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**Урок 2. Создание «Журнала неорганической химии», его английской версии «Russian journal of inorganic Chemistry» и написание статьи «Знакомый и незнакомый кислород»**

Презентация 2

Если вода – это жизнь,

то кислород – дыхание жизни!

*Денисова О. И. (слайд 2)*

**Цель урока:** Сформировать целостное представление учащихся о кислороде.

**Задачи урока:**

1. Углубить знания учащихся о свойствах кислорода, областях его применения, способах получения. Закрепить умения учащихся устанавливать соответствие между свойствами и применением кислорода.

2. Развивать познавательный интерес к предмету, а также развивать логическое мышление, монологическую и диалогическую речь. Развивать умения выражать свои мысли, а также поддерживать и вести беседу на английском языке. Развивать умение обобщать и систематизировать материал.

3. Воспитывать творческие способности, а также эстетический взгляд на окружающий мир. Продолжать формирование экологического мышления и применения его в жизни *(слайд 3).*

**Тип урока.**Обобщение и систематизация знаний.

**Вид урока.** Урок творчества на английском языке (45ʹ).

**Подготовка к уроку:** К данному уроку учащиеся начинают готовиться примерно за месяц до его проведения: читают дополнительную литературу, делают домашние заготовки; сами распределяют роли, а именно: выбирают учёных, исследователей, художников – оформителей, корректоров, распределяются в группы. Под руководством учителя английского языка переводят свои тексты на английский язык. Также выбираются два учащихся, которые будут корреспондентами.

**Средства обучения:**

* **материальные:**
* **информационно-поисковые и справочные:** Стол «Источник знаний»: научные журналы – «Наука и жизнь», «Химия и жизнь», «Журнал неорганической химии», журнал «Знание» №4 1978, книги для чтения по неорганической химии, книги о кислороде, например, В. И. Бгатов «История кислорода земной атмосферы», брошюра «О кислороде одной строкой»! русско-английские словари.

Информационная карточка «Интернет-ресурсы»: [www.n-t.ru](http://www.n-t.ru) (электронная библиотека наука и техника), [www.facty.by](http://www.facty.by) (интересные факты о кислороде), [www.elementy.ru](http://www.elementy.ru) (сайт о науке – химии, физике, математике, биологии. Новости науки, популярные лекции крупнейших учёных, краткая научная энциклопедия), [www.critical.ru](http://www.critical.ru) (Энциклопедия CRITICAL), [www.ebaumsworld.com](http://www.ebaumsworld.com) (видео парамагнетизм кислорода).

* **лабораторные:** спиртовка, спички, пробирки, перекись водорода, магниевая лента, лучинка *(слайд4)*.
* **аппаратные:** компьютер, программа презентаций Power Point, Презентация 2 «Создание «Журнала неорганической химии», его английской версии «Russian journal of inorganic Chemistry» и написание статьи «Знакомый и незнакомый кислород». Программа создания документов Microsoft Publisher, программа создания электронного журнала FlippigBook Publisher Professional.

**Ход урока**

**Учитель:** Сегодня у нас необычный урок. А говорить мы будем о самом обычном и одновременно удивительном веществе. Обычном, потому что его знают все, его изучают во всех школах мира. Удивительном, потому что только это вещество называют «вездесущим» и «всемогущим». В начале XIX века оно именовалось «кислотвором». Сэр Кенельми Дигби, член Лондонского королевского общества, назвал это вещество «скрытая пища жизни», а Джозеф Пристли назвал его «предметом роскоши».

Какому веществу мы посвящаем наш урок?

Вы дали правильный ответ.

Конечно – кислороду!

Урок наш необычный ещё и потому что сейчас наш кабинет химии превращается в лабораторию изучения свойств веществ научно – исследовательского института. В лаборатории очень увлечённо работают семь групп исследователей. Каждая группа изучает один из вопросов:

«Он везде и всюду» (кислород в природе).

«Кто, когда и как?» (открытие кислорода).

«А какой он?» (физические свойства кислорода).

«Он дружит со всеми» (химические свойства кислорода).

«Мы сами получим кислород» (способы получения).

«Кислород нужен всем» (применение кислорода).

«О кислороде одной строкой» (интересный кислород).

«Чего мы ещё не знаем о кислороде?» (неизвестный кислород) *(слайд 5).*

И ещё он необычный потому что к нам приехали необычные гости – корреспонденты «Журнала неорганической химии», его английской версии «Russian journal of inorganic Chemistry». Мы будем вести беседу с ними на английском языке. Вы согласны?

**Учащиеся:** Конечно согласны.

Раздаётся стук в дверь кабинета.

**Учитель:** Да-да, пожалуйста, входите!

Входят два ученика. Это корреспонденты «Журнала неорганической химии», его английской версии «Russian journal of inorganic Chemistry».

**Correspondents.**Good afternoon!

We are correspondents of “Inorganic chemistry journal”, its Russian regional office. (They represent themselves).

We received a letter with a task which is to write an article for the magazine. But we didn’t understand what the article should be about. The original data for the article is presented in a form of a poem. Our editor found it in one of the books, but we cannot understand what it is about. It’s a kind of a riddle. How should we complete the editor’s task? What should we write the article about?

And then we recollected that there was a very interesting conference in our scientific-research institute. We decided that the researchers will understand everything.

**The researchers.** Please, read the poem.

**Correspondent 1***.*

«Two centuries ago

It was discovered random.

One and all know it now

It is not mystery for us.

They know for sure

That sulfur, phosphorus, carbon, ferrum, magnesium

Burn off very well in it.

Even hydrogen burns all out in it.

But for this gas there is no life

For human beings and wild animals

Children could easily identify it

Cause this is *(slide 6).*

**Correspondent 2.** We suppose that we discuss some element, but about which one? Can you answer?

**The researchers.** It is obvious for us that this poem is about oxygen.

**The correspondents.** So, we have to write the article about oxygen. Can you help us, dear researchers? What are you working at now?

**The researchers.** We examine properties of oxygen.

**«Who, when and how? » (Discovery of oxygen)**

Antuan Lavuazje, Carl Sheele and Joseph Pristley are sitting at one of the tables.

The correspondents are coming near them.

- Hello, dear scientists! Could you tell us, how did you recover oxygen?

- With pleasure!

**Story of Carl Sheele.**

How did it happen? In 1771 I observed educing of “virtol air” during heating of manganese black with concentrated sulphuric acid. Then, when I lived in Uppsala, I started examination of fire nature and I began to think about the role of oxygen in the process of burning. I knew already that Robert Boil and many other scientists proved one hundred years ago that a candle, coal and any other combustible body can burn only in case of having sufficient quantity of oxygen. Than nobody could explain thoroughly why everything happens like that and why oxygen is necessary for a combustible body. That times air was thought to be an element – a homogeneous matter, which couldn’t be broken up into simpler matters. First I had the same opinion. But soon I changed my mind after I started conducting of experiments with different matters in reservoirs, which were closed tightly. No matter what elements I tried to burn in closed reservoirs I always discovered one curious event: the quantity of air which was in the reservoir became a fifth less. And after finish of the experiment water always filled a fifth of a retort volume. That is well seen on the picture from my manuscript. *(slide7).* And then I realized that air is not homogeneous.

After that I started examination of degrading of many elements by heating: mercuric oxide, mercurous carbonate, silver carbonate, potassium nitrite and magnesium nitrite, plombous orthoplumbate and got a gas which provides breath and burning. I wanted to solve the riddle of fire and suddenly found out that air is not an element but a mix of two gases, which I called as “fire” air and “useless” air. It was my most significant discovery. I told down my observations in a great manuscript “Chemical tractate about air and fire”. The book was published only in august of 1777, when they published manuscripts of my colleagues Joseph Pristley and Anthuan Lavuazje about oxygen.

**The correspondents:** Thank you very much for the story, dear Carl Sheele! And what can you tell us, Joseph Pristley?

**Story of Joseph Pristley.**

I placed a little bit of powder “mercurius calcinatius per se” under a retorted tin. Then I took a small burning glass and directed streams of sun inside of the can on the powder. Air began to segregate from the powder and it began to displace mercuric from the can. *(slide 8).* I began examination of the air. I was astonished, deeply excited by the fact that a candle burns better and gives brighter light in this air than in usual atmosphere. It happened on 1 august, 1774 г. I observed emission of “new air”. Even earlier I assured myself that during heating of powder “mercurius calcinatus per se” I led out unknown gas through the tube into the vessel filled with hydrargyrum not water. I told Anthuan Lavuazje, my colleague from France about my discovery. Two months later after the discovery of “sky air” I came to Paris and told him in details how I made this discovery and about the elements from which I led out the new “air”. Also I suggested the second way to lead out the air by means of heating of minium.

**The correspondents:** And what is “mericurius calcinatius per se” and minium are?

**The researchers:** “Mercurius calcinatius per se” – is powder of mercurius oxide HgO. And minium is a lead oxide Pb3O4.

**The correspondents**: Thank you very much, dear Joseph Pristley! We are listening to you, Anthuan Lavuazje!

**Story of Anthuan Lavuazje.**

I didn’t know that only a part of air is necessary for burning and breathing. Now I conducted researches I had started two years earlier in a new way. I watched formation of red scales of “mercurial oxide scale” and decrease of air volume during heating of hydrargyrum in a sealed retort. (*slide 9*). Having used high temperature heating of another retort I decomposed 2,7 g of “mercurial oxide scale” which I got during the previous experiment and got 2,5 g of hydrargyrum and 8 cubic inches of that very gas Pristley told you about. 8 cubic inches of air were lost during the first experiment when hydrargyrum was turned into “oxide scale” and its remainder became “nitrogen” – unvital, not supporting breathing or burning. The gas which was evolved during the decomposition of “mercurial oxide scale” had opposite features. That’s why first I called it a “vital gas”.

**The correspondents:** Do you share merit of oxygen discovery together?

**Scientists:** Yes, that’s right!

**The researchers:** But they give Carl Vilgelm Sheele preference in many academic books and reference books.

**The researchers.** Dear correspondents, do you know that you step on oxygen right now?

**The correspondents.** You are kidding us! Is it true?

**The researchers.** Yes, it’s true! Wherever you look, there is oxygen everywhere. He is simply invisible!

**«It is everywhere around us» (oxygen in nature)**

The researchers of this group tell us about oxygen in nature (*slide 10*).

Oxygen is everywhere. It is the most wide-spread element on Earth. Oxygen exists in the form of three isotopes: 816О (99,76%), 817О (0,04%), 818О (0,2%). It is wide-spread on Earth in a form of species like no other element. Fixed oxygen is $^{6}/\_{7}$ of the water atmosphere of Earth – hydrosphere or 85,82% by weight. Sial zone of earth – steady cover contains 47,2% of oxygen. Oxygen takes 85,52% by weight in ocean water taking into account all chemical components dissolved in it. More than 1500 species of crust contain oxygen. These are silicates, carbonates, silica sulphates, iron oxides and other minerals. As a chemical component oxygen is a part of many organic matters and of all living cells. By the number of atoms in living cells it reaches about 25% or 50-85% by the weight.

It takes the second place after nitrogen – 20,95% by the volume or 23,15% by the weight only in the atmosphere where it has loose condition. Atmosphere contains 1,5·1015 tons of oxygen. General quantity of dissolved oxygen is great: 1,5·1013 tons. All the mass of free oxygen on Earth appeared and remained due to life activity of green plants of the land and World Ocean, evolving oxygen during the process of photosynthesis. Basic part of oxygen on Earth is evolved by the phytoplankton of the World Ocean. The vegetable world of the Earth returns about 400 billions of tons of oxygen to the atmosphere.

(pupils make notes in notebooks).

**Correspondent 1.** According to your story we can call oxygen ubiquitous. It is everywhere around us.

**Correspondent 2.** What is it like? You say that it is everywhere, so where is it?

**«What is it like?» (physical features of oxygen)**

The researchers of this group tell us about the physical features of oxygen *(slide 11).*

Ofcourse you can not see it. Because oxygen is a colorless gas which has no smell and taste. Moreover oxygen dissolves bad in water: 5 volumes of oxygen dissolves with temperature of 0˚С in 100 volumes of water, and 31 ml of oxygen dissolves with temperature of 20˚С in 1 liter of water. It is a little bit heavier than air. Its density is 1,43g/l under ordinary conditions. In case of the conditions change oxygen can turn into bice liquid or even into solid blue crystals. But solid oxygen is very unstable, For this reason there is no practical use for it. In case of slightest decrease of pressure it crystalline gride becomes broken and it dissolves. By the way, solid oxygen can exist in form of three crystalline modifications.

Liquid oxygen has paramagnetic properties. It can be retracted into magnetic field.

**The correspondents:** Could you please tell us about paramagnetic properties of oxygen?

**The researchers:** We will show you a movie. Let’s watch it! *(slide 12).*

(pupils make notes in notebooks).

**Correspondent 1:** Its very interesting! The gas is invisible, has no smell and color, and it dissolves very bad in water. How do they get it? What methods do they use?

**«We will obtain oxygen by ourselves» (ways and methods of getting it)** *(slide 13)*

**The researchers:** All mass of free oxygen on the Earth appeared and remains due to life activity of green plants on the land and in the World Ocean, which evolve oxygen during the process of photosynthesis. Oxygen appears in the atmosphere by means of photosynthesis. If oxygen is 47% of sial zone of earth, so we can logically conclude that it is possible to use different elements which are a part of Earth crust to get it. For example different salpetres – chile niter, potassium nitrat. You can use other matters which are easily dissolved during heating, for example peroxide, potassium hypermanganate (*slide 14*)

**Correspondent 2:** Can we obtain a lot of oxygen by these means?

**The researchers:** You can get not so much oxygen from matters which are easily dissolved. They use such sources of oxygen as air and water in industrial sphere.

**The correspondents:** Yes, right. You said that hydrosphere contains 85,52% of oxygen by weight and that there is 23,15% of oxygen in the air.

**The researchers:** Lets watch how we will get oxygen by ourselves.

The first researcher conducts the experiment of dissolving of peroxide during heating;, the second researcher – should explain this experiment; the third one – should write the chemical equation on the desk, and the pupils write it down in the notebooks. Two methods are used to get oxygen in a laboratory: dewatering and air drive. Usage of these methods is based on physical properties of oxygen: it dissolves very bad in water and it’s a little bit heavier than air (*slide 15*) The fourth pupil should report about industrial ways of getting oxygen:

The simplest way to get oxygen energetically is to get it from the air because air is not a combination. And it is very easy to dissolve air. Boiling temperature of nitro and oxygen differ (taking into account atmosphere pressure for 12,8°C. It means that we can be resolved for elements in distillation columns in the same way as for example oil is resolved.

But in order to turn air into liquid you need to freeze up to 196°C. We can say that the problem of getting of oxygen is the problem of getting chill.

In order to get chill using usual air, you need to compress air and then let it expand and at the same time make it do mechanical work. Then in accordance with physical laws the air should chill. Expansion machines are machines in which all this process is conducted. Modern installations for air dissolving in which they get chill by means of turbo expansion machines provide industry and first of all metallurgy and chemistry thousand hundred cubic meters of gas oxygen. They work not only on the territory of our country but all over the world (*slide 16*)*.*

**Correspondent 1***.* Oh, this is very interesting. Thank you!

**Correspondent 2*.*** Yes, we learned a lot about oxygen. It is very unusual matter. Tell me, why do we have a candle lighter, candle, beautiful silver strip and lots of strange things here?

**«He is a friend for everybody» (chemical properties of oxygen)**

**The researches.**

Oxygen is very active, likes keeping company.

He is a friend for simple and composite matters.

Everybody is glad to see him.

Do you want to watch it?

**The correspondents:** Ofcourse we want it! Show us please interesting experiments and tell us about friendship between oxygen and other matters.

The researchers in this group tell about chemical properties of oxygen and show the experiments. (We can show video clips. *Slides 17, 18, 19, 20)*

Experiment 1: Magnesium combustion: 2Mg + O2 = 2MgO (in a draught cupboard)

Experiment 2: Coal combustion: С + О2 → СО2

Experiment 3: A candle combustion: paraffin + О2 → СО2 + Н2О (paraffin has the following formula С18Н38)

(the researcher writes the equations on the desk and the pupils write them down in the notebooks).

**Корреспонденты.** Dear researches, do you know why eternal flame burns?

**The researches.** It burns because methane burns in oxygen. Methane is a complex matter. Oxides of the elements of the matter always appear during combustion.

 СН4 + 2О2 = СО2 + 2Н2О

**The researches.** If oxygen takes part in some reaction then its called a combustion reaction. They are always accompanied by heat emission. But there is one more process in nature in which oxygen takes part too. It is called “slow oxidation”.

 We can observe processes of slow oxidation during breathing of aerobiotic creatures, i.e. creatures which breathe by oxygen. We can observe it during oxidation of organic fertilizers (peat, manure). Processes of bio degradation, racidification of butter, corrosion of cast iron, steel are accompanied by heat emission.

**Correspondent 1.** But we can say that oxygen is “almighty”.

**The researchers.** Yes, that’s right! Because oxygen supports both burning and breathing!

**Correspondent 2.** I already knew so much about oxygen, that a phrase came to my mind. This phrase will be an epigraph to our article. This phrase is: “Oxygen is a basis for all earth chemistry”.

**The researchers.**

That’s right!

Oxygen is all around us

We can’t do without it.

It is essential for life! *(slide 21)*

**«Everybody needs oxygen» (usage of oxygen)**

The researchers of this group report about usage of oxygen *(slide 22).*

Extensive use of oxygen started in the middle of XX century after invention of turbo-expanders – gadgets for liquidizing and separation of liquid air.

Oxygen is used:

* **in metallurgy**
* for pneumatic steelmaking.
* Oxygen-air mixture is used in most metallurgic machines instead of air for more effective fuel combustion in flares.

 Enriching of air by oxygen makes most technological processes based on the process of oxidation more effective, faster, efficient. These processes is the basis of thermal power engineering.

* Turning of cast iron into steel is also impossible without oxygen. The very oxygen takes out surplus of carbonium from cast iron. At the same time quality of steel becomes better.
* Oxygen is used in non-ferrous industry too.
* Bottle-oxygen is extensively used for flamecutting and metal welding.

By the way, acetylene is obtained on a larger scale by use of oxygen in particular during processes of thermal-oxidative cracking: 6СН4 + 4O2 = С2Н2 + 8Н2 + ЗСО + СO2 + ЗН2O.

* **as rocket fuel**
* Liquid oxygen and other combinations which contain a lot of oxygen are used as an oxidizer for rocket fuel.

 Mixture of oxygen and liquid nitro is one of the strongest oxidizers of rocket fuel. During hydrogenium combustion a very usual matter is formed – Н2O. Of course it was a mistake to combust oxygen (which is obtained more often form water) in order to obtain this matter. (который, кстати, часто именно из воды получают). You will understand the goal of this process if you look at the thermos-chemical equation of this reaction: Н2+0,5O2=H2O+68 317 calories.

Almost seventy big calories per one mole-rat of water. You can obtain not only a whole lot of water but also plenty of energy. Water in rocket engines operated on hydrogenium and oxygen is obtained for this.

* **in chemical industry**
* oxygen is used as a chemical-agent – oxidizer in numerous processes of synthesis, for example in a process of carboniums oxidizing into oxygenate compounds, of ammonia oxidizing in production of azotic acid.

 Oxygen is required for production of many other matters, for conversion of coal, oil, heating oil…

* Any porous combustible matter, for example cuttings when soaked by blue cold liquid – liquid oxygen become an explosive.

 Such matters are called oxyliquits and they can replace dynamite during mineral exploitations if necessary.

* **in medicine**
* oxygen is used for enrichment of respiratory gas mixtures used in case of irregular breathing.
* for asthma treatment.
* for compressed air disease.
* for preventive measures for hypoxia in the form of oxygen cocktails, oxygen cushions.
* subcutaneous injection of oxygen is an effective treatment of such serious diseases as gangrene, thrombophlebitis, trophic ulcers.
* **in food industry**
* oxygen is registered as food additive E948.
* used as a propellent.
* used as a wrapping gas.
* **in agriculture**
* for gaining weight of animals.
* For enriching of water environment by oxygen in a sphere of farming of fish.

Annual worldwide production (and consumption) of oxygen is evaluated in millions of tons, not taking into consideration oxygen we breathe with.

**The correspondents.** This is very important and necessary information!

The correspondents come to a table called “Knowledge source”.

**The correspondents:** Oh, look! A very interesting brochure – “Оne line about oxygen”! What is that? *(slide 23).*

**The researchers.** That is the brochure containing very interesting facts about oxygen. You should read it!

**«One line about oxygen» (interesting oxygen)**

All green of the planet forms about 3 trillion tons of oxygen per year.

One tree can form up to 125 kilos of oxygen per year.

Atmosphere of metropolises contain 18% of oxygen.

Several millions of years ago concentration of oxygen was almost 2 times more – 37-40%.

If there is less than 8% of oxygen in the air, it is considered to be a threat for life.

Fishes don’t need much oxygen.

But carp needs oxygen concentration of minimum 4 mg/l.

Oxygen is received by organs through the blood-vescular system.

The general carrier of oxygen in an organism is hemoglobin, which is contained in erythrocytes.

Eye corneas obtain oxygen right from the air.

Oxygen helps us to watch North Light.

We can obtain oxygen in small quantities from aurous oxides Au2O3 and Au2O.

**The correspondents.** Yes, oxygen is actually is everpresent and almighty! Now we really learnt everything about oxygen!

**The researchers.**No, dear correspondents. You haven’t learnt everything yet. Oxygen discloses new unknown pages about it.

**«What else don’t we know about oxygen?» (unknown oxygen)**

**The researchers.** We examine oxygen on the unknown part. While looking through old scientfic magazines and also surfing through the Internet we found interesting data about oxygen. We want everybody to know about it. (*slide 24*)

The researchers report about interesting facts about oxygen:

* Oxygenian injections into mould.
* Still there is oxygen on Mars.
* It’s all about oxygen.
* The richest.
* Oxygen was in the Universe since the moment it appeared.
* Oxygen appeared 2,5 billion years ago.
* Oxygen appeared due to moss.
* Oxygen appeared in the atmosphere of Earth 800 million years earlier, then it was thought to be earlier.
* Liquid oxygen is in the howels of Earth.
* Add a little bit of oxygen.

**The correspondents.** Well, the article is going to be very interesting. We are going to the editors office to write and publish the article.

**The teacher:** Our chemical laboratory is turning into the editors of “Inorganic chemistry journal” magazine, its english version «Russian journal of inorganic Chemistry».

The work is humming in the editors office: correspondents, editors, proofreaders, painters, graphic-designers are working. The chief-editor is taking part in the work (the teacher).

The prepared data is placed on the pages of the magazine (a big mould made of cardboard)

You can make a digital version of the magazine using Microsoft Publisher, a program for creating documents, FlippingBook Publisher Professional, a program for creating a digital magazine.

**The chief-editor (the teacher).** I express big gratitude to all the researchers, scientists, employees of the editors office (everybody are evaluated).

I suggest you the homework:find interesting facts about oxygen to fill in the page “What else don’t we know about oxygen”.

**The facts about unknown oxygen (examples)**

***«Oxygenian injections into mould»***

 Gas transpires from underground gas pipelines. Though leakage is not strong, gas can gradually be accumulated in mould cause slow destruction of trees and bushes put in on streets.

 According to “Science Journal” (1970 № 12) they fight against green destruction in Rotterdam the following way. They pump compressed air into mould around a tree using a usual compressor. Air pushes out the gas collected there and also prevents new gas cumulating. Several portions of such kind is enough to revive perishing trees.

 «Chemistry and life» 1971 № 8, page. 52.

***«Still there is oxygen on the Mars»***

 Though there is so few oxygen there. We are talking not about fixed oxygen, but about molecular one. Its formula is О2.

 It was found on Mars by E. Barner, scientist of Texas University of indicative spectral line. The scientist assumed that carbon oxide and water vapour can be sources of molecular oxygen.

 «Chemistry and life» 1973 № 7 page. 75.

***«It is all about oxygen»***

 Usually there are a lot of small sea maxillopods and shell-fishes in underwater bed. It was explained in different ways. Some biologists supposed that animals in “sargassa jungles” seek for savior from hunters. Others said that the reason of symbiosis of such kind is connected with leaves of plants which evolve oxygen in day time.

 Recently a decision was made to conduct an experiment concerning this theory in the underwater laboratory not far from Virgin Islands. During several weeks aquanaut-biologists have been working there relieving each other. They built up their own “jungle” on the sea bottom – the square covered with artificial grass and other imitation typical for the places of underwater green in this area. Cancroids and shell-fishes didn’t appear in the artificial “jungles”… Thus tiny fishes occupied the region of the “new building” hastily, not differentiating it from see grass. But shell-fishes and maxillopods appeared to be more selective: they needed both shelter and oxygen.

 «Chemistry and life» 1971 № 5 page. 69.

***«The richest»***

 Peroxide contains more oxygen than any combination known by science. Oxygen takes 95% from its weight. It is very important for science that during dissolving of Н2О2 first atomic oxygen is exhaled. It has more chemical activity than oxygen which is in the air surrounding us. They counted that 2 kilos of peroxide is enough to provide daily scale of water and oxygen for one cosmonaut.

 «Chemistry and life» 1972 № 1 page. 48.

***«Oxygen was a part of the Universe since the moment it appeared»***

Physicists from Japan made a statement that they managed to find out that oxygen was in the Universe almost since the moment it appeared: they made this conclusion watching one of the oldest galaxies.

«This galaxy contains tenth oxygen which contains in our Sun» - said one of the scientists, Naoki Yosida.

He and his colleagues observed galaxies which existed during one of the first periods of the Universe existence.

We need to specify that these galaxies are very distant and it is possible to observe them only using powerful telescopes.

So they found galaxy SXDF-NB1006-2, which contains not so much oxygen. But the fact of oxygen presence tells us that enough quantity of this element atoms was formed during explosions of supernovas and during thermonuclear reactions in subsoil assets of the stars.

[www.medikforum.ru](http://www.medikforum.ru)

***«Oxygen appeared about 2.5 billion years ago on Earth»***

A new research held by scientists of USA and Australian universities proves that oxygen appeared on our planet 100 million years earlier then it was thought earlier. Having analyzed old layers of rocks specialist made a conclusion that oxygen appeared on our planet about 2,5 billion years ago, i.e. 100 million years before brisk growth and breeding of biological species began. The specialists say that oxygen existed in the structure of the Earth before, but there was none of it in the atmosphere. It was thought previously that oxygen appeared in the atmosphere of the planet 2,3 – 2,4 billion years ago. At the same time oxidizing processes started. They led to life appearing. Though it is still unknown what was the reason of active appearance of oxygen in the atmosphere. Discovery of American and Australian scientists was made during analysis of rocks which exist 90 metres deep. According to Ariel Anbar science became perplexed with one question when this discovery was made, i.e. why active oxidizing processes started not initially after oxygen appeared but only 50 million years minimum later?

 <http://www.cybersecurity.ru>

***«Oxygen appeared on Earth due to mosses»***

August 18 2016

Oxygen appeared on our planet due to mosses. British scientists made this conclusion having conducted experiments using modern techniques of computer modelling.

The researchers clarify that modern type of oxygen appeared in the atmosphere more than 2,5 billion years ago. But only 400 million years ago its concentration in the air came to optimal level required for start of complex organizations.

Computer modelling demonstrated that mosses had the main role in this process. The specialists are sure that the mosses were one of the first plants on our planet. Among other characteristics they are thought to take a role of colonizers. And they have been colonizing for a long time. Because due to them percentage of oxygen in the atmosphere decreased gradually and that was that very push for life evolution.

The bryophets, first elementary mosses, have big influence in this process. Nowadays oxygen takes 21% in the atmosphere. Generally speaking the process of air fulfillment have been lasting for 50 million years.

 <http://www.trkterra.ru>

***Oxygen appeared 800 million years earlier in the atmosphere, than it was thought previously.***

OSLO, March, 24 2016. /Corr. TASS Yuriy Michailenko/. According to sciencenordic.com, Scandinavian scientific web-site free oxygen was in the atmosphere of Earth 3,8 billion years ago. It is 800 million years earlier than some of the researchers thought. This conclusion was made by a group of scientists under the leadership of Robert Fry, professor of Copenhagen University. Fry made this conclusion having conducted an isotopic analysis of banded iron ore formations located on the west of Greenland the oldest rocks found on the planet. Their age is 3,7-3,8 billion years. He found out that uranium and especially chrome isotopes types found in them reflect that these metals have already been oxidized. Presence of oxygen in the atmosphere (though in small quantities) is the most evident explanation to this fact. "Frankly speaking, I was shocked with the obtained results, when I first checked them. We are dealing with a very delicate sphere of science, geological evidences relating not so much to that period of time. Most part of scientific community doesn’t believe in existence of free oxygen in that age. I had to listen to many critical opinions of colleagues. I spent more than a year to publish this article. But I conducted very thorough calculations having examined a number of samples and I’m sure in their accuracy” – says Fry.

[www.tass.ru](http://www.tass.ru)

***«Liquid oxygen in the subsoils of Earth»***

February 17 2016

Russian and German found unknown layers in mantle of Earth. They contain great amount of liquid oxygen. It was found during an experiment with a laser press-anvil held in DESY, German synchrotron center. They published this information in their article in “Nature Communications” magazine.

"By our evaluations this layer contains 8-10 times more oxygen than atmosphere of Earth. It was a real surprise for us and we still don’t know what is going on with these “oxygen rivers” in subsoils of the planet” — said Elena Bykova, a scientist from Bayreuth University (Germany).

Bykova and her colleagues found an unexpected source and accumulation of oxygen in the subsoils of Earth when observing reactions of different types of iron oxides on different temperatures and levels of pressure. These iron oxides is on the basic components of deep rocks.

According to the scientists iron oxide constitutes hematite under usual conditions – a composition of iron atoms and three atoms of oxygen. According to Bykova, lately chemists and physicians discovered some new “versions” of iron oxide, which are formatted under high pressure and temperature and contain exotic number of atoms - Fe4O5, Fe5O6, or for example Fe13O19.

Having examined how hematite and its “magnetic” namesake Fe3O4 behave under conditions imitating the core and mantle of the Earth having squeezed them by laser “gripes” [PETRA III](http://petra3.desy.de/index_eng.html) till the level of pressure, exceeding the atmospheric 670 thousand times. This atmosphere led to decomposition hematite and formation of a new iron oxide Fe5O7 under levels of pressure and temperature corresponding to level of depth 1500 km. Further squeezing led to formation of one more unknown oxide Fe25O32. As the researchers say both conditions led to ejection of a big mass of oxygen, which turns into liquid not gas on such depth and under this level of pressure.

Bykova and her colleagues have an opinion that streams of this liquid often flow through mantle of earth at the points containing accumulations of magnetite and hematite, which were formed on the sea bottom “flow” with other matter of mantle and bark to the core of the earth.

The future of this oxygen is unknown – these oxygen “rivers” can both interact with the rocks and oxidise them and rise to higher layers of the mantle and even higher.

[www.science.dirty.ru](http://www.science.dirty.ru)

***Add a little bit of oxygen***

Very often we feel sudden irresistible tiredness, our head fills with heaviness, our thoughts get confused, we want to sleep so much…Such kind of disposition is not taken as a disease, but it disturbs us from a usual way of life and work. Most people hurry to take a pill from headache and go to a kitchen to make a cup of strong coffee. And what if you feel a slight lack of oxygen? As you know earth atmosphere is chemically neutral gas – nitro up to 78%, oxygen takes almost 21%, basic element for life. But it was not always like that *(slide 25)*. According to modern researching, 150 years ago oxygen took 26% of the air and during prehistoric age dinosaurs breathed with air containing more than one third of oxygen. Nowadays all inhabitants of Earth suffer from chronic lack of oxygen – hypoxia. Especially its not easy for inhabitants of cities. So, underground (in the underground, passages and underground trade centers) oxygen concentration is 20,4%, in high rise buildings – 20,3%, and in the chock-full car of above-ground transport it is only 20,2%. It is well-known that increase of oxygen in the air we breathe till the level defined by nature (about 30%) influences beneficially on man health. Not in vain cosmonauts of the International Cosmic station breathe with air having 33% of oxygen. How can we save ourselves from hypoxia? Among inhabitants of Japan so called “oxygen bars” became popular recently. It is like a coffee-house. Everybody who wants can come in and having paid cash can breathe with air enriched with oxygen for 20 minutes. Hematoglobulin contained in red blood cells – erythrocytes is the basic transporter of oxygen in an organism. The more oxygen erythrocytes deliver to cells of the organism, the more intensive metabolism is in general: fats and also matters harmful for the organism “burn”; lactic acid (accumulation of this matter in muscles causes symptoms of tiredness) gets oxidized; new collagen is synthesized in cells of skin; bloodstream and breathe are improved. That is why increasing of oxygen concentration in the air we breathe with get us rid of tiredness, drowse and giddiness, decreases gasp, improves memory and attention and sleep.

Doctor of chemistry O. BELOKONEVA [www.nkj.ru](http://www.nkj.ru)

**Технологическая карта урока**

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| --- | --- | --- |
|  | Предмет | Химия |
|  | Класс | 8 |
|  | Базовый учебник | Н.Е. Кузнецова, И.М. Титова, Н.Н. Гара, А.Ю. ЖегинХимия – 8. М., ИЦ Вентана-Граф или Химия. 8 класс. Рудзитис Г.Е., Фельдман Ф.Г. М., Просвещение |
|  | Тема урока | Создание «Журнала неорганической химии», его английской версии «Russian journal of inorganic Chemistry» и написание статьи «Знакомый и незнакомый кислород» |
|  | Тип урока | Обобщение и систематизация знаний (Урок творчества на английском языке). |
|  | Цели урока в соответствии с планируемыми результатами. | *Предметные:* закрепить знания учащихся о свойствах кислорода, областях его применения, способах получения.Формировать умения учащихся устанавливать соответствие между свойствами и применением кислорода.*Метапредметные:* формировать умения школьников устанавливать соответствие между свойствами кислорода и областями его применения. Формировать у школьников умения владения устной речью, монологической контекстной речью. Учить школьников логически рассуждать, правильно и грамотно выражать свои мысли, делать верные выводы.Формировать у школьников умения произносить научные тексты на английском языке, поддерживать и вести беседу на английском языке.*Личностные:* формировать умения организовывать учебное сотрудничество с учителем и сверстниками, работать индивидуально. Формировать у учащихся навыки основ экологической культуры и экологического мышления.Воспитывать творческие способности. |
|  | Межпредметные связи | Литература, физика, английский язык. |
|  | Виды используемых ИКТ | *Лабораторные:* спиртовка, спички, пробирки, перекись водорода, магниевая лента, лучинка.*Аппаратные:* компьютер, программа презентаций Power Point, Презентация 2 «Создание «Журнала неорганической химии», его английской версии «Russian journal of inorganic Chemistry» и написание статьи «Знакомый и незнакомый кислород». Программа создания документов Microsoft Publisher, программа создания электронного журнала FlippigBook Publisher Professional. |
|  | Материалы и оборудование | Спиртовка, спички, пробирки, перекись водорода, магниевая лента, лучинка. |
|  | Список используемой литературы | *1.* Гин А.А. Приёмы педагогической техники: пособие для учителя. — Издательство «Вита Пресс», 2009.*2.* Кульневич С.В., Лакоценина Т.П. Современный урок. Часть II: Не совсем обычные и совсем необычные уроки: научно-практическое пособие для учителей, методистов, руководителей учебных заведений, слушателей ИПК. — Ростов–н/Д: Издательство «Учитель», 2005.*3.* Кузнецова Н.Е., Титова И.М., Гара Н.Н., Жегин А.Ю. Химия: 8 класс: учебник для учащихся общеобразовательных учреждений. — М.: ИЦ «Вентана-Граф», 2005.*4.* Химия. 8 класс. Рудзитис Г.Е., Фельдман Ф.Г. М., Просвещение 2011.*5.* Пак М.С. Основы дидактики химии: Учебное пособие. СПб.: Издательство РГПУ им. А.И. Герцена, 2004.*6.* Хуторской А.В. Современная дидактика: Учебное пособие. М.: Высшая школа 2007.*7.* Журналы – «Наука и жизнь», «Химия и жизнь», журнал «Знание» №4 1978.*8.* В. И. Бгатов «История кислорода земной атмосферы»Интернет-ресурсы: [www.n-t.ru](http://www.n-t.ru), [www.facty.by](http://www.facty.by), [www.elementy.ru](http://www.elementy.ru), [www.critical.ru](http://www.critical.ru), [www.ebaumsworld.com](http://www.ebaumsworld.com). |

**Структура и ход урока**

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| **№** | **Этапы урока**  | **Деятельность учителя** | **Деятельность учащихся** | **Планируемые результаты (включая УУД)** |
| 1. | Организационныймомент (1ʹ) | Приветствие учащихся. Проверка готовности учащихся к уроку. | Приветствие учителя. |  |
| 2. | Вступительное слово учителя (3ʹ). | \*Ставит задачу урока:Сегодня у нас необычный урок. А говорить мы будем о самом обычном и одновременно удивительном веществе. Обычном, потому что его знают все, его изучают во всех школах мира. Удивительном, потому что только это вещество называют «вездесущим» и «всемогущим». В начале XIX века оно именовалось «кислотвором». Сэр Кенельми Дигби, член Лондонского королевского общества, назвал это вещество «скрытая пища жизни», а Джозеф Пристли назвал его «предметом роскоши».  |  |
| \*Вопрос к учащимся:Какому веществу мы посвящаем наш урок? | Учащиеся отвечают. |
| \*Представляет группы исследователей.\*Сообщает о прибытии иностранных корреспондентов.\*Сообщает о том, что урок будет проходить на английском языке. |  |
| \*Мы слушаем и обсуждаем сообщения о кислороде. А также вы делаете записи в тетрадях. | Делают краткие записи об услышанном в тетрадях. |
| 3. | Выступления учащихся (37ʹ). |  | \*Корреспонденты представляются.\*Читают стихотворение *(слайд 6).*\*Выступает группа исследователей 1 **«Кто, когда и как»;** **«Who, when and how?» *(Discovery of oxygen)*** ***(открытие кислорода, слайды7, 8,9).***\*Выступает группа исследователей 2 **«Он везде и всюду»; «It is everywhere around us» *(oxygen in nature)*** ***(кислород в природе,* *слайд 10).***\*Выступает группа исследователей 3 **«А какой он?»;** **«What is it like?» *(physical features of oxygen)*** ***(физические свойства, слайд 11, парамагнитные свойства, слайд 12).***\*Выступает группа исследователей 4 **«Мы сами получим кислород»;** **«We will obtain oxygen by ourselves» *(ways and methods of getting it)*** ***(способы и методы получения,* *слайды 13, 14, 15, 16).***\*Выступает группа исследователей 5 **«Он дружит со всеми»;** **«He is a friend for everybody» *(chemical properties of oxygen)*** ***(химические свойства,* *слайды 17, 18, 19, 20).***\*Исследователи.Совершенно верно!Кислород везде и всюду.Он нужен всем, всем, всем.Без него нет жизни, это знают все! *(слайд 21)*\*Выступает группа исследователей 6 **«Кислород нужен всем»;** **«Everybody needs oxygen» *(usage of oxygen)*** ***(применение кислорода,* *слайды 22).***\*Выступает группа исследователей 7 **«О кислороде одной строкой»;** **«One line about oxygen» *(interesting oxygen)*** ***(интересный кислород,* *слайды 23).***\*Выступает группа исследователей 8 **«Чего мы ещё не знаем о кислороде»; «What else don’t we know about oxygen?» *(unknown oxygen)* *(неизвестный кислород,* *слайды 24).*** |  |
| 4. | Слово учителя (1ʹ). | \*Наша химическая лаборатория превращается в редакцию журнала «Журнала неорганической химии», его английской версии «Russian journal of inorganic Chemistry». | \*Учащиеся становятся корреспондентами, редакторами, корректорами, художниками – оформителями.\*Используя домашние заготовки пишут статью на русском и английском языках и помещают её на страницы журнала (большая раскладка из картона). |
| 5. | Оценка результатов урока. (2ʹ) | \*Подводит итоги урока, оценивает выступления учащихся, а также тех, кто участвовал в обсуждении, оценивает работу учащихся-корреспондентов.  |  |
| 6. | Задание на дом. (1ʹ) | \*Найдите интересные сведения о кислороде, чтобы пополнить страницу «Чего мы не знаем о кислороде». |  |  |