ТЕМА 2.4.4. НАНОТЕХНОЛОГИИ В СТРОИТЕЛЬСТВЕ.

NANOTECHNOLOGY AND BUILDING CONSTRUCTION

ACNIVE VOCABULARY

1. ***Use the QR-code and learn the words and word combinations.***

Data, extension, improve, interaction, management, monitor, network, performance, precise, scale.

2. ***Complete the table with the appropriate words.***

Manipulation, use, carefully, development, produce, available, create examine, precision, potentially, relatively, beneit, improvement, internal, approximately, logical, resist, efficiency, industrial, develop, environmentally, performance, solar, adopt, actually.

Noun	*Verb*	*Adjective*	*Adverb*

3. ***Give Russian equivalents to the compound words.***

Large-scale, nanoscience, nanotechnology, nanomaterial, self-healing, self-cleaning, day-to-day, multifunctionality, cyber-physical.

4. ***Choose the correct equivalent in B of the word in A***

A	B
1) определение	a) title b) definition c) equation
2) улучшение	a) improvement b) development c) increase
3) свойство	a) sign b) characteristic c) property
5) видимый	a) internal b) visible c) sensitive
6) точный	a) solar b) potential c) accurate

5. ***Complete the sentences with the correct forms of the words in brackets. Give Russian equivalents to the sentences.***

1. Nanotechnology is the ... of maters on an atomic and molecular scale *(manipulate).*
2. Nanoparticles are not... to the human eye *(visibility).*
3. The use of nanotechnology in construction can ... energy and environmental performance of buildings *(improvement).*
4. The use of nanomaterials in building construction can allow important improvements in energy ... in lighting with the use of LEDs *(efficient).*
5. Building and ... monitoring and control can be improved with use of nano-embedded sensor, actuation, and control systems *(environment).*
6. Smart building is a complex building ... system that allow the motorized action of specific subordinate functions and appliances *(manage)/*
7. The existing models of smart buildings can be operated with aclose ... with the users *(interact).*

READING AND SPEAKING

6. Read the text *Nanotechnology and Building Construction* and check if your answers are correct.

NANOTECHNOLOGY AND BUILDING CONSTRUCTION

In 1974 Norio Taniguchi, a researcher at the Tokyo University of Research, first used the term ‘"nanotechnology” meaning the processing of materials, atom-by-atom or molecule-by-molecule. In 1981 Eric Dexler presented a more accurate definition of nanotechnology, such as the use of very small particles of material by themselves or by their manipulation to create new large-scale materials. At the nanometer scale (approximately 100,000 times smaller than the diameter of a human hair), the chemical and physical properties of materials can be altered to produce improved traditional building materials.

Nanotechnology is not a new science and it is not a new technology. It is rather an extension of the sciences and technologies that have already been in development for many years and it is the logical progression of the work that has been done to examine the nature of our world at an ever smaller scale. Today nanoscience and nanotechnology hold great promise for future innovation and transformation, as it is recognized by most of the industrial world and confirmed by government funding allocated to this area. Hundreds of products based on nanoscience and nanotechnology are already in use across many sectors.

In the construction sector, the use of nanotechnology can bring many benefits by improving energy and environmental performance of buildings, with application potential in all technical elements, from structures to opaque and transparent closures, internal partitions, systems, and appliances.

Several applications are already available for this specific sector increase the mechanical, physical, and chemical properties of materials, products. and equipment, as well as their durability over tune, with the aim of improving environmental comfort, safety, and energy efficiency of buildings and at the same time reducing operating and maintenance costs and environmental impacts.

In particular, the use of nanomaterials in architecture and building construction can allow important improvements in:

- performance of load-bearing structures, with use of lightweight nanocomposite construction materials (metal matrix composites, nano-coated light materials, ultra-high-performance concrete, polymer composites, etc.);
- thermal and lighting control, with use of high-performance nanoporous insulating materials (aerogels), low-e, antireflective, passive and dynamic solar control and self-cleaning nanocoatings for glazing;
- surface characteristics of building elements, with the application of specific nanocoatings or nanopaints (self-healing, air purifying, self-cleaning, antibacterial, antigraffiti and antistain, photoluminous, scratch resistant, antireflection, antiicing, antifogging, fouling resistant oxidation and corrosion resistant, UV resistant, fire resistant, etc.);
- energy efficiency in lighting (LEDs);
- building and environmental monitoring and control, with use of nano-embedded sensor, actuation, and control systems.

Still the cost and relatively small number of practical applications for now holds back much of the prospects of nanotechnology. Construction also tends to be a fragmented, low researched oriented and conservative endeavor and this plays against its adoption of new technologies especially ones that appear so far removed from its core business Materials are construction core business and the prospects for more changes are significant in the not too distant future. In tact, the researchers surveyed and predicted that many advances would arrive within the shortest terms. The sheer size and scope of the construction industry means that the accompanying economic impact will be huge. In order to capitalize on the effects of nanotechnology on the business, however, much more funding for construction related research, increased interdisciplinary working between researchers and communication between those researchers and industry is needed.

7. ***Use the QR-code and find the words connected to nanotechnology. Words can be placed both horizontally and vertically.***

8. ***Match the words to their synonyms and give Russian equivalents to them.***

1)	to change	a)	to study
2)	to detect	b)	to monitor
3)	to create	c)	to withstand
4)	to examine	d)	to advance
5)	to improve	e)	to identify
6)	to control	f)	to alter
7)	to resist	g)	to develop

8. ***A. Give Russian equivalents to the word combinations from the text Nanotechnology and Building Construction.***

To process construction materials; to create new large-scale materials; an extension of the sciences and technologies; to improve energy and environmental performance of buildings; to reduce operating and maintenance costs; to change the properties of materials; to increase the durability of construction materials; ultra-high performance concrete; self-cleaning nanocoating.

B. Choose three word combinations from ex. 8. A. and make up sentences with them.

9. ***Work in pairs. Decide if the sentences are true or false according to the text Nanotechnology and Building Construction. Correct the false ones.***

1. Nanotechnology is a relatively new science. 2. Nanotechnology is aimed to improve the mechanical, physical, and chemica proper les materials. 3. Better building materials are obtained by changing the properties of materials through manipulation of matters on an a and molucular scale. 4. Today nanotechnology holds great promise forfuture innovation and transformation. 5. Nanomaterials are used only in the construction sector. 6. Aerogels and ultra-high-performance concrete are good examples of nanotechnology in construction. 7. High cost of material production is the only reason that holds back the prospects of nanotechnology.

10. ***Work in pairs. Discuss the questions*****.**

1. When did the term “nanotechnology” first appear? 2. What is nanotechnology? 3. Is nanotechnology a new science? 4. What prospects does nanotechnology offer? 5. What will construction benefit from nanotechnology? 6. Where can the use of nanomaterials in construction allow important improvements? 7. What holds back the development of nanotechnology? 8. When will the advances in the use of nanotechnology arrive?

11. ***A. Find and underline key words and word combinations in the text Nanotechnology and Building Construction.***

B. Make up a short summary of the text Nanotechnology and Building Construction. Retell it using your notes.