal education at Kharkiv National Medical University:
http://files.knmu.edu.ua:8181/upload/redakt/doc_uchproc/polog_neform_osv.pdf
13. INCLUSIVE EDUCATION: http://www.knmu.kharkov.ua/index.php?option=com_content&view=article&id=7108%3A2021-03-10-14-08-02&catid=12%3A2011-05-10-07-16-32&Itemid=33&lang=uk
14. ACADEMIC INTEGRITY:
http://www.knmu.kharkov.ua/index.php?option=com_content&view=article&id=2520%3A2015-04-30-08-10-46&catid=20%3A2011-05-17-09-30-17&Itemid=40&lang=uk.