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ЧЕРНІГІВСЬКИЙ НАЦІОНАЛЬНИЙ ТЕХНОЛОГІЧНИЙ УНІВЕРСИТЕТ

АНГЛІЙСЬКА МОВА ЗА ПРОФЕСІЙНИМ СПРЯМУВАННЯМ

МЕТОДИЧНІ ВКАЗІВКИ

до практичних занять та самостійної роботи для студентів напряму підготовки 6.060101 «Будівництво» денної форми навчання

ЗАТВЕРЖЕНО
на засіданні кафедри
іноземних мов
протокол № 9
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АНГЛІЙСЬКА МОВА ЗА ПРОФЕСІЙНИМ СПРЯМУВАННЯМ. МЕТОДИЧНІ ВКАЗІВКИ

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Зміст

Вступ

У зв'язку зі значним зростанням контактів нашої держави з іншими країнами виникає нагальна потреба у вивченні міжнародної термінології у сфері будівництва.

Методичні вказівки призначені для студентів вищих навчальних закладів за спеціальністю «Будівництво» денної форми навчання за напрямом підготовки: 6.060.101 «Будівництво».

Мета методичних вказівок до практичних занять та самостійної роботи для студентів денної форми навчання – забезпечення цілісного й послідовного засвоєння англійської лексики та термінології у сфері будівництва і вироблення вмінь та навиків роботи з фаховою літературою, а також розширення знань студентів у сфері будівництва, що ґрунтуються на читанні та перекладі текстів за фахом і виконанні вправ, творчих завдань, які додаються до текстів. Ці вправи сприяють швидкому засвоєнню лексики та удосконаленню мовленнєвих умінь.

Методичні вказівки складаються з восьми розділів. Кожен розділ містить сучасний фаховий текст та завдання різного ступеня складності, які дозволяють перевірити рівень сформованості граматичних та лексичних навичок та умінь писемного мовлення, читання та говоріння для висловлення власних думок щодо професійних проблем, розглянутих у даному розділі. Читання запропонованих фахових текстів та виконання завдань сприятиме розвитку розуміння та тлумачення різних аспектів мовної поведінки у професійному середовищі, а також розвитку вмінь, характерних для поведінки в різних професійних ситуаціях.

Матеріал, вміщений у методичних вказівках, спрямований на формування у студентів лінгвістичної та фахової компетенції, дає інструменти для використання англійської мови у професійній діяльності та має привчити їх до читання оригінальної літератури за професійним спрямування з мінімальним використання словника.

Unit I: Civil Engineering

1.1 My future specialty

1.1.1 Read, study and try to memorize words and word combinations

apply, **syn.** use, utilize	застосовувати, використовувати
civil engineering	цивільне будівництво
contribute	сприяти, робити внесок
ensure	забезпечувати, гарантувати
experience	досвід
explore	досліджувати, вивчати
influence	впливати, вплив
involve	залучати, включати
large-scale	великомасштабний
purpose, **syn** goal, aim	мета
receive	отримувати
scope	кругозір, сфера діяльності
sewerage	каналізаційна мережа
supervise	спостерігати, контролювати
supply	постачати, забезпечувати
surround	оточувати
work out	розробляти

1.1.2 Translate the international words

Profession, practice, civil, project, construction, military, topographical, location, design, forts, docks, discipline, canals, dams, drainage, irrigation, system, nation, standard, term, activity, municipal, specifications, general, office blocks, hydro-electrical, architecture, region, protection, structure, plan, classification, to classify, role, technique, airport, urban, steel, cement, factors, basic, principle, to reflect, social, communication, infrastructure.

1.1.3 Find the equivalents. Match A with B

A	B
1. forces of nature	1. діапазон інженера-будівельника
2. pure and applied science	2. підрозділятися на ...
3. to be subdivided into	3. сили природи
4. the scope of civil engineering	4. чиста і прикладна наука
5. to work out plans and specifications	5. гарантувати якість, ефективність, швидкість і низьку вартість будівництва

6. to ensure quality, efficiency, speed and low cost of construction	6. розглядати метод, обладнання та матеріали
7. to consider the method, equipment and materials	7. розробляти плани і специфікації
8. вносити вклад в охорону здоров'я, безпеку і рівень життя	8. professional training
9. проектування будівель і споруд	9. efficient use of the materials
10. спостерігати за будівництвом об'єктів	10. to be planed and designed by civil engineers
11. містобудування	11. to supervise the construction projects
12. професійна підготовка	12. to build the world's infrastructure
13. бути спланованим і спроектованим інженером-будівельником	13. to contribute to the public's health, safety and standard of living
14. ефективне використання матеріалів	14. structural engineering
15. будувати світову інфраструктуру	15. municipal engineering

1.1.4 Read the text given below and answer the following questions

1. What is engineering?
2. How did the term "civil engineer" appear?
3. What field of construction activity does civil engineering comprise?
4. What are the duties of a civil engineer?

Engineering is a term applied to the profession in which a knowledge of the mathematical and natural sciences, gained by study, experience, and practice, is applied to the efficient use of the materials and forces of nature. Engineers are those who have received professional training in pure and applied science.

Before the middle of the 18th century, large-scale construction work was usually placed in the hands of military engineers. Military engineering involved such work as the preparation of topographical maps, the location, design, and construction of roads and bridges; and the building of forts and docks. In the 18th century, however, the term civil engineering came into use to describe engineering work that was performed by civilians for nonmilitary purposes.

Civil engineering is the broadest of the engineering fields. It contributes in more ways than any other engineering discipline to our modern society. Nearly everything that surrounds us has been planed and designed by civil engineers. Today the scope of civil engineering is subdivided into:

- structural engineering (all kinds of buildings),
- highway and railway engineering,
- hydraulics engineering (canals, dams, drainage and irrigation systems),
- municipal engineering (city planning, traffic regulation, water supply and sewerage).

As for the duties of a civil engineer, they are:

- to work out plans and specifications,
- to supervise the construction projects,
- to ensure quality, efficiency, speed and low cost of construction,
- to consider the method, equipment and materials to be used to construct a project.

Now you understand that civil engineers build the world's infrastructure. In doing so, they quietly shape the history of nations around the world. Most people can not imagine life without the many contributions of civil engineers to the public's health, safety and standard of living. Only by exploring civil engineering's influence in shaping the world we know today, we can creatively envision the progress of our tomorrows.

1.1.5 Mind the difference between the terms. Match A with B

A	B
building	is connected mainly with domestic dwellings such as houses, schools, hospitals and offices
construction	is concerned with erection and repair of all types of buildings, roads, bridges and other structures
civil engineering	deals with surrounding features like bridges, roads, harbors, water supply and hydro-electric schemes

1.1.6 Act out dialogues

My faculty and my subject

- Would you introduce yourself?
- Of course. I'm a second-year student. My subject is construction.
- Oh? Are you from the KSTU?
- Yes, I'm. I study at the Faculty of Building and Underground Construction.
- Will you speak about your faculty?
- Our faculty was founded in 1978. Nowadays about 800 students study there. The stuff comprises about 100 lecturers and researchers.
- I see. Thank you.

Choice of a specialty

- You study to be a civil engineer, don't you?
- That's right.
- Why have you chosen this profession?
- Because I take after my parents. My father and mother graduated from the Kuzbass Polytechnic many years ago. They like their job. I think civil engineering is important and interesting. And what about you?
- As for me, I enjoy solving problems and putting my ideas into action. More over I am curious about how things work and how to make them better.
- Then, I think civil engineering may be the perfect career for you!

Civil Engineering

- What is civil engineering?
- Civil engineering is a very broad professional field.

- What are the areas of civil engineering interests?
- Civil engineering deals with the construction of different kinds of buildings, renewal and development projects, transport systems, water supply and waste disposal systems, dams and other coastal protection
structures, off-shore facilities, flood and pollution-control systems.
- I see. Nearly everything around us is planned, designed and constructed by a civil engineer.
- Yes, you are right.

The duties of a civil engineer

- What are you?
- I am a student.
- What is you subject?
- My subject is Civil engineering.
- Do you know what the duties of a civil engineer are?
- A civil engineer is to work out plans and specifications, to supervise the construction projects, to ensure quality, efficiency, speed and low cost of construction. And, of course, he considers the methods, equipment and materials to be used to construct a project.
- I see. To my mind the duties of a civil engineer are very important.

1.1.7 Speak about your future specialty answering the following questions

1. What are you?
2. What is your faculty?
3. When was your faculty founded?
4. How many students are there at your faculty?
5. What can you say about the staff?
6. What is your subject?
7. Why have you chosen this profession?
8. Civil engineering is important, isn't it?
9. Is civil engineering a broad professional field? Why do you think so?
10. What are the duties of a civil engineer?

11. How long does the course of study last?
12. What subjects do you study?
13. What do the students do at the end of the 5-th course?
14. Where do you plan to work after graduation from the University?

1.1.8 Act out the situations

Discuss with your group-mate why you have chosen the profession of a civil engineer. What are its advantages? Where do you think you will work after you graduate from the university.
Useful phrases: to be interesting for,
to be fond of architecture,
town planning and design,
to be important for (our country),
the scope of civil engineering, to be broad,
to be easy (difficult), to find a good job in the future.

Unit II: Architecture

2.1 Types of architecture

2.1.1 Read, study and try to memorize words and word combinations

according to	згідно чого-небудь
adaptability	пристосовність
approach	підхід
building, **syn.** structure	будівля, споруда
commodity	зручність
communication	передача
delight	захоплення, насолоду
depend upon	залежати від
design	проектувати, конструювати
distinguish	розрізняти
drawing	креслення
employ	застосовувати, використовувати
engineering	інженерне мистецтво
ensemble	ансамбль
experience	знати з досвіду
firmness	стійкість
generic	характерний для певної групи
in accordance with	відповідно до
man-made	створений руками людини
permanence, **syn.** stability	міцність, стійкість
possess	володіти

requirement	вимога
social formation	суспільно-економічна формація
suitability	придатність
technique of building	методика (технічні прийоми) будівництва
vary	мінятися

2.1.2 Try to recognize the international words. Give Ukrainian equivalents to the following words

architecture, theorist, civilized, produce, aesthetic, human, social, hospital, function, type, formation, group, religious, commercial, industrial.

2.1.3 Read the text and find answers in it to the questions given bellow.

What is Architecture?

Architecture is the art and the technique of building, employed to fulfill the practical and expressive requirements of civilized people. Almost every settled society that possesses the techniques for building produces architecture.

Architecture is the science of designing and building structures, or ensembles according to aesthetic and functional criteria. Structures built in accordance with such principles are also architecture.

The Roman architect and theorist Vitruvius (46-30 BC) wrote that architecture needed to possess three qualities, usually rendered in English as commodity, firmness, and delight. Vitruvius required all three elements to be present for a building to be "architecture". So the characteristics that distinguish a work of architecture from other man- made structures are (1) the suitability of the work to use by human beings in general and the adaptability of it to particular human activities; (2) the stability and the permanence of the work's construction; and (3) the communication of experience and ideas through its form. All these conditions must be met in architecture. The second is constant, while the first and the third vary in relative importance according to the social functions of buildings.

A historical approach exposes key relationships between architecture and other disciplines - sculpture, drawing, engineering, and town planning, to name a few. Most of us, however, experience architecture in relation to certain generic building types. We live in a house, worship in a religious building, go to work in skyscrapers, spend our money in shopping centers, feed our cars at gasoline stations, stay overnight in a hotel, go to hospitals when we are sick.

The types of architecture are established not by architects but by society, according to the needs of its different institutions. So the types of architecture depend upon social formations and may be classified according to the role of the patron of the community. The simplest classification of architectural types represents the following groups: domestic, religious, governmental, recreational, welfare and educational, commercial and industrial.

1. How can you define architecture?
2. What have you learnt about Vitruvius?
3. What distinguishes a work of architecture from other man- made structures?
4. Which of the conditions that must be met in architecture is constant?
5. Is architecture an autonomous discipline? Speak on its relationships.
6. What are the basic types of architecture?

2.1.4 Match A with B

A	B
1. technique of building	a. основні взаємини
2. expressive requirement	b. методика будівництва
3. man-made structure	c. передача досвіду
4. quality	d. осіле суспільство
5. key relationships	e. містобудування
6. communication of experience	f. наприклад
7. relative importance	g. споруда, створена руками людини
8. settled society	h. якість
9. characteristic	i. відносна важливість
10. town planning	j. потреба у виразності
11. to name a few	k. особливість

2.1.5 The word architecture can have many meanings. Depending on the context, architecture can refer to

a) any man-made building or structure;
b) a man-made building or structure that is important, large, or highly creative;
c) a carefully designed object, such as a chair, a spoon, or a tea kettle;
d) a design for a city, town, park, or landscape;
e) the art or science of designing and building buildings, structures, objects, and outdoor spaces;
f) a building style or method.

How do you define architecture?

2.1.6 Act out a dialogue

Architecture

- What is architecture?
- Architecture is the art and the science of building.
- Can you say what the basic principles in architecture are?
- Oh, they are convenience, strength and beauty. You see, about 2000 years ago

the Roman architect Vitruvius called these principles. They are always present in the best structures.

- So, an architect is to achieve an integration of these principles in his work, isn't he?
- You are quite right.
-There are different architectural styles: Gothic, Baroque, Classicism, Neoclassicism, Modern. Do they reflect a man's desire for something new?
- First of all they reflect different social functions. Each generation write its history in buildings. For example, medieval towns were designed and built for protection. The Baroque city is organized for show. American metropolis says: "Finance must dominate".
- I see. As to modern architecture, it is characterized by simplicity of line and design.

2.1.7 Now, try to speak about architecture, its function and styles

2.1.8 Do you know where these buildings are? Read these newspaper cuttings making use of the vocabulary. Match the descriptions with the buildings

look like бути схожим
hull корпус судна
deck палуба
be shaped бути у формі
bottom низ
be connected бути пов'язаним
skewer шпилька
tripod треножник
triangular трикутний
rectangular прямокутний
a huge chisel величезне долото
empty space порожній простір
dome купол, звід
square link in a chain квадратна ланка в ланцюзі

1. This building looks like a huge ship, an ocean liner, sailing up the river. One part of the building is shaped like three hulls. The other part looks like the decks and the bridge.

2. The building looks like a TV transmitter. It has three spherical structures. The bottom two are connected by a structure which is shaped like a ladder.

It looks like three onions on a skewer! The foot of the building has legs, like a tripod.

3. It is a triangular at the base, but thin and rectangular at the top. It looks like a huge chisel, with an empty space in the middle of the blade.

4. The skyscraper is shaped like a giant sail. The sail is standing on a short surfboat in the sea.

5. This building is in three parts. In the centre there is a tall H-shaped building. On the left there's the top part of a dome. It looks like an upside-down plate. On the right there is the bottom part of a dome, like a soup bowl.

6. It consists of three L-shaped structures, attached to each other. It looks like a square link in a chain.

Useful language:

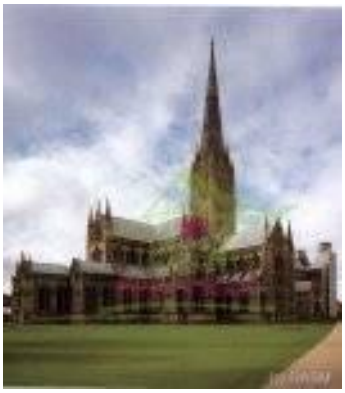
You can describe the ***shape*** or ***appearance*** of something in these ways:

- ✓ The building **looks like** a TV transmitter.
- ✓ The building **is shaped like** a dome. It's a **dome-shaped** building.
- ✓ The plan is **in the shape of** an L. It's an **L-shaped** plan.
- ✓ The screen is **in the shape of** a circle. It's a **circular** screen.

2.1.9 Cover up the texts in the previous exercise. Choose and describe one building in the photos, so that other students could guess the letter of the building under description

2.1.10 Translate the following texts about different architectural styles in written form. Use a dictionary if it is necessary

Gothic architecture, architectural style in Europe that lasted from the mid 12th century to the 16th century, particularly a style of masonry building. In the 12th – 13th centuries, feats of engineering permitted increasingly gigantic buildings. The rib vault, flying buttress, and pointed (Gothic) arch were used as solutions to the problem of building a very tall structure while preserving as much natural light as possible. Stained-glass window panels rendered startling sun-dappled interior effects. One of the earliest buildings to combine these elements into a coherent style was the abbey of Saint-Debis, Paris (1135 – 44). The High Gothic years (1250 – 1300) were dominated by France, especially with the development of the Rayonnant style. Britain, Germany, and Spain produced variations of this style. Late Gothic (15th-century) architecture reached its height in Germany's vaulted hall churches. Other late Gothic styles include the British Perpendicular style and the French and Spanish Flamboyant style.



Baroque architecture, architectural style originating in late 16th-century Italy and lasting in some regions, notably Germany and colonial South America, until the 18th century. Complex architectural plan shapes, often based on the oval, and the dynamic opposition and interpenetration of spaces were favoured to heighten the feeling of motion and sensuality. Other characteristic qualities include grandeur, drama and contrast (especially in lighting), set of rich surface treatments, twisting elements, and gilded statuary. Architects applied bright colours and illusory, vividly painted ceilings. Outstanding practitioners in Italy included Gian Lorenzo Bernini, Carlo Maderno, and Guarino Guarini. Classical elements subdued Baroque architecture in France. In central Europe, the Baroque arrived late but flourished in the works of such architects as the Austrian Johann Bernhard Fischer von Erlach. The late Baroque style is often referred to as Rococo.

Art Nouveau (Modern) although known as Modernista in Spain, and Stile Liberty in Italy, Nouveau has become Art term applied to a highly the general movement at the end of varied The extensive use of the century. glass in Art Nouveau iron and buildings was also rooted in 19th-century practice. In France bizarre forms appeared in iron, masonry, and concrete, such as the structures of Hector Guiimard for the Paris Mètro (1900), the Montmartre church of Saint-Jean L'ªvangèliste (1894 – 1904) by Anatole de Baudot, and the Samaritaine Department Store (1905) in Paris, by Frantz Jourdain (1847 – 1935).

The Classicism that (1750 – 1830) is often known as "Neoclassicism," in order to distinguish it from the Classical architecture of ancient Rome or of the Renaissance. Stylistically this began with an onslaught against Baroque architecture. Neoclassical architecture is based on the principles of simplicity and symmetry, which were seen as virtues of the arts of Rome and Ancient Greece, and were drawn from ththe 16th century.

High-tech architecture, also known as Late Modernism or Structural Expressionism, is an architectural style that emerged in the 1970s, incorporating elements of high- tech industry and technology into building design. Structural Expressionist buildings reveal their structure on the outside as well as the inside, but with visual emphasis placed on the internal steel and/or concrete skeletal structure as opposed to exterior concrete walls.

The style's practitioners include the British architects Sir Norman Foster, Sir Richard Rogers, Sir Michael Hopkins, Italian architect Renzo Piano and Spanish architect Santiago Calatrava, known for his organic, skeleton-like designs. Early High Tech buildings were referred to by historian Reyner Banham as "serviced sheds" due to their additional exposure of mechanical services in addition to the structure. Most of these early examples used exposed structural steel as their material of choice.

2.1.11 Now summarize the information from the translated texts in a table

Architectural style	**Years**	**Features**
1.		
2.		
3.		
4.		
5.		

2.1.12 Find the English equivalents to the following words and word combinations in the just read texts

1. опора	
2. кам'яна кладка	
3. вітражне скло	
4. нервюрний звід	
5. майстерність інженерного	
6. гармонійний стиль	
7. велич	
8. освітлення	
9. позолочений	
10. химерні форми	
11. внутрішня сталева конструкція	
12. конструкційна листова сталь	
13. конструкція будівлі	
14. високо-технологічна промисловість	

2.1.13 Look through the text "Forms and Functions of Architecture" and find two facts which are new to you and two facts which are already known to you

Forms and Functions of Architecture

The sequence of the three basic aims – "convenience, strength and beauty" – has its own significance. First any building exists for some particular purpose, it is built because of some definite human need, either practical or emotional, or both. The use problem – "convenience" is therefore primary.

Next, the construction of any object or shelter for human use must be a true construction; that is, it must stand up solidly for the duration for which it is designed.

Finally, mankind has always realized that buildings to be complete must

have not only “convenience” and “strength” but also “beauty”.

The value of true architecture lies in the direct effect of the structure itself and of the actual elements of which it is constructed. Outside we observe the physical structure; we see variations of plane, of colour, and of light and shade. There are doors to allow ingress and egress; windows to admit light and air; walls for shelter or support, or both; roofs to keep out the rain, snow, cold, and sometimes sun.

We enter the building, and we pay attention to the same complexity of elements. Partitions separate space from space; there may be stairs, escalators, or elevators to allow progress from level to level and halls or corridors to permit easy circulation from part to part; finally there may be all sorts of interior spaces for definite human activities - rooms both public and private - to take care of the varying functions of human living.

Such elements – walls and openings, supports, floors and ceilings, enclosed areas or rooms – are the letters of the architect’s alphabet. No building can exist without some of them, and upon their correct arrangement and design the success of the building, both practically and aesthetically, will almost entirely be founded. The architect must always study each detail from the viewpoints of both use and appearance as well as from that of construction, and he must continuously see it not as an isolated detail but as an individual note in a great composition.

The architect has the task of being an artist as well as an inventive engineer.

The triple nature of architectural design (convenience, strength, beauty) is one of the reasons why architecture is a difficult art; for it takes a special type of imagination as well as long years of training and experience to produce a designer capable of making the requisite in the light of these three factors – use, construction, and aesthetic effect simultaneously. The designer must have a sufficient knowledge of engineering and of building materials to enable him to create economically a strong as well as practical structure and, in addition, must possess the creative imagination which will enable him to integrate the plan and the construction into one harmonious whole. The architect’s feeling of satisfaction in achieving such an integration is one of his greatest rewards.

2.1.14 There are some notes the student made after reading the text “Forms and Functions of Architecture”. Did he remember everything right? Read his notes and correct them if necessary

1. A large number of systems and theories for the construction of the buildings have been developed since earliest times of architecture.
2. The construction of any object or shelter for human use must be a true construction; that is, it must stand up solidly for the duration for which it is designed and that’s why such factor in architecture as strength is primary.
3. Architects must study each detail in their work only from one viewpoint, that is, of use.

4. To create a work of architecture the designer must project an integration of the whole with the help of such elements as walls and openings, supports, floors and ceilings, rooms.
5. The architect must possess the knowledge in different sciences but the creative imagination isn't necessary for him.

2.1.15 Read the following text and give its short summary

Bioclimatic Architecture

Bioclimatic architecture is a way of designing buildings and manipulating the environment within buildings by working with natural forces around the building rather than against them. Thus it concerns itself with climate as a major contextual generator, and with environments using minimal energy as its target.

The idea of designing and building structures that are environmentally friendly has become widespread throughout the community of architects and builders in developed nations. In many areas there is the necessity of complying with new regulations and standards aimed at protecting the environment. In addition, there are an increasing number of incentives for putting up buildings with more efficient energy consumption and that reduces the negative impacts on natural resources by using recycled or sustainable materials

There is growing interest in "green" building practices, which offer an opportunity to create environmentally sound and resource- efficient buildings by using an integrated approach to design. "Green" buildings promote resource conservation through energy efficiency, renewable energy, and water conservation features. They take into consideration the environmental impact of the building and minimize waste. Other goals are to create a healthy and comfortable environment, reduce operation and maintenance costs, and address issues such as historical preservation, access to public transportation and other community infrastructure systems. The entire life cycle of the building and its components is considered, as well as the economic and environmental impact and performance.

What is integrated bioclimatic architecture? It is the architecture that arises out of the landscape, with the site determining the orientation and construction of a building, not just aesthetically, but also mechanically, determining its heating, cooling, and lighting. Thus, it is an architecture that respects nature and its resources and provides its occupants with the most comfortable and pleasing environment possible. However, this architectural approach need not be a restrictive one for imaginative practitioners. As integrated bioclimatic architecture encompasses examples of vernacular architecture, like the typical "white stucco Mediterranean fishing village", as well as mimetic architecture, which draws on the materials, textures, even the plants of the surrounding landscape for its inspiration. Indeed, good integrated bioclimatic architecture should exist in harmony with the site.

Unit III: Building Materials

3.1 Types of building materials

3.1.1 Read, study and try to memorize words and word combinations:

assemble	монтувати, складати
availability	наявність, корисність
concrete	бетон
decay	гнити, розкладатися, руйнуватися
durable	довговічний, міцний
dwelling	житло, житлове приміщення
fabric	матеріал, тканина, матерія
floor	пол
frame	основа
hardness	стійкість
impact	вплив
influence	впливати, вплив
insulate	ізолювати
mortar	розчин
porosity	пористість
possess	розташовувати, володіти
precast concrete	збірний залізобетон; збірний бетон
prestressed concrete	попередньо напружений бетон
proof	стійкий, непроникний
property	властивість
protect	захищати
range	ряд, область поширення, зона, коло, діапазон, межа
recycle	повторно використовувати, переробляти
reinforced concrete	армований бетон
resist	чинити опір, протидіяти
shape	форма
sound	звук; міцний, надійний
strength	сила, міць, міцність, стійкість
structural	будівельний
substitute	замінювати, заміщати, підставляти
support	підтримувати
tightness	напруженість
workability	здатність піддаватися обробці, технологічність

3.1.2 Find synonyms. Match A with B

A	B
hardness	complete
realize	differ
vary	collapse
finish	weakness
crush	understand

3.1.3 Find antonyms. Match A with B

A	B
cheap	finish
require	destroy
start	offer
advantage	fast
construct	expensive
slow	disadvantages

3.1.4 Complete the table with the correct forms of the word. Translate Participle I and Participle II in each case

noun	verb	ParticipleI/II
	manufacture	
insulate		
		resisting, …
	possess	
support		
	use	
	protect	…, protected

3.1.5 Read the text "Materials Used for Structural Purposes" and be ready to answer the questions under it

Materials Used for Structural Purposes

Materials to be used for structural purposes should meet several requirements depending upon their practical uses. In most cases it is important that they should be hard, durable, fire-resistant and easily fastened together. We determine whether a material is good for building purposes judging by its qualities. At all times it was important to know how the most commonly used materials – steel, stone, wood and brick – differed in hardness, durability and fire resistance.

Wood is the most ancient structural material. It is light, cheap and easy

to work. But wood has certain disadvantages: it burns and decays.

Stone. Stone belongs to one of the oldest building materials used by man. Primitive stone structures were the earliest types of human dwellings. Stone has many properties owing to which it is widely used for building purposes. They are mechanical strength, compactness, porosity, sound and heat insulation and fire-resistance. Stone is widely used for foundations, walls and steps of buildings, for supports of piers and bridges, and for finishing and decorating all sorts of structures.

Brick. Bricks as a structural material were known many thousand years ago and are used as a substitute for other materials found in natural state. Bricks are hard and easily fastened together with the help of mortar which makes them suitable for construction purposes. A brick building is strong, durable and weather resistant. It has, however, certain disadvantages. First, its foundation requires durability and takes up a much larger space than that of a wooden structure and is consequently more expensive. Second, the process of constructing a brick building is very slow and requires much skilled labour on the site. Such limitations of bricks led to the development of steel frame technique which allows an easy assembly of structural parts and makes possible the use of new materials.

Steel. As structural material steel has come into general use with the development of industry, its manufacture requiring special equipment and skilled labour. Steel gas largely displaced wood and bricks as basic materials in construction. Its technique has combined the best principles of the older methods.

Concrete. Concrete is one of the most important materials. Concrete is a mixture of cement, sand and crushed stone, made into a paste with water. It forms a hard durable mass and is largely used for the foundations and walls of houses, and for structures under water.

Plastics combine all the fine characteristics of a building material with good insulating properties. That is why the architects and engineers have turned to them to add beauty to modern homes and offices.

1. What are the properties of the building materials?
2. What are the most commonly used building materials?
3. Do building materials differ from each other?
4. What is the most ancient building material?
5. Is concrete an artificial or natural building material?
6. When do the architects and engineers turn to plastics?

3.1.6 Translate one of the texts given below in written form within 30 minutes. Use a dictionary if it is necessary

Concrete

Concrete is a construction material composed of cement (commonly Portland cement) as well as other cementitious materials such as fly ash and slag cement, aggregate (generally a coarse aggregate made of crushed rocks such as

limestone, or granite, plus a fine aggregate such as sand), water, and chemical admixtures.

The word concrete comes from the Latin word "concretus" (meaning compact or condensed), the past participle of "concresco", from "com-" (together) and "cresco" (to grow).

Concrete solidifies and hardens after mixing with water and placement due to a chemical process known as hydration. The water reacts with the cement, which bonds the other components together, eventually creating a stone-like material. Concrete is used to make pavements, pipe, architectural structures, foundations, motorways / roads, bridges / overpasses, parking structures, brick / block walls and footings for gates, fences and poles.

Concrete is used more than any other man-made material in the world. About 8 cubic kilometers of concrete are made each year – more than one cubic meter for every person on Earth.

Reinforced concrete, prestressed concrete and precast concrete are the most widely used modern kinds of concrete functional extensions.

Metal

Metal is used as structural framework for larger buildings such as skyscrapers, or as an external surface covering. There are many types of metals used for building. Steel is a metal alloy whose major component is iron, and is the usual choice for metal structural building materials. It is strong, flexible, and if refined well and / or treated lasts a long time. Corrosion is metal's prime enemy when it comes to longevity.

The lower density and better corrosion resistance of aluminium alloys and tin sometimes overcome their greater cost. Brass was more common in the past, but is usually restricted to specific uses.

Other metals used include titanium, chrome, gold, silver. Titanium can be used for structural purposes, but it is much more expensive than steel. Chrome, gold, and silver are used as decoration, because these materials are expensive and lack structural qualities such as tensile strength or hardness.

3.1.7 Read the text “Building materials” and complete the table given below

Building materials

Building material is any material which is used for a construction purpose. Many naturally occurring substances, such as clay, sand, wood and rocks, even twigs and leaves have been used to construct buildings. Apart from naturally occurring materials, many man-made products are in use, some more and some less synthetic.

Construction materials can be used for aesthetic purposes to make buildings look nice. More importantly, though, construction materials are vital for structural stability. With the right building materials, you can achieve both goals - creating an attractive building that is structurally sound. Options for building supplies include:

1. Wood building materials
2. Stone and brick building materials.
3. Metal building materials.
4. Concrete building materials.
5. Glass building materials.
6. Green building materials.

Use wood building materials for everything from framing to flooring. Wood building materials are perhaps the most common and versatile construction materials in the world. Appropriate for almost any structure in a variety of climates, they're useful inside your building and out.

Turn to bricks and stones as wall-worthy construction materials While they're too heavy, awkward and energy-inefficient for broad applications, stone building materials are popular for exterior construction and landscaping designs. Projects that would benefit from the strength of stone building supplies should consider brick, which is equally sturdy (стойкий) but more practical.

Choose metal commercial building materials for larger construction projects. Metal building supplies are ideal for large buildings, such as warehouses and skyscrapers, which require metal skeletons for framing. Add a modern touch to your project with concrete building materials. Even better than brick, and stronger than stone, concrete commercial building materials, including cinder blocks and reinforced concrete, are the predominant choice for modern builders.

Use glass building materials for their aesthetic interest. Unlike other building materials, glass is more decorative than structural. Most commonly used for windows, it can also be used for architectural elements like curtain walls and space frame ceilings.

Help the environment with green building materials. Increasingly popular are environmentally friendly building materials, including sustainable lumber and recycled building supplies.

Choosing the best building materials for your project comes down to both form and function. Answer, which building materials will give you the aesthetic that you desire and the structural integrity that you need.

While traditional building materials like wood and metal will always form the core of commercial building projects, interesting building materials like plastic, ceramics, fabric and even foam are becoming increasingly popular as accents and alternatives.

Options	**Usage**	**Advantages**	**Disadvanta**
Wood			
Bricks and stones			
Metal			
Concrete			
Glass			
Green BM			

3.1.8 Look through the text once again and give its short summary

3.1.9 Act out a dialogue

Building materials

– A lot of building materials are used in construction, among them concrete, steel, brick, timber, cement, lime, gypsum. What are the most important?

– The most important building materials are considered to be structural steel and concrete. But we must keep in mind that all building materials vary in their properties. Even steel varies considerably in its microstructure.

– What factors must a civil engineer consider when he chooses this or that material?

– The main factors are: availability, cost, physical properties of materials such as their workability, strength, water tightness, resistance to erosion, etc.

– What influences the choice of building materials?

– The type and the function of a building.

3.1.10 Scan the text "Top Seven Alternative Housing Ideas", find international words and translate them

3.1.11 Read the following text and give its short summary

Top Seven Alternative Housing Ideas

As housing prices rise and people become more concerned (зацікавлені) about their environmental footprints, green construction has been gaining popularity. Green construction can include mainstream features, like a green roof, or more unique material. In general, what makes a building eco-friendly are the materials that go into the structure and the attention paid to energy usage in its design.

Green builders use recycled or low-impact components to create energy-efficient homes, and you can construct green homes in any number of ways. Now, we'll look at some unique, eco-friendly alternative housing ideas.

Hemp Concrete

Traditional concrete is very energy intensive to create, so one Asheville, NC, company is looking to change that. "Hemp Technologies" developed an alternative concrete, called Hemcrete, out of hemp (пенька; пакля, конопля), water and lime that's more durable than regular concrete. This material insulates better than concrete, you make that up that cost over time in energy savings. Walls constructed with this material are also resistant to fire, mold (плесень) and insects, and some researchers think that it may even last as long as 700 to 800 years.

Beer Bottles

Tito Ingenieri built his Quilmes, Argentina, home out of 6 million empty glass bottles. He sets the bottles in concrete to create a light, airy space that's a testament to the amount of empty bottles that go to waste. Friends and neighbors (соседи) have saved their bottles for Ingenieri over a period of more than 19 years, and he says that his home "doesn't belong to me, but to many people in this town. They say this is an ecological house, as it is made of bottles from the street, and now the streets are clean".

Green Wall

Living walls are as beautiful as they are functional. These vertical gardens are able to support a widerange of plants. A green wall on thesouth side of your building helps reduce cooling costs in the summer.

Most green walls are constructed using a modular design, which not only makes them easier to build, but also allows you to create interesting patterns and designs by mixing and matching different plants.

Green Roof

A green roof is more than a cool architectural feature. It can help manage storm water runoff by providing a permeable (проницаемый) surface, and it can help offset the urban heat-island effect. Rather than absorbing and storing heat like a regular roof, a green roof reflects heat and can help lower a building's cooling costs. They are also great insulators and can reduce both air and noise pollution. On a home, the most practical type of green roof is an extensive roof, which can support a variety of small plants. Because these roofs are designed to support only a few inches of soil, they don't require much maintenance, and you'll have a new kind of eco-friendly garden to enjoy.

Wood-pallet House

Architectural firm "I-Beam Design" came up with the idea of creating homes out of wood pallets (транспортный стеллаж) as an affordable and eco-friendly solution for disaster relief housing. Used wood pallets are readily available and cheap. A small 3-by-6-meter shelter would cost around $500 and require about 80 pallets. It's easy to imagine combining several of these small shelters and reconfiguring(повторно планировать конфигурацию) them to form a unique, energy-efficient home. And if you do decide to remove the building at any time, the materials are easy to recycle.

Straw-bale (тюки з соломою) Construction

Bales of straw are also natural and inexpensive, and they provide excellent insulation. This makes straw-bale construction an economical green- building method. Since straw is a byproduct of grain farming, it often goes to waste, so using it in construction is a great way to reuse it.

Straw-bale construction is versatile (різнобічний), too. Since youэre using the straw bales either to construct the frame or as insulation in conjunction (з'єднання. стик) with a wooden frame, the house itself can look however you want. In most straw-bale construction, recycled steel beams or bamboo rods support the bales.

Cob (обмазка з глини з соломою) House

In green construction, cob refers to a mixture of earth and straw similar to the adobe (глинобитний) homes you might see in the American southwest. Cob is an inexpensive, versatile material that allows builders to shape walls any way they want. While adobe is usually formed into bricks or blocks, cob is unique in that it's applied in large handfuls to form the structure. Typical cob homes have unique, rounded features and almost look like they’re made out of clay – that’s probably because they basically are! And cob is sturdier than you might think: Some cob homes built in England in the 19th century are still around today.

By Becky Striepe

Unit IV: Types of Buildings

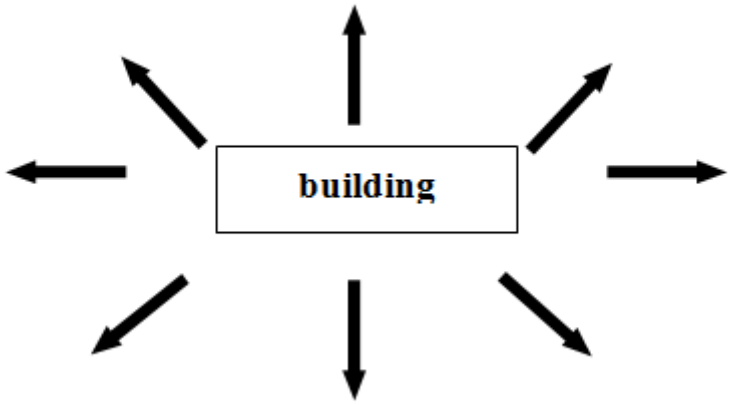
4.1 Functional requirements when building a house

4.1.1 Read, study and try to memorize words and word combinations

apartment	квартира; житлової
blind	сліпий
commercial	промисловий, торговельний
community	громада
damp	сирої, вологий
double-glazed window	склопакет
environment	навколишнє середовище
external	зовнішній, зовнішній
floating	плаваючий
functional	функціональний, ділової
insulate	ізолювати
lodge	відкрити кредит
meet the needs (requirements)	задовольняти вимогам

one (multy)-storey	одне (багато) поверховий
prevent	запобігати
protection	захист
rectangular	прямокутний
residential	житловий
roof	дах
scarce	недостатній, убогий
shutter	шторка, віконниць
sloping	похилий
take into consideration	брати до уваги
threat	загрожувати; загроза
well-fitted	добре підігнаний

4.1.2 Create a word web. Translate the word combination you've got



building materials

4.1.3 Act out the dialogue. Learn it by heart

Types of Buildings

– What is the classification of types of buildings?
– Types of buildings are classified according to their role and function. They can be residential, educational, office, sport, commercial, industrial, etc.
– How does the type of a building influence its construction?
– The type and function of a building influence its design, building technique or method and building materials.
– Residential construction includes cottages, one-and-multi-storey buildings in which people live, doesn't it?
– That's right. Speaking of residential construction, I must say that apartment houses are designed and built to meet the needs of the population.

4.1.4 Read the text given below and find the answer to the questions

1. What types of protection are important for houses?

2. What are the functional requirements of a house?

Building a House – the Requirements

Some functional requirements should be taken into consideration when building a house. A house needs protection against the elements, the environment and, a number of other risks. Different types of protection are important.

The first factor is solar radiation. In hot climate this type of protection is provided by means of external wooden shutters or internal blinds.

The next factor is rain. This type of protection is provided by solid brick walls and a sloping roof.

The next factor is high winds. A country house may need more protection against high winds than a city house.

The fourth factor is noise from outside. But a normal brick structure with double-glazed windows provides sufficient protection.

Let's move onto the next factor – noise from inside. Here we need to consider how to insulate one room against noise coming from another room. For this purpose, interior brick walls are recommended.

There is also damp from underground or rising damp. Houses need protection against this. Good foundation and solid stone floor are ideal for this type of protection.

The next factor is the risk of fire from outside. There is also the danger of fire from inside. In this case, we need to consider the type of heating used, as well as other factors.

The next point is heat lost. Here again thick walls and well-fitted doors and windows prevent heat loss.

And finally there is the question of heavy snow. Heavy snow is normal in many parts of the world and a house there needs this type of protection.

4.1.5 Learn the dialogue by heart

Types of protection of a house

– There are different types of protection that a house needs. What protection does a house in Kemerovo require?

– We live in cold climate. Our winters are typically severe. Heavy snow is normal in Siberia and therefore a house needs these types of protection.

– So, some types of protection depend on environment, don't they?

– That's right. A house needs protection against solar radiation, rain, high winds, heat loss. But there are some other types of protection that are important.

– There may be the danger of fire. What about this?

– Protection against fire from both inside and outside is very important. Besides there may be noise from other parts of the house and from outside. All houses may require these types of protection.

4.1.6 Act out the situation

Denis Bykov decided to build a cottage for himself and his family. He is discussing his plans with a designer. They are speaking about the kind of a house he wants, its size, where it will be situated, the building materials used, etc.

Useful phrases: in the center of the town, in the country, in a new district, large, small, one-storey, two-storey building, 4-6 windows, oval, rectangular, circular, white, grey, blue, to be made of bricks, concrete, glass, plastics, wood, double-glazing.

4.1.7 Now, render the information below from Ukrainian into English. Make use of the following phrases

to suggest a unique project; designed as; isolated energy system; alternative energy sources; flooding and reflow; waste processing; to withstand catastrophes of the future; a giant tube; pumps and engineering services; necessary for work and rest; to house up to 10000 people; under any climatic conditions; to be easy in operation and maintenance; to be awarded the III-class diploma at.

Російський "Ковчег" для всього світу

Російські архітектори з майстерні Олександра Ремізова разом з академіком Львом Бритвина запропонували суспільству унікальний проект під назвою "Ковчег". Це біокліматичної споруда спроектовано як автономна енергетична система, заснована на альтернативних джерелах енергії (сонце, вітер, припливи-відпливи, переробка відходів). За задумом архітекторів, споруда здатна протистояти катастрофам майбутнього.

Основа " Ковчега " - гігантська труба , усередині якої розташовуються електростанція , генератори , насоси , і інженерні комунікації. Зверху розміщується все інше, необхідне людям для роботи і відпочиваю.

Російський "Ковчег" може вмістити до 10000 чоловік і бути зібраний в будь-якій точці планети з якими кліматичними умовами. Він невибагливий в експлуатації і для його складання не потрібні над дорогі матеріали.

ЕКОПРОЕКТ російських архітекторів був нагороджений дипломом третього ступеня на Першому міжнародному фестивалі інноваційних технологій в архітектурі і будівництві " Зелений проект - 2010 " .

За матеріалами газети "Комсомольская правда"

4.1.8 Read the following text and give its short summary

Dutch float a new idea in housing

The Netherlands is to start building homes, businesses and even roads that float because of living space shortage and danger of flood.

With nearly a third of the country already covered with water and half of its land mass below sea level and constantly under threat from rising waters, the authorities believe floating communities may be the future.

Six prototype wooden and aluminum floating houses are already moored off Amsterdam, and at least a further 100 are planned on the same estate.

The fact is that after Bangladesh Denmark is the most densely populated country in the world. Building space is scarce and government studies show that there is a need to double the space available to meet all housing needs."

Before being placed on the water, the houses are constructed on land atop concrete pontoons, which encase giant lumps of polystyrene reinforced with steel. The pontoons are said to be unsinkable because they are anchored by underwater cables. The floating roads apply the same technology.

The concept is proving popular. The waiting list for such homes, which will cost $360,000 to $900,000 to buy, runs to 5000 names. “We expect to build between 50 and 200 floating homes a year. It was estimated that for every 100 homes built in the next few years, 3-4 per cent will be floating ones.”

The developers (проектувальники) have lodged an application to build a 40-home floating “mini-village” in Leeuwarden, about 160 kilometers north-west of Amsterdam, while the Government itself is building the country’s first floating road.

Construction of the experimental stretch of road is a new concept. The authorities hope such roads can be built on reclaimed (меліорованих) land. With much of the country given over to market gardening and the intensive cultivation of flowers and vegetables, planners have also come up with ideas for floating greenhouses designed so that the water beneath them irrigates (зрошувати) the plants and controls the temperature inside.

A pilot project covering 50 hectares of flooded land near Amsterdam’s Schiphol Airport has been already planned.

The opportunities for innovative developers look promising. They have 10 projects in the pipeline (на подходе) – floating villages and cities complete with offices, shops and restaurants.

By Andrew Osborn “The Guardian”

Unit V: Some facts from the history of arhitecture

5.1 Outstanding people in the field of civil engineering

5.1.1 Translate. Mind the derivatives

to assist – assistant – assistance, to found – founder – foundation, to build – builder – building, to design – designer – designed, to create – creator – creation – creative, to restore – restoration – restorative, to observe – observation – observant, to indicate – indication – indicator, to manage – management – manager, to present – presentation – presented, to correct – correction – corrector – corrected.

5.1.2 Can you name any famous engineers or architects in your field? You probably can … But the list seems to be not very long. So, read the text about two outstanding architects and speak on their scientific and practical activity

Useful phrases: was born, studied architecture in, well known for his, designed and built, his works reflected, his buildings are.

Matvei Kazakov (1738 – 1812)

Matvei Kazakov is the distinguished founder of Russian Classicism and designer of scores (два десятка) of the buildings in Moscow.

A native born Muscovite, Kazakov studied architecture in this city. Then he worked in Tver before returning to Moscow. Kaiakov assisted Bazhenov in building the famous Grand Palace in the Kremlin (a masterpiece (шедевр) in itself, but hardly in its place within the medieval walls of the Kremlin).

Kazakov was particularly well known for his exquisite (вишуканий) cupolas, and the one in the Kremlin bears the Imperial Crown with the word Law on it. There is a story that when he had completed construction of the cupola and removed all the scaffolding (будівельні ліси) all the known architects were assembled and expressed their doubts as to the firmness of the structure. Then Kazakov personally climbed up on the cupola and stood on it for half an hour. When he descended (спустився) he was met with cries “Hurrah!”

Kazakov enjoyed the favor of the Empress Catherine the Great and subsequent (наступний) emperors Paul and Alexander I. He designed subsequent

numerous churches as well, taught architecture, and compiled architectural pattern albums. His excellent drawings of houses and daily scenes have come down to us.

Kazakov died in 1812 in Ryasan at the age of 79, forced to flee (бігти) from the French who destroyed a large part of his beloved city.

Vasily Stasov (1769 – 1848)

Vasily Stasov was a whole age in Russian architecture. He had two excellent teachers – Vasily Bazhenov and Matvei Kazakov. His career started in 1793 – 1794, when he had a job as assistant architect at the Moscow town building department. By the end the 1790s, he was working independently. In 1802 – 1808 he studied architecture in France and Italy. Upon retuning, Stasov moved to St. Petersburg and continued to work as architect. He became a full member of the Academy of the Arts in St. Petersburg in 1811. In 1816 he became one of the leading members of the Committee for Buildings and Hydraulic Work in St. Petersburg. In 1817 he supervised all construction for the Imperal court.

The 1810s and the 1820s were Stasov's best years in terms of creative work. He drew up more than a hundred standard designs for residential and other buildings. Then there is a huge body of unique monuments in St. Petersburg built by Stasov including the Barracks of the Pavlov Regiment, the chief monument of the Field of Mars complex, the house of the Stables Department, and Yamsky Market.

Simultaneously, he was the architect of several structures in Tsarskoye Selo near the capital. Later, at the turn of the 1830s, he built two outstanding churches, the Cathedral of the Transfiguration (1827 – 1829) and Trinity Cathedral (1828 – 1835), both in St. Petersburg.

Stasov's Trinity Cathedral, St. Petersburg, represents a high point of Russian Neoclassicism.

Several gates (ворота) and triumphal arches also belong to him. In the 1830s, Stasov completed the ensemble of Smolny Monastery and, following the fire of 1837, restored the Winter Palace in the center of St. Petersburg, Stasov's works reflected Russia's victory over Napoleon in 1812-1814. His buildings are majestic and monumental and intended to demonstrate the power of the state.

The oldest statement of Russian Revival, 1826 Alexander Nevsky church in Potsdam.

5.1.3 Translate one of the texts given below in written form within 45 minutes. Use a dictionary if it is necessary

Ivan Zholtovsky (1867 – 1959)

Zholtovsky began working as an architect in pre-Revolutionary Russia. He graduated from the Academy of Arts in St-Petersburg in 1896. Before the revolution he designed factory buildings, estates, and residences. In 1909 Zholtovsky received the title of academician of architecture.

After the revolution Zholtovsky made an incredible career and became a leading official architect in Soviet times. In 1918 he was busy working on the plan for Moscow's reconstruction. In 1923 he designied the entrance to the agricultural and industrial exhibition which bore the obvious traits (черты) of Constructivism. In 1927 the reserve electric power plant was built according to Zholtovsky's design across the Moskva River from the Kremlin. This ugly and out- of-place monument to Soviet industrialization can still be observed from Red Square.

Zholtovsky never really espoused all the new trends in architecture and was deep inside a traditionalist. So when Constructivism was rejected in the Soviet Union it was easy for Zholtovsky to retun to the classica1 architecture he really liked. Soviet reference books indicated that Zholtovsky was an opponent of decadent art, modernism, and eclecticism.

Zholtovsky also taught architecture at an architectural workshop and translated into Russian Palladio's famous treatise(трактат) on architecture.

The paradox of Zholtovsky's life was that a conservative person managed to survive the Great Terror. Why? May be because of his adherence to tradition.

Zholtovsky's works gallery

Spirodonovka Streer, Tarasov House

FirstPowerplant

Mokhovaya Street Building

Theatre "Pobeda"

Moscow race-cource

Dmitry Nickolayevich Chechulin (1901 – 1981)

A graduate of the Higher Tecnology and Art School, he was tutored by Shchusev, whom he later succeeded as the head of the Moscow City Council Administration for the Planning of Urban Building and Structures.

He started out as a Constructivist: his first projects hospitals and higher educational complexes for provincial towns in Russia – featured a simplicity of design and appearance. Then, in the early 1930s, the architect went in for the so- called classical style, which was officially encouraged at that time. Chechulin combined it with decorative sculpture glorifying the themes of labor and abundance, so dear to the heats of the Soviet authorities. The architect designed *Komsomolskay and Kievskaya radial metro stations,*

the Dinamo and Okhotny Raid pavilions,

the Pekin Hotel, the Tchaikovsky Concert Hall,

and a number of residential buildings on Leninsky Prospect.

Many of the architect's projects, for example, the Rossia Hotel in Zaryadye or the high-rise building on Kotelnicheskaya Embankment – caused considerable controversy among his colleagues, all of them agree: Chechulin to a large extent defined the image of the 1950s Moscow.

The "White House" became his last project. Chechulin died in 1981.

5.1.4 Read the text "J.B.van Loghem"and write its summary using the phases below the text

J.B.van Loghem

In the 1920s and 30s the Modern Movement was an important international architectural development. The cultural, economic and technical results of this movement are still noticeable today. Characteristic of this movement is among others that buildings were designed with a relatively short functional as well as technical life expectancy (ожидаемая продолжительность жизни) in mind.

After the Russian Revolution of 1917 many modern architects were attracted by the challenges of building a new society, including mass housing projects and industrialization.

The Urals and Siberia were promising mining areas where coal, chemical and steel industries could be developed together with large cities.

One of the idealistic foreigners who worked in Siberia after the revolution was the Datch architect J. B. van Loghem (1881 – 1940).

In 1925 he was invited by Sebald Rutgers, a Dutch civi1 engineer who along with the American Herbert Calvert took an initiative to found the Autonomous Indistrial Colony Kuzbas (AIK). This project was connected with the exploitation (эксплуатация) of mines in the Kuznets basin.

After building severa1 private dwellings, he built six housing projects in Amsterdam and Harlem between 1919 and 1922. The invitation to come to Kemerovo to head the planning of a new town of 5000 houses arrived at a moment when Van Loghem was frustrated (заважали) with Dutch housing practice.

Van Loghem arrived in Kemerovo in March 1926. A 1000 hectare area was available for housing, factories, workshops, bath houses, schools and recreational facilities. Due to the lack of maps, the planning was done on site, with correction on paper made afterwards (пізніше). Van Loghem made use of existing building methods for log (бревно) walls of some structures. On flat terrain, however, he designed terraced housing in stone. Here he could introduce severa1 technical innovations connected with lighting, waterworks and sewerage (каналізація).

Van Loghem has to overcome the Russian conception that a good building is a heavy building. In order to improve insulation, he proposed a wall constructed of two brickwork shells (оболочка) 10 cm in thickness with a 15 cm space in between to be filled up with slags (шлак). The Russians, accustomed to build walls at least 70 cm thick, were skeptical at first, but at the end admitted that Van Loghem's plan worked.

In the two years that Van Loghem worked in the Kuznets region, 1000 houses and a number of utilitarian buildings, such as factories, shops, community centers, a school with a water tower, a firehouse and a bathhouse were built under his supervision. In 1927 Van Loghem gave up his plans to continue living and working in Russia and left the country.

J.B.van Loghem's architectural heritage in Kemerovo

1. The title of the text is …
2. The text deals with the question of …

3. It should be noted that …
4. The text gives names (figures, facts) illustrating…
5. The text says in detail about …
6. The most interesting (important) information in the text is …
7. I found the text informative (useful for me) and hard (easy) to understand.

5.1.5 Read your summaries to the classmates. Whose one is the best?

Appendix I: Phrases to summarize the information of a text or an article

1. The title of the article (text) is …	Заголовок статті (тексту) ...
2. It was published in …	Вона була опублікована в ...
3. The author of the article is …	Автор статті ...
4. The article deals with the problem (question) of …	Стаття має справу з проблемою (питанням) ...
5. It also touches upon …	Вона також стосується ...
6. The article (text) says in detail about …	Стаття (текст) говорить в деталях про …
7. The article (text) gives facts (figures, names) illustrating …	Стаття (текст) дає факти (цифри, імена), що ілюструють ...
8. It should be noted that …	Слід зазначити, що ...
9. In conclusion the author says that …	На закінчення автор говорить, що ...
10. I think the most important (interesting) fact in this article is …	Я думаю, що найважливіший (цікавий) факт в цій статті це ...
11. I found the article (text) … .	Я знаходжу статтю (текст) ....
interesting	цікавою
useful	корисної
important for me	важливою для мене
informative	інформативною
hard (easy) to understand	важкою (легкої) для розуміння

Unit VI: Growth of cities

6.1 Principle of city location

6.1.1 Read, study and try to memorize words and word combinations

Freighter — вантажне судно; pier — пристань; warehouse — товарний склад; terminate — закінчуватися; personnel — особовий склад; necessitate — робити необхідним; furnish — постачати, приставляти; harbor — гавань; barge — баржа; truck — ваговоз, товарна платформа; cause — викликати; ferry — пором; exclusively — винятково; inaccessible — недоступний; estuary — морський рукав (гирло); perch — розташувати високо; hover — нависати; cease — припиняти.

6.1.2 Translate the words

Urban developments; oceangoing freighter; highway; seacoast shipping center; inland trading center; remnants; inaccessible hillside; estuary of river; bulky raw materials; pottery industry.

6.1.3 Read the text

Cities, that is, large and dense population settlements, tend to be located at breaks of transportation lines. The crowding of urban developments is undoubtedly due to the need for unloading facilities for ocean-going freighters. In addition to docks and piers, and to ware-houses for temporary storage, there must be facilities for inland transportation. Thus, cities are located where the inland waterways connect with the open sea, or where highways and, later, railroad lines terminate at the edge of the continent, providing coast-to-coast distribution of all incoming goods.

It takes both personnel and equipment to transfer goods from one means of transportation to another. There are opportunities for work as well as commercial gain where the boats come in. Harbour facilities must be provided, and the final distribution of incoming goods must be decided upon. Manpower is needed for the operation of physical as well as commercial processes in demand at such locations. Thus a sufficient population is attracted and retained to provide for the first foundation and further growth of an urban settlement.

The seacoast shipping centers furnish only the most obvious example of a principle of city location that has much wider application. There are urban settlements at river crossings which in earlier days necessitated reloading activities. There are urban settlements along the indand waterways where goods were transferred from barges to wagon trains, railroads, or trucks. There are urban settlements at the edges of mountain range that formerly made necessary the shifting from one means of transportation to another.

Wherever railroad construction came temporarily to an end, urban settlements developed to accommodate the transfer of goods from freight train to some other means. Today, the break of transportation which caused original city location has in many instances been replaced by further extensions of the rail system. Railroad construction was continued with devastating effect upon inland trading centers. Bridges were thrown over rivers to eliminate the need for reloading to and from ferries. In this process, many urban communities came to outlive their usefulness. The location of new communities and their development changed continuously with the improvement of our means of transportation.

In addition to the reason for city location, there are many other reasons for city growth. The function of the city as a trading center is emphasized by the theory that points exclusively to location at breaks of transportation lines.

In the early Middle Ages, city location was determined primarily by the needs of defence. We find remnants of these ancient cities on almost inaccessible hillsides, on the estuaries of rivers, or perched on peninsulas. With the development of trade and commerce, many of these cities lost importance, ceased to grow, and drifted into stagnation. Nor is urban growth entirely explainable anymore by location to transportation facilities. Most modern cities have developed from centers of commerce and trade to centers of industry. Under the circumstances, new economic considerations have to be added to the explanation of urban growth and development.

Modern industry needs bulky raw materials. The distance these raw materials have to travel from their place of origin (for example, from the mines) to the place of industrial transformation enters heavily into industrial cost calculations. Quite often several raw materials are required in the process of production.

Location of industry and location of urban settlement are attracted to the places where raw materials are extracted. On top of the mines, obviously, the cost of cross-country transportation is reduced to nothing.

Coal proves to be more effective in attracting the steel industry than iron. More coal than iron ore — in weight and bulk — is used and lost in the production of any given amount of steel. For this reason, the steel industries of Western Europe are located in the Ruhr valley where coal is founds rather than in France where the iron ore is mined.

The relationship of industrial and urban location to coal and iron ore is, of course, only a striking example of a more general principle. Location is determined by the attempt to reduce the total cost for transportation to the lowest possible level. The pottery industry moves to deposits of suitable clay; oil refineries hover over the most productive wells; and paper mills cluster around our resources of timber. Urban settlements provide the necessary manpower for industrial and commercial activities in such locations.

6.1.4 Find the following word-combinations in the text and translate the sentences into Ukrainian

urban development, inland transportation, inland waterways, open sea, incoming goods, commercial gain, harbour facilities, river crossing, transfer of goods, freight train, railroad construction, ancient city, railroad line, pottery industry.

6.1.5 Read the text again and write out terminological words and word-combinations

6.1.6 Give Ukrainian equivalents of the following international words

transportation, continent, commercial, process, principle, construction, theory, industry, distance, total, resources.

6.1.7 Construct sentences to illustrate the difference between the following pairs of words

construction — building; modern — contemporary; old — ancient; bank — coast; mountain — hill; people — population; manpower — labour force.

6.1.8 Put as many questions as possible to each of the following sentences

1. Each culture characterizes in the city the unifying idea that runs through its activities. 2. Cities are located where the inland waterways connect with the open sea, or where highways, railroad lines terminate, providing distribution of all incoming goods. 3. In the early Middle Ages, city location was determined primarily by the needs of defence. 4. The modern city should be planned with reference to biological, social and personal needs of the community, its cultural and educational purposes. 5. Location of industry and location of urban settlements are attracted to the places where raw materials are extracted. 6. Urban settlements provide the necessary manpower for industrial and commercial activities in such locations.

6.1.9 Define the function of the Infinitive in the following sentences by putting questions to each of them

1. We have come here to build a new town. 2. I have entered the institute to become a highly qualified engineer. 3. To build a house one must have a plan, necessary materials and manpower. 4. To learn a foreign language it is necessary to read, write and speak every day. 5. To become a good construction designer one should know fundamentals of many sciences. 6. To find the state of a mass of a gas, we must know its volume, its pressure and its temperature.

6.1.10 Analyse the use of the Infinitives in the text, translate the sentences into Ukrainian

6.1.11 Comprehension questions

1.What is a city and what is a town? 2. Where do cities tend to be located? 3. Why were urban settlements located along the inland waterways or at breaks of transportation lines? 4. What determined city location in the early Middle Ages? 5. What factors determine modern city location? 6. Why are urban settlements attracted to the places where raw materials are available? 7. What factors determine city location nowadays? 8. Do you know the history of the appearance of your city (town)?

6.1.12Speak about

a) the principles of urban location;
b) the factors determining modern city growth;
c) the industrial transformation of modern cities.

6.1.13 Render the following text into English. Make use of the words and expressions given below the text

Трипільська культура — феномен часу

Трипільська культура — повноцінна складова української духовної і мистецької традиції. Вона існувала як історична реальність за тисячі років перед християнством, як явище первісної високорозвиненої культури.

Це не тільки археологічне відкриття кінця минулого століття, це — феномен національної культури, наша давня історія, ключ до цілої духовної епохи. В ній можна знайти вічну мистецьку національну традицію, свій код до розуміння дійсності, релігії, естетики. Неолітична культура, яка дістала назву трипільської, знайшла відображення в працях таких видатних археологів, як наш земляк Вікентій Хвойка або англійський дослідник Гордон Чайлд.

Київщина дала світові культуру, яка ще за два тисячоліття до єгипетських пірамід, індійських храмів і шумерських пам'яток налічувала вже вісім тисяч років. У прадавніх трипільських містах археологи знайшли астрономічні обсерваторії, храми, календарі, знаряддя праці, речі домашнього вжитку, прикраси з дорогоцінних металів. Серед знахідок були й скульптури людей, дуже схожих на сучасних космонавтів. Археолог Вікентій Хвойка натрапив на глечик, на якому зображено літальні апарати з реверсивним слідом, смугою відпрацьованих газів, ніби від реактивного літака.

У результаті багаторічних розкопок вчених-археологів було

відтворено й описано трипільські знахідки — прадавні міста з двоповерховими, розписаними червоною вохрою, оселями, капища, дивовижні керамічні вироби, тарілки, глеки, жбани, на яких відображені міфічні уявлення наших предків про світобудову, статуетки, що являли собою релігійні скульптури.

Трипільська культура, як повноцінна складова, входить до скарбниці світової культури; вона відображає українську духовну й мистецьку традицію, споріднену з давніми культурами шумерів, індійців, єгиптян, тібетців, монголів. Глибоке й ретельне вивчення її принесе нові «нахідки, нові відкриття, нові несподіванки в галузі мистецтва, культури, а також науки й техніки.

(трипільська (неолітична) культура — neolithic culture; повноцінна складова — a full-fledged constituent part; первісний — primordial; духовна епоха — spiritual epoch; вічна мистецька традиція — the everlasting art tradition; храм — temple; прадавній—ancient; знаряддя праці — labour implements; речі домашнього вжитку — domestio utensils; дорогоцінні метали — precious metals; глечик — jug; розкопки — excavation; предки — predecessors).

6.2 City of middle ages

6.2.1 Read, study and try to memorize words and word combinations:

Medieval — середньовічний; moat — рів з водою; apparent —видимий; sprawl — розповзатися в різні боки; thoroughfare — пожвавлена вулиця; subservient — сприятливий; siege — облога; suburbanite — приміський житель; burgh — місто із самоуправлінням; hierarchical — ієрархічний; pretentious — претензійний; squeeze — видавлювати, притискувати; ordinance — указ, постанова.

6.2.2 Translate the words

Air views; protective shelter; in the course of centuries; market place; city gates; purposeful planning; symbolic reference; interurban traffic; generous lay out; to encompass tillable land; hierarchical arrangement; guildhalls; ball houses; wholesale market; scramble for space; plumbing system.

6.2.3 Read the text

The cities of the Middle Ages were planned cities. Present air views make the ruins of medieval cities appear as random agglomerations of dwellings crowded like the chicks of a hen into the protective shelfer of walls and moat, with a minimum of rational internal organization. The original structure of the city is no longer apparent. In the later phases of the Middle Ages, the city outgrew its

original design. In the course of centuries, it filled up and, unable to sprawl beyond the limits of its fortifications, developed differently from the metropolis of the industrialization period.

The main streets and thoroughfares of the medieval cities were deliberately and rationally planned. They led directly — and frequently in a straight line — from the central market place to the city gates.

At times, an element foreign to our conception of purposeful planning entered into the picture. The street system was occasionnally determined by symbolic references, dividing the city area, for example, into 12 sections representing the .12 apostles of Christ. A straight north-south and east-west direction was frequently preferred to arrangements more convenient to interurban traffic. But plans there were; although subservient to values different from ours.

Originally, the medieval cities were planned with a generous layout, leaving room for additional expansion. The belt of fortifications was wide enough to encompass tillable land for food supplies in case of prolonged siege. The gardenland of the urban residents was also enclosed within the city walls.

City location, of course, was determined by defence purposes. A variety of strong defence positions were exploited. Cities were located on the tops of cliffs and mountains; we also find them on islands, and at river deltas and peninsulas. The winding course of a river offered many opportunities for well protected urban locations.

Yet what was an advantageous position in the beginning later often turned into an embarassing restriction to further growth. Neither the hill-top nor the island could be extended to allow for unlimited population increase. Man y urban set-tlements thus fell by the wayside due to geographical obstructions. They fell into a state of stagnation from which they never recovered. Others extended in suburban settlements beyond their natural borders. They continued to grow at the foot of the hill-side or overflowed the river line behind which the early settlement had sought protection.

From the 12th to the 16th century, not only were these cities filled up, but most of them were repeatedly extended beyond earlier ranges of fortification. As the medieval city filled up, additional populations settled in clusters outside the city walls. By the concerted efforts of these peripheral settlers, something like a stockade was thrown around their dwelling units to hold the site against the enemy at least long enough to permit the suburbanites to withdraw to the inner ring of fortifications.

Sooner or later, the city walls proper were extended to embrace all the outlying settlements in a widened ring of defensive construction. Successive rings of abandoned protective belts are still clearly visible in the street system of cities that have survived from Middle Ages.

Inside, the medieval city pattern expressed the class structure of a feudal society and that of the urban community itself. Not all, but many of the earlier cities nestled at the feet of burghs. As the city spread in a circle or semicircle, it retained a hierarchical arrangement of residential construction according to status.

Advanced status pre-empted the grounds in the center of town. Members of the nobility had their city residences close to the central market place. As the nobility declined in power and numerical importance, their place was taken by the family residences of wealthy merchants or craftsmen with seats in the city council.

Unlike our modern cities, these cities had no slums close to their centers; instead there were pretentious stone structures, palaces, and stately mansions. Here was the place also for the numerous public buildings. Many of these have since been converted to residential use, thus obscuring their original function. Cathedrals and city halls, to be sure, still stand out as such. In addition the innermost ring of urban construction contained the guildhalls and the ballhouses, the public baths, and the wholesale markets with indoor as well as outdoor space for commercial activities.

At the periphery of the medieval city, we find the residences of the poorer members of the community, squeezed close to the wall and crowded together in a frantic scramble for space. The modest dwellings of the early Middle Ages, as a matter of fact, have not endured to the present times. These one-story and one-room structures were later replaced by more elaborate three-floor structures protruding over the street front to increase the amount of dwelling space.

If the main streets of the medieval city were laid out according to a uniform plan, the same cannot be said for the side streets and alleys. The winding network of sidestreets often leaves us with an esthetically pleasing impression.

These side streets of the Middle Ages were never laid out with a view to purposes of communication. They were spaces left over in the built-up area of the city, as farm and garden land, vineyards, barns, and stables were gradually f cut up into lots for residential construction. There were no premeditated plans for as much as a single city block. As a matter of fact, there were no city blocks.

Sanitary conditions in the medieval city were such as to endanger by either plague or fire its very survival. There I was progress, but the growing population pressure continuously made obsolete the water system and the sewerage system, I as well as the protective measures designed to forestall the devastating fires that annihilated entire cities.

City ordinances determined the distance between individual structures in order to limit the spread of possible fires. I Streets were paved, restrictions were imposed upon the elimination of waste products, public toilets were installed. The pigsties had to disappear from the street system and, in the late Middle Ages, many cities installed plumbing systems that piped running water into the individual dwelling units.

To permit a minimum of sunlight to penetrate into the side alleys, building ordinances restricted the custom of letting the upper floors of residential construction protrude to the point where the houses almost touched at the top-level. Street-lighting helped to improve the citizen’s safety from robbery by night, and the organization of the fire brigade was improved as these cities grew and filled up into dense clusters of humanity within the confines of the city wall.

6.2.4 Comprehension questions

1. Were the cities of the Middle Ages planned? 2. What happened to the cities in the later phases of the Middle Ages? 3. What was the street system occasionally determined by? 4. How were the medieval cities planned? 5. Why did the medieval cities fall into a state of stagnation? 6. How did the medieval , city pattern express the. class structure of that time society? 7. Who lived at the periphery of the medieval city? 8. What community conveniences did the medieval city offer? 9. How was order kept in the medieval city? 10. What helped to support the citizen's safety by night?

6.2.5 Discussion questions

1. Why is the original structure of the medieval city no longer apparent? 2. How can you prove that the medieval cities were planned? 3. What enabled cities to fulfil the function of defence? 4. What hindered the further growth of the medieval cities? 5. What can you see in the street system of cities that have survived? 6. How can you prove that the medieval city pattern expressed the class structure of society? **7.** Were there city blocks in the medieval cities? 8. What can you say about sanitary conditions in the medieval city?

6.2.6 Explain the difference between the words of similar semantic group

a) house — building — residence — dwelling;
b) city — town — settlement — village;
c) land — soil — earth — ground.

6.2.7 Find in the text sentences describing

a) the main streets of the medieval cities;
b) that city location was determined by defence purposes;
c) numerous public buildings in the medieval city.

6.2.8 Retell the text in short according to your own plan

Unit VII: Geodesy

7.1 Definition, classification, problems of geodesy

7.1.1 Read, study and try to memorize words and word combinations

Geodesy — геодезія; ocean — океан; external — зовнішній; selenodesy — селенодезія; coordinate — координатний; curvature — кривизна, вигин; surveying — зйомка; series — серія, ряд; fluid — рідкий, текучий, рідина; assumption — припущення; equipotential — рівнопотенційний; geoid — геоїд; exterior — зовнішній; ellipsoid — еліпсоїд; ascertain — пересвідчитися; variable — мінливий, змінний.

7.1.2 Translate the words

Validity; earth's surface; space exploration; heavenly body; planetary geodesy; reference surface; estate cadastre; terrestrial body; marine geodesy; artificial satellite; ocean surface; bounding surface.

7.1.3 Read the text

According to the classical definition geodesy is the «science of the measurement and mapping of the earth's surface». This definition has to this day retained its validity; it includes the determination of the earth's external gravity field 1 as well as the surface of the ocean floor. With this definition, geodesy may be included in the geosciences, and also in the engineering sciences.

Triggered by the development of space exploration B, geodesy turned in collaboration with other sciences toward the determination of the surfaces of other heavenly bodies (moon, other planets). The corresponding disciplines are called selenodesy and planetary geodesy.

Geodesy may be divided into the areas of global geodesy, geodetic surveying, and plane surveying. Global geodesy is responsible for the determination of the figure of the earth including the complete external gravity field. A geodetic survey defines the surface of a country by the coordinates of a sufficiently large number of control points. In this fundamental work, the overall curvature of the earth must be considered. In plane surveying (topographic surveying, cadastral surveying, engineering surveying), the details of the land surface are obtained; the horizontal plane is in general sufficient as a reference surface.

There is close interaction between global geodesy, geodetic surveying and plane surveying. The geodetic survey adopts the parameters determined by measurements of the earth, and its own results are available to those who measure the earth. The plane surveys, in turn, are generally tied to the control points of the geodetic surveys and serve then particularly in the development of national map

series and in the formation of real estate cadastres.

The problem of geodesy is to determine the figure and the external gravity field of the earth and of other heavenly bodies as functions of time; as well as, to determine the mean earth ellipsoid from parameters observed on and exterior to the earth's surface. This geodetic boundary-value problem10 incorporates a geometric (figure of the earth) and a physical (gravity field) formulation of the problem; both are closely related. By the figure of the earth we mean the physical and the mathematical surface of the earth.

The physical surface of the earth is the border between the solid or fluid masses and the atmosphere. Recently, the ocean floor has also been included in the formulation of the geodetic problem, being the bounding surface between the solid terrestrial body and the oceanic water masses. The extension of the problem to the oceans is designated marine geodesy. The irregular surface of the solid earth (continents and ocean floor) is incapable of being represented by a simple mathematical relation; it is therefore described point wise by the use of coordinates u of the control points. On the other hand, the ocean surfaces (70 % of the earth's surface) possess a simpler principle of formation. Under certain assumptions, they form a part of a level (equipotential) surface (surface of constant gravity potential) of the earth's gravity field. We may think of this surface as being extended under the continents and then identify it as the mathematical figure of the earth.

What we call the surface of the earth in the geometrical sense is nothing more than that surface which intersects everywhere the direction of gravity at right angles, and part of which coincides with the surface of the oceans,

The majority of the observed parameters used in geodesy refers to the earth's external gravity field, whose study thereby becomes a concern of geodesy. The upper limit of space that is of interest is governed by the geodetic usage of artificial satellites and space probes, as well as the earth's moon. The physical aspect of the problem of geodesy follows from the consideration of the earth's surface and the geoid as bounding surface in the earth's gravity field. The external gravity field may be described by the countless level surfaces extending completely or partially exterior to the earth's surface.

Reference systems with a defined metric and curvature are required for the computations in global geodesy and geodetic surveying. Because of its simple equation, a rotational ellipsoid flattened at the poles is better suited as a geodetic reference surface than the geoid, which is determined by the uneven distribution of the earth's masses. Particular significance is given to the mean earth ellipsoid, which is the optimal ellipsoid approximating the geoid.

The body of the earth and its gravity field are subject to temporal variations of secular, periodic, and singular nature, which can occur globally, regionally, and locally. The geodetic measurement and evaluation techniques today have advanced to the extent that they can detect a part of this change. Should average conditions be ascertained, observations must be corrected for these changes. With the detection of a part of the variations, geodesy also contributes to the investigation of the dynamics of the terrestrial body. The figure of the earth and the external

gravity field are accordingly conceived as time dependent variables.

7.1.4 Find the following word-combinations in the text and translate the sentences into Ukrainian

Classical, global, figure, coordinate, fundamental, detail, formation, function, mass, control, principle, sense, interest, limit, regionally, locally.

7.1.5 Group the following word-combinations according to the models and translate them into Ukrainian

M o d e l s : S + S — space exploration — дослідження космосу
A + S — planetary geodesy — планетарна геодезія

Gravity field, control points, cadastral surveying, plane surveying, reference surface, estate cadastre, heavenly body, marine geodesy, artificial satellite, topographic surveying, fluid masses, terestrial body, ocean surface.

7.1.6 Read the text again and write out all terminological words and word-combinations according to their models; give their Ukrainian equivalents

7.1.7 Give English equivalents of the following words and word-combinations

Гранична поверхня, океан, поверхня океану, рідкий, зовнішній, морська геодезія, крива, топографічні зйомки, інженерна геодезія, вища геодезія, гравітаційне поле Землі, припущення, штучний супутник, земне тіло.

7.1.8 Read and translate the following sentences paying attention to the tense forms of the verbs

1. The formulation of the problem of geodesy first developed in the course of the nineteenth century. 2. The question of the figure of the Earth had already been raised in antiquity. 3. In the sixteenth and seventeenth centuries, new observations and ideas from astronomy and physics decisively influenced the perception of the figure of the Earth and its position in space. 4. After the rotational ellipsoid had asserted itself as a model for the Earth, numerous arc measurements were conducted until the middle of the nineteenth century to determine the dimension of the Earth ellipsoid. 5. Polar motion has been determined since 1899. 6. The terrestrial geodetic measurements with the exception of spatial distances are tied to the direction of the plumb line at the point of observation, and thereby, to the earth’s gravity field.

7.1.9 Read the text again, write out sentences with verbs in the Passive Voice and translate the sentences

7.1.10 Put questions to the Subject and Predicate in the s ntences from ex. 7.1.8

7.1.11 Comprehension questions

What is the classical definition of geodesy? 2. What sciences may geodesy be included in? 3. What is the object of modern geodesy? 4. What areas may geodesy be divided into? 5. Why is there close interaction between global geodesy, geodetic surveying and plane surveying? 6. What are the problems of geodesy? 7. What do the majority of the observed parameters used in geodesy refer to? 8. What can you say about the advance of the geodetic measurement and evaluation technique today?

7.1.12 Formulate 5 - 6 questions of your own on the text and find answers in the text

7.1.13 Speak about

a) geodesy as a science;
b) the object of geodesy today;
c) the branches of geodesy today and their interrelation with other sciences.

7.2 Life devoted to mineralogy

7.2.1 Read, study and try to memorize words and word combinations

Mineralogist — мінералог; rearing — виховання; academician — академік; geochemistry — геохімія; initiative — ініціатива; renowned — славетний, знаменитий; urgent — терміновий; honorary — почесний; suburbs — околиці; heritage — спадщина.

7.2.2 Translate the words

Went down into the history; outstanding; did his best for; to make an important contribution; to defend a candidate's (doctor's) thesis; senior research worker; on his initiative and by his active participation; carrying out a wide range of duties; it was on this basis that; annual scientific conferences; remained to his dying day; neighbouring sciences; cherished the idea; experiencing great hardships.

7.2.3 Read the text

Yevhen Kostyantynovych Lazarenko (1912—1979) whose life was an example of service to his native land went down into the history of Ukrainian science as an outstanding mineralogist, a gifted pedagogue and a talented organizer of scientific research. All his life he studied minerals, their formation, structure and properties, did his best for their practical application, thus making an important contribution to world mineralogical science.

The famous Ukrainian scientist was born on December 26, 1912 in Kharkiv. On graduating from the faculty of geology and geography at Kharkiv University in 1934 he entered post-graduation devoting these fruitful years to the deep study of the science of minerals.

In 1937 he defended his candidate's thesis and later on worked as a docent, dean of the geological faculty at Voronizh University. In the war years he worked in the Urals as a senior research worker.

His real scientific career began in 1944 at Lviv University where he organized and headed the chair of mineralogy, became one of organizers and the first dean of the geological faculty. In 1947 he defended his doctor's thesis and in 1951 he was elected a corresponding member of the Academy of Sciences of Ukraine and appointed Rector of University.

The following twelve years, up to 1963, was Prof. Y. Lazarenko's brightest period in establishing the national University's principles, in rearing talented youth. In 1963 he was dismissed from his high position and the following six years were given to the teaching activity and scientific work as head of the chair of geology.

Since 1969 till his dying day on January 1, 1979, he lived and worked in Kyiv. Here he headed the Institute of geological sciences in 1969 carrying out a wide range of duties in scientific and organizational, editing and social activities, and the same year he was elected Academician of the Ukraine's Academy of Sciences. In 1972 he continued his investigations in the field of Ukraine's mineralogy as well as of general mineralogy problems. This was already done in the Institute of geochemistry and physics of minerals to which the scientist was transferred together with his department.

On his initiative and by his active participation, the Ukrainian Mineralogical Society was organized whose first President was the renowned geologist. It was on this basis that Academician Y. Lazarenko held annual scientific conferences discussing urgent problems of mineralogy as well as its connection with neighbouring sciences, organized a wide-spread publishing activity. He was an honorary member of the Bulgarian geological society, Honorary Doctor of natural sciences at Lublin University and an active member of the Mineralogical Society of Great Britain and Ireland, the Society of Mineralogy and Geology of the Czechoslovak Academy of Sciences.

The great scientist loved his native land, thought of its natural resources, he cherished the idea of transforming its waste-lands into mineralogical reservations.

The Academician was one of initiators of creating the Podilsk Park of Nature including the picturesque suburbs of the town of Kamyanets- Podilsk. In 1977 the corresponding decision was taken and directed to the Ukrainian Government.

Y. Lazarenko was the author of a three-volume textbook on mineralogy in Ukrainian as well as the Ukrainian-Russian- English mineralogical dictionary (in co-operation with O. M. Vinar).

Living under very hard circumstances experiencing great hardships in his life and creative work, Y. Lazarenko remained to his dying day a true patriot of his native land, the defender of her science, culture and historical heritage.

7.2.4 Comprehension questions

1. What science was Yevhen Lazarenko's life devoted to? 2. When was Lazarenko born? 3. When did he die? 4. What University did he study at? 5. When and where did Lazarenko's real career begin? 6. Did Lazarenko establish the national University's principles? 7. When was Prof. Y. Lazarenko dismissed from rectorship? 8. What problems did Lazarenko investigate in Kyiv? 9. What scientific establishments awarded Lazarenko with honorary titles and degrees?

7.2.5 Discussion questions

1. What had Lazarenko devoted all his life to? 2. What was his scientific, social and pedagogical activity at the University? 3. When was Lazarenko dismissed from his position? 4. What was Lazarenko engaged in when in Kyiv? 5. What problems did the Ukrainian Mineralogical Society work out? 6. What dictionary did Lazarenko publish?

7.2.6 What are the ties among geology, geodesy and mineralogy?

7.2.7 Retell the text according to the landmarks of Academician Lazarenko's life

7.2.8 Group activities

a) Isn't the title of the text too narrow in your opinion?
b) What is more important — patriotism or professionalism?
c) Why were such scientists as Lazarenko dismissed from their high positions?
d) What is your ideal of a real scientist?

Unit VIII: Photogrammetry

8.1 Basic principles of photogrammetry

8.1.1 Read, study and try to memorize words and word combinations

Photogrammetry — фотограметрія; environment — середовище; measurement — вимірювання, вимір; perspective — перспективний; inherent — властивий, притаманний; procedure — процедура; duplicate — розмножувати, робити копію; missile — ракета; emulsion — емульсія; inertial — інерційний; mensural — мірний, мірчий; override — відкинути; worth — цінність; pertinent — доречний, підходящий.

8.1.2 Translate the words

Reliable information; precision dimensional measurements; mathematical computations — математичні обчислення; projective geometry — проективна геометрія; analog instrument — аналоговий інструмент; accurate results — точні результати; ballistic missile — балістична ракета; tracking— спостереження; panoramic photography systems — панорамні фотографічні системи; electron micrography systems — електронні мікрографічні системи; auxiliary information data — допоміжні інформаційні дані; comprehensive knowledge — всебічні знання.

8.1.3 Read the text

Scientists consider photogrammetry to be the art, science and technology of obtaining reliable information about physical objects and the environment through process of recording, measuring and interpreting photographic images and patterns of electromagnetic radiant energy and other phenomena.

Included within the above definition 2 are two distinct aspects of photogrammetry: 1) Quantitative (or, metric), which involves precision dimensional measurements 8 to obtain direct information related to size and shape of objects or derived information such as change (e. g., velocity, volume change, etc.), statistical (e. g., area distribution, time variation, etc.), or associated (e. g., stress, force, etc.) parameters; 2) Qualitative (or, interpretative), which deals with the recognition and interpretation of objects.

Within the scope of Quantitative photogrammetry Analytical Photogrammetry deals with the Solution of problems by mathematical computations, using measurements made on the photographs as input data. In general, a mathematical model is constructed to represent relations between points in the object space and their corresponding images on the photographs. The principle of perspective and projective geometry is inherent in this.

During the recent developments of the analytical (computational) procedures the interest of numerous photogrammetrists has been to somewhat duplicate the performance of the analog instruments for standard mapping problems. For such applications, analytical approaches have demonstrated efficiency (in terms of accuracy, time and cost), such as are comparable to the instrumental approaches without any great improvement.

The analytical photogrammetrlsts have always tried to justify their efforts on the basis that they should be able to obtain more accurate results in less time than in the Instrumental approaches. The real strength of analytical photogrammetry justifies its continuous application and growth.

The principal justification lies in the recent applications in the tracking of ballistic missiles, satellites, etc. and others which are completely outside the capabilities of the instruments of only optical-mechanical scopes. The second justification lies in those applications where the concept of a simple central perspective projection is no longer adequate. Examples of these are strip and panoramic photography systems, electron micrography systems, etc. Also included are the applications in which the greatest accuracy is required in eliminating mensural errors due to lens distortionu, atmospheric refraction, deformations of emulsions, comparator errors, etc., which are difficult or impossible to incorporate in optical-mechanical devices but are easily accomplished through mathematical models with a computer. The third justification lies in the inclusion of auxiliary information data and numerical adjustment proceduresla in a fully satisfactory manner. Such information may be obtained from various sources like electronic positioning, inertial navigation system, etc. Often, such information may not be directly and rigidly enforced but may be entered as adequately weighed parameters to reinforce rather than override the geometric strength of the normal photogrammetric procedures.

The basic material used in all these are the photographs, negatives or diapositives of various types. The basic inputs are the photo-coordinates in x, y (rectangular two-dimensional) system. The outputs may be of various types, like x, y, z ground coordinates, orientation elements, derived information on specific relations and conditions, etc.

The working system involves, broadly speaking, the following: Object (terrain, etc.), Sensing tool (camera or other sensor), Environment (atmosphere, etc.), Data acquisition tool (instrument or comparator), Data processing mechanisms (computer, accessories and the mathematical models), and the human worker. Each offers working limitations and contributes towards errors of various nature. The comprehensive knowledge of such limitations and error contributions is essential for an efficient job.

Theoreticians and practical workers noticed analytical photogrammetry to be rapidly becoming more and more complex. Increased complexity does not necessarily mean increased worth. By being more complex, it may become less used because of the concern of the potential user. In this respect, it will be pertinent to emphasize that such situations call for the wisest possible treatment of the

photogrammetric resources and the involved technologies with sensible innovations at all stages.

8.1.4 Try to recognize the international words. Give Ukrainian equivalents to the following words

Record, precision, associated, interpretation, duplicate, accurate, basis, ballistic, concept, adequate, manner, positioning, navigation, coordinates, complex, innovation.

8.1.5 Which of the following words are terms

Information, distribution, photogrammetry, object, problem, geometry, computation, tracking, micrography, refraction, deformation, diapositive, coordinates, terrain, missile, lens.

8.1.6 Find in the text English equivalents of the following Ukrainian words and word-combinations

Технологія, середовище, вимірювання, фотографічні зображення (образи), явища, визначення, точні просторові виміри, пояснення об'єктів, вихідні дані, на підставі (основі), спостереження за балістичними ракетами, математична модель, електричне позиціонування, оптйчно-механічні прилади, прилади (механізми) обробки даних, новинки.

8.1.7 Read the text again and translate the sentences containing the following word-combinations

Reliable information, mathematical model, numerical adjustment procedures, adequately weighed parameters, data processing mechanisms.

8.1.8 Find in the text and translate the sentences describing

a) photogrammetry; b) analytical photogrammetry; c) quantitative and qualitative aspects of photorgammetry.

8.1.9 Translate into Ukrainian the following sentences with the Complex Object Construction

1. We consider computer, accessories and the mathematical models to play a great role in photogrammetry. 2. The students watched the operator control the functioning of the equipment. 3. The students asked. the engineer to show them sensing tools and data acquisition tools of photogrammetry. 4. We heard geophysicists do prospecting by means of radio instruments'. 5. Radio-electronic

devices permit the pilot to find the way in fog and storm. 6. The electric pressure of lightning causes the current to pass through the air.

8.1.10 Find in the text the sentences with the Complex Object Construction and translate them into Ukrainian

8.1.11 Comprehension questions

1. Do you know the meaning of the term *photogrammetry?* 2. What do scientists consider photogrammetry to be? 3. What are the two distinct aspects of photogrammetry? 4. Can you describe in short the quantitative aspect of photogrammetry. 5. What does qualitative aspect of photogrammetry include? 6. What does analytical photogrammetry deal with? 7. What is the basic material used in photogrammetry procedures? 8. What does the working system of photogrammetry involve?

8.1.12 Write a short summary of the text and discuss it in class

8.2 From historical development of geodesy

8.2.1 Read, study and try to memorize words and word combinations

Assert — обстоювати (право); solstice — сонцестояння; Ass(o)uan — Асуан; circle — коло; cadastre — кадастр; pursue — переслідувати, продовжувати; calif (caliph) — каліф; quadrant — квадрант (чверть круга); hitherto — раніше, досі; pendulum — маятник; infer — виводити, робити висновок; triangulation — триангуляція; parallax — паралакс.

8.2.2 Translate the words

Earth disk; measurement method; summer soltice; plumb line; vertical staff; hemispherical shell; complete circle; stadia (від stadium); wagon wheel; instrumentation technology; principal control networks; mean Earth radius; light rays.

8.2.3 Read the text

The formulation of the problem of geodesy first developed in the course of the nineteenth century. However, the question of the figure of the Earth had already been raised in antiquity. After the sphere first served as a model for the Earth, the rotational ellipsoid as figure of the Earth asserted itself in the first half of the eighteenth century.

Various opinions on the form of the Earth prevailed in the past: e. g. the notion of an Earth disk encircled by Oceanus (Homer's Illiad). The founder of

scientific geodesy is Eratosthenes of Alexandria, who under the assumption of a spherical Barth deduced from measurements a radius for the Earth.

The principle of the arc measurement method developed by him was still applied in modern ages.

Eratosthenes found that at the time of the summer solstice, the rays of the sun descended vertically into a well in Syene (Assuan, today); whereas in Alexandria, roughly on the same meridian, they formed an angle with the direction of the plumb line. From the length of the shadow of a vertical staff *(gnomon)* produced in a hemispherical shell *(skaphe)*, he determined this angle as 1/50 of a complete circle. He estimated the distance from Syene to Alexandria to be 5000 stadia as taken from Egyptian cadastre maps which are based on the information of *bematists* (step counters). With the length of an Egyptian stadium as 157.5 m, we obtain an Earth radius of 6267 km.

During the middle ages in Europe, the question of the figure of the Earth was not pursued further. An arc measurement handed down by the Arabs was carried out by the caliph of al-Mamun, northwest of Bagdad. At the beginning of the modern ages, the French physicist Fernel in 1525 observed on the meridian through Paris the geographical latitudes of Paris and Amiens using a quadrant; he computed the distance from the number of rotations of a wagon wheel.

The remaining arc measurements based on the notion of a spherical earth are characterized by fundamental advances in instrumentation technology (1611, Kepler telescope) and methodology (after the initial application of triangulation by Gemma Frisius (1508—1555) in the Netherlands, and by Tycho Brahe (1546—1601) in Denmark, the Dutchman Willebrord Snellius (1580—1626) conducted the first triangulation to determine the figure of the Earth).

In 1615 with triangulation applied by Snellius to the arc measurement between Bergen op Zoom and Alkmaar (Holland), the hitherto inaccurate estimate or direct measurement of the length of arc was replaced by a procedure of high precision. This method served into the twentieth century for arc measurements and for the formation of principal control networks. For Snellius, the deviation with respect to the mean Earth radius amounts to — 3,4 %.

Through the initiative of the Academy of Sciences, founded in Paris 1666, France in the seventeenth and eighteenth centuries assumed the leading role in geodesy. The French abbé J. Picard in 1669/70 carried out an arc measurement on the meridian through Paris between Malvoisine and Amiens with the aid of a triangulation network; he was the first to use a telescope with cross hairs. The value obtained by him for the radius of the earth aided Newton in the verification of the' law of gravitation which he had formulated in 1665/66. |

Another solution of the determination of the central angle, different in principle, namely by using reciprocal zenith angles, found application in 1645 by the Italians Grimaldi and Riccioli. This procedure does not yield satisfactory results due to the insufficiently accurate determination of the curvature of light rays (refraction anomalies).

In the sixteenth and seventeenth centuries, new observations and ideas

from astronomy and physics decisively influenced the perception of the figure of the Earth and its. position in space. N. Copernicus (1473—1543) achieved the transition from the geocentric universe of Ptolemy to a heliocentric system. J. Kepler (1571—1630) discovered the laws of planetary motion and Galileo Galilei (1564—1642) developed modern mechanics (law of falling bodies, law of pendulum motion).

In 1666, the astronomer J. D. Cassini observed the flattening of the poles of Jupiter. The astronomer J. Richer in 1672 discovered on the occasion of an expedition to Cayenne to determine Martian parallaxes, that he must shorten a one-second pendulum which had been regulated in Paris, in order to regain oscillations of one second. From this observation and on the basis of the law of pendulum motion, one can infer an increase in gravity from the equator to the poles. Building on these and on their own works, Isaac Newton (1643—1727) and Christian Huygens (1629—1695) developed Earth models flattened at the poles and founded on principles of physics.

8.2.4 Comprehension questions

1. When did the formation of the problem of geodesy first develop? 2. What figure first served as a model for the Earth? 3. Who is considered to be the founder of scientific geodesy? 4. What did Eratosthenes find? 5. Was the question of the figure of the Earth pursued further during the middle ages? 6. What did the French physicist French use a quadrant for? 7. Who conducted the first triangulation to determine the figure of the Earth? 8. Who are the authors of the Earth models flattened at the poles?

8.2.5 Discussion questions

1. What opinion on the form of the Earth is expressed in Homer's Illiad? 2. What experiments did Eratosthenes carry out? 3. Why was the question of the Earth figure not pursued further in the middle ages? 4. What new instrumentation technology and methodology did Kepler, Frisium, Tycho Brahe and Snellius apply? 5. Why did the role of the French Academy of Sciences become leading in geodesy in the 17—18th centuries? 6. What did the law of pendulum motion do for the development of the principles of physics?

8.2.6 Explain the etymology of the terms *heliocentric* and *geocentric*

8.2.7 Group activities

a) What figure is the nature's favourite: the circle or the ellipsis?
b) What way is geodesy connected with geography, geometry and astronomy?
c) Name the victims among scientists, persecuted for their scientific teachings.

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