

Methodology for Conducting A Lesson on the Topic «Electric Current in Gases»

Absalyamova Ilmira Ildarovna,

Assistant

Abdullaeva Shoira Isajanovna,

Assistant

Ochilova Ozoda Odilovna,

PhD of Technical Sciences, Associate Professor,

Ashirbayeva Almagul Kurbanbekovna,

Assistant

Tashkent university of information technologies named after Muhammad Al-Khorezmiy

Annotation. The article deals with the issues of teaching the topic «Electric current in gases», development of educational and cognitive motivation and interest in this topic, development of the ability to exercise reflection in relation to actions to solve educational and cognitive problems.

Keywords. physics, subject teaching, problem solving, scientific knowledge, individual work, learning of students, learning effectiveness.

Lesson on the topic: "Electric current in gases." The purpose of the lesson: developing the skills of applying theoretical knowledge to solve problems (Electric current in gases). Tasks: educational: update previously acquired knowledge; identify the degree of assimilation of the material;

reinforce problem solving skills:

calculated, qualitative and experimental;

improve the ability to conduct an experiment and establish cause-and-effect relationships;

developing:

continue to develop the ability to analyze the conditions of tasks and answers, draw conclusions, highlight the main thing, compare, generalize. To improve the erudition of schoolchildren;

educational:

to cultivate a culture of communication when working in groups in combination with the independent activities of students;

develop a responsible attitude towards learning.

The type of the lesson is the lesson of consolidating the studied material (solving physical problems).

Methods and techniques: verbal, visual, practical, research.

Used technologies: information, personality-oriented, health-saving.

Equipment: cards with an individual task; task cards for group work; test program prepared using Power Point; electronic presentation of the lesson, current sources, ammeters, rheostats, keys, pads with wire different sections and resistivity, computer, screen, projector.

Lesson plan:

1. Organizational moment (1 min).
2. Updating knowledge (7 min).
3. Problem solving (15 min).
4. Fizminutka (1 min).
5. Solution of experimental problems in groups (8 min).
6. Individual survey using the Power Point test (6 min).
7. Summing up the lesson, homework (2 min).

During the classes.

- Organizational moment, greeting
- greetings;
 - checking attendance;
 - students are informed of the objectives of the lesson, as well as the organization of educational activities during the lesson.
- Knowledge update.

Epigraph:

“The day before yesterday we did not know anything about electricity, yesterday we did not know anything about the huge reserves of energy contained in the atomic nucleus, which we do not know today?”

/Louis de Broglie/

Electric current in a gas is a directed movement of positive ions to the cathode, and negative ions and electrons to the anode.

- The process of mutual neutralization of ions is called ion recombination.
- When positive and negative ions collide, the negative ion can donate its excess electron to the positive ion and both ions will turn into neutral atoms.
- When a positive ion and an electron or two ions recombine, a certain energy is released, equal to the energy spent on ionization.

Partially, it is emitted in the form of light, and therefore the recombination of ions is accompanied by luminescence (luminescence of recombination).

- The process of passage of electric current in gases is called a gas discharge.

Discharges are of two types:

- Independent - a discharge that occurs without anyone's help in gases.
- Non-self-sustained - a discharge that occurs in gases with the help of an ionizer.
- Ionizers are factors that cause gas ionization.

Factors include:

- heating the gas to a high temperature;
- x-rays;
- rays arising from radioactive decay;
- cosmic rays;
- bombardment of gas molecules by fast moving electrons or ions.



Non-self discharge

- The electrical conductivity of the gas is created by external ionizers;
- With the termination of the action of external ionizers, the non-self-sustained discharge ceases.
- Non-self-sustained gas discharge is not accompanied by gas glow.

Self discharge

For its implementation, it is necessary that as a result of the discharge itself, free charges are continuously formed in the gas. The main source of free charges is the impact ionization of gas molecules.

Positive ions formed during the collision of electrons with neutral atoms, when moving towards the cathode, acquire a large kinetic energy under the action of the field. When such fast ions hit the cathode, electrons are knocked out from the cathode surface.

In addition, the cathode may emit electrons when heated to a high temperature. This process is called thermionic emission. It can be considered as the evaporation of electrons from the metal. In many solid substances, thermionic emission occurs at temperatures at which the evaporation of the substance itself is still small. Such substances are used for the manufacture of cathodes.

Types of independent discharges

Depending on the properties and state of the gas, the nature and location of the electrodes, as well as the voltage applied to the electrodes, various types of self-discharge occur.

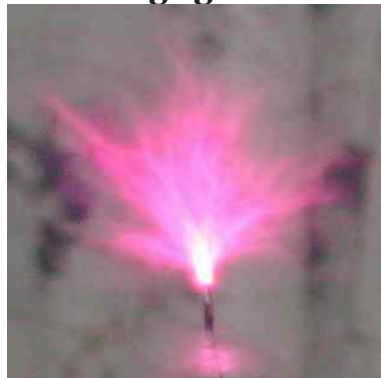
Glow discharge

A glow discharge is observed in gases at low pressures of the order of several tens of millimeters of mercury and less.

The main parts of a glow discharge are the cathode dark space, the negative, or glow, sharply distant from it, which gradually passes into the region of the Faraday dark space. These three regions form the cathode part of the discharge, followed by the main luminous part of the discharge, which determines its optical properties and is called the positive column.

At sufficiently low pressures, electrons knocked out of the cathode by positive ions pass through the gas almost without collisions with its molecules, forming electron or cathode rays.

Type of glow discharge. **Glow discharge generated by a generator**



Application of glow discharge

Glow discharge is used in gas-light tubes, fluorescent lamps, voltage stabilizers, to obtain electron and ion beams.

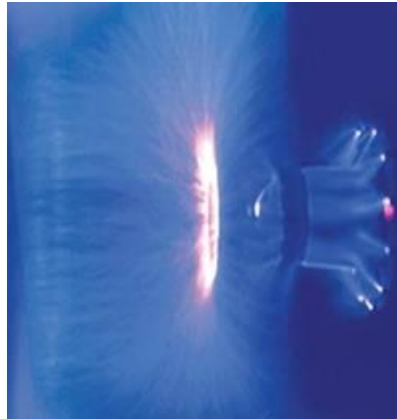
If a slit is made in the cathode, then narrow ion beams, often called channel beams, pass through it into the space behind the cathode

The phenomenon of cathode sputtering is widely used, ie. destruction of the cathode surface under the action of positive ions hitting it.

Ultramicroscopic fragments of the cathode material fly in all directions along straight lines and cover the surface of bodies (especially dielectrics) placed in a tube with a thin layer.

In this way, mirrors are made for a number of devices, a thin layer of metal is applied to selenium photocells.

Glow discharge in production



Corona treatment of surfaces

Corona discharge

Corona discharge occurs at normal pressure in a gas in a highly inhomogeneous electric field (for example, near spikes or wires of high voltage lines).

During a corona discharge, gas ionization and its glow occur only near the corona electrodes. In the case of cathode corona (negative corona), electrons that cause impact ionization of gas molecules are knocked out of the cathode when it is bombarded with positive ions.

If the anode corona (positive corona), then the birth of electrons occurs due to photoionization of the gas near the anode.

Corona - a harmful phenomenon, accompanied by current leakage and loss of electrical energy. To reduce corona, the radius of curvature of the conductors is increased, and their surface is made smoother.

Type of corona discharge



A special case of corona discharge – carpal

With increased voltage, the corona discharge on the tip takes the form of light lines coming from the tip and alternating in time. These lines, which have a number of kinks and bends, form a kind of brush, as a result of which such a discharge is called a brush discharge.

Corona has to be considered when dealing with high voltage. If there are protruding parts or very thin wires, corona discharge can start. This results in power leakage.

The higher the voltage of the high voltage line, the thicker the wires should be.

A special case of corona discharge – carpal

With increased voltage, the corona discharge on the tip takes the form of light lines coming from the tip and alternating in time. These lines, which have a number of kinks and bends, form a kind of brush, as a result of which such a discharge is called a brush discharge. Corona has to be considered when dealing with high voltage. If there are protruding parts or very thin wires, corona

discharge can start. This results in power leakage. The higher the voltage of the high-voltage line, the thicker the wires should be.



Saint Elmo's fire

A charged thundercloud induces electric charges of the opposite sign on the Earth's surface under it. A particularly large charge accumulates on the tips. Therefore, before a thunderstorm or during a thunderstorm, cones of light like brushes often flare up on the points and sharp corners of highly raised objects. Since ancient times, this glow has been called the fires of St. Elmo. Especially often climbers become witnesses of this phenomenon. Sometimes even not only metal objects, but also the ends of the hair on the head are decorated with small luminous tassels.

Saint Elmo's fires before a thunderstorm in the ocean



Spark discharge

A spark discharge has the form of bright zigzag branching filaments-channels that penetrate the discharge gap and disappear, being replaced by new ones. The spark discharge channels begin to grow sometimes from the positive electrode, sometimes from the negative, and sometimes from some point between the electrodes. A spark discharge is accompanied by the release of a large amount of heat, a bright glow of gas, crackling or thunder. All these phenomena are caused by electron and ion avalanches that occur in spark channels and lead to a huge increase in pressure, reaching 10^7 – 10^8 Pa, and an increase in temperature up to 10,000 C.



Application of spark discharge

With a small length of the discharge gap, the spark discharge causes a specific destruction of the anode, called erosion. This phenomenon was used in the electrospark method of cutting, drilling and other types of precision metal processing.

The spark gap is used as a surge protector in electrical transmission lines (eg telephone lines).

An electric spark is used to measure large potential differences using a spherical spark gap, the electrodes of which are two metal balls with a polished surface.

Electric spark machine



A typical example of a spark discharge is lightning

The main channel of the lightning has a diameter of 10 to 25 cm, and the length of the lightning can reach several kilometers. The maximum current of a lightning pulse reaches tens and hundreds of thousands of amperes.

Lightning are linear and ball

Ball lightning is a single brightly luminous, relatively stable, small mass that is observed in the atmosphere, floating in the air and moving along with air currents, containing great energy in its body, disappearing quietly or with great noise like an explosion, and leaving no traces after its disappearance. material traces, except for the destruction that she managed to do.



How to behave during a thunderstorm?

- It is impossible to take shelter in a thunderstorm near lonely standing trees, poles and other high local objects, it is necessary to move 15 meters away;
- It is dangerous to be in or near water;
- It is impossible to pitch a tent near the water, as lightning often strikes the river banks;
- Never underestimate the danger of lightning;
- If a thunderstorm caught you in a car, do not get out of it. Close all doors and windows and wait out the bad weather inside;
- Being in a country house during a thunderstorm, disconnect electrical appliances from the network, and the TV from an individual antenna. Lightning rarely strikes shrubs, almost never hits maple and birch, most often hits oak and poplar.

Line lightning



Arc discharge

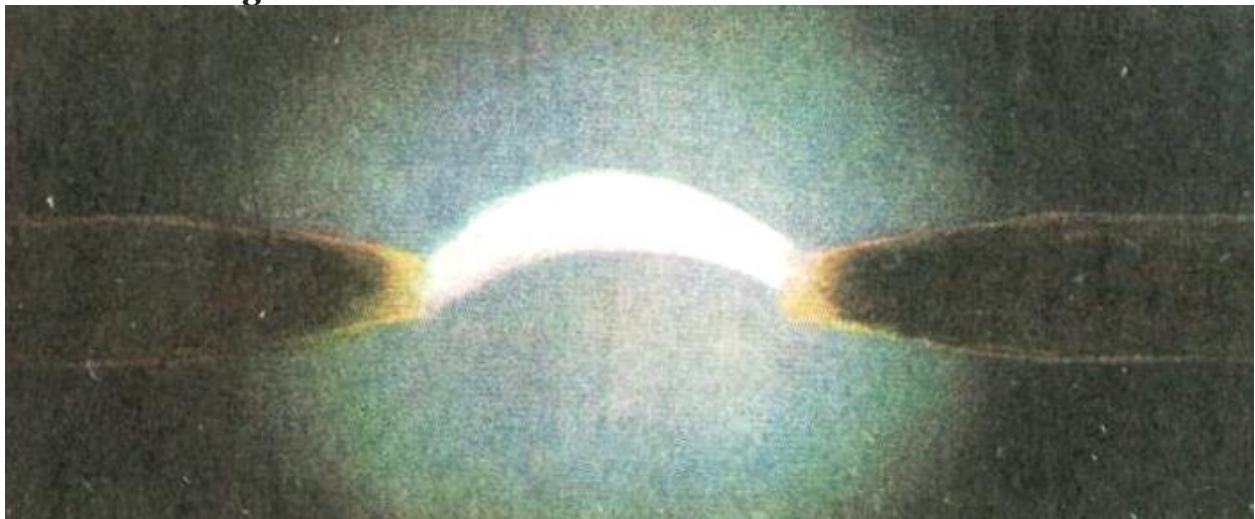
The arc discharge was discovered by VV Petrov in 1802. This discharge is one of the forms of gas discharge, which occurs at a high current density and a relatively low voltage between the electrodes (on the order of several tens of volts).

The main cause of the arc discharge is the intense emission of thermionic electrons by a hot cathode. These electrons are accelerated by an electric field and produce impact ionization of gas molecules, due to which the electrical resistance of the gas gap between the electrodes is relatively small.

In some cases, an arc discharge is also observed at a relatively low cathode temperature (mercury arc lamp).

The arc discharge has found application in a mercury rectifier, which converts alternating electric current into a direct current.

Type of arc discharge



Application of an arc discharge

In 1876, P. N. Yablochkov first used an electric arc as a light source.

Arc discharge is used as a light source in projectors and projectors.

The high temperature of the arc discharge allows it to be used in an arc furnace. Arc furnaces, powered by a very high current, are used in a number of industries: for the smelting of steel, cast iron, ferroalloys, bronze, the production of calcium carbide, nitrogen oxide, etc.

In 1882, N. N. Benardos was the first to use an arc discharge for cutting and welding metal.

In 1888, N. G. Slavyanov improved this welding method by replacing the carbon electrode with a metal one.

Arc welding in production

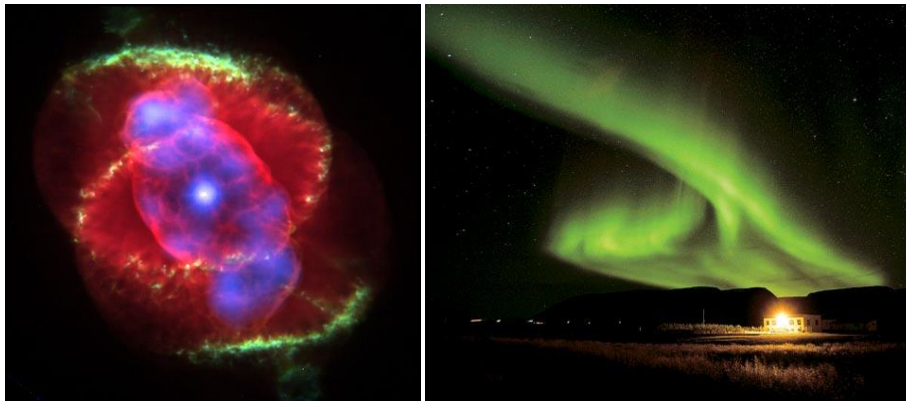


Plasma

Plasma is a partially or fully ionized gas in which the densities of positive and negative charges are almost the same. Thus, plasma as a whole is an electrically neutral system. The quantitative characteristic of plasma is the degree of ionization.

Depending on the degree of ionization, plasma is subdivided into weakly ionized (a fraction of a percent), partially ionized (about a few percent) and fully ionized (close to 100%). Weakly ionized plasma in natural conditions are the upper layers of the atmosphere - the ionosphere. The sun, hot stars, and some interstellar clouds are fully ionized plasma that forms at high temperatures.

This is how plasma is formed



Plasma applications

Low-temperature plasma is used in gas-discharge light sources - in luminous tubes for advertising inscriptions, in fluorescent lamps. A gas discharge lamp is used in many devices, for example, in gas lasers - quantum light sources.

High temperature plasma is used in magnetohydrodynamic generators. Recently, a new device has been created - a plasma torch. The plasmatron creates powerful jets of dense low-temperature plasma, which are widely used in various fields of technology: for cutting and welding metals, drilling wells in hard rocks, etc. Xenon or neon in ionized state for TV.



Plasma in the kitchen



Consolidation (transfer the table to a notebook and fill out):

The view is independent discharge	Receipt condition	Application in production	Application in everyday life	Examples

6. Individual survey using the Power Point test. Performing a test using a computer. Each child sits down at a separate computer (the lesson is held in the office.

Informatics) and executes a test program, which includes the test execution time and independent self-grading for the completed test.

Summing up the lesson, homework.

Teacher:

Well done boys! You did a good job!

Grading.

Homework.

Teacher:

Thank you for your work!

See you soon! All the best!

Literature

1. Коменский Я. А. «Великая дидактика» (избр. главы (по хрестоматии М.: Просвещение, 1988))
2. Л.В.Голиш, Д.М.Файзуллаева «Педагогик технологияларни лойihalаштириш ва режалаштириш». Т. 2010 й, 149-б.
3. A.N. Remizov “Tibbiy va biologik fizika” “O'zbekiston milliy ensiklopediyasi” Davlat ilmiy nashriyoti Т. 2005 у, 592-b
4. Ишмухамедова Р.Ж. Инновацион технологиялар ёрдамида таълим самарадорлигини ошириш йўллари. Т: ТДПУ, 2004. - 44 б.
5. M.F. Atoyeva. Use of Periodicity in Teaching Physics. Eastern European Scientific Journal. – Düsseldorf-Germany, 2017. № 4. –P. 35-39.
6. <https://4brain.ru/pedagogika/principy-didaktiki.php>
7. Лукашик В.И., Иванова Е.В. «Сборник задач по физике 7-9», Москва, «Просвещение» 2004
8. Марон А.Е., Марон Е.А «Дидактические материалы. Физика», Москва, «Дрофа», 2009.
9. Степанова Г.Н. «Сборник задач и вопросов по физике 7-8», Санкт-Петербург, «Специальная литература», 1995.
10. BV.Muzaffarovna, MM Usmonovna The issue of equivalence in English and Uzbek proverbs. Middle European Scientific Bulletin Volume 5 October 2020 ,93
11. VM Bozorova . Easy to Use Interactive Methods of Distance Learning Foreign Languages. Science and Practice: A New Level of Integration in the Modern World .DOI: http://doi.org/10.15350/UK_6/11
12. V.M. Bozorova . THE DESCRIPTION OF SOCIAL ISSUES IN “THOUSANDS SPLENDID SUNS”. Theoretical & Applied Science Volume 81, Issue 01, Philadelphia, USA, January 30,2020, p 422-425
13. KVF Maksudova Mokhigul Usmanovna, Bozorova Viloyat Muzaffarovna. Pedagogical Process of Teaching in Higher Education Institutions. International Journal of Recent Technology and Engineering (IJRTE) Volume 8, Issue 3S
14. B.M. Bozorova . Развитие терминов изобразительных искусство. Учёный XXI века. Международный научный журнал . 2019, 3 (50), ст 67-69
15. V.M. Bozorova. The Use of Psychology in Literary Genres. International Journal on Integrated Education Volume 3, Issue2, Feb 2020,e- ISSN:2620 3502 ,p- ISSN:n2615 3785
16. Bozorova Viloyat Muzaffarovna, Maqsudova Mohigul Usmonovna. Alienation as a form of self-protection; the painfulness of growing up in the book “The Catcher in the Rye” of J.D. Salinger. International Journal of Integrated Education Volume 4, Issue 3, March 2021 e- ISSN:26203502, p- ISSN: 2615 3785, p 189-192
17. Maqsudova Mohigul Usmonovna. Character of Maggie in George Eliot’s “The Mill on the Floss”. Til, adabiyot, tarjima, adabiy tanqidchilik xalqaro ilmiy forumi: zamonaviy yondashuvlar va istiqbollar mavzusidagi xalqaro amaliy-ilmiy anjumani materiallar to'plami Buxoro 2021
18. Bozorova Viloyat Muzaffarovna. Modern Approches and Innovations in teaching Englishbin Primary Schools. Til, adabiyot, tarjima, adabiy tanqidchilik xalqaro ilmiy forumi: zamonaviy yondashuvlar va istiqbollar mavzusidagi xalqaro amaliy-ilmiy anjumani materiallar to'plami Buxoro 2021